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A Study on the Development of Railway Logistics Business Model and Track Capacity*

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Abstract

Purpose: This study attempts to analyze the current status of the railway logistics business and to seek ways to improve it by using the business model as an analytical framework. It was intended to reflect practical implications that could be applied to the field, by dealing with issues at the industrial site related to each component in the business model. **Research design, data and methodology:** This study was conducted through literature review and field research. We analyzed academic papers and industrial reports on the development of the railway logistics industry and interviewed various stakeholders in the railway logistics industry. **Results:** This study determined the factors that could be eliminated, raised, reduced, or created from the customer and product perspective, infrastructure management perspective, and financial perspective. **Conclusions:** The growth of existing business can be achieved by lowering service prices, improving service quality, and securing large-scale transportation capacity. The additional transportation of high value goods and cold chain commodities will be promising business opportunities. Existing services can be provided to new customers (large pre-shippers, forwarding customers, etc.) in order to increase the size of sales Urban delivery services and comprehensive logistics services based on complex logistics centers may open an avenue for new market. A more timetable and track capacity need to be assigned to logistics, which significantly improve the flexibility and the competency of railway logistics.

Keywords: Railway Logistics, Customer, Product, Infrastructure, Financial

JEL Classification Code: L92, M10, M38, R42

1. Introduction

The government recently announced the 2nd Railway Logistics Industry Promotion Plan, which is the culmination of the official five-year plan that was established to enhance the competitiveness of the railway logistics industry and revitalize it. Since the first promotion plan for the railway logistics industry, efforts have been made to seek alternative logistics systems that break away from the current roadway-centered logistics system and establish an environmentally friendly logistics system in response to climate change.

While the size and volume of the logistics industry have continued to grow, the rate of transportation by railways within the national logistics system has plummeted. This is due to an increase in roadways, which has led to an increase in truck freighting. Furthermore, the competitiveness of rail

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transportation has decreased in comparison to road transportation. Despite long-standing efforts to improve railway logistics, there has been few noticeable improvements because railway operations are centered on the passenger business. Additionally, it is hard to find an appropriate support from the government policy.

Since railway logistics transport is an environmentally friendly means of transportation, developed countries such as the EU and Japan have been actively using it to reduce greenhouse gas emissions. Korea needs to actively use railway logistics as well to respond to environmental pollution and climate change issues across the nation. Additionally, Korea needs to prepare for the expansion of the international railway market, such as with the Eurasian Railway.

Many studies have investigated methods to strengthen the railway logistics industry. These studies have discussed the problems facing the railway logistics industry and ways to resolve them. They have proposed measures to objectively and professionally diagnose the issues of the railway logistics industry and suggest solutions for them. Nevertheless, despite the numerous studies and efforts to strengthen the railway logistics industry, noticeable improvement has not been achieved. This is because of the restrictions arising from the preference for partial improvements to maintain the existing railway logistics business model. For noticeable improvements to the railway logistics industry, innovative enhancements that modify and supplement the existing railway logistics business model are required. Unlike previous studies, this study discusses the tasks necessary for the development of the railway logistics industry from the perspective of developing a new business model as well as improving the existing business model. To this end, both literature review and filed research was conducted in parallel.

Therefore, this study attempts to analyze the railway logistics business and improve it by using the business model as an analytical framework. Furthermore, this study provides practical suggestions that could be applied to the field by considering issues at the industrial site for each component constituting the business model. In addition, when railway logistics achieve considerable market share, the more trains need to be assigned to railway logistics. The appropriate allocation of train timetable and track capacity will be discussed in order to facilitate the railway logistics.

This study comprises four main parts. Following the introduction, the literature review examines the state of the railway logistics sector and the railway logistics business model. The railway logistics industry is then analyzed utilizing its business model as a framework. Finally, based on the findings of the investigation, the target business model and growth strategy for railway logistics are discussed.

2. Literature Review

2.1. Status of the Railway Logistics Industry

2.1.1. Road and Rail Transport

The trend of ton-based transportation and transport distribution of roads and railways suggest a generally rising trend for roads, while railway transportation has consistently been on the decline. The transport distribution of roads increased by 3.1% from 89.7% in 2011 to 92.8% in 2020. However, the transport distribution of railways declined continuously by 1.1% from 2.5% in 2011 to 1.4% in 2020.

Table 1: Trends in Land Freight Volume and Share per Ton

Year	Entire Transport	Roadways		Railroads	
		TV*	DR**	TV*	DR**
2011	1,605,506	1,439,625	89.7	40,012	2.5
2012	1,714,141	1,554,510	90.7	40,309	2.4
2013	1,704,342	1,546,407	90.7	39,822	2.3
2014	1,668,282	1,512,700	90.7	37,379	2.2
2015	1,927,284	1,761,291	91.4	37,094	1.9
2016	1,975,641	1,799,565	91.1	32,555	1.6
2017	2,028,558	1,854,011	91.4	31,670	1.6
2018	2,036,246	1,895,686	93.1	30,915	1.5
2019	1,983,572	1,847,241	93.1	28,664	1.4
2020	1,926,888	1,788,917	92.8	26,277	1.4

Source: National Transportation Database (www.ktdb.go.kr), National Transportation Statistics
Note:* Transportation Volume(1,000 tons), ** Distribution Ratio (%)

The trend and distribution of transportation by road and rail (based on ton-km) showed that transportation by road is increasing, while transportation by rail is decreasing.

Table 2: Trends in Land Freight Volume and Share per Ton-km

Year	Entire Transport	Roadways		Railroads	
		TV*	DR**	TV*	DR**
2011	141,808	104,476	73.7	9,997	7
2012	147,713	111,529	75.5	10,271	7
2013	159,621	118,582	74.3	10,459	6.6
2014	164,225	124,650	75.9	9,564	5.8
2015	173,814	132,382	76.2	9,479	5.5
2016	180,824	135,259	74.8	8,414	4.7
2017	182,570	140,374	76.9	8,229	4.5
2018	179,794	143,530	79.8	7,878	4.4
2019	175,094	139,862	79.9	7,357	4.2
2020	171,006	135,446	79.2	6,652	3.9

Source: National Transportation Database (www.ktdb.go.kr), National Transportation Statistics
Note:* Transportation Volume(1 million tons), ** Distribution Ratio (%)

The volume and distribution of transportation by road show a general increase; the distribution of transportation by road increased by 5.5% from 73.7% in 2011 to 79.2% in 2020. On the other hand, the volume and distribution of transportation by rail continue to decrease, with the distribution of transportation by rail dropping by 3.1% from 7.0% in 2011 to 3.9% in 2020.

2.1.2. Rail Freight Items

Cement, containers, and steel accounted for the largest proportions of freight transported by rail in 2021 (per ton). Specifically, cement (39.0%), containers (35.0%), and steel (8.7%) accounted for 82.7% of the freight transported by rail per ton. Additionally, coal, ore, and oil accounted for 10.0%, while other items accounted for 7.4%.

Some items increased in ton-based rail transportation from 2020 to 2021. However, this is probably because the logistics volume decreased in 2020 owing to the influence of the COVID-19 pandemic and recovered in 2021. The temporary recovery in logistics volume in 2021 was reflected as a partial increase in rail freight volume, and rail transportation of cement, containers, steel, and ore increased as well. The ton-based transportation of steel was the third highest among all transported items since 2018, which is when it exceeded coal transportation by rail.

Table 3: Railway Transportation Performance by Item per Ton in the Past Five Year

Type	Year				
	2017	2018	2019	2020	2021
Cement	13,223	12,396	11,329	10,250	10,442 (39.0)
Containers	8,465	9,874	9,473	8,841	9,373(35.0)
Steel	2,486	2,356	2,516	2,320	2,329 (8.7)
Coal	2,724	2,029	1,588	1,443	1,311 (4.9)
Ore	1,660	1,656	1,277	1,117	1,193 (4.5)
Oil	508	191	165	188	164 (0.6)
Others	2,605	2,413	2,316	2,130	1,971 (7.4)
Total	31,671	30,915	28,664	26,287	26,783 (100.0)

Unit: Thousand tons, %
Source: Korea Railroad Corporation (2022)

Containers and cement accounted for the majority of freight transported by rail based on ton-km in 2021. Specifically, containers (45.0%) and cement (25.4%) accounted for 73.4% of the freight transported by rail based on ton-km. Coal, ore, and oil comprised 12.9%, while other items comprised 18.1%. Regarding the items that saw an increase in transportation from 2020 to 2021, it is thought that logistics volume recovered in 2021 after it decreased in 2020 owing to the COVID-19 pandemic, much like what we saw with ton-based transportation.

Table 4: Railway Transportation Performance by Item Based on Ton-km in the Past Five Year

Item	Year				
	2017	2018	2019	2020	2021
Containers*	3,072	3,191	3,091	2,821	3,040 (45.0)
Cement	2,576	2,425	2,183	1,940	1,917 (28.4)
Coal	593	431	330	297	265 (3.9)
Ore	357	346	258	239	254 (3.8)
Oil	168	70	60	66	59 (0.9)
Others	1,470	1,415	1,435	1,289	1,222 (18.1)
Total	8,236	7,878	7,357	6,652	6,757 (100.0)

Unit: 1 million tons-km, %
* Container items statistics in ton-km includes steel items
Source: Korea Railroad Corporation (2022)

2.2. Business Model

The concept of the business model has been defined and used variously according to the scholar and expert. Timmers (1998) defined the business model as a description of the structure of products, services, and information flows by combining the main agents and roles in a business. However, Osterwalder and Pigneur (2010) defined the business model as a rational and systematic description of how an organization creates, spreads, and captures value.

At the same time, the components of a business model can be categorized differently based on different scholars. However, some common elements include clients, the movement of goods and services, collaborative goals outside the organization, and the pursuit of efficiency and reason. A business model can be categorized into value proposition, target customer, value chain/organization, value delivery, and revenue stream (Samsung Economic Research Institute [SERI], 2011).

Value proposition is defined as what value (benefits) should be provided to customers, target customer is defined as who the target customer is, value chain/organization is defined as the method of creating value, and value delivery is defined the method of delivering value to customers. Finally, revenue stream refers to the source of income realized through the business model.

Some studies have categorized the business model into nine components, namely, “9 Building Blocks” (Osterwalder & Pigneur, 2010). Specifically, value propositions, customer segments, channels, customer relationships, key resources, key activities, key partnerships, revenue streams, and cost structures have been listed below as the nine elements of the business model.

“Customer segments” defines the target customer group and their problems, concerns, and needs. “Value propositions” refers to the combination of goods or services used to create the value needed by a particular customer segment. “Channels” refer to the methods of communication with the target customer segment and the trade of products

and services with those customers. "Customer relationships" refers to the type of relationship with a specific customer segment. "Revenue streams" refers to the method of income generation from the customer segment. "Key resources" refers to the most important assets needed to run a business smoothly. "Key activities" refers to the kind of core activities required by the core value proposition. "Key partnerships" refers to the network of partners that can help one's business model work smoothly. Finally, "cost structure" refers to all the costs incurred in operating a business model. Table 5 organizes the components of the business model into four areas and nine building blocks.

Table 5: Components of the Business Model

Area	Components	Content
Product	Value Propositions	Combination of products or services to be offered to the customer
Customer Interface	Customer Segments	Specifying the consumers to whom value is to be delivered and selecting target customers
	Channels	Delivering goods or services to the target audience: Sales teams, websites, direct stores, etc.
	Customer Relationships	Methods to retain one's customers: Online communities, customer participation, etc.
Infrastructure Management	Key Resources	The assets one needs to run one's company smoothly: Physical resources, human resources, intellectual assets, financial resources, etc.
	Key Activities	Key activities through which a company conducts its business: Product design, production, transportation, etc.
	Key Partnerships	Partners who can compensate for a company's lack of resources or capabilities.
Financial Aspects	Cost Structure	Expenses incurred to execute the business model
	Revenue Streams	Methods to generate revenue from business activities

2.3. Logistics Business Model

2.3.1. Logistics Business Model Type

The types of logistics business models have been classified with slightly different standards in various domains of logistics. In the logistics of port hinterland complexes, business models have been classified into the following types: rapid delivery, value-added, market expansion, and service promotion (Lee et al., 2007). Furthermore, other studies have classified the following business model types at airport logistics complexes: immediate delivery, production processing, wide-area base, and facility supply (Lee & Ye, 2007). Yet more studies have classified logistics business models into the following types: consignment business, specialized business, affiliated corporate business, network business, and integrated business (Lee & Shin, 2009). Finally, studies have also classified the following business types in international logistics: service improvement, market expansion, cost reduction, profit generation, import and export integrated delivery management, and imported raw material collection and delivery models (Won, 2010).

Table 6: Component Analysis of Logistics Business Model

Business model classification		Components of Business Model			
		Customer Value	Resources	Profit	Process
Port	Quick Delivery		V		V
	value-added	V		V	
	Market expansion		V		
	Service improvement	V	V		
Airport	immediate delivery		V		V
	Production Processing	V		V	
	Wide-area base		V		
	Facility supply		V		
logistics company	Consignment		V		
	Specialized	V	V		
	Form of partnership		V		V
	Network		V		V
	Integrated form	V	V		
Inter-national	Integrated import and export delivery		V		V
	Imported raw materials, collection, and delivery		V		

Source: Jung Kyung-sun and Kim Tae-bok (2011)

However, logistics business model types have been analyzed from the perspective of the components of business models (Jung & Kim, 2011). Therefore, the existing logistics business model types have been analyzed from the perspectives of customer value, profit, resources, and process in this study. The results of the analysis have been presented in Table 6. The analysis revealed that the existing logistics business model types include mostly elements of resources, and their components are the following order: process,

customer value, and profit.

2.3.2. Logistics Business Model and the Railway Industry

Based on existing studies on the logistics business model, four business models can be applied to the railway industry. The first is a time-sensitive business model, such as fast delivery or on-time delivery to customers. In the current railway logistics industry, this can be executed by high-speed freight trains. Examples of this include Longlow High-Speed Freight Trains in China.

The second model is a cost-saving business model that emphasizes reducing logistics costs (freight transportation costs, etc.) for customers. Financial support from the government (subsidies, exemptions, investment cost support, etc.) is involved in this model. Significant financial support has been provided in the EU and China.

The third model is a service-improvement business model that provides new logistics services or added value to customers. Services for complicated logistical facilities and new cargo transportation are conceivable. Examples of this type of model includes Japan's large-scale and complex logistics facility operation.

Finally, the fourth model is an integrated business model that integrates partnerships with logistics-related companies or partially integrates business processes. Germany's freight railway service provides a logistics service that uses railways and other means of transportation by implementing a comprehensive logistics operation that goes beyond the scope of railway transportation.

3. Railway Logistics Business Model

3.1. Railway Logistics Status of Business

The railway logistics business can also be considered to have nine components encompassing four areas. In the following section, the railway logistics business will be categorized into four areas: customer interface, product, infrastructure management, and financial aspects.

3.1.1. Customer Interface

From the perspective of customers and cargo, railroad logistics business customers are categorized into either customer company types such as shippers and carriers or shipping item types such as containers and non-containers (or general). Since carriers are also considered shippers, shippers who request actual logistics through carriers are sometimes referred to as real shippers. The distinction between containers and non-containers is made by considering the specifications of the customer and handling. Cement (39.0%), containers (35.0%), and steel (8.7%) account for 82.7% of rail freight per ton, and items handled in the railway logistics business can be classified into cement, steel, coal, ore, and oil. Currently, containers and steel are the main strategic products of railway logistics.

The railway logistics business can be understood from the perspective of channel and customer management. Rail logistics operations can be categorized into inbound and outbound operations. Currently, it mainly comprises inbound operations. It is mostly composed of responding to customer inquiries, and it utilizes phone/FAX, Internet/EDI, and face-to-face channels. Face-to-face and remote customer management activities are carried out to maintain customer relations. The face-to-face method focuses on meetings and briefing sessions, while the remote method uses phone calls and online chat rooms.

3.1.2. Product

Looking at the railway logistics business from a product and service perspective, railway transportation consists mostly of its core services, and some logistics subsidiaries are in operation. Along with the core service, which is railway transportation, this business includes loading and unloading services, storage warehouse services, internal land transportation (shuttle) services, KTX special delivery/ delivery partnership services, and forwarding services. The value proposition (value proposal) of railway transportation services, which is a core business of the railway logistics business, is “stable and environmentally friendly transportation over long distances.” Customers use railway logistics services, which have a high level of stability, along with roadway logistics for long-distance transportation. Furthermore, they use railway logistics services by applying conversion transportation subsidies that are influenced by environmentally friendly transportation policies.

3.1.3. Infrastructure Management

The core resources of the railway logistics business can be categorized into railway stations, railway lines, railway vehicles, and cargo bases. Railway station resources include container yards, silos, warehouses, rubbish yards as well as the railway stations. Railway lines include general tracks and special tracks, such as incoming lines and cargo-only lines. Railway vehicles are categorized into engine cars and freight cars, and cargo bases include railway logistics-oriented ICD and inland cargo bases. Rail logistics services provide railway stations, railway lines, and railway vehicles as essential services. The transport capacity and service quality of railway logistics are determined through the various combinations of the three essential services. Therefore, it is possible to increase the capacity to execute the railway logistics business by combining railway logistics technologies that improve the three essential services.

The core activities of the railway logistics business comprise the activities undertaken by KORAIL for the railway logistics business. Furthermore, it is categorized into railway logistics sales and customer management, railway transportation, and consignment management of auxiliary projects. Observation of railway logistics and customer management activities reveals that the railway logistics business consists of proposing new product development or conducting briefing sessions with products that reflect customer requests. Customer management comprises responding to customers face-to-face or remotely before and after the signing of railway logistics contracts. Rail transport activities are categorized into tasks that determine transport availability, inspection and transportation, preparation of cargo, and confirmation of delivery. One determines transport availability by evaluating the cargo, vehicles, and transport conditions. Consignment management activities for auxiliary projects consist of posting public biddings for consignment businesses and managing consignment businesses. Public biddings for consignment businesses entail publicly selecting businesses with specific standards and qualification conditions. In consignment business management, tasks under consignment contracts are evaluated and managed.

The main partners that run the railway logistics business are categorized into carriers, KORAIL Logistics, and consignees. The carrier is the customer who contracts with KORAIL at the request of the shipper. Furthermore, they are responsible for loading and unloading the shuttles in long-distance transport. KORAIL Logistics is a subsidiary of KORAIL that supports railway logistics services through case-by-case contracts or partnerships for the railway logistics business. A consignment business is a partner company that entrusts and operates logistics subsidiary projects centered on railway stations. If the proportion of vocational sales to shippers were to increase in the future, it would be possible to actively use carriers and KORAIL Logistics as partners.

3.1.4. Financial Aspects

The income structure of the railway logistics business can be categorized into income from railway logistics transportation, income from logistics subsidiary businesses, and PSP subsidies. Transportation income refers to income from fees corresponding to cargo volume and transportation condition. Income from subsidiary businesses is integrated income from logistics other than rail transportation, and it is at very low levels. PSP subsidies, although small in comparison to government subsidies, are helpful for business execution. Rail freight transportation revenue constitutes a significant portion of the railway logistics income structure. However, it has been continuously declining owing to the decrease in cargo transportation.

The cost structure of the railway logistics business consists of labor costs, power costs, track usage fees, expenses, and depreciation costs. Labor costs for engineers account for a large portion of the overall labor costs, power costs comprise fuel costs, and track usage fees are linked to sales. The total cost comprises the following factors: labor costs (50%), expenses (17–18%), power costs (12%), depreciation costs (11%), and track usage fees (9%).

3.2. Railway Logistics Business Issues and Opportunities for Improvement

3.2.1. Customer Interface

One issue from the standpoint of the customer and channel is that the majority of the organizations that are customers are carriers. The business structure is set up as follows: "shipper-carrier-Korail." Even if the business is conducted for shippers, who are the actual customers, it needs to have a business and customer management structure that contracts with carriers. To ensure more shipping in the future, it will be important to create new, significant shippers like shipping corporations. In this process, direct sales and customer management for shippers will be necessary.

In contrast, the railway logistics business handles limited items, mainly bulk cargo and containers. It does not handle e-business-related cargo, which is leading the growth of the entire logistics industry. Hence, it does not have a share of its growth, unlike the rest of the logistics industry. Additionally, possibilities are lacking to expand to household logistics items, which can lead to profitable growth, and the business is not ready to handle cold-chain products.

Finally, it is limited in that it operates an inbound-oriented passive sales and marketing system. Inbound-oriented sales and marketing, which starts with responding to inquiries from customers, is becoming the mainstream. There is a lack of direct outbound sales or forwarding business for shippers, unlike with transportation companies. Therefore, it is necessary to strengthen this aspect in the future.

3.2.2. Product

The first problem identified from the perspective of products and services is that freight transportation by rail leads to higher transportation costs compared with road transportation. Rail transportation has a higher total transportation cost than road transportation because of additional costs, such as shuttle accommodation costs from the production site to the departure station and the cost of loading and unloading required for transshipment. Shuttle transit and loading and unloading charges account for more

than 40% of the overall rail transportation expenditures (Railway Technology Research Institute, 2017). The cost of rail transportation is higher than that of road transportation across almost all sections and items. In terms of distance, rail transportation costs are not much higher than that of road transportation for long-distance transportation. In this aspect, rail transportation is relatively competitive with road transportation. In terms of transportation items, both containers and cement, which are the major transportation items, have a higher level of transport costs with rail transportation than with road transportation. Transportation costs are also high for long-distance transportation, even though railway logistics should be competitive from a distance perspective. Additionally, transportation costs are high for containers and cement items, which are the mainstay items of railway logistics.

Moreover, cargo transportation by rail is slower than road transportation. Rail transport requires shuttle transport and loading and unloading stations to complete the service, which causes delays in transportation. According to a survey, a two-to-three-hour delay in transportation can be incurred because of delays in shuttle transportation and loading and unloading stations (Ministry of Land, Infrastructure and Transport, 2020). Additionally, the average speed of freight trains is less than 60km/h for each train line, and in the case of general cargo transport trains other than containers, it can go lower than 40km/h. The speed of all routes except the Gyeongbu Line is less than 60km/h, and that of the Jungang Line, Taebaek Line, and Yeongdong Line is less than 40km/h (Ministry of Land, Infrastructure and Transport, 2020).

3.2.3. Infrastructure Management

Looking at KORAIL's main resources, three problems can be identified. First, railway transportation stations and route-related infrastructure are shrinking. Regarding the status of cement silos and CY, cement silos in the Seoul metropolitan area have disappeared and existing silos and CY are also being closed as tracks are being renovated. Logistics handling history and routes are also decreasing. The number of stations and routes that handle logistics continues to decrease to protect the profitability of the railway logistics business. Developing new stations and sites has several limitations. State-owned land that is not owned by KORAIL is difficult to use to improve railway logistics, and legal conflicts and local complaints hinder its use as a station.

Additionally, there is a shortage of railway vehicles and tracks. First, in terms of railway vehicles, there is a shortage of both power cars and freight cars. There is also a shortage of resources (engine cars and freight cars) to the extent that they cannot accommodate the quantity demanded by current customers. Increasing the number of engine cars and freight cars could increase the amount of transportation to meet the additional demand. In terms of tracks, the lines that diesel and electric locomotives use are different, which results in inefficiency. The capacity and utilization of tracks are insufficient for railway logistics. Passenger-oriented track operation is leading to the elimination of cargo trains, which is leading to a decrease in the on-time rate. In the case of the Jungang line, trains are forced to travel long distances owing to the lack of tracks, resulting in an increase in transportation time and costs.

Finally, there are infrastructure limitations related to inland logistics bases. Uiwang ICD is a key logistics hub that was built twenty years ago, but its infrastructure is aging and it has exceeded its capacity to accommodate goods. Among all the inland logistics bases, only Uiwang ICD and Jungbu Inland Logistics Base are actively used for railway logistics, and the other bases are underutilized. Since the opening of Busan New Port in 2009, Yangsan IC has been cut off from rail transportation (specifically, since 2013), and the railroad is deteriorating. Other inland logistics bases are not used for rail transportation, so they are either used for road transport or not at all.

3.2.4. Financial Aspects

The first financial problem is that the income structure of the railway logistics business comprises mainly low-profit transportation businesses. Most of the revenue of the railway logistics business comes from the railway logistics transportation business, in which it is difficult to increase profitability in terms of transportation and transportation costs, and its income has also been decreasing owing to the continuous decline in the transportation volume. However, it is possible to increase profitability for cement, and it is possible to improve profitability through the transport of high value-added products, such as aviation oil. Railway logistics subsidiary projects have high profitability, but they comprise a small proportion of the overall income structure. Consignment-oriented railway logistics subsidiary projects are highly profitable as well, but they account for a small proportion of the total income, so it is necessary to actively expand this aspect of the business in the future.

The other financial problem is inefficient operations entailing excessive labor costs. First, it is necessary to reduce the labor cost incurred for engineers, which accounts for half of the total labor cost. The labor cost burden can be greatly reduced by changing the two-engine crew system into one-man and automated operations. Furthermore, cost reduction is possible through government support. For instance, KORAIL’s track usage fees can be reduced by the government supporting track usage fees that are linked to sales. Additionally, KORAIL's power costs can be reduced through oil subsidies or tax cuts related to power costs.

4. Discussion

4.1. Target Business Model

4.1.1. Analysis of Railway Logistics Business Conditions

Based on the analysis of the existing business model of the railway logistics business, it is possible to identify areas for improvement in three areas. In the areas of customer interface and product, it is necessary to strengthen the competitiveness of railway logistics services, expand the vehicle and track infrastructure, maximize railway station and site activities, and increase profitability by diversifying businesses and income structures and streamlining operating costs.

Requirements from a policy and trend perspective can be determined by analyzing the railway logistics business. From the policy direction perspective, the trend is to strengthen the logistics business of railway operators. Additionally, the trend is to increase the volume of rail transportation and strengthen the profitability of railway logistics businesses. From the perspective of industrial trends, environmentally friendly logistics and everyday logistics are expanding, and new technologies are being increasingly applied to logistics. From the perspective of overseas operations, the revitalization of railway logistics and diversification of railway logistics projects are underway to increase sustainability.

4.1.2. Railway Logistics Target Business Model

Modifications and supplements for the current railway logistics business model were derived using the Blue Ocean Strategy framework. In this process, this study determined the factors that could be eliminated, raised, reduced, or created from the customer and product perspective (customer, channel, and value proposition), infrastructure management perspective (core activities, resources, and partners), and financial perspective (revenue, cost).

From the customer and channel perspective, it is necessary to increase the number of shippers and carriers by increasing the number of existing customers and items handled (raise) and secure new customers for new logistics services (increase). From the perspective of product value proposition, it is necessary to increase the volume and competitiveness of existing long-distance rail transportation and promote railway-oriented complex transportation services, urban courier services, and comprehensive logistics services (create).

From the perspective of the core activities of the railway logistics business, it is necessary to strengthen sales and customer management, with the focus on actual customers (direct customers), such large shipping companies, for new transportation items (creation). From the core resource perspective, it is necessary to increase infrastructure investment to increase the number of railway vehicles and expand track utilization, develop (complex logistics centers, etc.) railway stations, and utilize idle sites for new uses. In relation to key partnerships, it is necessary to actively utilize its subsidiary Korail Logis in the process of expanding logistics services (raise), securing the new consignment operators and affiliates necessary to provide new logistics services, and providing urban delivery services and comprehensive logistics services (creation).

It is also necessary to improve the structure of income and costs from a financial perspective. From the income flow perspective, it is necessary to increase transportation revenue by expanding existing railway transportation businesses (raise), supplement the profitability of the entire logistics business by expanding auxiliary businesses that are profitable (raise), and increase income by providing new logistics services (creation). From the cost flow perspective, labor cost items need to be restructured to increase cost efficiency (elimination) and power costs and track usage fees should be reduced by switching from diesel to electricity and increasing government assistance (elimination and raise).

4.2. Strategy for the Growth of the Railway Logistics Business

4.2.1. Railway Logistics Business Growth Model

By expanding the current business, the target business model for the railway logistics industry may be derived. Based on products and customers, business growth models can be divided into four categories. A market penetration model proposes expansion by offering more current products to current clients. Selling new products to current clients is one way that expansion is possible with a product development business model. A market development model suggests growth by selling existing products to new customers. Finally, a diversification model suggests growth by selling new products to new customers.

The contents discussed in the target business model of the railway logistics business can be classified into different types of business growth models. In the market penetration model, the growth of existing businesses can be executed by lowering service prices, improving service quality, and securing large-scale transportation capacity. The product development model allows for the additional transportation of high-value goods and cold chain-related commodities, which will help businesses flourish. In the market development model, existing services can be provided to new customers (large pre-shippers, forwarding customers, etc.) to promote business growth. In the diversification model, business growth is possible through urban delivery services and comprehensive logistics services based on

complex logistics centers. In Figure 1, the growth model of the railway logistics business is schematically presented.

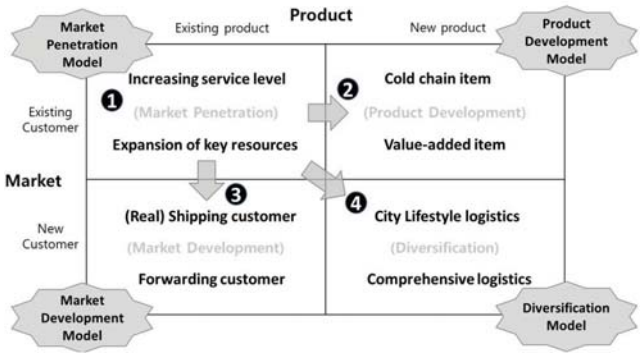

Figure 1: Railway Logistics Business Growth Model

4.2.2. Railway Logistics Business Growth Stage

A three-step growth strategy can be established to attain the desired business model using the four railway logistics industry growth models mentioned above. Enhancing the capabilities of existing railway logistics projects using core resources and related technology is the first stage of expansion. This stage also aims to enhance transportation and increase revenue. The creation of new railroad logistics-related enterprises as well as the growth of the company's handled goods volume and clientele constitutes the second stage of growth. Infrastructure (containers, etc.) for conveying new goods and new business procedures for acquiring new clients are needed in the second stage of growth. The third stage of growth comprises operating a comprehensive logistics business centered on railway logistics. To diversify its business into urban living logistics services, comprehensive transportation, and comprehensive logistics services, new infrastructure, such as urban logistics centers and complex logistics centers on unused land, may be needed.

5. Conclusions

This study analyzed the current status of the railway logistics business and sought ways to improve it by using the business model as an analytical framework. Through research, we tried to find strategies and improvement measures that can be practically applied to the field by dealing with issues at the industrial field related to each element in the business model. First, the railway logistics industry needs to strengthen the capabilities of core railway logistics business, which requires tasks such as increasing the size of railway transportation, improving railway transportation services, improving railway transportation fares, and improving railway logistics infrastructure. Second, it is necessary to expand new railway logistics-related businesses, which requires tasks such as expanding railway transport items, expanding railway transport customers, expanding logistics subsidiary businesses, and revitalizing forwarding businesses should be implemented. Finally, it is also necessary to carry out comprehensive logistics business, which requires tasks such as complex transportation services, urban living logistics services, complex logistics centers, and total logistics business expansion.

This study has theoretical implications that it attempted a systematic approach using a business modeling tool called 9 building blocks and a strategy formulation framework called the Blue Ocean Strategy. The approach used in this study can be used not only for application to the railway logistics industry, but also for the process of analyzing the current status of other industries and establishing improvement strategies. There are two practical implications of this study. From a practical point of view, it is possible to try to improve by area by utilizing the problems dealt with by business model components and improvement opportunities in this study. Next, a step-by-step growth strategy can be established and implemented based on the growth model set in this study.

Currently, most trains in Korea are dedicated to passenger trains. However, the increase in railway logistics requires more track capacity. A more timetable for logistics can significantly improve the flexibility of railway logistics. Railway operators and policy makers in Korea needs to understand the importance of railway logistics and consider train timetable and track capacity in terms of logistics.

This study has several limitations and the future research needs to address these issues. The first limitation is that the position of other stakeholders was not sufficiently reflected because the analysis was based on the perspective of KORAIL, a railway logistics operator. In the future, researchers should reflect the positions of other stakeholders in the railway logistics business, such as customers, partners, and the government. The second limitation is that railway logistics technologies, the essential elements for the development of the railway logistics industry, are not appropriately considered in analyzing the current status and deriving tasks. In the future, sufficient review of technologies that can improve and innovate the business process of the railway logistics industry should be conducted.

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