

A Study on the Influence of the Packaging System-related Institutional Approach on Logistics Efficiency (Focusing on Retail Ready Packaging System)

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Abstract This paper conducted a study on the operation plan of the packaging system to enhance the logistics efficiency between the manufacturer and the distributor, whose prior research in the relevant field was insignificant. By identifying problems and improvements in the operation of the packaging system between domestic manufacturers and distributors through the Retail Ready Packaging. The institutional aspects were investigated to confirm that the mediation role of government and social organizations was required to resolve issues ($\chi^2 = 148.916, p < 0.001$), and that guidelines that gathered diverse opinions for the rational operation of the packaging system were essential, while institutional aspects are needed to be supplemented to be willing to improve logistics efficiency ($\chi^2 = 95.781, p < 0.001$). In this study, even though the difference in perception between manufacturers and distributors is clear and the issue related to the operation of the packaging system is ongoing, if there is no effort to grasp the issue, the opinions between manufacturers and distributors will be left at odds and could become a social problem. Unnecessary interference from government and social organizations should be excluded, but the level of mediation to support win-win management in order to promote logistics standardization and reduce CO₂ and national logistics costs can be explained as a catalyst for improving logistics efficiency through reasonable operation of the packaging system.

Keywords Packaging Design, Institutional Approach, Logistics efficiency

Introduction

Retailers these days have a huge influence on the determination of their own packaging formats, materials and sizes. The pressure from retailers to secure display space removed the “Shadow Box” which was used to store deodorant containers and focused on compact containers to spread liquid detergent. Meanwhile, in order to make their shelves cleaner and better aligned, North American retailers have recently introduced the RRP method, being actively propelled in Europe, that employees are able to store goods on shelves faster and easier. As a result, empty brown corrugated cardboard boxes, which had previously been thrown away at retail stores, are being replaced with billboards of various colors. Since packaging design is recognized as a powerful medium of products that satisfy various environments and needs in modern life, the relationship between products and packaging is expanding its function and role as a sales tool for consumers' satisfaction and convenience beyond just sealing and protection. Twede¹⁾

stated that the most basic tasks for a package of goods are seal of the product, protection the product and specification the contents²⁻⁴⁾. However, problems can arise if it is not easy to find the products you want by visiting nearby stores, and even if retailers receive all of their orders from general manufacturers, importers and PB suppliers, they still have the last door to overcome before putting them on the shelves. ECR Europe⁵⁾ offers a variety of examples of trays and cases that can be displayed on the shelves, some of which are shown in <Figure 1>⁶⁾.

Things that happen in stores are vary from the basic problem of making it easy to find products in the store's warehouses to putting them on the shelves intact without damaging them, to the difficulty of opening the product's case, checking the product, quickly replenishing the product, which make the shelf corridors too crowded. From the customer's point of view, poor availability is defined as a situation in which the product is not available when it is found. This situation occurs when the product is out of stock, but it can also often occur if the product is not found in the store due to poor product management⁷⁾. The RRP aims to greatly improve these problems and completely redesign the “exterior packaging” so that the product can be moved smoothly from warehouse to display stand and eventually to consumers' shopping carts⁵⁾. Thus, the introduction of RRP began with a concern to simplify inventory replenishment work and to encourage consumers to

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Fig. 1. RRP types that can be displayed on shelves.

purchase more easily, RRP was introduced for the purpose of solving problems arising from the increase in profit and the the inventory replenishment process in the rear of store through the improvement of customer's product awareness, efficient replenishment of inventory, reduction of rear classification work, and improvement of utilization of display space. On the other hand, physical distribution is divided into five components: packaging, transportation, unloading, storage and information, and with these five components being systematized with each other, logistics can be established. Importance of packaging accounts for a small portion of physical distribution based on the total amount of logistics costs, but packaging is called a source of logistics because it directly affects other factors, such as transportation, storage, and unloading. Therefore, the packaging design of the product should be considered as elements of the physical product distribution⁸⁻¹⁰). Packaging is a means of protecting products from breakage or damage during the distribution phase, and has a significant impact on increased value added and increased sales through cost reduction and productivity improvement¹¹). Therefore, packaging is the beginning of logistics, and should be the basis for rationalization of transportation, storage and loading and at the same time, logistics standardization will enable palletization and containerization, mechanization and automation, and will be an area that supports the reduction of logistics costs. It can be assumed that we should focus on developing international-level package designs which are the most suitable for our situation with containing a Korean image, and at the same time, we have a responsibility to find the factors so that packaging can play a role as a social common resource that contributes to reduction of national logistics costs in consideration

of logistics efficiency. Therefore, in this study, the relationship between packaging design and logistics efficiency raised in prior research was intended to be carried out through empirical analysis from an institutional perspective. The main research was conducted on the institutional aspects of packaging, the mediation role of government and social organizations related to packaging system operation issues, the presentation of guidelines, and the willingness to comply with packaging system procedures and systems.

Study Procedure and Methods

The Act on Logistics Policy defines logistics as processing, assembly, classification, repair, packaging, trademark attachment, sales, and information and communications that generate additional value to the main activities such as transportation, storage, loading, and unloading goods that are procured from suppliers and produced, delivered to consumers, or collected or discarded, and includes procurement, production, sales and collection, kind of waste¹²⁻¹³). This can be summarized as basic activities of logistics management, such as transport, unloading, warehouse(storage), packaging activities, information which works as support factor, and distribution processing activities, and these factors were defined as a system that acted organically rather than as separate independent activities to cover the entire process of logistics. Meanwhile, Steiner¹⁴) defined social responsibility as "a generally accepted relationship, duty and constraint in relation to the influence of enterprises on the welfare of society." The most influential option considering retailing characteristics is to carry out and extend social responsibility through contracts, coordination, collaboration

and partnerships with large store partners such as suppliers and producers in the supply chain, and there is a natural environment protection sector that can maximize these capabilities¹⁵⁻¹⁶. In fact, in the United Kingdom, under the leadership of the Retailers Association, the company operates an eco-friendly promotion program called Carbon Trust, in cooperation with suppliers¹⁷.

Lee¹⁸ presented the institutional aspects as the viewpoints of the minimization measures in the "Study on the Minimizing Factors of Environmental Causing in the Logistics System". In "Study on the effects of government's environmentally friendly logistics policies on their logistics performance", Cho¹⁹ argued that the government's environmentally friendly logistics policies, the Environmental Friendly Enterprise Designation Scheme, the Extended Producer Responsibility (EPR) and the Logistics Standardization Policy, could enhance the performance of individual enterprises' environmentally friendly logistics activities. Jung and Ji²⁰ argued in the "Study on the Relationship between Logistics Management Form and Logistics Performance of Korean Pharmaceutical Manufacturers" that the integration of logistics-specific functions through the revision of the Pharmacist Act alone can reduce and streamline costs, so the government needs to play a role. Kagan and Skolnick²¹ said that social pressure is a very important factor in gaining high levels of support for the prohibition of smoking. Consumer organizations in the U.S. list the six best packaging types (Best, Very Good, Good, Fair, Bad, Worst) and encourage consumers to actively consider packaging production when purchasing goods and firms to actively consider packaging production when producing package²². Based on this rationale, the following verification details were established in this study to supplement the institutional aspects for the packaging system for improving logistics efficiency between manufacturers and distributors.

(Research Model 1) The mediation role of the government and social organizations related to the issue of packaging system operation will have a positive impact on rational operation.

SCM is a strategic technique that maximizes efficiency by integrating and managing inter-chain interfaces from a holistic perspective on the flow of information, materials and cash in the supply chain from supplier to customer²³. Meanwhile, cooperation between large and small businesses can be achieved through factors such as coordination, participation and joint problem solving²⁴. The partnership capabilities held by an individual entity are considered an important success factor in implementing the strategy, which allows the entity to gain the objectives of the individual organization and competitive advantage in the industry²⁵⁻²⁶. Supply chain management also aims to minimize costs and maximize services to customers through partner-to-partner collaboration in the supply chain. This goal emphasizes that it is a win-win strategy that benefits

all supply chain participants based on synergies from mutual collaboration, not limited resource segmentation²⁷⁻²⁸. Eom et al.²⁹ argued that guidelines and operating procedures should be developed in related unit road systems as well as future pallet standards.

In ECR Europe⁵, an eight-step approach was developed to assist in the RRP execution process and to provide a framework for trading companies in the supply chain to work together, and the first step is verification of key principles, second is adoption of value chain effect approach, the third is implementation of evaluation of high level, the fourth is defining and evaluating alternative solutions, the fifth is agreement and evaluation of related business case initiatives, the sixth is conduction of business case assessment, the seventh is implementing of solution or chosen improved factor, the eighth is tracking and measuring success of implementation³⁰⁻³². Assuming that guidance was prepared by collecting diverse opinions on the first phase of the key principles, the following verification details were established, assuming that it could be the basis for principle compliance and approach.

(Research Model 2) The guidance presented after gathering various opinions on the operation of the packaging system will have a positive effect on rational operation.

According to An¹⁷, social responsibility has recently attracted the attention of ordinary citizens in Korea regarding the issue of large corporations. Scholz and Lubell³³ said that taxpayers show a high level of tax compliance when it is thought that a large number of taxpayers pay taxes, which is mentioned in their study on taxpayer compliance. Various measures are being proposed to reduce the nation's national logistics costs, and one of the important measures is reducing costs by improving the level of national logistics standardization³⁴. Standard is defined as something that is widely used and utilized in everyday life, such as traffic lights at intersections and expiration dates of products³⁵, and is set as a model or example by an authorized entity, custom, or general agreement. Issues related to improving the legal system can be largely summarized as the lack of consistency in the legal system, the lack of awareness at the site, and the lack of incentives for standardization⁶, and it is important to establish various measures to consider transport efficiency from a packaging perspective to reduce transportation costs. However, the following verification details were established to supplement the institutional aspects, assuming that the distribution company RRP officials had no will to implement reasonable procedures and systems that could be utilized to improve logistics efficiency.

(Research Model 3) The willingness of the distributor to comply with the systems related to the reasonable packaging system procedures for improving the logistics efficiency will have a positive effect on the improvement of logistics efficiency.

To check the verification of each of the above research models, a chi-square test was performed, and for the analysis

of the variance of one-way layout, the test method of Scheffe was used as a post-test method. After showing a brief description and picture related to RRP, the survey was conducted and retrieved only to those who clearly knew or knew RRP, and those who did not know or indicated that they knew little about it were not allowed to conduct the survey itself. Accordingly, surveys were requested only if the the manufacturer and the distributor were practical or hands-on workers related to RRP, and logistics experts and logistics company employees who responded that they knew or knew the RRP were selected for the sample.

Results and discussion

1. Analysis of one-way layout and post-test of Scheffes

A one-way distributed analysis was conducted to compare the average of each industry by measurement variable, as shown in <Table 1>, and a post-test of the Scheffe was conducted as shown in <Table 2> to find out which measurement variable

levels differed statistically. A post-test by Scheffe showed that there were statistically significant average differences in all questions.

2. Results of verification of research model

(Research Model 1) : The mediation role of government and social organizations related to the issue of packaging system operation will have a positive impact on rational operation.

As a result of the analysis of whether the mediation role of government and social organizations on issues related to RRP progress would result in improved operational performance and efficiency, result showed a statistically meaningful difference at a significant level of 0.000, with $\chi^2 = 148.916$ as shown in <Table 3>. Overall, the largest number of respondents were 'Normal' 135 (58.2%), and 'No' 8 (3.4%). Manufacturers and logistics companies were found to have the most 'Yes' in common, while distributors answered 'Normal'. The results of the <Table 2> Scheffe post-test showed that distributors averaged 2.94, statistically lower than manufacturers 3.98 and logistics

Table 1. Result of One-Way Layout Analysis of Variance

Measurement Variables	Industry Classification	N	Average	Standard deviation	Standard error	95% confidence interval for the mean		Minimum Value	Maximum Value
						Lower Limit Value	Upper Limit Value		
Institutional aspect1	Manufacturer	101	3.98	0.346	0.034	3.91	4.05	3	5
	Distributor	71	2.94	0.410	0.049	2.85	3.04	2	4
	Logistics Company	60	3.87	0.536	0.069	3.73	4.01	3	5
	Total	232	3.63	0.624	0.041	3.55	3.71	2	5
Institutional aspect2	Manufacturer	101	4.07	0.406	0.040	3.99	4.15	3	5
	Distributor	71	3.34	0.533	0.063	3.21	3.46	2	4
	Logistics Company	60	4.00	0.368	0.048	3.90	4.10	3	5
	Total	232	3.83	0.547	0.036	3.76	3.90	2	5
Institutional aspect3	Manufacturer	101	4.30	0.625	0.062	4.17	4.42	3	5
	Distributor	71	3.76	0.430	0.051	3.66	3.86	3	4
	Logistics Company	60	4.30	0.561	0.072	4.15	4.45	3	5
	Total	232	4.13	0.606	0.040	4.06	4.21	3	5

$p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

Table 2. Result of Scheffe post-test (Manufacturer:a, Distributer:b, Logistics Company:c)

Measurement Variables	Industry Classification	N	Average	Standard Deviation	F-Value (p-value)	Scheffe
Institutional aspect1	Manufacturer	101	3.98	0.346	138.491*** (0.000)	b < c = a
	Distributor	71	2.94	0.410		
	Logistics Company	60	3.87	0.536		
Institutional aspect2	Manufacturer	101	4.07	0.406	63.697*** (0.000)	b < c = a
	Distributor	71	3.34	0.533		
	Logistics Company	60	4.00	0.368		
Institutional aspect3	Manufacturer	101	4.30	0.625	23.087*** (0.000)	b < a = c
	Distributor	71	3.76	0.430		
	Logistics Company	60	4.30	0.561		

$p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

Table 3. Results of Chi-Square Test of Government and Social Organizations Arbitration

Classification		No	Normal	Yes	Strongly Yes	Total	χ^2 (p-value)
Manufacturer	Frequency	0	7	89	5	101	148.916*** (0.000)
	Row %	0.0%	6.9%	88.1%	5.0%	100.0%	
	Column %	0.0%	8.9%	65.9%	50.0%	43.5%	
Distributor	Frequency	8	59	4	0	71	
	Row %	11.3%	83.1%	5.6%	0.0%	100.0%	
	Column %	100.0%	74.7%	3.0%	0.0%	30.6%	
Logistics Company	Frequency	0	13	42	5	60	
	Row %	0.0%	21.7%	70.0%	8.3%	100.0%	
	Column %	0.0%	16.5%	31.1%	50.0%	25.9%	
Total	Frequency	8	79	135	10	232	
	Row %	3.4%	34.1%	58.2%	4.3%	100.0%	
	Column %	100.0%	100.0%	100.0%	100.0%	100.0%	

$p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

companies 3.87, and that manufacturers and logistics companies did not have statistically significant average differences between each other. It can be interpreted as meaning that opinions between companies may conflict if government and social organizations have insufficient understanding of issues or lack of mediation roles, although additional packaging which is carried out manually by transporting products to processing company to form an RRP, double packaging and poor logistics efficiency can cause cost increment and environmental issue.

(Research Model 2) : The guidelines presented after gathering various opinions on the operation of the chi-square test result packaging system of mediation of government and social group will have a positive impact on rational operation.

After consultation with manufacturers, distributors, and government and social organizations, the analysis of various aspects of the guidelines showed that there was a statistically meaningful difference at a significant level of 0.000 with $\chi^2 = 95.781$, as shown in <Table 4>. Overall, 162 respondents

(69.8%) answered ‘Yes’ and only two distributors answered ‘No’ (2.8%). Manufacturers and logistics companies were found to have the most ‘yes’ in common, while distributors answered ‘Normal’. These results showed that the average of distributors was 3.34, statistically lower than manufacturers 4.07 and logistics 4.00, while manufacturers and logistics companies did not have statistically significant average differences, also as shown in <Table 2> Scheffe post-test result. The result can be seen as a result of determining that a lack of adequate guidelines considering the environmental aspects, standardization aspects, logistics efficiency aspects, and social cost-cutting aspects of RRP operations by governments and social organizations could lead to problems that would have no basis for implementation.

(Research Model 3) : Willingness of the distributor officials to comply with the reasonable packaging system procedures for improving the logistics efficiency and the systems related to packaging design will have a positive effect on the improve-

Table 4. Results of Chi-Square Test Related to Guidelines

Classification		No	Normal	Yes	Strongly Yes	Total	χ^2 (p-value)
Manufacturer	Frequency	0	5	84	12	101	95.781*** (0.000)
	Row %	0.0%	5.0%	83.2%	11.9%	100.0%	
	Column %	0.0%	9.6%	51.9%	75.0%	43.5%	
Distributor	Frequency	2	43	26	0	71	
	Row %	2.8%	60.6%	36.6%	0.0%	100.0%	
	Column %	100.0%	82.7%	16.0%	0.0%	30.6%	
Logistics Company	Frequency	0	4	52	4	60	
	Row %	0.0%	6.7%	86.7%	6.7%	100.0%	
	Column %	0.0%	7.7%	32.1%	25.0%	25.9%	
Total	Frequency	2	52	162	16	232	
	Row %	0.9%	22.4%	69.8%	6.9%	100.0%	
	Column %	100.0%	100.0%	100.0%	100.0%	100.0%	

$p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

Table 5. Results of Chi-Square Test for the Willingness of Distribution Companies to Improvements

Classification		No	Normal	Yes	Strongly Yes	Total	χ^2 (p-value)
Manufacturer	Frequency	0	9	53	39	101	41.625*** (0.000)
	Row %	0.0%	8.9%	52.5%	38.6%	100.0%	
	Column %	0.0%	31.0%	37.1%	65.0%	43.5%	
Distributor	Frequency	0	17	54	0	71	
	Row %	0.0%	23.9%	76.1%	0.0%	100.0%	
	Column %	0.0%	58.6%	37.8%	0.0%	30.6%	
Logistics Company	Frequency	0	3	36	21	60	
	Row %	0.0%	5.0%	60.0%	35.0%	100.0%	
	Column %	0.0%	10.3%	25.2%	35.0%	25.9%	
Total	Frequency	0	29	143	60	232	
	Row %	0.0%	12.5%	61.6%	25.9%	100.0%	
	Column %	0.0%	100.0%	100.0%	100.0%	100.0%	

$p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

ment of logistics efficiency.

An analysis of whether logistics efficiency would be improved if distribution company RRP design stakeholders were willing to comply with the system and reasonable packaging system procedures for improving logistics efficiency showed that there was a statistically meaningful difference at a significant level of 0.000, with $\chi^2 = 41.625$, as shown in <Table 5>. Overall, the largest number of respondents were 'Yes' 143 (61.6%) and 'Normal' 29 (12.5%). Manufacturers, logistics companies and distributors all said 'Yes' the most, with the exception of distributors saying 'Yes' and 'Strongly yes'. In particular, the analysis shows that the composition of the response ratio of 'yes' was positive for both manufacturers, logistics companies and distributors, and that even if reasonable procedures and systems that can be used are prepared to improve logistics efficiency, logistics efficiency will inevitably be reduced if distribution company RRP officials do not have the will to implement them.

3. Summary of Study Model Verification Results

The verification of institutional aspects of this study were shown in <Table 6>.

(Research Model 1) indicates that the findings in this study clearly distinguish recognition differences between manufacturers and distributors, indicating that unnecessary government and social organizations should be excluded, but from the institutional standpoint, there is a need for a willingness to mediate between manufacturers and distributors to identify and resolve issues related to packaging systems. (Research Model 2) indicates that guidelines are essential for the rational operation of the packaging system, which can create an atmosphere for collaboration by contributing to resolving differences in perception between distributors and manufacturers from an institutional perspective. (Research Model 3) shows that even if there is no incentive for distributors and they contribute to improving logistics efficiency, there is a need for institutional approach and active supplementation. In other words, if the government reviews policy support and tax support measures such as certification system for distributors and officials who contributed to improving logistics efficiency related to packaging design, it will be able to contribute to the spread of national logistics cost reduction through the improvement of logistics efficiency with will, and institutional supplementation in terms of activation rather than regulation-oriented supplementation is required.

Table 6. Results of chi-square test of the entire research model

Research Model	Verification Contents	χ^2 (p-value)
Research Model 1	The mediation role of the government and social organizations related to the issue of packaging system operation will have a positive impact on rational operation.	148.916*** (0.000)
Research Model 2	The guideline presented after gathering various opinions on the operation of the packaging system will have a positive effect on rational operation.	95.781*** (0.000)
Research Model 3	The willingness of the distributor officials related to packaging design to comply with the systems and reasonable packaging system procedures for improving the logistics efficiency will have a positive effect on the improvement of logistics efficiency.	41.625*** (0.000)

$p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

Conclusion

This paper conducted a study on the operation plan of the packaging system to enhance the logistics efficiency between the manufacturer and the distributor, whose prior research in the relevant field was insignificant. By identifying problems and improvements in the operation of the packaging system between domestic manufacturers and distributors through the RRP, solutions and action plans were drawn and this study presents a package system operation plan to enhance logistics efficiency between manufacturers and distributors in the future. In addition, it was intended to investigate the opinions of experts on the priority of improvement and importance and to reflect them in the conclusions of this study. Regarding survey types and content, case studies and prior studies on issues about difficulties in practice were used, and the comparison of means based on industry by factor indicated that there were statistically significant differences for all sub-factors ($p < 0.001$). In addition, a correlation analysis conducted through Pearson's correlation coefficient to confirm their relationship showed that there were all statistically significant correlations ($p < 0.001$). A one-way analysis of variance was conducted to compare the means by industry of measurement variables, and a post-test of Scheffes was conducted to determine which levels of measurement variables differed in means, and there were statistically significant differences in all factors ($p < 0.001$). All verification result that 3 verification contents which is set according to the goal of this study were implemented and analyzed by Chi-Square test and turned out to be statistically significant ($p < 0.001$), and result drawn by verification of each factor is as follows. The institutional aspects were investigated to confirm that the mediation role of government and social organizations was required to resolve issues ($\chi^2 = 148.916$, $p < 0.001$), and that guidelines that gathered diverse opinions for the rational operation of the packaging system were essential, while institutional aspects are needed to be supplemented to be willing to improve logistics efficiency ($\chi^2 = 95.781$, $p < 0.001$). In this study, even though the difference in perception between manufacturers and distributors is clear and the issue related to the operation of the packaging system is ongoing, if there is no effort to grasp the issue, the opinions between manufacturers and distributors will be left at odds and could become a social problem. Unnecessary interference from government and social organizations should be excluded, but the level of mediation to support win-win management in order to promote logistics standardization and reduce CO₂ and national logistics costs can be explained as a catalyst for improving logistics efficiency through reasonable operation of the packaging system. On the other hand, despite of the absence of incentives for distributors in the event of contributing to the improvement of logistics efficiency in connection with the operation of packaging systems between manufacturers and

distributors, it shows the need for institutional access and active supplementation ($\chi^2 = 41.625$, $p < 0.001$). In other words, if implemented by reviewing policy support and tax support measures, such as certification systems, for distributors and officials who contributed to improving logistics efficiency related to packaging design, it will contribute to the spread of national logistics cost reduction through the improvement of logistics efficiency with will and will serve as a basis for the utilization of various proposals derived from this study. Meanwhile, problems caused by insufficient mediation roles by government and social organizations were analyzed as problems that should be improved preferentially. Strengthening the mediation role of government and social organizations is closely related not only to institutional aspects but also to factors in standardization, SCM efficiency and partnership, and the following are the measures that can be implemented by governments and social organizations.

First, the government and social organizations' efforts to grasp issues related to the operation of the packaging system between manufacturers and distributors, and the establishment of guidelines for collecting diverse opinions, and the preparation of checklists, are continuously required to play a role of mediation to support win-win management.

Second, for eco-friendly management of packaging and decrease of consumer price due to RRP, the reduction of packaging costs of manufacturer through the use of eco-friendly packaging such as reusable packaging and the improvement of logistics efficiency are essential, so it is desirable for the government and social organizations to pay attention and take part in.

Third, institutional supplementation is needed to provide incentives to companies and officials who have contributed to reducing national logistics costs by improving the delivery system including reducing transshipment work and improving the packaging system cooperation for improving logistics efficiency.

Fourth, the current national standard KS T 1002 standard is required to review the revision as a simplified standard that can be also applied in common to T-11 and T-12 pallets and also required to be easy to use in practice.

Fifth, this case study based on pallet width showed that type T-12 pallets had a 4% higher load efficiency than type T-11, and were also more valid for convergence with display shelves. In addition, since it has been confirmed that warehouse-type discount stores prefer block types to pinwheels among pallet display patterns, a review is needed to spread T-12 pallets with the best block-type loading efficiency.

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