

## Transportation Taxonomy – Working Paper

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### Introduction

The transportation industry moves astonishing volumes and varieties of products for diverse industries. To meet these widely diverging needs, the transportation industry employs a various processes. Each product is moved utilizing one of these processes or a blend of two. The goal of this paper is to describe these general processes and the types of products moved by each. Examples from the trucking industry will be provided, though the processes are generalized and applicable to all other transport modes. Once presented in the first section, it will be shown that the processes form a continuum – thus a taxonomy for transportation.

The advantages of a taxonomy are threefold:

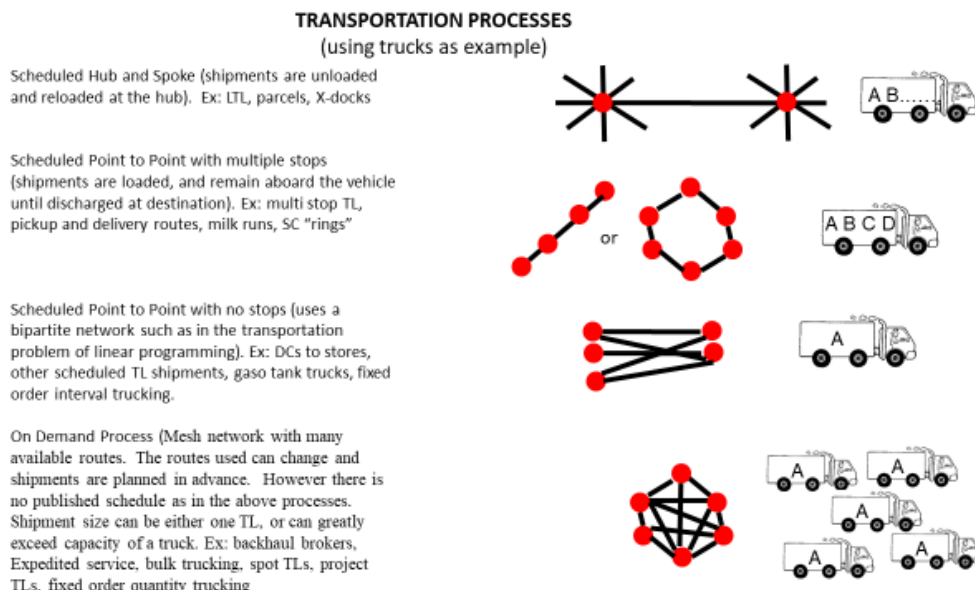
1. It is a useful educational tool to identify the primary segments of the trucking (or other) industry and their interactions
2. For particular types of shipments one can identify the relevant segments of the trucking (or other) industry
3. One can identify the strengths and weakness of each structure

### Transportation Processes

A transportation process for this paper is defined as a combination of a network (route) structure, along with a discipline under which it operates. Regarding the discipline, the routes can be operated either on a scheduled basis with regularly scheduled deliveries, or on an on-demand basis, where service is provided only when demanded.

A figure showing the four basic tenets appears below. Please note that segments of the trucking industry are listed alongside the process they utilize.

Figure 1 Primary Transportation Processes

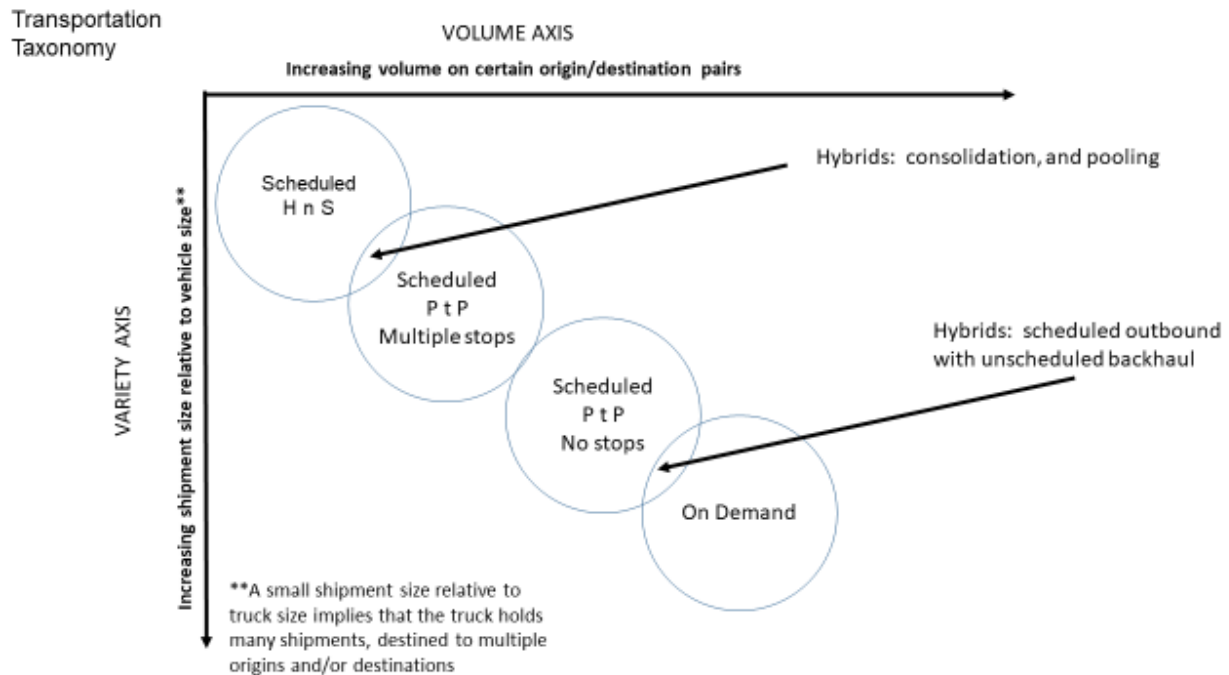


Hybrids exist between pairs of processes above. As example, consolidation and pooling utilize elements of hub and spoke, and yet benefit from the point to point characteristics of long haul transport.

### Taxonomy Applied to Trucking

Once the structures are understood, the question arises as to which types of shipments are relevant for each. Some shipments are small and others quite large. Hub and spoke networks are associated with relatively small parcel or LTL types of shipments. For such shipments, the number of shipments per truck is quite large. At the other extreme end, bulk trucking is typically utilized on an on-demand basis, and can entail one or multiple truckloads being required to complete a single shipment. In addition to large or small shipments, one can categorize their routes as being heavily utilized or lightly utilized. Lightly utilized routes are associated with Hub and Spoke, while more heavily utilized routes can justify full truckloads or multiple full truckloads. With the above two considerations as a “variety axis” and a “volume axis”, the figure below portrays the processes:

Figure 2 Graph of Transportation Processes and Shipments



Please note the overlapping categories. Also please note that the volume axis refers to volume on a subset of the routes. Overall scale of a trucking company in any of the categories above can be either large or small (such as regional versus national LTL, and small versus large TL companies). The next section compares the characteristics of these processes

### Characteristics of Transportation Processes

The axes above identify a progression of trucking (or other modes) segments. Other progressions exist as well. For instance, 40’ and 53’ general purpose vans are included in the upper left of the figure, while both general and special purpose trailers (such as semi dumps, tank trucks, pneumatic trucks) tend to be used in the lower right categories.

A further difference is that the processes differ as to the forms of “waste in transportation” that they employ:

Figure 3 Forms of Waste in Transportation  
 (as one proceeds down the diagonal, there are fewer inherent forms of waste)

	Double handle	Sequence delays	Out of line	Schedule inefficiency
H n S	Y	Y	Y	Y
P t P stops	N	Y	Y	Y
P t P nonstop	N	N	N	Y
On demand	N	N	N	N

**Double handling:** Cargo is sorted and assorted at the hub, as cargos are allocated and accumulated. This requires additional handlings of the cargo

**Sequencing time delays:** Cargo is loaded and unloaded in sequenced fashion to be easily handled at stopoffs. The last cargos are delayed due to unloading time of earlier cargos.

**Out of line:** additional miles and time required to travel in an out of line route. Valid for hub operations and P t P with stopoffs

**Schedule inefficiency:** with fixed published schedules, trucks may not travel full. On demand trucking does not work on such a schedule

As one proceeds to the right and down the diagonal, one encounters less handling, sequencing, and out of line delays. When one reaches the on-demand process at the bottom right, one further eliminates the utilization issues encountered by the need to adhere to a fixed schedule.

**Summary**

The figures above describe the many segments of the trucking industry in an organized way, so as to clearly depict their primary characteristics. As such it is useful as a teaching tool to dispel the initial thought that trucking is simply “A to B transportation”. Such a Figure can and has been developed for every transport mode. One can see clearly how transport segments “fit together” such as consolidation as a combination of hub and spoke and point to point. One can further identify the forms of waste inherent mode which is a factor in their selection to move any specific product.