

A Study on the Product Categorization Model for Efficient Search in On-line Chartering

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Abstract : Off-line ship chartering is done nearly through the brokers. Because of the international scale of chartering market, brokers spend too much times and costs on searching the most appropriate product which the consumers want. In this research, we propose the on-line Charter Product Categorization Model to search the products efficiently in the Cyber Chartering System. This Model will make concerned parties of the ship chartering to get unified product information efficiently, and to select the most appropriate product. In this research, we classified the ship chartering products into categories of cargo, ship type, and sea routes, and defined mutual relation of each products. and we verified that this classification is necessary to search the products through the product searching experiment.

Key words : the product categorization model, ship chartering, cyber chartering system, search system

1. Introduction

The expansion of on-line business which exchanges the information through Internet and makes on-line transactions, is suggesting and enhancing new systems and paradigm in various fields. This on-line business reduces the work processing time and costs in manufacturing and distribution. A report predicts on-line business will build up the distribution market with the volume of from US\$ 4 billion to US\$ 5 billion(Miguel Garcia Gosalvez, 1997).

The shipping market is turning to electronic transaction and on-line transaction. The Baltic Exchange in UK, world's leading maritime market place, advanced into e market with the opening of its own website. It is the chartering that is converted to electronic transactions and expands the on-line market at the earliest. In chartering, the transaction between shipowners supplying the product of vessels and shippers demanding shipping space through negotiation, the efficient search plays a key role in business deals. In fact, most of off-line chartering is transacted by brokers. As chartering market covers the global and has international characteristics in itself, brokers spend too much time and costs on searching the most appropriate products and acquiring the information.

Even cyber chartering system, which Shipbroker.net and other sites introduced for improvement in searching efficiency, has not secured the product categorization and

consequently not provided the electronic catalogue. Therefore users are not provided with enough search functions and product details.

Then, this study formed the definition of the product categorization model for efficient searching in on-line chartering, which users can find the most appropriate product information, and correlation of each product. Also, through the comparison this product categorization model with general search model, we verified the product categorization model is superior to other general search models.

In chapter 2, the importance of product categorization model and analytical comparison with search functions in existing on-line chartering are explained. In chapter 3, the process of development of the product categorization and correlation of each product are described and in chapter 4, the product search experiment verifies the superiority of this product categorization model.

2. Literature Review

2.1 Advance research in product categorization model

The first step, which most of consumers takes to purchase the product, is to search exactly what they want in electronic commerce. After finishing the search for

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appropriate product, the negotiation can be made and the transaction contract can be completed. So success or failure in electronic commerce depends on how to form the easy and quick product information search model and whether it leads users to choose the most appropriate product (Commerce Net, 1997).

Following search methods have been provided for consumers to search the products easily and quickly(Open Market).

- Classified search method : Arranges the products in classes or categories and searches through the subdividing these classification
- Keyword search method: Uses boolean operators to specify what keyword the product description should contain
- Field search method: Represents the product data as defined type, as part of record in database and uses boolean operators same as Keyword search method

This importance of product search is also mentioned at EM's Reference Model. EM's Reference Model divided the transaction into three phases which are Information Phase, Agreement Phase and Settlement Phase. It is emphasized that among those phases, the information phase collecting the information on products, services and competitors is the most important and fundamental(Beat F. Schnid, Markus A. Lindemann, 1998).

It is essential to provide consumers with the product information for supporting product search in the digital form previously. This can be realized by providing electronic catalogue. This electronic catalogue differ from the off-line product catalogue and is electronic records stored information on product and service including product information, seller information and order processing data, etc.

Recent research on electronic catalogue focuses on the technology standardization covering posting, formatting, transferring and manifestation centering product categorization model. The research on product categorization model has been done in various fields centering government-aided projects performed by the Office of Supply, the Electronic Industries Association of Korea and the Small and Medium Industry Promotion Cooperation, etc. The research on system framework and format standard in electronic catalogue system has been performed through MartSoft's Open Catalog Format(OCF), CXML.org's cXML Catalog Definition and OASIS's EbXML UN/CEFA CT, etc. National Computerization Agency is performing the research on technical components in electronic catalogue(Ean Joo Hong, 1999). However, it is the product standardization through establishing product categorization

model that should be regarded as the most important matter and precedence of interest.

Nevertheless, most of researches in on-line chartering focus on the transaction related part such as various transaction types and transaction process improvement. The research on product categorization model to support the transaction and provide consumers with efficient product information has been made not performed.

2.2 Comparison and analysis of Cyber chartering system

The cyber chartering is the most popular area in on-line maritime market and has the most Internet sites. Users of cyber chartering system are composed of shipowners, shippers and brokers. The shipowners and shippers are consumers and suppliers as they provide the products and buy them at the same time. Brokers play roles as brokers, consumers and suppliers.

Functions and services in existing cyber chartering models to be provided users for efficient search are compared and analyzed. The result is as following (Table 1)

Table 1 Comparison and Analysis of Cyber chartering system search ability

Site	compared function			
	search function	search method	product categorization	combination search
shipbroker.net	○	keyword search	×	×
worldwidemarine.net	○	keyword, category search	×	△
shipping.net	○	keyword search	×	×
marine-net.net	○	category, keyword search	×	△
levelseas.com	○	category, keyword search	×	○

[Remarks] ○ : include, △ : partly include, × : not include

As seen in (Table 1), most of system services the simple search method such as keyword search and category search. In case of category search, the simple information such as "sea route" is arranged at most. And the combination search based on several conditions such as sea route & cargo type, ship type & cargo type is hardly provided.

3. Chartering product categorization mode testing

This chapter suggests the product categorization model in on line chartering which makes users search the type of products with ease and comfort. The types of chartering is divided into Time Charter (T/C) and Voyage Charter (V/C). As the product category isn't influenced by the types of chartering, the subject of this model is limited to V/C. This product category is systemized with reference to Shipping consulting firm's division system, KMI (Korea Maritime Institute) division system and interview with chartering brokers and concerned experts.

3.1 Product categorization model

In this chapter, the products are categorized by ship type, cargo type and sea route, which are main conditions in search chartering product. The product categorization will be utilized as the basic information in establishing electronic catalogue systems.

1) Classification by ship type

The first work process is the classification of Dry Bulk and Oil & Tanker by ship type. The classification of Clarksons and Korea Maritime Institute is applied to the basic data in this product categorization. (See (Table 2), (Table 3))

Table 2 The standard comparison of Domestic and International Ship Type - Dry Bulk

organi- zation	ship type	Dry Bulk (Unit : DWT)			
		Handysize	Handymax	Panamax	Capesize
Clarksons		less than 40,000	40,000 - 60,000	60,000 - 80,000	more than 80,000
KMI		less than 40,000	40,000 - 50,000	50,000 - 80,000	more than 80,000

Table 3 The standard comparison of Domestic and International Ship Type - Oil & Tanker

organi- zation	ship type	Oil & Tanker (Unit: DWT)				
		Handy small tank	Panamax	Aframax	Suezmax	VLCC
Clarksons		less than 60,000	60,000 - 80,000	80,000 - 120,000	120,000 - 200,000	more than 200,000
KMI		less than 60,000	60,000 - 10,000	100,000 - 200,000	more than 200,000	

* Annotation1) Hereafter Oil Tanker includes oil tanker, LPG tanker, LNG tanker, etc.

As seen in [Table 2], the classification by ship type by Clarksons has no difference with KMI's classification and the capacity (Dead weight ton) a little differs in two. So this research needs the process for systemization in chartering product classification by ship type. For this systemization, the followings are used as basic information: the standard classification by ship type suggested by Clarksons and KMI, etc., many years' statistics related chartering(Clarkson, 2001), special book and reports(KMI, 2001) and benchmarked information on other cyber chartering system. Several interviews with brokers and concerned experts are utilized, also.

Through this process, chartering products by ship type are organized according to international standard of ship type and Below (Table 4) is to systemize Handysize Dry Bulk chartering products division by ship type. Each product type is classified on the basis of what standards brokers use in actual business. This classification is used in statistics by ship type(Clarkson, 2001).

Table 4 The product Categorization Model by Ship Type

Ship Type	Capacity (Unit: DWT)
Handysize	10,000 ~ 14,999
	15,000 ~ 19,999
	20,000 ~ 24,999
	25,000 ~ 29,999
	30,000 ~ 34,999
	35,000 ~ 39,999

As seen in (Table 2) and (Table 3), Clarksons and KMI indicate DWT in form of range by ship type. So for the quick and easy search, the systemic subdivision is essential. Even handysize of Dry Bulk, to reflect customers' demands, is subdivided at intervals of 5,000 DWT. Like subdivision of handysize, Handymax at intervals of 5,000 DWT, Panamax at intervals of 10,000 DWT, Capesize at intervals of 10,000 and 20,000 DWT are subdivided. Oil & Tank is subdivided at intervals of from 5,000 DWT to 20,000 DWT by ship type. These subdivision standards are set-up through internationally applied classification standard in statistics and several times of discussions and verifications with experts.

2) Classification by cargo

Next process in product classification is to classify the chartering products by cargo. Dry Bulk and Oil & Tanker are representative cargo in chartering and occupy the highest ratio. This research made a set-up the chartering product classification model on the basis of Dry Bulk and Oil & Tanker.

Previously, Dry Bulk is classified to 15 types according to cargo description. The standard for this classification in Dry Bulk is made on the basis of statistical data on world dry bulk logistics volume over ten years(KMI, 2001) and consultation and verification data by brokers and concerned experts for realistic research. Five Major Bulks ranging from first Iron Ore to fifth Phosphate Rock occupy more than 90% in chartering market. Minor Bulks ranging from sixth Sugar to fifteenth Steel and Other Bulk are classified and defined according to market share in chartering. Researchers concentrate on the subject of suggesting specific bulk type in Sugar, Agribulks excluded in major bulk to reflect consumers' demands. (See (Table 5), (Table 6))

Table 5 The product Categorization Model by Cargo Type

Cargo Type	Cargo Description
Dry Bulk	Iron Ore
	Coal
	Grains
	Bauxite/Alumina
	Phosphate Rock
	Sugar
	Agribulks
	Fertilizer
	Scrap Iron
	Cement
	Coke
	Pig Iron
	Forest
	Steel
	Other

Secondly, As seen in (Table 6), Oil & Tanker is classified to three categories such as Crude Oil, Clean Petroleum Product and Dirty Petroleum Product on the basis of market share in chartering and brokers' actual product classification standard like Dry Bulk(Clarkson, 2001).

Table 6 Oil & Tanker - by Cargo Type

Cargo Type	Cargo Description
Oil & Tanker	Crude Oil
	Clean Petroleum Product
	Dirty Petroleum Product

3) Classification by sea route

Classification by sea route is different in major shipping companies and sea route by cargo type has the same differences. After finishing the comparison and analysis of various classification standards for the systemizing classification, the classification models in (Table 7) and (Table 8) are suggested through the verification process by

field-working brokers. Dry Bulk is classified to eight items and Oil & Tanker to twelve. Sea routes are different by cargo types, nations and organizations and this research includes most of sea routes through the comparison and analysis of the differences and commonness in these sea routes with brokers and concerned experts.

Table 7 Dry Bulk - by Route Type

Sea Route
UK/Cont
Mediterr
Oth. Europe
Africa
America
S.America
Asia
Australia

Table 8 Oil & Tanker by Route Type

Sea Route
M.E.Gulf to US Gulf
M.E.Gulf to Singapore
M.E.Gulf to Japan
W. Africa to US Gulf
W. Africa to USAC
Cross Mediterranean
N. Sea to Continent
Crude/DPP Kuwait to Singapore
Caribbean to USG
CPP/UNL M.E Gulf to Japan
CPP/UNL Continent to USAC
CPP/UNL Carib to USAC

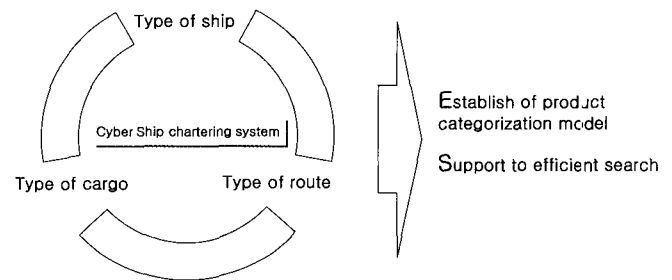


Fig. 1 The structure of product categorization

The product categorization model by ship type, cargo and sea route is materialized in on-line chartering system on the basis of statistics and data in actual chartering transactions and users can do an efficient and combined search with one or more required search conditions. The pattern in information acquisition and depth in interests of on-line users have much differences. As a single classification and model cannot provide the proper product

information, it cannot satisfy users. So for a quick and efficient search, the various condition formulas reflecting ship type, cargo and sea route and combined search functions must be provided.

3.2 correlation in chartering product classification

In this section, the correlation in above-mentioned chartering model is analyzed with the application of diagram. For this correlation analysis, the product catalogue classification model suggested by Jung Ji-Hye and others (Ji Hye Jung, Sang Gu Lee, Chi Su Woo, 1999) is a good guide and is expressed by category, hierarchical relationship and connectional relationship. The purpose in this correlation analysis is to reflect on establishing search model through the verifying the fact that the product categorization models aren't composed separately but have diverse relationships.

1) The relationship by category

Category is a specially defined division in a system of classification in e-shoppingmall and the basic categories for efficient search in this model are Ship type, Cargo type and Sea Route. And these categories forms one category mutually related in cargo type, the scale of ship and sea route. Therefore each category can be defined as one connected group interlinked with common characteristics in other categories. For example, ship type field has the categories such as Handysize, Handymax and Panamax, etc. and the sub-category of Panamax is divided according to DWT like 16,000 and so on. This ship type category is interlinked with cargo type category such as sugar and sea route category such as Asia. These categories has their own indicators and form the classification system by interlinking these indicators. And each category is defined by rule. For instance, the category of Sugar has a rule as follows:

if Dry Bulk is "Sugar" and Ship Type is "Panamax" and Sea Route is "Asia", this are included in one category.

That is to say, the products aren't included only one category by ship type, cargo type and sea route but included in categories satisfying given search conditions. So each other category can have common parts and one category can be related with other categories.

2) The hierarchical relationship

As explained in previous section, the categories of chartering products are divided to ship type, cargo type and sea route and the hierarchical relationship can be described by interlinking common characteristics. Following (Fig 2) is

one example of the hierarchical relationship by Cargo.

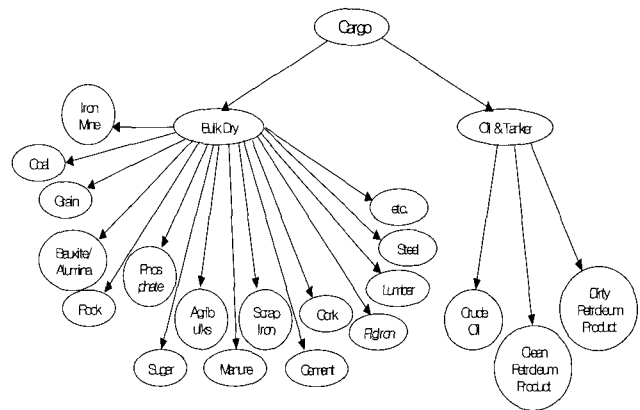


Fig. 2 The hierarchical relationship by Cargo

3) The connectional relationship

Though sub-categories are included in different categories, these sub-categories may have the connectional relationship each other. In following (Fig 3), the dotted lines express the connectional relationship.

For example, "Dirty Petroleum Product" in Oil & Tanker, "Aframax" in Ship type and "M.E.Gulf to US Gulf" in sea route belong to different categories but have relationship in view of one chartering product. As these kinds of connectional relationship are reflected in this model, the efficient product information providing can be made with the integration of various search conditions.

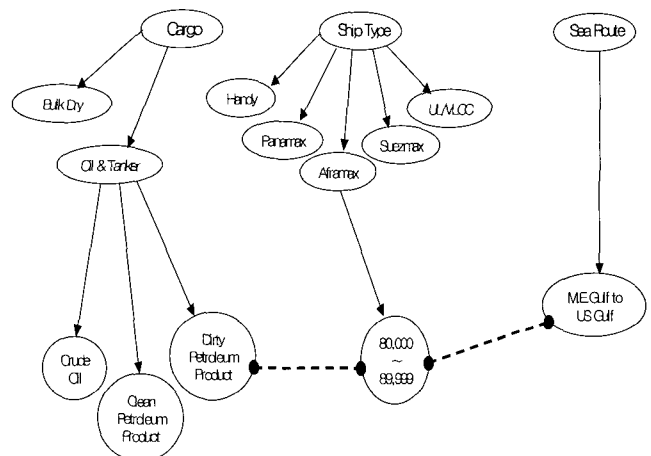


Fig. 3 The connectional relationship by Category

4. Product search system

In this section, the chartering product categorization system, effectiveness in the connectional relationship and capability of combination search are tested.

For the test in this section, the system which has the function to search products with various conditions on the basis of product categorization system was developed. This

program is based on ISP, Oracle 9i in DBMS and JEUS in Web Application Server(WAS). In this program, the search keyword rankings are different according to users (charterer or shipowner). So users' preferences are reflected on this program with priority difference in rankings and this can provide users the efficiency in search. And the comparison with existing cyber chartering system in same condition was made to verify the fact it is more efficient to search the product according to product categorization model.

4.1 Cargo Search

Cargo search is for shipowners to search shippers and cargo that need their chartering service. This cargo search has four types of search according to shipowners' and brokers' preference and characteristics in search pattern.

- Search to select single one among "Cargo Type, Cargo Description", "Loading Place Area", "Discharging Place Area", "Capacity"
- Select one category among Cargo type, Ship type, Sea route and do search considering "Cargo Type", "Cargo Description", "Loading Place Area", "Discharging Place Area", "Capacity"
- Select two categories among Cargo type, Ship type, Sea route and do search considering "Cargo Type", "Cargo Description", "Loading Place Area", "Discharging Place Area", "Capacity"
- Select all three categories of Cargo type, Ship type, Sea route and do combination search considering "Cargo type" "Cargo Description", "Loading Place Area", "Discharging Place Area", "Capacity"

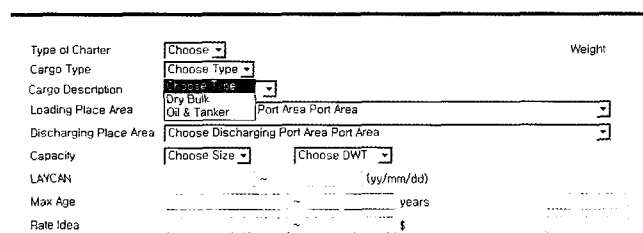


Fig. 4 The interface of Cargo Search

And the search based on product categorization model make it possible to do the combination search according to various correlation of products as mentioned in previous section like (Fig 4). For example, if you select one between Cargo Bulk and Oil & Tanker in Cargo Type, the select button types of Cargo Description, Area, Capacity are automatically changed according to what Cargo Type you

selected. Then, if you select one among buttons in Capacity, the select button types of Cargo Description, Area, Capacity are automatically changed according to what Capacity you selected.

4.2 Ship Search

Ship search is for shippers to search the most appropriate ship to ship their own cargo. This ship search has four types of search according to shippers' and brokers' preference and characteristics in search pattern as explained in cargo search.

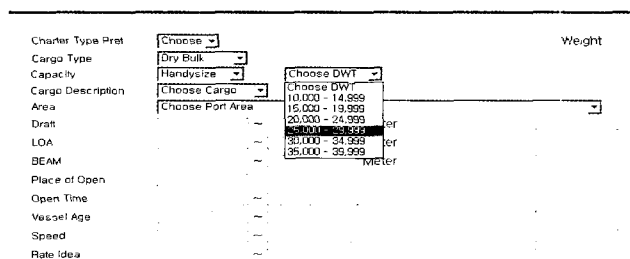


Fig. 5 The interface of Ship Search

And the search based on product categorization model make it possible to do the combination search according to various correlation of products as mentioned in cargo search like (Fig 5).

4.3 Efficiency validation in search

It was verified that the search based on product categorization model is more efficient than general keyword searches through actual search tests. Most of existing chartering models provide keyword searches and category search by sea route without systemic product categorization model. For the efficiency based on product categorization model, following tests are made:

- Optional 100 chartering products are stored as the control group. After 100 times of keyword searches, the level of similarity is calculated according to require time for product information acquisition and precision in searched information.
- The product categorization model in 100 chartering products as the experimental group is established. After 100 times of searches based on product categorization model, the level of similarity is calculated according to require time for product information acquisition and precision in searched information same as keyword search.
- The level of similarity is expressed in percentage

aggregating given points in comparative items such as the number of searched information and precision in searched information.

The precision level in this experiment means the calculated result on how much acquired information by one single search or search within fixed time is similar to initially required information. The result of similarity is as following (Fig 6)

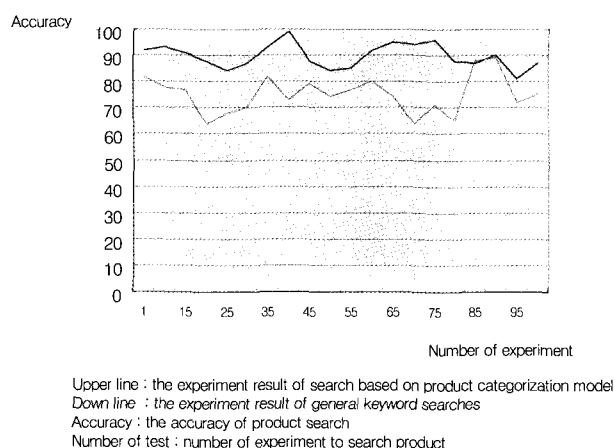


Fig. 6 The result of similarity experiment

As seen above graph, The accuracy of the search based on product categorization model is 94%, and The accuracy of general keyword search is 78%. it is verified that the search based on product categorization model established in this research is more excellent in search efficiency.

We cover 100 products in this experiment and if the number of products are more, the differency in efficiency will be more. And with this quantitative analysis, the qualitative analysis is made that experts search the products using two search methods and evaluate the search results personally. In result, mose of experts think highly of the efficiency in search based on product categorization model.

5. Conclusion

This research establish the product categorization model to provide efficiency in product search in cyber chartering system, which leads chartering into on-line business. And

for the verification the efficiency in product categorization model, the search program is developed and this program is compared with existing search program in chartering market. The result of verification tells this search model based on the product categorization model is excellent in search speed and efficiency in searching in comparison with existing search model.

This research has a significance in respect of attempting to establish unprecedented proper product categorization model and suggesting the possibility in combination search model based on various search conditions.

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