International Journal of Advanced Culture Technology Vol.9 No.1 224-241 (2021)
DOI https://doi.org/10.17703/IJACT.2021.9.1.224

IJACT 21-3-31

Performance Analysis of Transport Time and Legal Stability through Smart OTP Access System for SMEs in Connected Industrial Parks

Ilgoun Kim, Jongpil Jeong

Student, Dept. of Smart Factory Convergence, Sungkyunkwan Univ., Korea
trade21@g.skku.edu, jpjeong@skku.edu

Abstract

According to data from the National Police Agency, 75.5 percent of dead traffic accidents in Korea are truck accidents. About 1,000 people die in cargo truck accidents in Korea every year, and two to three people die in cargo truck accidents every day. In the survey, Korean cargo workers answer poor working conditions as an important cause of constant truck accidents. COVID 19 is increasing demand for non-face-to-face logistics. The inefficiency of the Korean transportation system is leading to excessive work burden for small logistics The inefficiency of the Korean transportation system is causing excessive work burden for small individual carriers. The inefficiency of the Korean transportation system is also evidenced by the number of deaths from logistics industry disasters that have risen sharply since 2020. Small and medium-sized Korean Enterprises located in CIPs (Connected Industrial Parks) often do not have smart access certification systems. And as a result, a lot of transportation time is wasted at the final destination stage. In the logistics industry, time is the cost and time is the revenue. The logistics industry is the representative industry in which time becomes money. The smart access authentication system architecture proposed in this paper allows small logistics private carriers to improve legal stability, and SMEs (Small and Medium-sized Enterprises) in CIPs to reduce logistics transit time. The CIPs smart access system proposed in this paper utilizes the currently active Mobile OTP (One Time Password), which can significantly reduce system design costs, significantly reduce the data capacity burden on individual cell phone terminals, and improve the response speed of individual cell phone terminals. It is also compatible with the OTP system, which was previously used in various ways, and the system reliability through the long period of use of the OTP system is also high. User customers can understand OTP access systems more easily than other smart access systems.

Keywords: *Smart Factory, CIPs, Smart Logistics, OTP, IoT*

1. INTRODUCTION

According to the Korea Occupational Safety and Health Agency's report on the status of industrial accidents in the logistics industry in the past eight years from 2012 to 2019, there were 18 deaths from industrial accidents in the logistics industry. Between 2012 and 2019, there were approximately 2.25 logistics industry fatalities. However, the number of deaths in the logistics industry has increased dramatically since 2020. In 2020, about 20 logistics workers died from overwork. Seven of them died from cerebral cardiovascular disease caused by overwork. Korea's small logistics private carriers are classified as "special employment workers" and are not subject to state-run industrial accident insurance [1]. If Korea's

Manuscript received: February 23, 2021 / revised: March 02, 2021 / accepted: March 09, 2021
Corresponding Author: jpjeong@skku.edu
Tel:+82-31-299-4260
Professor, Dept. of Smart Factory Convergence, Sungkyunkwan Univ., Korea

small logistics private carriers get hurt during transportation, they are not covered by industrial accident insurance, small logistics private carriers pay for treatment themselves, and small logistics private carriers pay about 200,000 won to find other alternative transportation workers [2]. For this reason, the nation's small logistics private carriers earn an income level of about 80 percent of the average income of Korean city workers [3].

In Korea, both large logistics companies and small private logistics businesses are placed under the structure of subcontractors and subcontractors. Small logistics private carriers who are in charge of actual delivery are at a vulnerable point where they are not protected by Korean law. Under the Personal Information Protection Act, small logistics private carriers did not directly receive consent from customers who requested delivery to disclose their personal information access system passwords. In this situation, if a customer claims a small logistics private carriers to be responsible for compensation under the Personal Information Protection Act, the small logistics private carriers is responsible for compensation. There is a dangerous gap between reality and Korean law, and small logistics private carriers are exposed to this dangerous gap in Korea [4].

Such subcontracting and subcontracting structures are equally applied to SMEs (Small and Medium-Sized Enterprises) located in CIPs. All efforts to improve hazardous areas not under Korean legal protection arising from subcontract-subcontracting structures could reduce transit time for Korean SMEs located in CIPs and improve the working environment of small logistics private carriers in Korea [5].

Figure 1. Transportation delays caused by inefficient access systems in Korea

Figure 2. Cargo exposed to external theft risk by inefficient access systems

SMEs located in CIPs often do not have smart access certification systems. And as a result, a lot of transportation time is wasted at the final destination stage in Korea. Reducing the unnecessary transportation time generated during the final destination access certification system can have an economic positive effects , such as waste of oil from idling cars, reduced transit time, improved working environments for small logistics private carriers, increased rest times for small logistics private carriers, and increased profitability for small logistics private carriers. In the logistics industry, time is the cost and time is the revenue. The logistics industry is a representative industry in which time is recognized as money [6].

In the Korean logistics industry, which has led to the structure of subcontractors and subcontractors, small logistics private carriers are currently exposed to violations of laws in violation of Articles 18, 1, 59 and 71 of the Personal Information Act. As it comes down to various lower levels, evaluation of actual delivery personnel, personnel management, and personnel compensation are not being done properly. And the possibility of customer personal information leakage is high in practice. In the event of a large-scale lawsuit by customers due to personal information leakage, legal responsibility lies primarily on small logistics private carriers. Small logistics private carriers are exposed to the risk of paying court fines [7].

[Article 18, Paragraph 1 of the Personal Information Act]

: Article 18 (Restriction on the use and provision of personal information other than the purpose of personal information) (1) A personal information handler shall not use personal information beyond the scope under Articles 15 (1) and 39-3 (1) and (2) or provide it to a third party.

[Article 59 of the Personal Information Act]

: Article 59 (Prohibited Acts) A person who has processed or processed personal information shall not engage in any of the following acts:

1. Obtaining personal information or obtaining consent for processing by fraudulent or other improper means or methods;
2. Disclosure of personal information he/she has learned on his/her business or providing it to others without authority;
3. Damage, loss, alteration, forgery, or leakage of other people's personal information without legitimate authority or exceeding permitted authority;

[Article 71 of the Personal Information Act]

: Article 71 (Penalty) Any of the following persons shall be sentenced to up to five years in prison or fined up to 50 million won:

The author created the CIPs smart access system by utilizing Mobile OTP, which is currently being utilized in many fields. While studying in the smart factory convergence research course at Sungkyunkwan

University in Korea [8], the author sought solutions to businesses, consumers, and Korean social problems through technological development. It studied ways to benefit from technological development with many consumers in Korean society and many SMEs, not some specific companies. The author began research to improve the poor working conditions in the Korean transportation market in October 2020. Author tried to improve the difficulties faced by many small logistics private carriers in Korea through the 4th industrial IoT technology [9]. The author wanted to find a solution for Korean companies and the Korean government to win-win each other through the 4th IoT industry technology without conflicting opinions. The author wanted to find a way to social integration and social harmony through the 4th IoT industry technology. The TRIZ method is a global way of creating new deliverables. There are a total of 40 types of TRIZ methods. Through the TRIZ method, everyone can make creative output. For this reason, the author chose the TRIZ method as a way to solve the problem [10]. The author utilized the Theory of Solving Inventive Problem (TRIZ) by Genrikh Saulovich Altshuller, an Eastern European engineering researcher. In the TRIZ, the system improvement target levels were categorized into `① Routine Design Probabilities (Stage 1)', `② Minor Improvements to an Existing System (Stage 2)', `③ Fundamental Improvements to an Existing System (Stage 3)', `④ New Generation of a System (Stage 4)', `⑤ Pioneering Inventions of an Essentially New System (Stage 5)' [11]. Among them, the system improvement target level was set to `③ Fundamental Improvement to an Existing System (Step 3)' to find solutions that can be applied on-site without investing additional change investing costs for current CIPs access systems. The author applied 40 methods including TRIZ's `Segmentation Method', `Symmetry Change Method', `Merging Method', etc. Among them, the `Separation method' is applied to derive the CIPs smart access system architecture. This is because the `Separation' method is effective in extracting the advantages of the OTP system and applying them to other fields [12].

This paper consists of the following order:

(1) Analyzing the current legal vulnerability points of SMEs in Korea

(2) Analysis of the waste of transit time in the final stage of transportation of SMEs in Korean CIPs

(3) CIPs Smart Access System Architecture Proposal

(4) Analyzing the effectiveness of CIPs Smart Access System Architecture

(5) Analyzing the effect of improving legal stability of small carriers in Korea

2. RELATED WORK

2.1 Current Status of Logistics Industry in Korea

There are already many large logistics industry centers in Korea. Many Korean and foreign capitalists have invested heavily in Korea's logistics infrastructures over the past few decades [13]. However, even though it's 2021, there are still inefficient sections of the entire transportation sector. One of these inefficient transportation sections is the inefficient access system at the final destination in Korea. Some companies' logistics access systems do not show significant differences from the 1950s and 1970s processes. One of the bottlenecks in inefficient logistics time is the SME's access system. Unnecessary delays in local and metropolitan logistics centers rarely occur between 3~10 minutes. This is because professional engineers participate in the construction from the first logistics center design. However, the CIPs factory and business office of the end-customer were not designed and constructed with logistics needs as the top priority. For this reason, unnecessary time delays at the final destination are very often occurring 15 ~ 60 minutes. Also, the final destinations to visit are 30 to 50 places a day. An unnecessary delay of at least 15 minutes to an hour per place occurs. In addition, If there is a customer claim, the same place should be visited twice. Unnecessary waste of time per day at the final destination is a very serious problem.

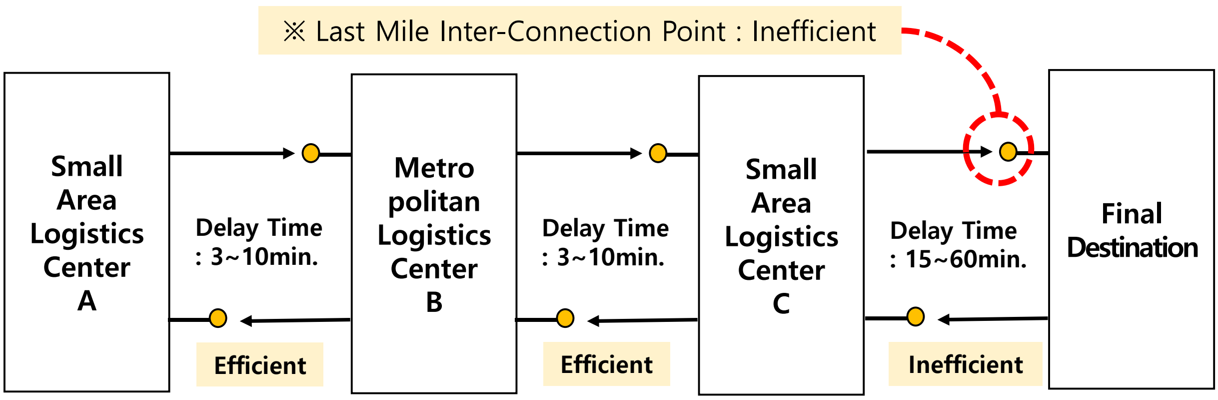

Figure 3. Inefficiency at the final point of connection

2.2 Australian Government Research Outcomes

The results of the Australian government's research suggest a lot to the Korean transportation industry in 2021. The Australian government's 20-year investigation into the link between freight rates and accidents is as follows. It was confirmed that there were many accidents when fares were low, and that the higher the fares, the lower the accident rate [14]. Since Australia enacted the 2012 Freight Act, the number of truck accidents in Australia has decreased. The Korean government is proposing various policies to prevent overworked deaths of private transportation carriers in Korea since COVID19 [15]. It includes such as blocking APP(Mobile Application) to prevent late-night delivery after 22:00, forcing proper working hours through legal systems, strengthening compensation responsibility laws for large logistics companies, and forcing logistics carriers to check their health. Most of them are forced regulations that confront the positions of companies and the government. However, when government officials improve their understanding of fourth industrial ICT(Information and Communications Technologies), government officials can apply fourth ICT industry technologies for public interest purposes. Through the 4th ICT technology public policy, the overall technical capabilities of the Korean logistics industry can be improved, the efficiency of Korean logistics companies can be increased. It can provide a technical background for Korean logistics companies to enter the global market. There are 4th ICT industry technologies that allow companies and governments to win-win each other without confrontation.

2.3 CIPs (Connected Industrial Parks)

Korea's CIPs consist of vertical and horizontal integration through the fourth industrial technology [16]. CIPs in Korea refer to a system that connects facilities and suppliers on Supply Chain inside a smart industrial complex.

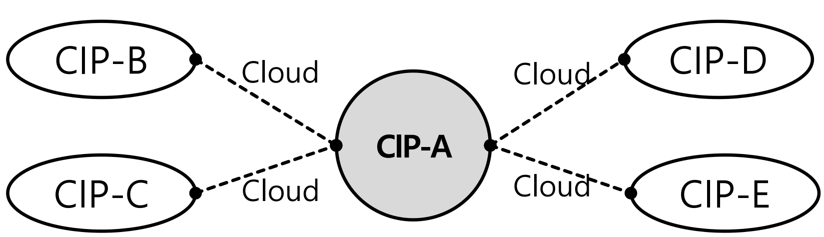

Figure 4. CIPs Structural Diagram

2.4 OTP Operating System

One Time Password (OTP) is a user authentication method that uses six randomly generated disposable authentication numbers instead of a fixed authentication number [17]. OTP is the world's first security system developed by the Bell Telecommunications Research Institute in the United States. The encrypted 6-digit authentication number is a single-use authentication number, which makes it more suitable for designing access systems for logistics carriers. This is because the access system authentication number is automatically changed every time the carrier visits. OTP authentication methods are divided into 'S/KEY method', 'time synchronization method', and 'event synchronization method', depending on the 6-digit authentication number generation and authentication method.

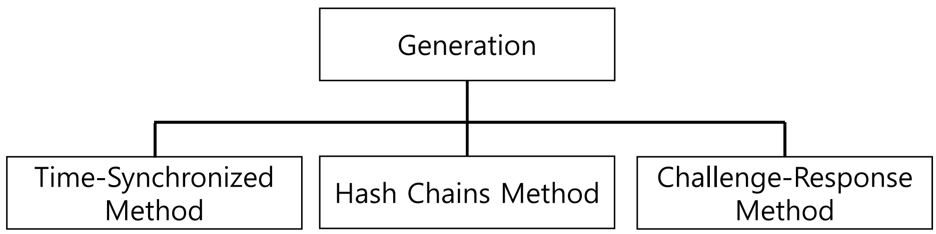

Figure 5. OTP Creation and authentication

OTP is categorized as 'hardware method', 'mobile APP method', and 'SMS method' according to 6-digit authentication number delivery method. 'Hardware method' is a method that utilizes separate hardware OTP generation device. 'Mobile APP method' is to receive OTP numbers from security servers through APP (Application) installed in customers' mobile phones. 'SMS method' is a method that receives OTP generated through SMS from security servers.

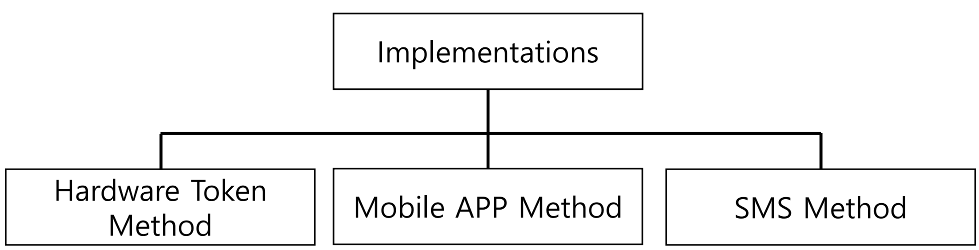

Figure 6. OTP delivery method

2.5 Smart Access System Technology

Foundation technologies for smart access systems include RFID (Radio Frequency Identification) [18], Cloud Computing [19], CPS (Cyber Physical Systems) [20], Big Data [21], 5G [22] , IIoT (Industrial Internet of Things) [23], VR-AR (Virtual Reality-Augmented Reality) [24], and Milk-run transportation. RFID is a recognition system that uses radio frequencies to read stored data such as tags, labels, and cards with embedded semiconductor chips. Cloud computing technologies consist largely of main servers and client computers. In a cloud computing environment, data can be safely stored, storage space restrictions can be overcome, and documents that you have worked on can be viewed and modified anytime, anywhere. CPS is a highly trusted system that controls a real-world system or process as a result of processing physical environmental information over cyber. Big data that can be applied to smart access systems include `cost, distance, destination, transit time, transportation cargo characteristics, shipper's requirements, shipper's location information, purchase information, etc’. According to the International Telecommunication Union (ITU), 5G is a mobile communication technology with a maximum speed of 20Gbps. IIoT refers to devices such as sensors, equipment, and others that are networked with various industrial sectors. The `VR-AR’ technology is the underlying technology for smart access systems. Other 4th industrial technologies of Smart Access System include Milk-run logistics AI technology.

3. OTP SMART ACCESS SYSTEM

3.1 OTP Smart Access System

OTP smart access systems improve transport inefficiencies at CIPs final destinations.

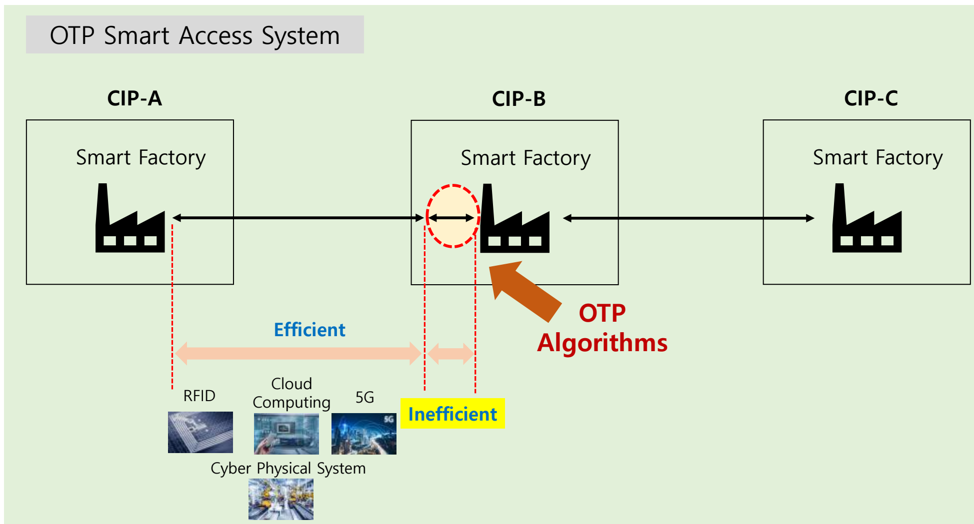

Figure 7. OTP Smart Access System at CIPs final destinations

3.2 Classification of CIPs Smart Access Systems

The categories of CIPs smart access systems can be classified as follows: First, it classifies SME's corporate activities as '① Manufacturing, ② Logistics, ③ Sales and ④ Accounting'. It classifies SME logistics businesses as '① VJP (Vehicle Junction Problem)' and '② Logistics Finance'. The components of physical logistics are classified as `① Delivery, ② Incoming and Outgoing, ③ Pick-up, and ④ Milk-run transport’. 'Incoming and leaving work' is classified as '① Working on the place of Departure', '② Working on the place of Arrival', '③ Loading cargo', and '④ Worker proficiency'. And CIPs Smart Access System is classified into '① Public service' and '② Private service'. In other words, the CIPs smart access system is a public service architecture that enables efficient incoming and outgoing operations at the final destination.

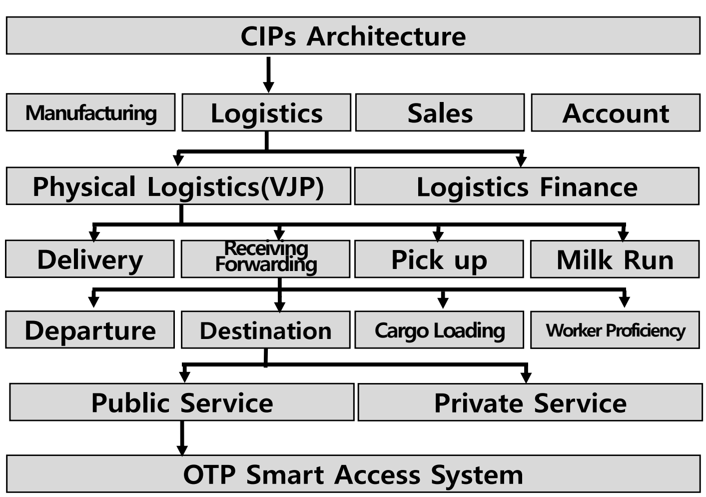

Figure 8. OTP Smart Access System Classification

3.3 Mechanical Device for OTP Authentication Number Generation

The OTP authentication number generation Mechanical Device of CIPs Smart Access System consists of '① Smart Access Authentication Password Generation Device', '② Transporter 5th Level Credit Information Analysis Device', '③ Location Information Analysis Device', `④ Communication Information Device' and '⑤ Display Device'.

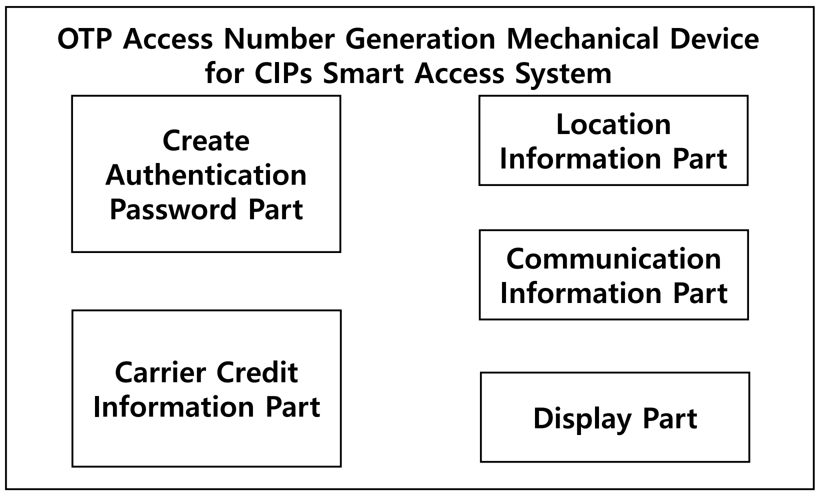

Figure 9. Mechanical devices in the OTP Smart Access System

3.4 Network Structure

OTP Smart Access System connects '① Sender', '② Security Connected Computer Server', and '③ Recipient' through Mobile Network.

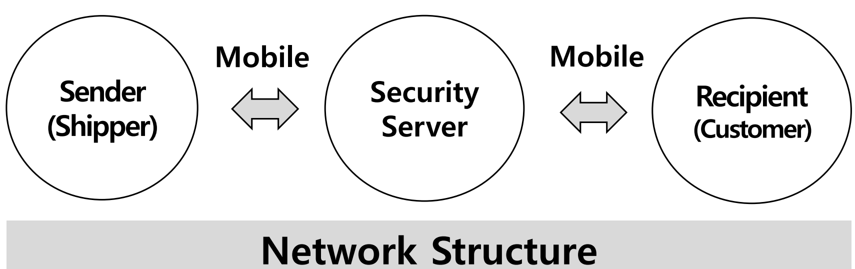

Figure 10. Network structure of the OTP smart access system

3.5 5-steps carrier identity authentication system

The OTP smart access system verifies the identity of the carrier in five steps. The identity verification procedures for OTP smart access systems are as follows. '① OTP algorithm certification number', '② Carrier location information', '③ Carrier route information', '④ Carrier name', '⑤ Carrier mobile phone number' '.

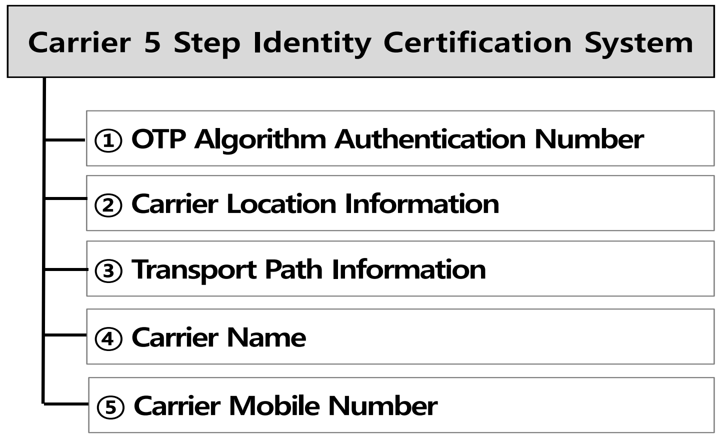

Figure 11. Carrier 5-Step Identity Certification System

3.6 Business Procedures

The business procedures for OTP smart access systems are as follows. The OTP smart access system can improve the work efficiency of small logistics private carriers at the final destination stage of transportation.

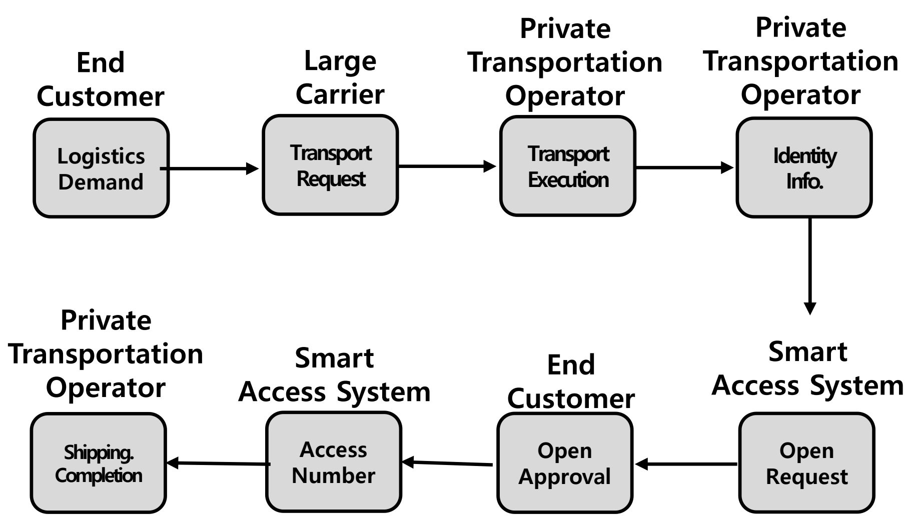

Figure 12. Business procedure diagram

3.7 Data

In OTP Smart Access System, the carrier Data is composed of 'shipper name, shipment, destination of transportation, etc.' and the customer Data is composed of 'customer name, customer phone number, access password, etc.'

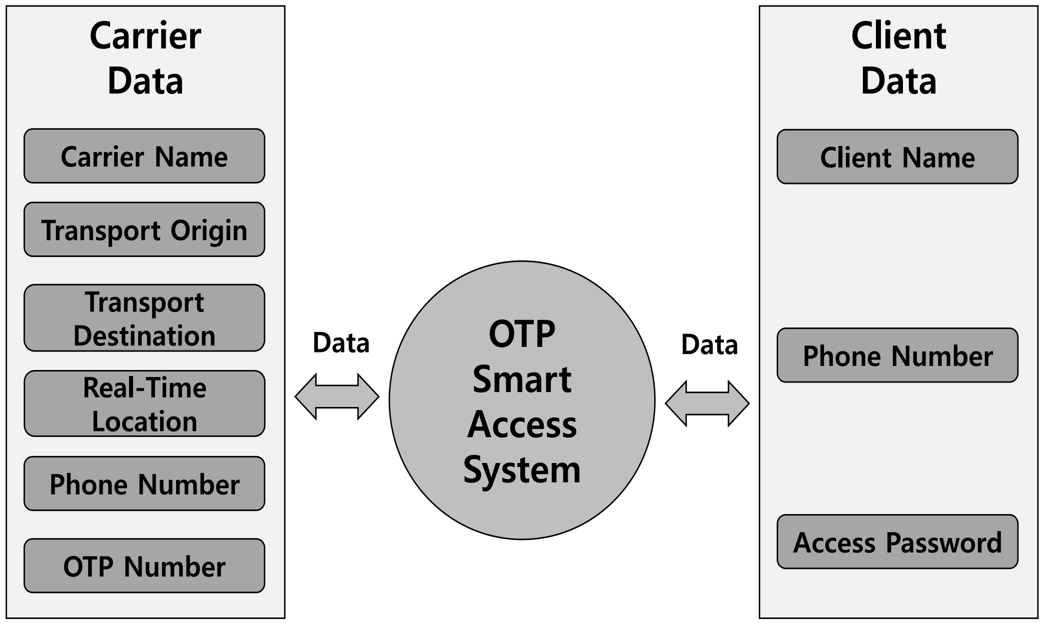

Figure 13. OTP Smart Access System Data

3.8 Process for generating authentication access numbers

In the OTP smart access system, based on the carrier's real-time location function, the mobile OTP number is automatically generated if the carrier approaches within 500M of the destination.

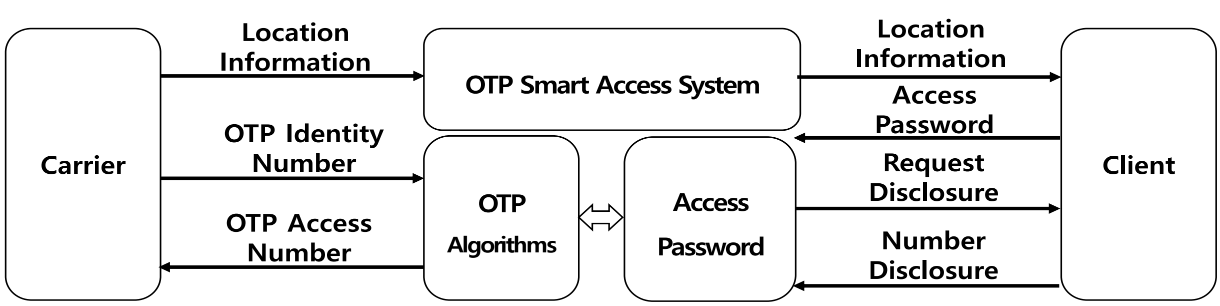

Figure 14. Process for creating an authentication access number

3.9 Real-time location information process

The carrier's location can be identified in real time through the carrier's mobile phone GPS function.

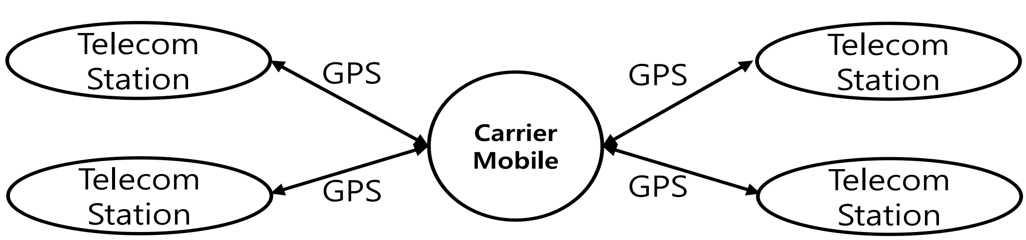

Figure 15. Real-time location information process

3.10 Identification process using transportation routes

The carrier's identity can be identified through information on the transport route of the cargo. The identity information of the carrier shall be verified by utilizing `receipt place information’ and `final destination information’.

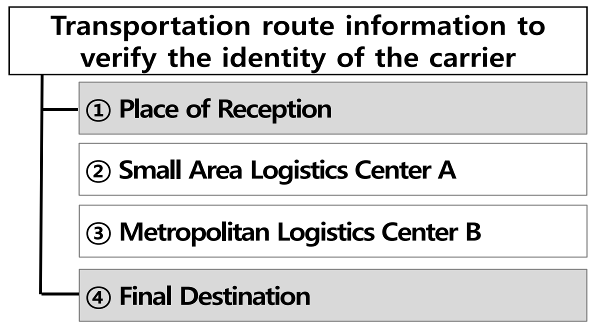

Figure 16. Process for utilizing transport route information

3.11 Access Number Disclosure Process

The OTP smart access system asks the customer if the access number is disclosed to the customer before disclosing it to the carrier.

Figure 17. Customer’s direct approval procedure

The OTP Smart Access System delivers encrypted single-use OTP access numbers to the carrier after obtaining direct customer approval.

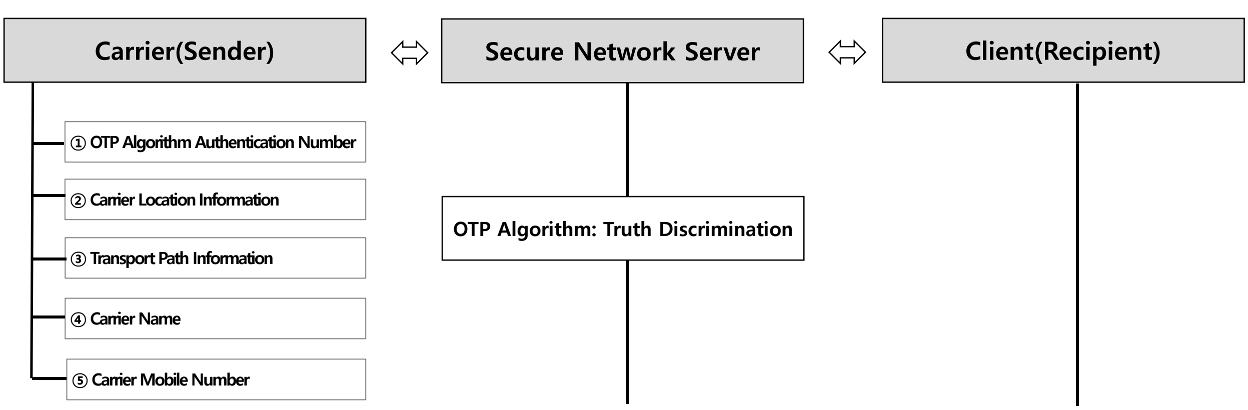

Figure 18. OTP access number disclosure process

3.12 Logical Structure

The OTP smart access system utilizes the OTP algorithm to identify the carrier and generate encrypted single-use OTP access numbers.

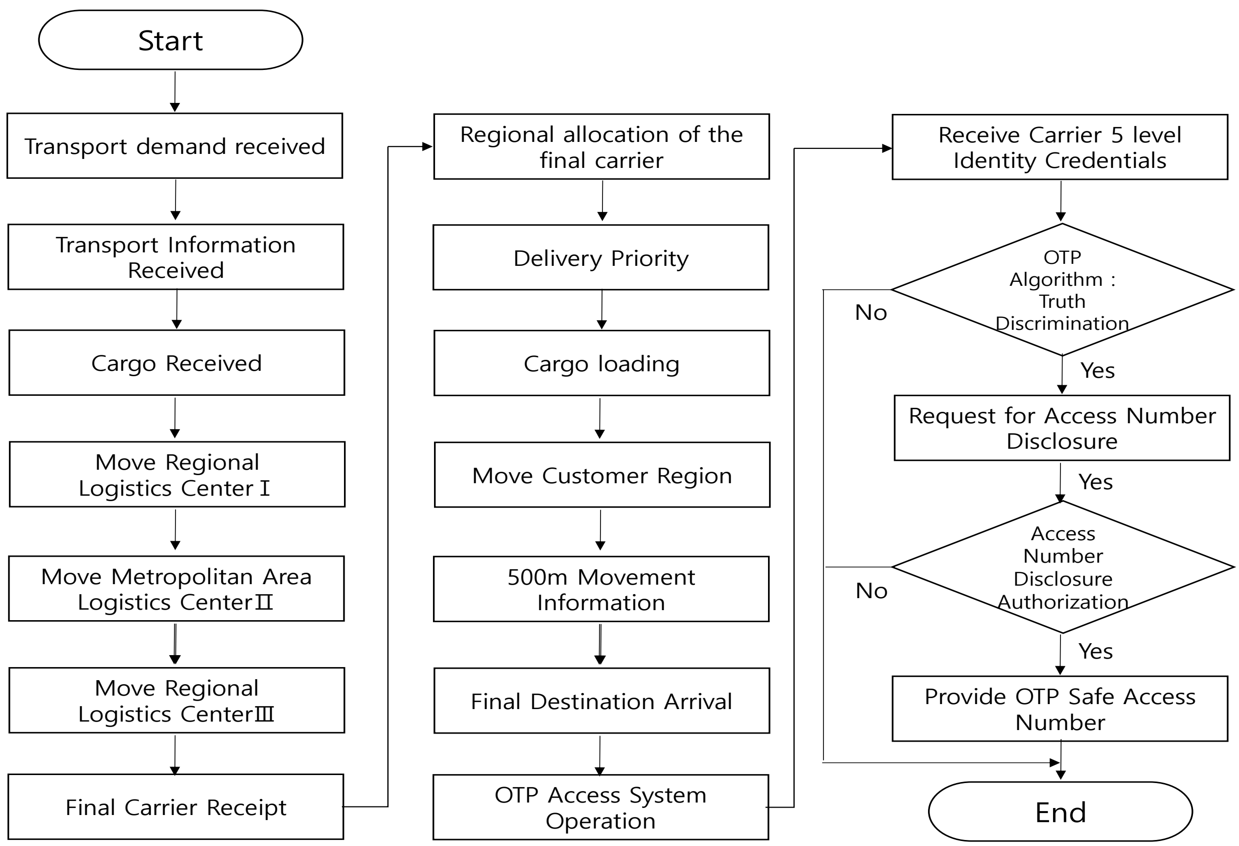

Figure 19. Logical Structure

4. PERFORMANCE ANALYSIS

4.1 CBA (Cost Benefit Analysis)

Cost-benefit analysis (CBA) provides an investment basis for social capital [25]. CBA is used as a tool to measure the performance of public capital investments [26]. NPV (Net Present Value) and IRR (Internal Rate of Return) can be calculated through the CBA method [27].

$$NPV = \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

$$IRR = r, \qquad where \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}, or \qquad NPV = 0$$

4.2 Hypothesis Premises

The prerequisites for cost benefit analysis are as follows: It is based on one CIP of Korea. The average annual revenue of a small logistics private carriers is assumed to be 70 million won. One CIP was assumed to have 500 individual small logistics private carriers. It was assumed that the daily working hours of a small logistics private carriers were 10 hours. The time to improve logistics transit time due to smart access systems was assumed to be 10 minutes per CIP vendor. It was assumed that an average of 20 SME companies visited by one small logistics private carriers per day [28].

4.3 Cost Analysis

Since the software cost was based on using open sources such as Android and JAVA, the technology cost (S/W, Soft Ware) was calculated as Zero. Since facility costs were based on the premise of using rental offices in the CIP, the cost of building separate offices was calculated as Zero. The equipment cost was calculated as KRW 9 million won for one year equipment (H/W, Hard Ware) rental fee, assuming the use of two rental servers for one year. Since the technology cost is based on the use of open sources such as Android and JAVA, the technology cost (S/W, Soft Ware) is calculated as Zero. The service cost was calculated based on the labor cost of four administrative clerks, with an average of KRW120 million won. Based on the assumption of a CIP rental office of KRW 1 million won per month, the facility cost of an average of 12 million won per year was calculated. Five Android mid-level developers with an average annual wage of 80 million won were estimated at KRW 400 million won per year. The CS(Customer Satisfaction) training expenses of administrative office staff for customer service were calculated at an average of about KRW 6 million per year. The license cost was calculated as Zero because it was assumed to utilize open sources such as Android and JAVA. Maintenance costs were calculated at an average annual cost of approximately KRW 2 million. The repair cost was estimated at about KRW 2 million won a year on average [29].

Table 1. Cost Analysis

(Unit: KRW, 10 million)

			Weight	1 Year	2 Year	3 Year
Cost	**One Time Cost**	**Software**	**100%**	0	0	0
		Facilities	**100%**	0	0	0
	Ongoing Cost	**Hardware**	**100%**	0.9	0.9	0.9
		Software	**100%**	0	0	0
		Services	**100%**	12	12	12
		Facilities	**100%**	1.2	1.2	1.2
		Staff Labor	**100%**	40	40	40
		Training Cost	**100%**	0.6	0.6	0.6
		License	**100%**	0	0	0
		Maintenance	**100%**	0.2	0.2	0.2
		Repair	**100%**	0.2	0.2	0.2
Total Cost per Year				55.1	55.1	55.1
Accumulated total cost over 3 years				165.3		

4.4 Benefit Analysis

One small logistics private carrier is analyzed to improve delivery delay time by about 200 minutes (about three hours) a day. The smart access system improved the daily transit time of about 33.3%. One small logistics private carrier is analyzed to improve delivery delay time by about 5,000 minutes (about 83 hours) a month. The smart access system improved the monthly transit time by about 33.3%. As transportation latency has been reduced, more additional transport demands can be resolved by the small logistics private carriers during the day. The carrier's revenue increases as more transport demands are resolved. An average annual revenue improvement of about 23.1 million won per individual small logistics private carriers can be expected. In one CIP, 500 small logistics private carriers can expect a total revenue improvement of KRW 11.5 billion per year. The working environment of transportation workers was improved by 33.3% through shorter transportation hours, and the welfare of transportation workers was improved by 33.3% as well. In addition, there is a positive possibility that the annual income of transportation workers will increase by 33.3% as they can win more new orders for extra working hours through the smart access system. As customers become familiar with the Smart Access System and its awareness within CIPs increases year by year, the benefits of the Smart Access System will increase. However, the minimum increase was conservatively assumed, and the increase in the benefits of domestic small logistics private operators (special employment workers) was conservatively calculated through the Smart Access System. The standard of increase was fixed as of 2021. For this reason, the Benefits figures for 1 Year, 2 Year, and 3 Year are assumed to be the same. The annual growth range of Intangible benefits is also conservatively assumed to be minimal. For this reason, the annual satisfaction of Intangible benefits was assumed to be a fixed factor of +3%. The standard of increase was fixed as of 2021. For this reason, the Intangible benefits of 1 Year, 2 Year, and 3 Year are assumed to be the same.

Table 2. Benefit Analysis

(Unit: KRW, 10 million)

			Weight	1 Year	2 Year	3 Year
Benefit	**Tangible Benefits**	**Logistics Delivery Time**	100%	+33.3%	+33.3%	+33.3%
		Logistics Shipping Revenue	100%	1,155	1,155	1,155
	Intangible Benefits	**SME Satisfaction**	120%	+3%	+3%	+3%
		Logistics Service Reliability	120%	+3%	+3%	+3%
		Ease of use	120%	+3%	+3%	+3%
Total Benefits per Year				1,155	1,155	1,155
Accumulated Total Benefits over 3 years				3,465		

4.5 NPV Analysis

Benefit Cost Ratio and NPV (Net Present Value) in OTP smart access systems were rated good.

Table 3. NPV Analysis

(Unit: KRW, 10 million)

	1 Year	2 Year	3 Year
Benefit	1,155	1,155	1,155
Cost	55.1	55.1	55.1
NPV	1,100	1,100	1,100
Benefit Cost Ratio	21	21	21

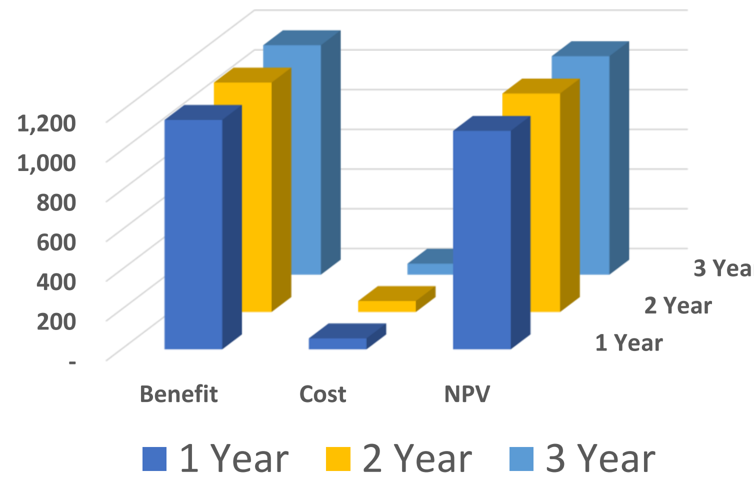

Figure 20. NPV Analysis

4.6 Intangible Benefits Analysis

The OTP smart access system improves the working welfare environment of small logistics private carriers by +33.3%. The OTP smart access system improves rest time by +33.3%. The OTP smart access system improves time to leave work by +33.3%. In the logistics industry, time is money. The OTP smart access system improves the working welfare environment of small logistics private carriers by +33.3%.

Table 4. Intangible Benefits Analysis

	Current	OTP Smart Access System
Working Welfare Environment	No change	Working Hours : +33.3% Physical Labor Fatigue : +33.3% Labor Satisfaction: +33.3%

4.7 Legal Review

The OTP Smart Access System is a system in which the customer's personal information is directly delegated by the customer. There is no possibility of leakage of customer personal information. There is no possibility of a large-scale customer compensation lawsuit. In the event of loss of cargo, small logistics private carriers are not unfairly responsible for all compensation. The OTP smart access system improves legal stability.

Table 5. Legal Review

	Current	OTP Smart Access System
Legal Safety	(1)Delegation of Personal Information : Company Delegation (2) Liability for Loss: Carrier (3) Possibility of customer privacy leakage: O (4) Possibility of large-scale compensation litigation from customer: O	(1) Delegation of Personal Information : Direct Customer Delegation (2) Liability for loss: Client (3) Possibility of customer privacy leakage: X (4) Possibility of large-scale compensation litigation from customer: X

4.8 Business feasibility assessment

The business feasibility evaluation of OTP smart access systems has been positively evaluated.

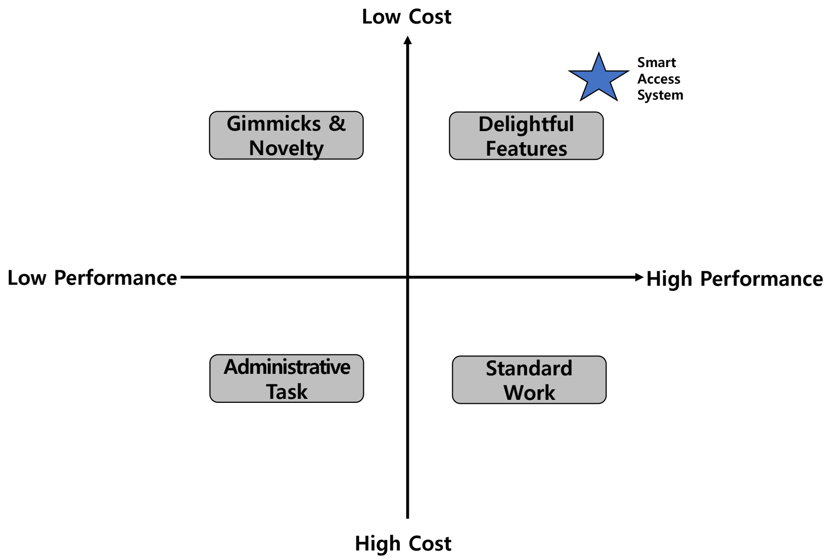

Figure 21. Business feasibility assessment

5. CONCLUSION

Due to seasonal and periodical causes such as the Korean Chuseok holiday and the New Year holiday, demand for delivery supplies in the Korean logistics market is showing a big monthly deviation. For these reasons, subcontracting contracts with subcontractors are preferred for the volume of delivery that corresponds to the variable volume [30]. This is because if large Korean logistics companies maintain their own logistics service providers until the large portion of monthly fluctuations, huge fixed costs will increase, and predicting demand for logistics service over the fluctuation period will be very difficult [31]. The OTP smart access system improves the transit time at the final stage, reducing the logistics transit time of CIPs Korean SMEs and improving the SCM efficiency of Korean SMEs [32]. OTP Smart Access System effectively improves `legal protection' and `legal safety' of small logistics private carriers. The OTP smart access system improves the mutual reliability of customers and carriers in the Korean logistics industry market [33].

REFERENCES

[1] Hyunkyung Shin, et al., "Temporal Impulse of Traffic Accidents in South Korea", IEEE Access (Volume8), 21 February 2020
DOI: 10.1109/ACCESS.2020.2975529
[2] Sungtae Kang et al., "Legal Protection of ‘Economically Dependent Workers’ in Labor Law", Labor Policy Research 2007 Vol. 7 No. 3, September 2007
UCI(KEPA) : I410-ECN-0101-2012-336-003853049
[3] Kwanghun Lee, Taesung Kim, "A Study on the Impact of Korean Trucking Labor Environment on Traffic Accidents", Logistic Research Vol. 25 No. 1, pp. 1-22, 2017
[4] Youngjue Kim, "Some Issues on the Draft Amendment to Multimodal Transport Law in Korea", Maritime Judicial Research Vol. 29 No. 1, pp. 119-162pages, 2017
[5] Young-Chuel Yang, "Connected-IPs: A Novel Connected Industrial Parks Architecture for Building Smart Factory in Korea", The Journal of The Institute of Internet, Broadcasting and Communication (IIBC) Vol. 18, No. 4, pp.131-142, Aug. 31 2018

DOI: https://doi.org/10.7236/JIIBC.2018.18.4.131
[6] Svetlana N. Kuznetsova, et l., "Advantages of Residents of Industrial Parks", HOSMC 2017: The Impact of Information on Modern Humans pp. 502-509, 06 March 2018
DOI: https://doi.org/10.1007/978-3-319-75383-6_64
[7] Jaeyul Kwon, "Some Thoughts on Improving Fairness in Subcontract Transactions", Legal discussion group, pp.199-220, 2006.02
UCI(KEPA) : I410-ECN-0101-2009-300-015842157
[8] Mohamed Hamdy Eldefrawy, "OTP-Based Two-Factor Authentication Using Mobile Phones", 2011 Eighth International Conference on Information Technology: New Generations, April 2011
DOI: 10.1109/ITNG.2011.64
[9] ByungRae Cha, "Random password generation of OTP system using changed location and angle of fingerprint features", 2008 8th IEEE International Conference on Computer and Information Technology, 11 July 2008
DOI: 10.1109/CIT.2008.4594712
[10] Kwang-Phil Kim, Hyung-Rim Choi, "A Study on TRIZ Application for Development of Container Security Device", The Journal of Korean Institute of Information TechnologyVol.11 No.7, July 2013
DOI: 10.14801/kiitr.2013.11.7.77
[11] R.Stratton, D.Mann, "Systematic innovation and the underlying principles behind TRIZ and TOC", Journal of Materials Processing Technology, Volume 139, Issues 1–3, pp.120-126, 20 August 2003
DOI: https://doi.org/10.1016/S0924-0136(03)00192-4
[12] Imoh M.Ilevbare, DavidProbert, RobertPhaal, "A review of TRIZ, and its benefits and challenges in practice", Technovation Volume 33, Issues 2–3, pp.30-37, March 2013
DOI: https://doi.org/10.1016/j.technovation.2012.11.003
[13] Se Young Oh, "The Present Situation of Courier Service Industry and It`s Improvement Plan", Shipping Logistics: Theory and Practice, Volume 4, pp.97-123, 2002
UCI(KEPA) : I410-ECN-0102-2009-320-004333216
[14] Yungsam Yoon, "The Content and Implications of Road Safety Remuneration System in Australi", Human Resource Management Research Vol. 21 No. 3, pp.321 - 339, 2014
[15] Yanhyung Lee, "Strategy for Overcoming Environmental Change Risks Facing the Distribution and Logistics Industry Caused by COVID-19 Pandemic", Journal of Distribution Management Vol. 23 No. 3, pp.81-95, 2020
[16] Raymond P. Cote, "Designing eco-industrial parks: a synthesis of some experiences", Journal of Cleaner Production
[17] Volume 6, Issues 3–4, pp.181-188, September 1998
DOI: https://doi.org/10.1016/S0959-6526(98)00029-8
[18] Konstantinos Domdouzis, "Radio-Frequency Identification(RFID) applications: A brief introduction", Advanced Engineering Informatics, Volume 21, Issue 4, Pages 350-355, October 2007
DOI: https://doi.org/10.1016/j.aei.2006.09.001
[19] Longfei Zhou, Lin Zhang, "Logistics service scheduling with manufacturing provider selection in cloud manufacturing", Robotics and Computer-Integrated Manufacturing, Volume 65, October 2020
DOI: https://doi.org/10.1016/j.rcim.2019.1019145
[20] Kyeongsik Kim, Byungmuk Im, "Design and Implementation of Web-based Virtual Twin Model for Synchronization between Physical and Cyber Space in Manufacture Industry", The Journal of Korean Institute of Information Technology, February 2016
DOI: 10.14801/jkiit.2016.14.2.115
[21] Karthik Kambatlaa, Giorgos Kollias, "Trends in big data analytics", Journal of Parallel and Distributed Computing Volume 74, Issue 7, Pages 2561-2573, July 2014
DOI: https://doi.org/10.1016/j.jpdc.2014.01.003
[22] Chang-Hyun Moon, Tae-Hun Lee, "A Study on Beamforming of 5G Antenna Using 4 Pole Array Structure", The Journal of Korean Institute of Information TechnologyVol.18 No.3, March 2020

DOI : 10.14801/jkiit.2020.18.3.89
[23] Choi, Eun-Soo, Kang, Min-Soo, et all. "Implementation of IoT-based Automatic Inventory Management System", International Journal of Advanced Culture Technology, Volume 5 Issue 1, pp.70-75, Mar. 31, 2017
DOI : https://doi.org/10.17703/IJACT.2017.5.1.70
[24] Xia Lia, Wen Yi, "A critical review of virtual and augmented reality (VR/AR) applications in construction safety", Automation in Construction Volume 86, Pages 150-162, February 2018
DOI: https://doi.org/10.1016/j.autcon.2017.11.003
[25] D Pearce, "Cost benefit analysis and environmental policy", Oxford Review of Economic Policy, Volume 14, Issue 4, pp.84–100, December 1998
DOI: https://doi.org/10.1093/oxrep/14.4.84
[26] E B Barbier, et al., "Environmental Sustainability and Cost-Benefit Analysis", First Published September 1, 1990
DOI: https://doi.org/10.1068/a221259
[27] Richard W.Goggins, et al., "Estimating the effectiveness of ergonomics interventions through case studies: Implications for predictive cost-benefit analysis", Journal of Safety Research Volume 39, Issue 3, pp.339-344, 2008
DOI: https://doi.org/10.1016/j.jsr.2007.12.006
[28] Cass R. Sunstein, "Cost-Benefit Analysis and the Environment", Ethics, Volume 115, Number 2, January 2005
DOI: https://doi.org/10.1086/426308
[29] Jan AnneAnnema, et al., "Cost-benefit Analysis (CBA), or Multi-criteria Decision-making (MCDM) or Both: Politicians' Perspective in Transport Policy Appraisal", Transportation Research Procedia, Volume 10, pp.788-797, 2015
DOI: https://doi.org/10.1016/j.trpro.2015.09.032
[30] Rolf Wu¨ stenhagen, et al., "Green energy market development in Germany: effective public policy and emerging customer demand", Institute for Economy and the Environment, November 2004
DOI: https://doi.org/10.1016/j.enpol.2004.07.013
[31] Adnan Midilli, et al., "Green energy strategies for sustainable development", Energy Policy 34, September 2005
DOI: https://doi.org/10.1016/j.enpol.2005.08.003
[32] Lee, Yong-Soo et al., "A Study on Smart Energy Management System using Information and Communication Technology", The Journal of the Institute of Internet, Broadcasting and Communication, Volume 14 Issue 5, August 2014
DOI: https://doi.org/10.7236/JIIBC.2014.14.5.167
[33] Beatrice Marchi et al., "Supply Chain Management for Improved Energy Efficiency Review and Opportunities", MDPI, October 2017
DOI: https://doi.org/10.3390/en10101618