Improving Intermodal Service Through Organizational Innovation

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A great deal of coordination within and between firms is necessary in order to complete a timely intermodal transportation movement. Recent developments in the theory and practice of management offer innovations designed to achieve just such intergroup coordination. This paper describes the type of relationships that exist and are needed in offering intermodal services. Further, the report explores how various managerial initiatives may be applied. Among these are hierarchy (use of common superior), plans and information systems, linking roles, task forces, integrating units, and matrix organizations. This study concludes that top management commitment is imperative, planning is essential, and the other devices facilitate the development of a controlled planning approach.

"The ability to produce a reliable transportation product is now recognized more widely than ever before as a critical element in the service package that must be sold in a competitive environment" (1, p. 1). Although this statement was made with regard to rail transportation, it is equally applicable to intermodal transport. Yet the preponderance of evidence seems to be that very few common carrier transportation firms are able to offer a carefully controlled service package (2). This paper maintains that the reasons for this are managerially oriented, not hardware oriented, and that the managerial problems that arise in intermodal operations are not much different from those found in other sectors of the business world.

The managerial impediments to offering improved service at a reasonable cost generally relate to conflicts in lateral relationships, i.e., conflicts between all the parties involved in an intermodal movement. The conflicts occur at several levels. An intermodal movement generally implies the involvement of two or more firms and two or more modes. Thus, there are interfirm conflicts between modes and, often, conflicts within modes. Within each firm there are often conflicts between marketing and operations. Improvements in service that benefit marketing often raise some operating costs. Finally, within marketing and within operations there may be conflicts. For example, intermodal services may not be the carrier's main business. Thus, there are disagreements as to what priority intermodal marketing efforts and intermodal operations should receive.

Lateral conflicts such as these are not new to managers of business firms in general nor to managers of carriers in particular. They are, perhaps, more difficult to resolve in intermodal circumstances because of the involvement of different firms and different modes. However, the many techniques developed by management theorists for resolving and mitigating lateral conflicts are applicable to intermodal operations as well as other types of business. This paper explores these techniques and their applicability to the improvement of intermodal freight service performance. However, only those intermodal movements that involve a highway movement at beginning or end will be considered.

NATURE OF INTERMODAL OPERATIONS

Factors Affecting Lateral Relations in Intermodal Operations

Management theorists indicate that there are three major determining factors that "are likely to influence the extensiveness and sophistication of formal mechanisms or devices in managing intergroup relations" (3, p. 219). These are the degree of differentiation between the groups, the degree to which the groups must be integrated to achieve the desired overall goals, and the level of uncertainty facing the groups in their interactions. The choice of the mechanisms to use in a given situation will depend on the levels of these factors. These mechanisms are discussed in the next section of this paper. The following briefly reviews the factors and then examines the intergroup relationships found in intermodal operations.

Intergroup differentiation refers to differences between organizational units with regard to management level (top management, middle management, and so on), orientation to time (short run versus long run), orientation toward other members in the group (permissive versus authoritarian), and orientation toward the environment (how the groups view outside factors and influences) (4).

Integration refers to the degree to which the different groups are required to coordinate their efforts in order to achieve the overall goals. The successful completion of a long-distance transportation movement obviously requires a good deal of coordination between groups within a firm and often between firms. However, it is possible to over-coordinate the effort to the point where the costs of integration go far beyond any possible benefits.

The uncertainty factor refers to the groups' perceptions of their external environments (3, pp. 62-66). Groups will differ as to the number of factors they must consider in making a decision (the complexity of the environment). Groups will also differ in terms of the speed with which individual factor values are changing and the frequency with which new and different factors become important.

Relations Between Intermodal Operating Groups

Any transportation movement usually goes through a series of terminal-line-haul operations. The terminal operations are often controlled independently; the connecting link—the line haul—may be controlled by the initiating (or dispatch) terminal or by a centralized dispatch operation.

There is not too much differentiation between terminals within a given mode. They are all generally on the same management level, although smaller terminals are sometimes considered to be satellites of the larger ones. Terminal operations are usually short term in orientation, for the big problem is how to get today's operations completed today. Terminal managers often

opt for the authoritarian approach to management because of the constant pressure.

There can be important differences between modes in the way terminal managers view their environment and in the way they manage their operations. In this report the important differences will relate to the orientations of the respective mode's terminal managers toward intermodal service versus other orientations, such as the minimum cost operation of the terminal or the maximization of service for unimodal traffic.

Integration between terminals and between terminals and line-haul operations is important. Each terminal affects adjoining terminals through the initiation of line-haul operations destined for those terminals. Line-haul operations begun for the benefit of the originating terminals can severely overload receiving terminals for short periods of time. Therefore, some planning of line-haul operations is necessary to smooth the work load at the terminals.

The major uncertainty facing terminal and line-haul operations is the question of what traffic will actually materialize from day to day. Traffic flows can vary substantially from day to day and week to week. If too few crews are available, traffic is delayed. If too many are available, labor costs can easily become excessive. The other complicating factor is that the complexity of terminal operations seems to increase exponentially as the number of transactions (operations) processed by the terminal increases (5, p. 27).

Relations Between Marketing Groups

The rail mode may be the only mode that has important differences between marketing groups. Highway carriers probably do little marketing of intermodal services, and the air and containership operators depend almost totally on intermodal traffic. The railroads face the problem that their customers may use both intermodal and carload services, yet the two types of service often compete with each other. (There is some justification for having two separate sales forces to maximize the penetration of both types of service because they are different. However, there is also reason to combine the two in order to minimize sales personnel and spare the customer multiple sales calls.) For the railroads, then, there is a need to integrate market planning for both carload and intermodal services because they serve many of the same customers and use many of the same terminal and line-haul facilities.

Between modes, the mode with the major portion of the haul usually performs the marketing and sales functions. Their concerns about integration and differentiation, although extremely important in operations, are not nearly as important in marketing.

The most important uncertainty facing marketing is the question of what will be the future demand for the various types of services that might be offered. This uncertainty is faced by marketing and business people in all fields, but because transportation demand is a derived demand and there are only a limited number of possible services and competitors, transportation faces no unique challenges here.

Relations Between Marketing and Operating Groups

The differences between marketing and operations are substantial, both within the given modes and between them. An article in the Harvard Business Review (6) explores the differences between marketing and operations in manufacturing firms, asking the question, "Can marketing and manufacturing coexist?" Changing "manufacturing" to "operations" makes this question equally relevant for carriers. For the purposes of this paper, it is sufficient to say that the differences range from cultural to technical and that the two groups generally have completely different outlooks.

Nonetheless, marketing and operations must achieve an important degree of integration if intermodal operations are to be successful. Ideally, marketing should identify the needs of potential customers and then work with operations to design a price and service package that will profitably meet these needs. Among carriers, however, it is often the reverse: Operations determines what services will be offered and marketing is charged with finding customers to utilize those services (5, pp. 46-48).

The uncertainties facing marketing and operations exacerbate their differences. Too often, marketing forecasts of traffic are not accurate; this makes operations planning difficult. Lacking good forecasts, operations resorts to its own new schedules and equipment plans that may or may not meet the needs of the marketplace. Marketing, uncertain about what types of service will be offered in terms of on-time delivery and speed of delivery, promises more than can be delivered or fails to sell what could be very good performance.

Conclusions

Of all the lateral relations described here, marketing and operational relations are probably the most difficult to resolve within the individual firm; they are also most important to resolve in order to maximize the health of the business. Between firms in intermodal operations the need is to bring together operating groups to ensure that the services sold are actually delivered.

MECHANISMS FOR MANAGING LATERAL RELATIONS

There are a variety of formal mechanisms that might be utilized by carriers to improve the management of lateral relations. These include hierarchy (use of common superior), plans and information systems, linking roles, task forces, integrating units, and the matrix organization (3, pp. 221-231). Generally these mechanisms can be viewed as existing on a continuum in the order given above with hierarchy at the low end and the matrix organization at the high end. As the degrees of uncertainty, differentiation, and desired integration increase, more of the mechanisms on the spectrum will be used in concert. This section of the paper will discuss the mechanisms and their applicability to the management of intermodal freight services.

Hierarchy

The hierarchical organization is the most common method of integrating groups. The groups to be coordinated are placed under a common superior who will sense and resolve differences between the various units. The different modes vary in their use of this mechanism for coordinating marketing and operations. For example, most railroads have only the president as the common superior for marketing and operations. At the other extreme, many large less-than-truckload motor carriers place the terminal manager in charge of both functions. Air and water carriers vary between these extremes with air closer to the trucking approach and water closer to the railroad approach.

The problem with forcing the hierarchy down to lower levels is that a substantial degree of suboptimization

may occur in operating the transportation system. On the other hand, integration only at a high level removes the incentive for lower-level coordination and often creates a very rule-oriented bureaucracy.

Between firms, hierarchy takes the form of horizontal integration; i.e., naturally following the hierarchical approach, common ownership of the modes of transportation would be the result. Because this approach is severely circumscribed in this country, it will not be considered here. It should be noted, however, that firms such as Canadian Pacific and some U.S. railroads that own other modes essentially operate the modes separately.

Hierarchy, then, is probably not sufficient to achieve the needed level of integration in intermodal operations.

Plans and Information Systems

Plans and information systems have a great deal of potential for integrating and coordinating intermodal operations. Carriers traditionally have been strong in information systems but less effective in planning. Both marketing and operations need to improve their planning and the integration of those plans. One approach to operations planning is described here.

In the long run, of course, the company must decide what kind of services it will offer. Presuming that intermodal transportation is a desirable business, then both marketing and operations must make their intermediate range plans (six months to two years). In the case of marketing, this involves identifying what types of traffic are most amenable to the ranges of service and price the firm can offer and the origins and destinations of such traffic. When there are natural traffic imbalances, pricing differentials may be necessary to minimize empty movements of equipment.

The mid-term plans of operations relate to achieving the most effective use of available fixed facilities. This requires routing decisions (through what terminals should a shipment from A to B pass) and capacity decisions (how intensively should the various facilities be operated) and inventory policy decisions (when and where should excess capacity exist). Capacity decisions determine how many line-haul operations to run and when to run them, as well as how many terminal crews to operate at various times. Inventory decisions refer primarily to planning numbers and the locations of empty vehicles to be held awaiting anticipated orders. Routing, capacity, and inventory decisions are all interrelated and depend on the forecasted traffic levels determined by marketing.

In the shorter run (up to six months) marketing needs to take two very important steps. The first is to identify potential short-term traffic imbalances and allocate field selling efforts to ensure that balanced operations are achieved. The second step is to assign priorities to traffic that is moving in order to help operations manage inevitable bottlenecks without damaging important commercial relations.

Over this same planning horizon, operations must make short-term capacity, routing, and inventory policy adjustments to most effectively handle the traffic that is materializing. The various modes have differing degrees of flexibility here, particularly with regard to line-haul operations, but crews and equipment can often be added or subtracted in the short run.

The execution of the plan requires all the day-to-day adjustments necessary to handle traffic actually tendered. As traffic is received, the movement plans between the particular origin and destinations are consulted. Based on the route, the schedule of operations along that route (set in the planning process), and the availability of uncommitted capacity in those operations, it should be possible to lay out a detailed schedule of any movement as soon as it is received for handling. If there are conflicts between the scheduled arrival time at the destination and the customer's desired arrival time, these may be resolved in several ways. It may be possible to add crews or equipment at certain points where a bottleneck exists. Another alternative is to delay some lower-priority traffic (as determined by marketing) in order to make capacity available to handle the shipment in question. Or marketing may have to face the problem and indicate to the customer that the late schedule is the best that can be provided under the circumstances.

Clearly there will be times when actual capacity differs from that planned because of breakdowns or other reasons. In those cases, the affected shipments will have to be rescheduled and all those involved, including the customer, will need to be informed.

The final aspect of managing the network concerns comparing the conformity of actual performance with the plan. Often this aspect is not emphasized due to the pressures of day-to-day business or the lack of a realistic plan to begin with. But it is extremely necessary and important. Performance involves both costs and service. The plan has for the most part dictated what the costs should be because it has established resources (schedules and capacities) for each operation. Given this, the more important question becomes, "Was the scheduled work assigned to each operation performed on time within the resource constraints?" If not, management must identify why and seek to remedy the situation. The question of on-time performance of individual operations, of course, is the major determinant of the service level offered.

The planning approach described herein is not beyond the realm of possibility for intermodal transportation. Such a system is currently being developed by the Missouri Pacific Railroad for use in managing its system (7). By implication, such an approach is also used by some large motor carriers (8). This basic approach is also used to manage large-scale manufacturing job shops that are conceptually similar to the production of transportation services (9).

This type of planning goes a long way toward reducing the uncertainty faced by the various operating groups and integrating their tasks. For example, once a shipment is received and scheduled, then all downstream operations can count on its arrival if operations adheres to that schedule.

Developing the plans probably cannot be achieved without the use of some of the integrating devices higher on the spectrum, however.

Linking Roles

In view of the need for close cooperation between marketing and operations in implementing the planning approach described in this paper, it may be necessary to establish several "linking roles." This is "a specialized position in which the individual attempts to facilitate communications and problem-solving between two or more interdependent units" (3, p. 225). Such a role is described in greater detail in Lawrence and Lorsch (10).

The linking role might be very useful in fostering interfirm communication and coordination. One individual from the firm with the major portion of the haul might be placed in offices of each of the connecting carriers in order to raise the consciousness of the connector with regard to service objectives and future plans. In addition, this representative would monitor service

performance by that carrier. The connecting carrier might also place its representative in the offices of the line-haul firm to facilitate communication.

Another use for the linking role might be within the individual firm. For example, it might be useful for marketing to be represented at major terminals by individual integrators. Similarly, operations may find it advantageous to have a representative in each of the major sales offices in order to inform the sales personnel of current operating conditions and service levels.

The linking role is useful. However, it will probably not bring about sufficient integration on its own to ensure that the overall planning approach described here is implemented.

Task Forces

Task forces are generally temporary in nature. Consisting of one or more representatives from each of the affected firms and departments, they usually serve until the problem in question is solved. Because planning procedures are ongoing, task forces will not be too useful. However, there are at least two occasions where they facilitate matters.

An interfirm task force might be formed to draw everyone into the initial planning attempt. This would encourage all partners in the service to participate in the process. Later, the formal planning could be done primarily by the major carrier.

Another possible use for a task force might be when a particularly difficult operations or marketing problem arises. For example, a major change in operating procedures might require the reconvening of the original task force. A problem with service to a major customer might also call for the task force approach. Generally, however, something more permanent than a task force will be required to maintain coordination.

Integrating Units

If the members of a task force are formally and permanently assigned to the task of facilitating integration between two or more firms or departments, the task force becomes an "integrating unit." Generally this group will have its own manager.

Integrating units are not new to rail transportation. Several rail firms have intermodal departments. Usually part of the marketing department, these groups have responsibility for planning and selling intermodal services. Although they work closely with operations, few of these groups have operations personnel assigned as formal members. The Consolidated Rail Corporation recently has gone a step further by assigning such groups for other equipment types as well as intermodal equipment. A different approach has been to assign the groups on the basis of commodities rather than equipment and service. Thus, several rail firms and some trucking firms have "market managers."

Integrating units can also exist between firms. For example, in the 1890s, such organizations as Trade Dispatch and Merchants Dispatch Transportation Company were formed to ensure that high-priority freight was moved expeditiously (11, pp. 287-288). Each had a general manager with marketing agents to get business and employees judiciously located to watch movement. The general manager "keeps a close record of his business, and reports promptly to the transportation office of any road on his line any neglect or delinquency he may discover" (11, p. 288).

The problem with integrating units is that they have no real power except the power of their expertise. If the involved units recognize their need for the integrating units, the power of expertise can be considerable. The problem with many of the rail efforts described herein is that they were accepted by marketing but much less frequently by operations. Further, as Wyckoff points out, top management has often been lukewarm toward such efforts (5, p. 16). Such units probably should be independent of both marketing and operations (though with representatives from each); these units can prepare the plans and then use the services of each to implement them.

Matrix Organizations

The matrix organization takes the integrating unit approach to its logical conclusion by establishing true "dual authority, information, and reporting relationships and systems" (3, p. 299). The intermodal organization on a railroad would become separate from operations and marketing but would be made up of operating and marketing personnel who would formally report to both their respective functional departments and to the intermodal organization. The leader of the intermodal department would be equal in stature, if not in pay, to the operations and marketing vice presidents. This concept could also be used between firms, with the intermodal organization becoming a jointly owned subsidiary of the involved firms.

Naturally there are many problems to be overcome in moving to a matrix organization, not the least of which is the availability of the proper type of personnel to make it work. These problems and their possible solutions are discussed thoroughly in Davis and Lawrence (12).

CONCLUSION

There are clearly a variety of managerial mechanisms available to help improve the quality of intermodal transportation services. Whichever mechanisms are chosen will depend on the nature of the problem, the sophistication of the firms involved and their current organizations and personnel, the complexity and uncertainty existing in the external environment, and so forth. It is clear that at least three basic conditions must be met if intermodal services are to flourish:

1. Top management must be committed to achieving the required degree of integration both between the firms and within the firms.
2. A comprehensive, operational planning system such as that described in this paper must be established.
3. A performance-monitoring system must exist to ensure that service objectives, not just cost objectives, are met.

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