

MORE THAN THE BOTTOM LINE -  
HOW USERS SELECT A SHIPPING SERVICE

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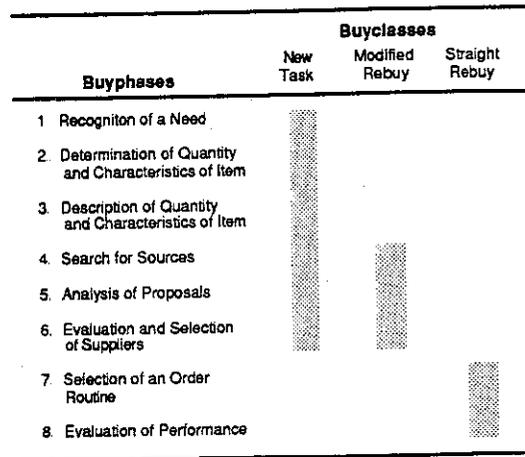
**ABSTRACT**

*The choices faced by shipping managers are generally complex. Typically, the manager is presented with a range of options, each of which has its individual strengths and weaknesses. It is difficult, if not impossible, to reduce all the attributes to a single dimension -- such as cost -- and in reality no-one tries to do so. Some managers choose to negotiate long-term contracts and face this decision infrequently but many shippers do not have a regular contract that covers all of their freight requirements and must continually assess the transport choices available to them and make decisions regarding the preferred carrier or carriers.*

*The aim of this study is, firstly, to understand the process by which the preferred carrier is chosen and then to develop a behavioural decision model that represents the stages in the decision process and the interaction of factors that influence the shipping manager. The results of several published studies of service and mode choice, together with the results of a new survey of shippers transporting goods by sea across Bass Strait, form the basis of the model development.*

**INTRODUCTION**

The way that users select a shipping service from the range of available options is a complex and poorly understood process. Undoubtedly there are aspects unique to the shipping industry but in many respects the decision is similar to that faced in purchasing any other commodity. Therefore the theories of consumer choice that have been developed for marketing purposes should also be applicable to the selection of a shipping service. Indeed Brooks (1984) has shown that the Buygrid Framework developed by Robinson et al (1967) can be successfully applied to the purchase of liner shipping services. The Buygrid formulation identifies 8 steps in the procurement process and 3 different classes of purchase as shown in Figure 1. A purchase is classified as either a New Task, appropriate for new purchasers in the market, as a Modified Rebuy when the purchaser is experienced but not committed to a particular supplier, or as a Straight Rebuy if the choice of supplier is automatic. The shaded vertical bars in Figure 1 indicate the most critical phases for each of the purchase classes



**FIGURE 1 : The Buygrid Framework**

The aim of this study has been to examine in detail the decision making behaviour of experienced users purchasing freight services across Bass Strait and to develop a conceptual model of the choice process. In terms of the Buygrid formulation this corresponds to Phases 4 to 6 in a Modified Rebuy situation. Current theories of carrier selection are reviewed and then critically evaluated against the results of a new survey of users of Bass Strait shipping. The principles of choice behaviour which emerge from this assessment are then used to create a schematic model of the decision making process.

## FREIGHT TRANSPORT CHOICE MODELS

The development of a conceptual model can be compared to the culinary process as shown in the following diagram:



The first component is the *ingredients* that will make up the model. In the case of a freight decision model, this includes the factors that are considered when making a decision and the relative importance given to each. These ingredients are then combined in specific quantities in a particular order to produce the desired result. In terms of the freight decision process, this *recipe* corresponds to postulating some behavioural mechanism that governs the way that the various factors interact. It comprises a theory or underlying philosophy of the choice process and a structure that marries the decision factors with the choice philosophy to produce a coherent explanation of the overall process.

There are numerous published studies of the freight transport choice process but with the notable exceptions of Bardi (1973), Brooks (1984,1985) and Saleh and LaLonde (1972), they have centred on modal choice - sea versus air or road versus rail - rather than addressing the broader question of choice between competing carriers utilising the same or different modes. This would appear to limit the number of precedent models that can be reviewed in establishing a conceptual model of carrier choice in the Bass Strait shipping market. However it seems reasonable to assume that modal choice and the broader question of carrier choice are intimately related and that the results from modal choice studies are directly applicable.

### Decision Factors and Their Importance

In terms of modelling the choice process, the most important and difficult task is to firstly determine the factors that influence decision-making and then to determine their relative importance. All of the possible model frameworks share one feature; they depend on the existence of an ordering or preference structure both within and between the attributes that influence the choice of transport service. Without some preference structure it would be impossible to compare and rank the various alternatives.

Investigations of decision factors, e.g. Gilmour (1976), McGinnis (1979), Ogden & Rattray (1982), Brooks (1985) and Wilson et al (1986), have identified a bewildering array of

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potential influences. These factors can be grouped into three broad categories; route factors, cost factors and service factors, as shown in Table 1.

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<b>Route</b>	Frequency, Capacity & Convenience Directness, Flexibility & Transit Time
<b>Cost</b>	Freight Rate Other Costs
<b>Service</b>	Delays, Reliability & Urgency Avoidance of Damage, Loss & Theft Fast Response to Problems Co-operation between Shipper & Carrier Documentation and Tracing Capability

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**TABLE 1 : Factors Influencing Carrier Choice**

These factors do not carry equal weight in the choice process and various studies of their relative importance have produced conflicting results. Further complications arise because

- shipper's perception of the level of performance may not be a fair reflection of the actual performance. For example, Miklius & Casavant (1975), in a study of road and rail shipments, found that the perceived delay in delivery was much greater than the actual delay and that the difference between the actual and perceived delay was much greater for rail than for road. This suggests that established reputations can take precedence over actual performance. Further, Jerman et al (1978) found that differences exist between shipper and carrier perceptions of the selection variables.
- shipper's actual behaviour may not accord with their stated preferences. Brooks (1985) found that when asked to rank the importance of the various factors, shippers rated cost most highly. However an analysis of their actual decisions revealed that service factors were more important in discriminating between options.
- local conditions affect the relative importance of decision factors and these preferences can also vary for different commodities traded in the same shipping market.

These uncertainties suggest that it would be rash to assume that observations of the

relative importance of decision factors are transferable from one shipping market to another. There is a strong case for collecting attitudinal data that is specific to the freight market under consideration.

### Underlying Philosophy

The next step is to postulate some choice philosophy or behavioural mechanism that governs the way that the various factors interact. Gray (1982) proposed that freight transport modal choice models can be grouped under three broad headings; *economic positivism*, *technological positivism* and *perceptual approaches*

#### *Economic Positivism*

This approach is based on the neo-classical theory of the firm and hence assumes that a firm maximises profits with full information and complete certainty and that there are no problems of an organisational nature. The essence of the economic positivist approach is that the decision-making unit - assumed to be the firm - attempts to maximise short-term revenue and/or minimise short-term costs in a trading situation where transport is a central element. A typical example of this approach is Allen (1977).

#### *Technological Positivism*

The essence of the technological positivist approach is that choice can be explained in terms of relationships between the physical aspects of the commodity (weight, volume etc) and of the transport system. In the technological positivist approach, choice tends to be represented as the dependent variable in a functional relationship relating choice to aspects of the transport system. In this approach the freight rate and other costs have no special place and are simply seen as one of many variables which may explain transport choices. A typical example of this approach is Bayliss & Edwards (1970), who incidentally found that under certain circumstances cost is not a significant variable.

#### *Perceptual Approach*

The perceptual approach is similar to the technological positivist approach but differs by assuming that the independent variables influencing choice are determined by the transport user's subjective perception of the situation rather than by objective measurements. This approach assumes that shippers adopt reasonably strongly entrenched but sometimes biased impressions of the choice alternative and that these impressions may have more weight in the choice process than the actual performance of the alternatives. The perceptual approach treats transport as a product that is

purchased like any other product and hence is more closely related to marketing than to economics. Gilmour (1976) is a good example of the perceptual approach

The majority of existing models adhere strictly to one of these doctrines but this does not preclude the possibility of hybrid models which apply different approaches to different aspects of the choice process.

The essential difference between the three approaches lies in the central unit of analysis: the economic positivist approach concentrates on the firm, the technological positivist approach concentrates on the consignment and the perceptual approach is primarily concerned with the individual decision-maker. It should also be noted that the economic and technological positivist approaches are much easier to implement as operational models since they are based on physically measurable factors.

#### Organisational Aspects of the Choice Process

The three competing philosophies provide options for representing the final choice mechanism but they do not address the more fundamental problem of explaining why an individual shipping manager adopts a certain approach to the decision process. In attempting to explain this behaviour it is important to consider the shipping manager in the context of the organisation since the individual is subject to strong organisational and social influences and cannot be considered in isolation.

It has been found, eg. see Davies & Gray (1985), that in general the efforts of shipping managers are not held in very high regard in their own organisation. This stems from a perception that transport is a non-productive activity that has a minor role in the overall activities of the organisation. As a result its contribution tends to be undervalued and is only prominent when things go wrong.

The outcome of these organisational pressures is that shipping managers tend to be conservative decision makers whose behaviour can be partially explained in terms of a *hierarchy of needs* appropriate to freight purchasing. This is a particular example of the hierarchy of human needs developed by Maslow (1943). According to Maslow, human needs are ordered; higher needs such as esteem or self-actualisation are not considered until more basic needs such food, warmth or safety are satisfied. Davies and Gunton (1983) used this approach to develop a hierarchy of needs for freight purchasing as shown in Figure 2.



**FIGURE 2 : Hierarchy of Needs for Freight Purchasing**

According to this theory, the objective assessment of a shipping option will only proceed if and when the more basic criteria of risk avoidance, price, ease of use and company image are satisfied.

#### Model Structure

The final component of the conceptual model is a representation of the way in which the various influences interact. There are two levels of structure to consider. At a strategic level there is the arrangement of the various stages in the evaluation and choice process. This general arrangement can be conveniently represented in flow-chart form. At a lower level there is the mode of interaction of the individual choice factors that contribute to the final decision. There are two basic modes of interaction; compensatory and non-compensatory.

In a *compensatory model*, strong performance in one factor, such as transit time, can compensate for poor performance in other factors such as service frequency and price. The aim of most compensatory models is to combine the effects of all factors into a single decision variable, such as cost or utility. Regression-based models are a good example of the compensatory approach.

In the *non-compensatory approach*, it is argued that any given factor cannot necessarily be traded-off against other factors at all levels of performance. Instead it is argued that options are compared on an attribute-by-attribute basis and that there are minimum

acceptable levels of performance. Exceptional performance in one factor cannot compensate for sub-standard performance in another. Therefore the non-compensatory approach involves multiple comparisons and filtering. Examples include the Elimination by Aspects model of Iversky (1972) and the sequential filtering model proposed by Recker and Golob (1979). For a comparison of the two approaches see Foerster (1979).

### CARRIER CHOICE IN BASS STRAIT SHIPPING

The preceding Section summarised existing theories and results concerning the decision-making behaviour of users selecting a shipping service. Unfortunately no clearly superior philosophical approach or structure has emerged and several different models could be reasonably derived from these precedents. Further, there is no guarantee that a model developed to explain the average behaviour of shippers will be valid for the special case of Bass Strait shipping. The relevance of published observations of shipper behaviour was tested by conducting a survey of major purchasers of Bass Strait shipping services.

#### Survey of Shippers

The survey was conducted in two stages. The first stage involved mailing out to all participants a comprehensive questionnaire covering their shipping activities, perceptions and preferences. The sample consisted of the *shipping managers* of major Bass Strait shippers, that is, the executive employed by each major importer/exporter who is responsible for purchasing shipping services. After allowing the participants two to three weeks to complete the questionnaire, each participant was then visited and the completed questionnaire was collected in person. Both the questionnaire and interview involved sensitive commercial information and personal questions regarding the individual's attitudes and management style. Consequently participants were assured that all responses were confidential and that results would only be published in aggregate form. This limits the extent to which the findings can be reported in this paper.

A two stage approach - questionnaire + interview - was adopted to

- allow the respondents to expand and clarify their answers,
- allow supplementary questions to be asked during the interview
- stimulate general discussion concerning the Bass Strait shipping market
- maximise response rate. The number of significant shippers in the Bass Strait market is small - the sample comprised only 45 shippers - so it was vital to achieve a very high response rate.

The benefits of the follow-up interview were that; a very high response rate was

achieved, virtually all answers were useable, considerable supplementary information was collected during the interview and respondents felt that their contribution was valued and would not be misunderstood.

### Summary of Findings

It is convenient to discuss the survey results, which were both quantitative and qualitative in nature, in terms of several broad conclusions that summarise the responses to one or more questions. These hypotheses can then be used to guide the development of a conceptual model of the choice process.

*Hypothesis 1: That shipping managers are fundamentally conservative decision-makers. They are risk-averse and seek to maintain the corporate image and goodwill of the company's clientele*

When offered a choice between a conservative decision and a potentially more profitable but riskier decision, almost 90% of surveyed shipping managers stated that they would take the conservative option. Similarly, almost 90% agreed that preserving the corporate reputation and goodwill of the company's clients was the most important consideration in the selection of a shipping service. This behaviour is intimately related to the economic and corporate significance of the shipping process and to the hierarchy of needs for freight purchasing. For most shippers, the movement of goods is a subordinate activity that intrudes between the production and sale of their product. Therefore shipping managers are reluctant to make decisions that may endanger the smooth flow of goods between the producer and its customers. The fundamental conservatism is also reflected in a desire to retain control over the decision making process. Less than 20% of surveyed shipping managers were prepared to delegate control to shipping agents or freight forwarders.

*Hypothesis 2: That the decision process involves firstly identifying the carriers that can deliver the required shipping service and then successively eliminating inferior options*

This appears to be a rather weak conclusion that provides little insight into the choice process but it has several important implications. In the majority cases, the perceived set of shipping alternatives is limited to carriers with an existing service. Few shipping managers stated that they were willing to consider carriers who were not already operating over the required route. This behaviour appears to be related to the short planning horizon maintained by most shippers in response to the recent volatility of Bass Strait shipping services. The second implication is that the decision process involves

successive filtering to progressively reduce the choice set. The alternative, that all available shipping options are retained throughout the choice process and fully evaluated, does not appear to reflect the actual decision making behaviour of users.

*Hypothesis 3 : That the choice process is strongly influenced by the knowledge, experience and perceptions of the individual shipping manager.*

The knowledge and experience of the shipping manager and personal contacts in the shipping industry were considered to be important factors in the decision process in around two-thirds of cases. Few of the shipping managers that were interviewed were consciously aware of the process by which they selected a freight carrier. Most had developed intuitive selection techniques through a long association with the shipping industry and found it very difficult to analyse and explain how their choices are made. Almost two-thirds did not have any formal evaluation process and a majority reported that decisions were usually made quickly using information already on hand. Further, very few shipping managers kept statistics or other objective records of the performance of their current carriers and an even smaller number had any objective information on the performance of other carriers. Taken together these findings suggest a strong reliance on personality and perceptions rather than on records of actual performance.

*Hypothesis 4 : That service factors, particularly service frequency, take precedence over price*

Shipping managers were asked to rank the relative importance of various decision factors on a scale from 0 to 5. The results are shown in Figure 3. For each factor, its importance is represented by a shaded bar; the bar extends over the range from the 25th to 75th percentile of observations and changes shading from dark to light at the mean importance. For example the availability of additional freight space when required has a mean importance of 3.5 and 50% of shipping managers rated its importance between 3 and 4.

Factors that were consistently highly rated were; service frequency, price, reputation for on-time delivery, transit time and fast response to shipping problems. This suggests that users are at least as concerned with service quality as with the direct cost of the service. Indeed three-quarters of surveyed shipping managers stated that they are prepared to pay a higher price to ensure that the consignment arrives on-time and undamaged. The predominance of service factors is not unusual and has been previously reported by Cook (1967), Bayliss & Edwards (1970), Brooks (1984), Wilson et al (1986) and others

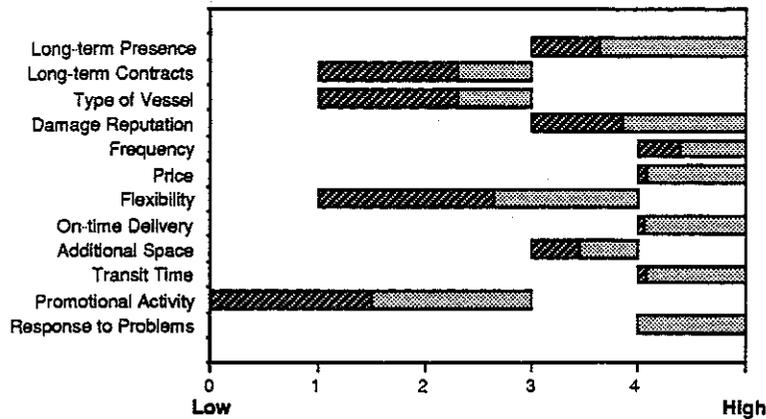


FIGURE 3 : The Relative Importance of Choice factors

Cost is undoubtedly an important factor but its role may be more subtle than is recognised in existing models of the choice process. Interviews with shipping managers revealed that they are more concerned with the indirect and long-term costs including loss of markets and market share, loss of customer confidence and opportunities foregone. These costs are not quantified by shipping managers but are expressed through an emphasis on service quality. It is important to note that selling a product is the major concern of most enterprises and that the Bass Strait freight cost is typically 2 to 4% but can be as low as 0.5% of the value of the consignment.

*Hypothesis 5 : That there is a minimum quality of service on which users will not compromise and a maximum price that they are willing to pay irrespective of the level of service provided.*

Bass Strait shippers were almost unanimous (90% agreement) in their support for the two aspects of this proposition. The criteria of minimum quality of service and maximum price establish a non-compensatory test that separates satisfactory from unsatisfactory shipping options. At this stage of the decision process, carriers are compared not with each other but against a prescribed standard.

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Hypothesis 6 : *Carriers are compared on the basis of their overall performance - the relative performance in particular aspects of the service is of lesser importance*

This proposition was also favoured by more than 90% of shipping managers. It suggests that when developing preferences by comparing shipping services with each other, they adopt a compensatory approach. The details of the trade-offs between choice factors will depend on the type of shipment but more than 85% of users agreed that the comparison is not made solely on the basis of financial cost.

Hypothesis 7 : *Shippers prefer to make use of all satisfactory shipping services*

When asked to express an opinion on the desirability of splitting usage between several carriers, shippers appeared ambivalent but when questioned more deeply on their actual usage it became apparent that most split their patronage and that more would do so given the opportunity. This propensity to patronise several operators has at least two motivations. Firstly shippers seek to maintain and foster competition between operators. By patronising all satisfactory services they attempt to keep all operators viable and they also encourage new services by promising to divert at least some of their cargo to the new service. The aim is to keep service standards up and freight rates down by ensuring competition. The second motivation is to ensure a continuity of supply by not having all their eggs in one basket. By regularly patronising several services, shippers maintain a presence and line of communication with the operators. The outcome is that shippers develop two classes of shipment; a *many baskets* component in which a base-level of usage is maintained with several operators, and a *discretionary* component in which all other cargo is allocated to carriers on the basis of preferences. Bass Strait shippers indicated that they will normally utilise their most preferred carrier but if space is not available on a convenient sailing, they will resort to less favoured carriers to ensure delivery.

### CONCEPTUAL MODEL OF THE CHOICE PROCESS

On the basis of the various published models and theories of freight transport choice and the results of the survey of Bass Strait shippers, a multi-stage conceptual model of the choice process has been constructed. The essential elements of the model are summarised in Figure 4.

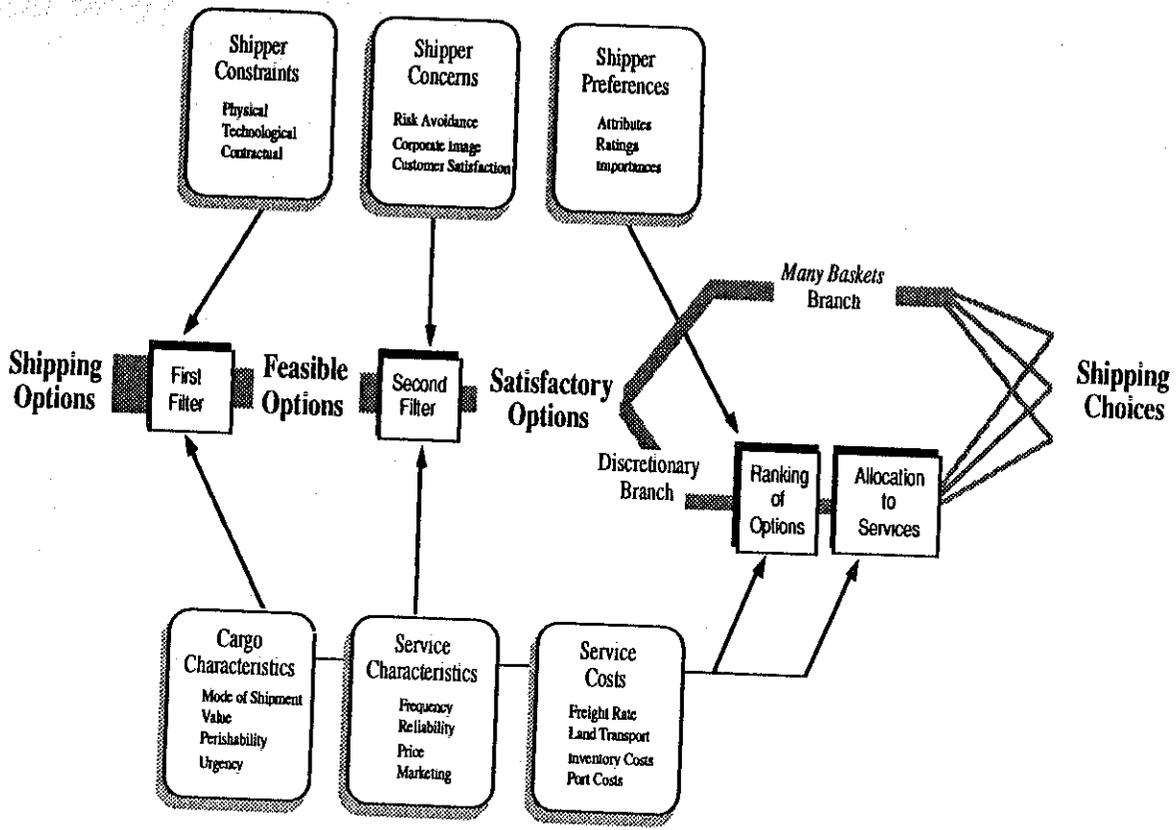


FIGURE 4 : Conceptual Model of the Choice Process

The underlying premise is that carrier selection is a sequential process in which shipping options are progressively eliminated. The first step is to eliminate all those shipping services that cannot perform the required task. This step is presumably implicit in other choice formulations but because it could be seen as simply *common sense*, it is rarely mentioned. In this filter, the user's constraints which may be physical, technological or contractual are compared with the service characteristics of all suppliers to identify the feasible options. If the shipper is locked into a long-term contract the purchase is a Straight Rebuy and there will be only one feasible option. In this case the choice process is essentially complete after the first step. Special features of the consignment may also mean that there is only one carrier capable of providing the service and consequently no real competition. If there are multiple feasible options then the choice process moves on to the next step.

The next step is to filter out all those feasible options that do not achieve a satisfactory level of performance. This filter is a product of the inherent conservatism of the decision makers and of the hierarchy of needs identified by Davies and Gunton (1983). Its aim is to ensure that all remaining options are *safe* options that do not expose the company or the individual shipping manager to any significant level of risk. Given that no trade-offs are made, any shipping option must satisfy all of the minimum quality of service and maximum cost criteria to be considered satisfactory. It should be noted that these performance thresholds are not absolute standards but are set relative to the perceived performance of carriers in the marketplace. A shipping user gains little benefit from demanding a level of service that is not provided by any carrier.

Shipping managers will tend to make use of all of the satisfactory options but will have a preference for certain carriers. As a result, the flow of decision making splits into two branches at this stage. One branch involves allocating a small base-level of usage to all satisfactory carriers and has been dubbed the *many baskets branch*, for reasons that have already been discussed. The other branch involves allocating the bulk of the user's patronage on the basis of a preference ranking of the satisfactory shipping options. In many respects this corresponds to the classical carrier or mode choice problem. Evidence from the survey of Bass Strait shippers suggests that the process of determining these preferences is best described by some form of compensatory perceptual model. With a preference structure in place, consignments are then allocated to carriers. The preferred carrier will normally be used but if there is not a convenient sailing, if space is not available, or if other problems arise then the next best carrier will be used and so on.

Given that the various shipping options have already been filtered for feasibility and acceptability, it is likely that only a small number of options are considered in the final objective assessment. The preliminary filters quickly eliminate all but the safest and most likely options. In most studies of the carrier selection, all of these preliminary steps are somehow assumed to have taken place and that the final phase of objective assessment can be equated with the choice process. This explains the conclusions of Saleh and LaLonde (1972) and others who found that, on the whole, shipping decisions tend to be made quickly and only a small subset of possible choices are actually considered.

### CONCLUSIONS

Shippers have an intimate knowledge of the shipping industry as it affects their day-to-day operations but tend not to take a broader view or to analyse the way that they make decisions. On the other hand, policy makers tend to take the broad view of the shipping industry and have less understanding of the factors affecting individual decision makers. Consequently policy-makers can misinterpret the actions of shippers and can fail to fully understand the implications of their actions because of a lack understanding of the motives and priorities of shippers. This paper has reported the results of a study of the principles underlying the decision making behaviour of shippers purchasing shipping services across Bass Strait. It provides an insight into the relative importance of the various decision factors and the way that these factors interact in the overall decision process.

An analysis of the decision making behaviour of shippers involved in purchasing Bass Strait shipping services has revealed that the choice process is more subtle and complex than accounted for in previous models. Previous models have tended to isolate and examine individual components of the process and have not linked these components together to form an integrated explanation. It is a multi-stage process with elements of both compensatory and non-compensatory behaviour and a strong emphasis on risk avoidance. The available shipping options are first filtered to eliminate all options that do not achieve a minimum standard of performance or involve undue risk. The remaining options are all satisfactory and shippers will tend to maintain at least a small base level of usage with all of these acceptable carriers. Shippers are loathe to keep all their eggs in one basket. The bulk of the shipper's patronage is then allocated to one or more of the satisfactory shipping options on the basis of preferences which appear to be determined using some form of compensatory perceptual approach.

Shipper behaviour appears to be guided by the interaction of the total monetary cost of delivery and the total perceived cost of non-delivery. The indirect and long-term costs of failure to deliver consignments on-time and intact include loss of markets and market share,

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loss of customer confidence and opportunities foregone. These costs are at least as important in the decision process as the immediate monetary costs. In the decision process the perceived costs of non-delivery are not quantified but are expressed through an emphasis on service quality and risk avoidance.

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