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articles

Understanding the 'new' distribution reality through 'old' concepts: a renaissance for transvection and sorting

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Abstract. *Technical developments in manufacturing and increasingly efficient systems for physical distribution and information exchange have made new distribution configurations available. The main feature of the new configurations is the opportunity to provide end users with customized solutions. The aim of this article is to analyse the characteristics and implications of the evolving distribution arrangements by comparing the features of these arrangements with those of 'traditional channels'. For this analysis we use two concepts developed by Wroe Alderson half a century ago: sorting and transvection. The article explores the features of a transvection and the role of sorting in each of the two channel contexts. We conclude that the transvection concept is particularly well-suited for understanding the characteristics and effects of the evolving distribution arrangements. We also explain how sorting is fundamental to both types of channels, although its role is different in the two settings.* ***Key Words*** ● *channel* ● *distribution* ● *network* ● *sorting* ● *transvection*

Introduction

The past decade has witnessed significant shifts in the way suppliers make their products available to customers. Major changes have occurred both in terms of the distribution strategies of individual firms and the structural features of distribution networks. In a study of distribution innovators in the USA, it was observed that 'forward-looking companies are experimenting with their channels to make them more flexible and responsive' (Narus and Anderson, 1996: 112). Moreover, changes in the distribution context have forced suppliers to 'reconsider fundamental assumptions about how they reach their markets' (Anderson et al., 1997: 59). Initiatives for change seem to originate from both the buyer and the supplier sides. One explanation for distribution reorganization is that customers are

increasingly 'demanding highly customized products and services' (Feitzinger and Lee, 1997: 116) – a tendency that seems to be reinforced over time (da Silveira et al., 2001; Jiao et al., 2003). Customization is also marketing and sales driven and perceived as a means by which a supplier's market position may be improved concerning both products (e.g. Kotha, 1995; Stump et al., 2002) and services (Cao et al., 2006).

The current reorganization of distribution has been made possible through technical development (Gadde, 2004). Progress in manufacturing technology, particularly in terms of shorter lead times, has made new distribution configurations available (Agrawal and Hurriyet, 2004; Chandra and Kumar, 2000). Improvements in logistics efficiency have affected the conditions of physical distribution (Christopher and Towill, 2001; Lemoine and Skjoett-Larsen, 2004). Information technology is a key tool in the restructuring process, and has been instrumental both to improvements in terms of joint coordination of activities (Disney et al., 2004; Garcia-Dastugue and Lambert, 2003), and to companies' strategies and operations, both on the selling side (Honeycutt, 2005; Varadarajan and Yadav, 2002) and the buying side (Carr and Smeltzer, 2002; Sriram and Stump, 2004).

The potential effects of current developments have been projected as far-reaching. For example, it is claimed that these changes will negatively affect the conditions for established types of distribution intermediaries (Mudambi and Aggarwal, 2003), as well as providing opportunities for new types of middlemen, such as 'electronic intermediaries' (Anderson and Anderson, 2002; Tamilia et al., 2002), 'third party logistics service providers' (Carbone and Stone, 2005; Murphy and Poist, 2000; Ying and Dayong, 2005) and 'electronic hubs' (Shevchenko and Shevchenko, 2005). The potential changes are perceived as being so substantial that even the fundamental building blocks of distribution are challenged. For example, Pitt et al. (1999) argue that the ongoing transformation of distribution practices may require reconsideration of some of the basic assumptions on which established distribution theory relies. They proclaim 'the death of distance' and 'the irrelevance of location' and claim that current transitions 'will transform and even obliterate channels themselves' (1999: 19).

Aim and scope

The aim of this article is to explore the ongoing changes in distribution practices and to analyse the respects in which the new conditions require supplementary analytical tools. We begin the article with a description of the ongoing changes in distribution reality and conclude that the evolving distribution arrangements require greater reliance on what Alderson (1950) identified as the principle of postponement. Two concepts developed by the same author at the same time provide the basic framework for our further exploration of the features of the new distribution practices. The first – sorting – has always been a significant concept for analysis of assortment building, representing the 'decision aspect of marketing'

(Alderson, 1965: 34). The second – transvection – is less established and seems rarely to have been applied in empirical studies. In brief, this concept involves all the activities necessary for placing 'an end-product in the hands of the ultimate consumer' (Alderson, 1965: 92). This framework is then used to describe and analyse the features of two 'ideal types' of activity structures in distribution. The first is what we identify as 'traditional channels', building on the principle of speculation (Bucklin, 1965), and the second the 'evolving arrangements' that are the main focus of this article. The remainder of the article is devoted to an analysis of the role of sorting in these two channel configurations and a concluding discussion.

The changing reality of distribution

Our analysis of the features of the evolving distribution arrangements is based on a comparison with the activity structure behind what we identify as a 'traditional channel'. This archetype is rooted in the features of the Modern Business Enterprise (MBE) established in the early 20th century, relying on the integration of mass production with mass distribution (Chandler, 1977). Exploitation of the potential economies of scale in manufacturing required distribution systems that could efficiently 'channel' goods to end users. The performance of these systems was therefore evaluated mainly from the perspective of the manufacturing firm. In the words of Alderson (1954) 'the technology of production' ruled the game, implying that the prerequisites for efficiency were set primarily by the outward directed operations of the factory. The principles governing the operations of the MBE have been characterized as 'the logic of aggregation' (Lampel and Mintzberg, 1996). At the heart of this principle are strategies based on standardization: 'standardization of taste that allowed for standardized design, standardization of design that allowed for mechanized mass production, and a resulting standardization of products that allowed for mass distribution' (Lampel and Mintzberg, 1996: 21).

From a theoretical point of view these distribution arrangements build on the principle of speculation (Bucklin, 1965), a prerequisite for realizing economies of scale in manufacturing operations at the time of the MBE. For manufacturers, the main implication of this principle is that production quantities and qualities have to be based on plans and forecasts of demand. These forecasts determine what will be produced and made available to buyers. The principle of speculation restricts end users to selecting among what is offered (or putting up with long delivery times for tailor-made solutions), owing to the inherent inflexibility of 'traditional' manufacturing and channel arrangements. But these same conditions also provide value to buyers, since manufacturers have to be inflexible due to their efforts to 'seek to cut costs through long and continuous production runs' (Berman, 2002: 53).

Once technical development changed the basic conditions of distribution, suppliers were able to generate value to buyers in alternative ways. They no longer

had to rely only on standardization and speculation, since it now became economically feasible to make adjustments to the specifications from individual buyers. The new conditions affected three of the fundamental building blocks of distribution. Firstly, manufacturers began to increasingly apply the 'logic of individualization', which made possible 'a move to greater customization in a wide variety of industries' (Lampel and Mintzberg, 1996: 23). Secondly, these customized distribution services paid greater attention to what Alderson (1954) identified as 'the technology of use'. This perspective puts the emphasis on the buyer's input operations rather than the output of the factory. Thirdly, a shift in this direction is based on the principle of postponement, which makes possible cost savings and risk reduction 'by moving differentiation nearer to the time of purchase' (Bucklin, 1965: 28). Several studies illustrate the increasing attention to postponement over time (e.g. Krajewski et al., 2005; Pagh and Cooper, 1998; Su et al., 2005; Van Hoek, 2001).

Postponement has been instrumental in distribution transition, primarily owing to its role in 'mass-customization', an approach based on advances in manufacturing and information technology, which increases process flexibility (da Silveira et al., 2001) and 'enables firms to provide product variety and quick responsiveness' (Kotha, 1996: 442). Mass customization is applied in numerous and diverse firms and industries. The best known cases are probably Hewlett Packard (Feitzinger and Lee, 1997) and Dell (e.g. Magretta, 1998). But mass customization also appears increasingly in many other contexts, for example, home appliance products (Henke, 2000), textiles (Abecassis et al., 2000), farm equipment (Berman, 2002), automobiles (Alford et al., 2000), and electronics (Partanen and Haapasalo, 2004).

In this article we deal mainly with illustrations from three sectors: the fashion, PC and passenger car industries. In the fashion industry postponement is used by suppliers to enable quick response to changes in demand. In these efforts it is a challenge for suppliers to respond to fashion changes 'whose rhythms are becoming more and more accelerated to satisfy customers' propensity for anything modern and unusual' (De Toni and Meneghetti, 2000: 18). The main problem in fashion is the risk of oversupply owing to the turbulence of demand. To minimize this risk the Spanish firm Zara keeps production volumes low early in the season. Efficient information systems integrated with the manufacturing operations then makes it possible to react quickly to actual sales data and new trends appearing during the season. The reliance on this postponement approach enables Zara to carry less inventory per unit of sales than its competitors, as well as to have lower discounts on unsold items (Ferdows et al., 2003).

The ultimate form of postponement is 'build-to-order' – an approach that is problematic to apply in fashion retail. In other industries, however, it is increasingly used (e.g. Gunasekaran and Ngai, 2005). Build-to-order implies that the individual customer's order initiates the supplier's operations. In this way it becomes possible to completely eliminate inventories of finished products. This approach is commonly used in the PC industry, which is characterized by short product life cycles that impose the same risks as in the fashion industry. In the PC

Table 1

Basic features of two 'ideal' distribution types

Criterion	Traditional channel	Evolving arrangements
Degree of customization	Logic of aggregation	Logic of individualization
Main determinant of channel arrangement	Technology of production (Factory output)	Technology of use (End user input)
Main mechanism for value generation and cost saving	Principle of speculation	Principle of postponement

industry, build-to-order is applied on different levels in the channel (Curry and Kenney, 1999): some producers like Dell build to order and ship directly to end users, while value-adding resellers (VARs) assemble components and subsystems from several of their suppliers to match specific end user requirements.

In the car industry, build-to-order production is a major issue, because car buyers nowadays are given the opportunity to be involved in the design of the product. For example, a study in the UK found that 75 percent of the cars sold in 2002 were individualized in some way (Svensson and Barfod, 2002). Even if the customers' choices are severely circumscribed, the total numbers of potential combinations of components and systems means a dramatic increase in product variety. In order to handle these operations economically, car manufacturers have had to abandon previous approaches related to 'make-to-forecast and sell-from-stock' (Holweg and Miemczyk, 2003). In order to implement customization, cars have to be built to order because it would be a financial disaster to produce on speculation and store all the potential variants. The transition from forecast-driven to customer-driven supply is not without problems and is claimed 'to have wide ramifications for the whole supply chain' (2003: 64).

This description of the characteristics of the evolving distribution arrangements illustrates some major differentials in relation to traditional channels, as displayed in Table 1. The further exploration of these differentials builds on Alderson's concepts transvection and sorting, presented below.

Transvections and sorting

Our analysis requires a framework that takes as its point of departure the particular activities involved in a specific business exchange. The transvection concept is most useful for this purpose. Alderson (1965: 92) defines a transvection as:

> a single unit of action of the marketing system. This unit of action is consummated when an end-product is placed in the hands of the ultimate consumer, but the transvection comprises all prior action necessary to produce this final result, going all the way back to conglomerate resources.

Two types of generic activities are involved in a transvection: transformation and sorting. A *transformation* is 'a change in the physical form of a product or in its location' in time and space (Alderson and Martin, 1965: 123). Transformations increase the value of the product and this value is consequently expressed as utilities in terms of form, time and place. Each transformation thus changes the features of the product in at least one of these dimensions. Form transformation involves changes in the physical features of a product, on the basis of various manufacturing, assembly, and packaging activities. Place transformation is concerned with the physical movement of the goods to the end user involving activities such as transportation, handling in warehouses, and loading/unloading operations. Time transformation, finally, relates to delivery conditions and storage of the product. The activities underlying a transvection thus aim at ensuring that the right product (including services) is available at the right place at the right time.

Transformations require resources, such as production and assembly equipment, trucks, warehouses, conveyors, distribution terminals, and storage shelves.

The transformation of a product is directed by *sorting*, because 'two transformations cannot appear successively without an intervening sort' (Alderson, 1965: 94). Sorting is a pure decision activity and thus not concerned with physical handling of products. Sorting relies on sorting resources, such as information systems, computers, databases, product catalogues, and the competence and the capabilities residing in human resources.

Figure 1 illustrates a transvection where the product is sorted and transformed in time, place, and form into what is finally delivered as an end product into the hands of the ultimate consumer (or end user). In this article 'transformation output' represents the various states of the product after each transformation along the transvection, from conglomerate resources to the end product when landed in the hands of the end user (which may be either a private or industrial user). The interpretation of 'conglomerate resources' will vary depending on the unit of analysis applied. This unit of analysis will determine what is perceived as the start of the transvection and thus what are conglomerate resources: raw materials, components, sub-assemblies, etc.

As regards sorting, Alderson (1965) distinguishes between four aspects: sorting out, allocation, assorting, and accumulation. He argues, however, that for 'some theoretical purposes sorting out and allocating can be combined under the term assignment' as seen from the standpoint of the supplier and that 'it is possible to combine assorting and accumulation under the term selection to cover sorting from the viewpoint of the buyer' (1965: 35). *Assignment* is thus performed by the supplier and concerns the decision of how to direct the transformation output to the next transformation resource, for example which warehouse to use for storage, or which lorry to use for transportation. *Selection* is conducted by the buyer and deals with the sorting of transformation outputs to be included in the buyer's collection of goods, such as the formation of a retailer's assortment, the items purchased by an industrial user, or the 'shopping basket' selected by a consumer during a particular shopping event.

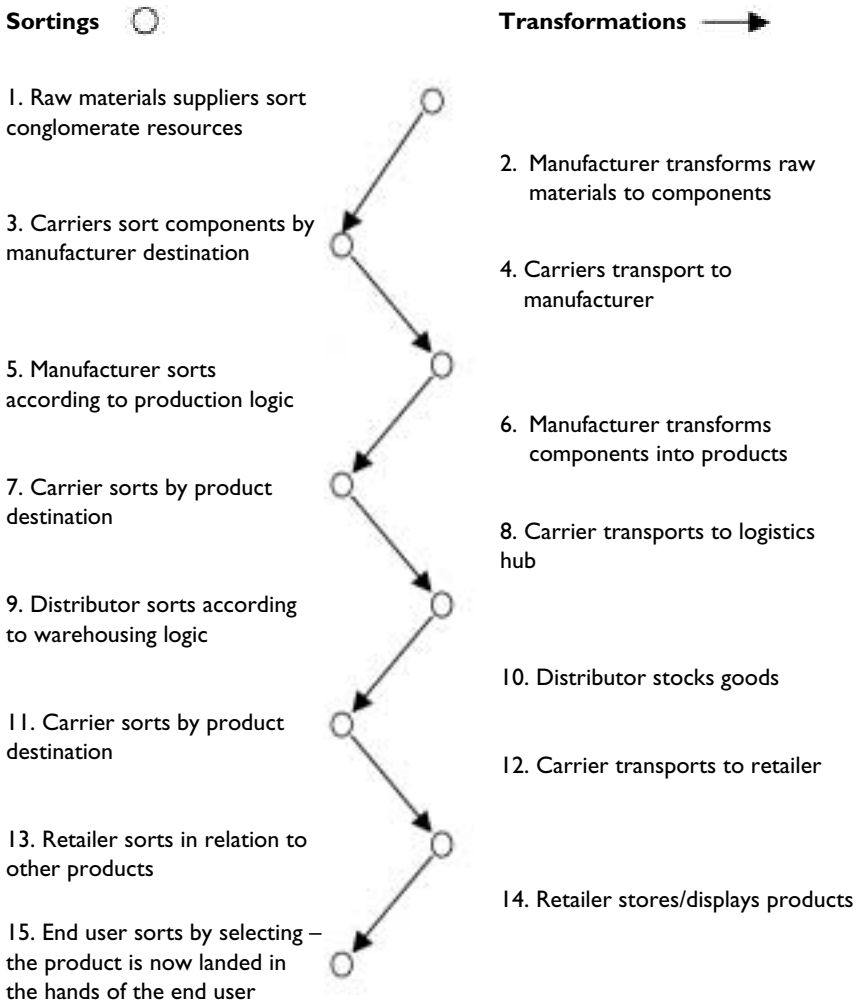

Figure 1

Transvection involving transformations and sortings

Alderson and Martin (1965: 123) conclude that 'every sale of an end-product has a transvection behind it', but there is considerable variety among transvections. This diversity occurs because of the different conditions for distribution among industries and companies, and also for the various business exchanges of one and the same company.

For this article the most important distinction appears between transvections based on speculation and those based on postponement. A transvection based on speculation represents the ideal type of distribution in 'traditional channels', while

a transvection based on postponement is representative of the 'evolving arrangements' for individualized production and distribution. In this way they signify two extremes from a 'transvectional' point of view, thus constituting quite different conditions for transformation and sorting.

The two types of transvections are also different from an analytical point of view. In transvections based on the principle of speculation, it is not possible to identify 'the single unit of action' until the end product has landed in the hands of the ultimate consumer. Once this final exchange occurs it becomes possible to trace 'all prior actions' backwards. However, at the time when these actions are actually being conducted, they cannot be related to a specific transvection, because in distribution arrangements based on speculation the end user is not identified until the final purchase decision has been made.

When the principle of postponement is fully applied the situation is different. In build-to-order production the order from the end user initiates the transvection. The selection made by the buyer triggers the first supplier's selection of conglomerate resources, and the following assignments to the transformation resources downstream of the supply chain. In these distribution arrangements the product is given the *identity* of the end user already from the beginning of the transvection. Therefore, a transvection based on the principle of postponement can be followed in real time. We will now illustrate the features of the two types with examples from the industries mentioned above.

Transvections building on speculation

Figure 2 illustrates a typical example of a transvection based on speculation. The example in the figure relates to the PC industry, but is relevant for any 'traditional channel' involving a number of intermediate levels (possibly with the exception of the word 'assembly').

Suppliers involved in a transvection of this type (producer, distributor, and retailer) make assignments of products on speculation in order for their products to be available once they are demanded. From these assortments the buyers in the channel (distributor, retailer, and end user) select products to match their own product ranges. Thus, in transvections based on speculation assignments and selections are always performed with reference to some particular collection of goods (Alderson, 1965) and there are no strong interdependencies between the assignments of sellers and the selections made by buyers.

In these transvections sorting is about building assortments at the different channel levels in accordance with expectations concerning buyers' future needs and requirements. Sorting in transvections based on speculation is the type of sorting represented in textbooks on marketing channels (e.g. Stern and El-Ansary, 1982). Sorting contributes in this respect to smoothing the flow between producer and end user by increasing or decreasing the homogeneity or heterogeneity of assortments by building up (assorting and accumulating) or breaking down (sorting out and allocating) a specific collection of goods.

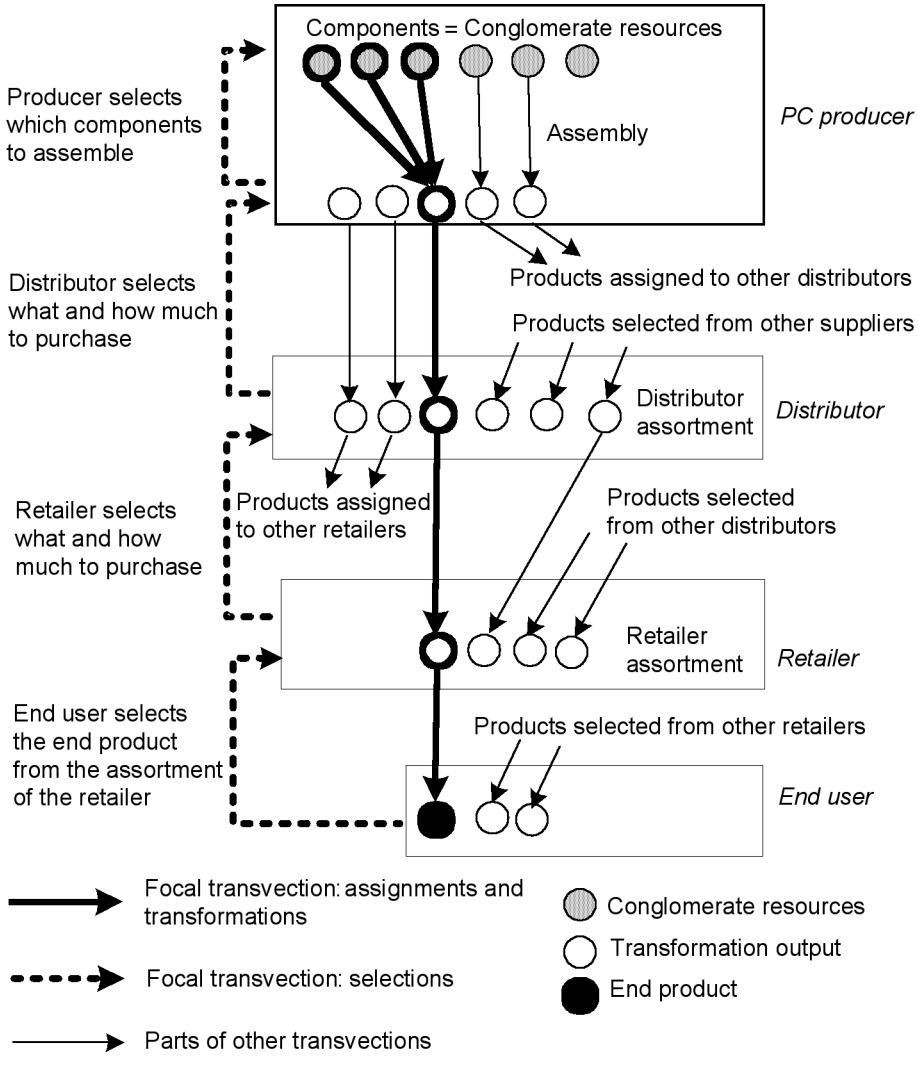

Figure 2

Transvection building on speculation

Thus, in transvections based on speculation, sorting is mainly a matter of assigning and selecting finished products with regard to time and place utilities, implying various place and time transformations. The form features of the product are determined mainly in the producer's factory and do not normally change along the transvection. In this type of channel, form transformations tend to be limited to 'mere cleaning or packaging of a product which is to reach the consumer in essentially the same form as it was produced' (Alderson, 1950: 1).

Transvections based on postponement

In order to illustrate the main differences between the two types of transvections, our examples in this section focus primarily on build-to-order transvections. In these transvections the selection of the end user is the starting point. The first illustration is from the PC industry and describes the transvection underpinning a PC delivered from Dell Computers to an end user (see Figure 3). Dell has received a great deal of attention for its production and distribution setup, based completely on the principle of postponement. Dell's business mission is to sell PCs directly to end users, without title-holding intermediaries. Moreover, each PC is built to customer order and in accordance with the specifications of the individual buyer.

In this case the transvection is initiated when the end user orders a PC with particular features concerning processor, keyboard, monitor, software, etc., illustrated as conglomerate resources (a–f) in Figure 3. The different manifestations of the product as it develops from conglomerate resources to end product are illustrated as five transformation outputs (1–5).

Dell offers a number of standard configurations directed to different customer groups. From these standards, the customer can adjust the features of the PC to his or her specific needs by making a selection (S1). This first selection directs Dell's selection of conglomerate resources (S2) and the following assignments (A1–A5) to the resources used for the five transformations of the product (T1–T5). The outputs of these transformations (1–5) are characterized by changes in form, time and place utility.

The main differential in comparison with transvections based on speculation is the opportunity for the customer to become involved in the actual design of the product features. This also means that once the first selection is made the product is given its end user identity and cannot be used for other users. Transvections building on postponement thus increase interdependencies in channels.

In the fashion industry full adherence to build-to-order is seldom a viable approach, because the basic aim of consumer shopping is normally instant delivery. However, examples from the industry clearly show the ambition to rely on postponement when possible. We described above the approach used by Zara to respond to fast-changing trends. It is a common principle applied by fashion retailers to book production capacity and time with manufacturers, and then postpone production specifications until close to the time of delivery (Birtwistle et al., 2003: 118). For example Zara only commits up to 20 percent of its yearly purchases six months in advance of the season, increasing to 50 percent by the start of the season, thus leaving the remaining 50 percent to be decided once the season has begun (2003: 122). These conditions are a challenge to manufacturers and it is claimed that in this industry successful manufacturers 'must have an extremely adaptable and flexible supply chain' to be able to handle this demand situation (Baker, 2004: 12).

Building cars to customers' orders has enabled a considerable reduction of inventories of finished cars. This shift required re-configuration of the activity

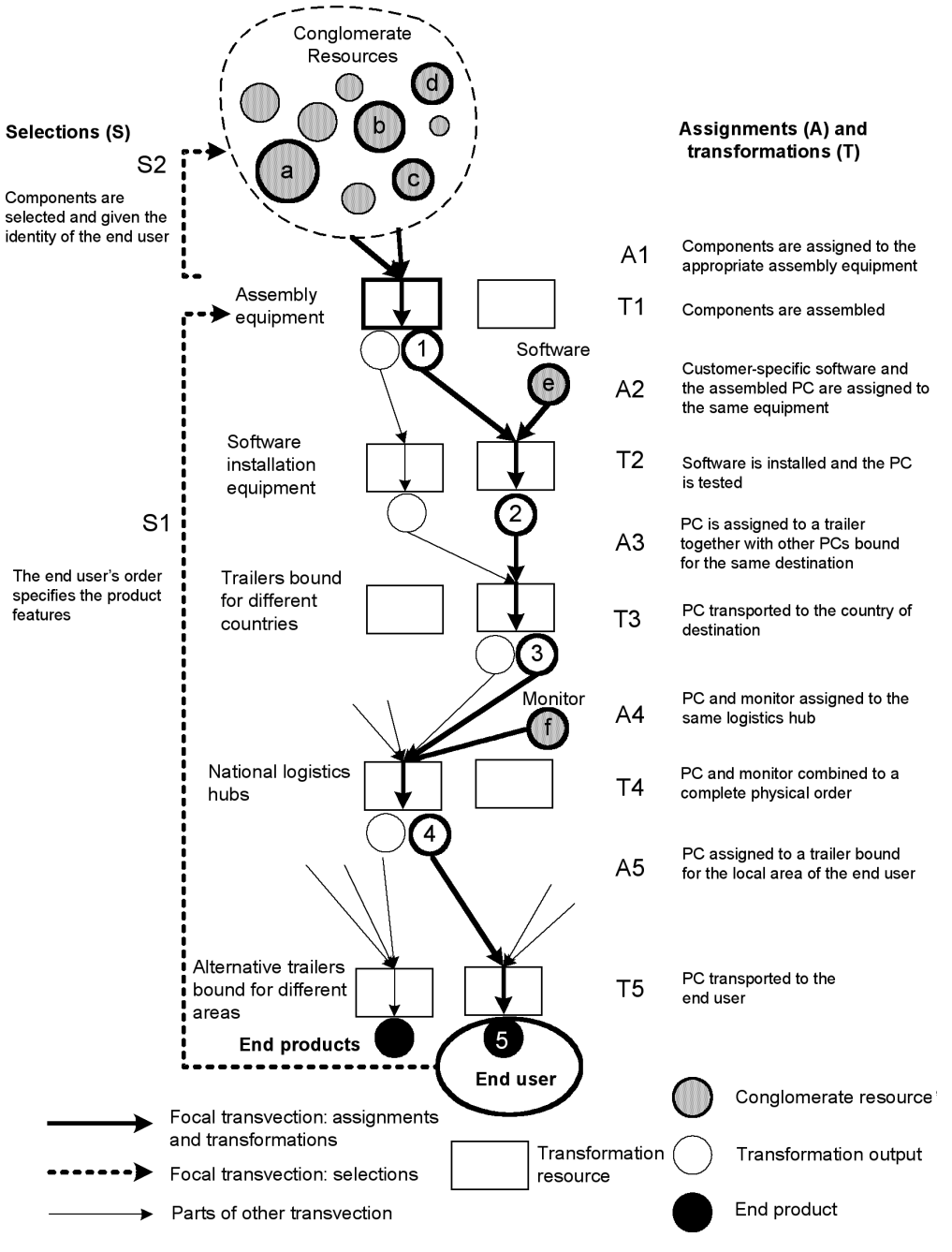

Figure 3

Transvection based on postponement

structure in the automotive network. A key issue in the restructuring was the reliance on a process of 'modularity', where pre-manufactured components and systems are assembled in relation to specific customer orders (Alford et al., 2000). Final assembly is postponed in order to ensure that customization may be accompanied by reasonable costs and lead times. Enabling these conditions on the demand side also requires a postponement approach on the supply side of the car manufacturer's operations. Suppliers of components and modules therefore have to deliver just-in-time to the assembly line of the car producer (Holweg and Miemczyk, 2003). Customization and build-to-order approaches thus increase interdependencies along the entire supply chain which, in turn, impacts on the role of sorting.

The role of sorting

The two transvections illustrate quite different patterns regarding the way transformations are organized, coordinated, and distributed among the actors. These patterns relate to different sorting principles. In order to understand the role of sorting in the two types of activity structures we use two concepts from Richardson (1972): similarity and complementarity.

Activities are *similar* when they 'require the same capability for their undertaking' (Richardson, 1972: 888). Consequently, similarity relates to economies of scale and scope through joint resource utilization. In our case, transformation activities can be similar in terms of form, place, and time. For example, similarities in form transformations are exploited when the same equipment is used for assembly or refinement of an increasing volume of products. Similarities in place and time transformations are exemplified by co-loading and joint warehousing of products bound for the same geographical area. Sorting is the main determinant of similarity, because after each transformation there are normally several options available for the next assignment, and the transformation output in a particular transvection is sorted several times in form, place, and time. The extent of similarity will differ depending on the outcome of these sorts because the opportunities for joint resource utilization differ among the alternative transformation resources.

Activities are *complementary* when they represent 'different phases of a process of production and require in some way to be co-ordinated' (Richardson, 1972: 889). Complementarity thus relates to the sequential interdependence in the activity structure and implies that activities have to be undertaken in a certain order. Over time this interdependence has escalated considerably through the establishment of systems for 'just-in-time' deliveries and 'efficient consumer response' solutions (Bhatt, 2001; Christensen et al., 2005; Kannan and Tan, 2005; Kaynak, 2002; White and Pearson, 2001). In these arrangements activities become *closely complementary* because the output of one transformation is the input of the following predetermined transformation. Activities become closely complementary at the point in the transvection where the product is given the identity of a particular counterpart.

Sorting and speculation

In distribution contexts characterized by speculation, the transformation outputs successively change identity through the transformations from a bundle of conglomerate resources to an end product: from the manufacturer, to the distributor, to the retail store, and finally to the end user. The product is not given the identity of the end user until the very last selection is made at the retail outlet. Moreover, the standardization of the product (in order to economize in the form dimension) implies that its form is 'locked' as early as in the manufacturing process. These conditions provide numerous opportunities for the transformation output to be sorted in time and place together with products in other transvections. Joint assignment to one and the same transformation resource increases the similarity of the transformation operations, enhancing economies of scale.

A particular transformation resource may thus be considered a *crossing point* for different transvections (Hulthén, 2002). At a crossing point products from different transvections jointly utilize the same transformation resource, such as a warehouse, a trailer, an assembly facility, etc. Joint assignment of products to the same transformation resource enhances similarities in the undertaking of activities. This means that the efficiency in one transvection is dependent on its connections to other transvections. Joint assignment is facilitated in transvections relying on speculation owing to the fact that products are 'locked' in the form dimension without end user identity.

In transvections relying on speculation there is no close complementarity with regard to the end user, because the identity of the product changes along the transvection as distributors and retailers select products for their assortments. These assortments function as buffers, and increase flexibility in delivery and availability of standardized products.

Transvections building on speculation are thus successively coordinated step by step: by producer, distributor, and retailer. In these 'traditional channel' arrangements coordination, sorting, and transformation become mainly firm-internal matters. Each firm tends to focus on improving its own operations. The supplier (a producer or a distributor) assigns products to the transformation resources that provide the most appropriate conditions with regard to criteria such as cost efficiency, market coverage, and quality of sales support. The buyer (a distributor or a retailer) selects products so as to make the best use of his own resources in terms of warehouses, transportation routes, customer contacts, etc. Over time the efforts to overcome the potential shortcomings of this approach have resulted in a shift from such 'conventional channels' towards 'vertical marketing systems' (Stern and El-Ansary, 1982). These systems aim at improving coordination along the channel. Vertical marketing systems take various forms when it comes to the degree of integrative efforts of the companies, ranging from joint administrative systems, via contractual arrangements, to full ownership integration (1982: 307).

In summary, in transvections based on speculation sorting is mainly about two things. First, in order to economize on a transvection it is crucial to assign the product in ways that exploit the potential for enhanced similarity among activities.

Ambitions to economize on facilities for manufacturing have historically been the main determinant of these sortings. Second, from the buying side it is important to make prudent selections in order to build the 'right' assortment for customers. However, as argued above, assignment and selection tend to be conducted mainly from a firm-internal perspective, with scant attention paid to interactive matching of joint plans, which is a characteristic of closely complementary activities (Richardson, 1972: 890) and thus a matter of concern in transvections based on postponement.

Sorting and postponement

Transvections building on postponement have quite different features. First, in build-to-order production the activities are closely complementary along the whole transvection because the conglomerate resources are given the identity of the end user as soon as the order is received. This first selection of a car buyer or a PC buyer completely specifies the form dimension of the product. It also triggers the whole transvection by being the basis for the subsequent assignments, from the suppliers of the conglomerate resources to the end user. Second, although the design of the product in terms of its form dimension is determined when the customer places the order, the product is in many cases successively transformed in the form dimension (illustrated in Figure 3 by components 'e' and 'f'). It is common that assembly operations 'are performed at some point downstream in the supply chain' in this way (Pagh and Cooper, 1998: 16).

These conditions imply that sorting products into assortments of finished goods in a classic sense is not an issue in this kind of transvection. The main selection in this respect is the car buyer's, or PC buyer's, selection of the product to be included in his or her 'collection of goods'. This selection will also direct the selection of conglomerate resources. After these selections the remaining sortings in the transvection are primarily assignments of components, modules and products to different transformation resources. By relying on postponement, suppliers may reduce the marketing risk associated with product differentiation. The general problem with differentiation is that every differentiation that makes a product more suitable for a specific buyer also makes it less suitable for other buyers. According to Alderson (1950) one of the main benefits of postponement is the increasing opportunity for differentiation.

The main challenge in this type of transvection relates to the coordination of activities in order to deliver an end product with the right features in the form, time, and place dimensions, as specified by the end user, and particularly to do so at a reasonable cost. Solving this problem involves the same issue as in transvections relying on speculation: enhancing the similarity of activities. However, that task is more difficult in this case because the activities are closely complementary along the whole transvection, owing to prevailing interdependencies in these types of supply chains.

The sorting capability required in such arrangements is the effective assignment to transformation resources of a product with a specified end user identity. The

efficiency of the transformation operations is contingent on the ways the product can be combined with other products. The key issue again is to exploit potential crossing points to increase the similarity among activities through adequate assigning of products to physical transformation resources such as lorries, logistics hubs, production equipment, and materials handling equipment. In this case, however, the opportunities for making assignments are severely restricted owing to the specified end user identities.

These problems are further accentuated by the fact that close complementarity spans the whole supply chain. The implication is that coordination and sorting become complex since interdependencies also tend to cross the boundaries of firms.

Sorting and activity interdependence

It is the activity interdependence in transvections based on postponement that imposes the greatest challenge for sorting in comparison with the conditions in transvections based on speculation. Owing to the close complementarity the outputs of a specific transformation resource have different end user identities, making 'mass-transportation' from the transformation resource problematic. Each output item has its particular destination and thus cannot be co-loaded with other outputs as easily as is the case in transvections based on speculation. When considering this problem it is easy to agree with the conclusion of Alderson and Martin (1965: 124) that 'it would be a very poor solution to send a truck from Point x to Point y for direct delivery if the item was a small parcel making up a very tiny fraction of a truckload'.

The solution to this intricate problem resides in the infrastructure of logistics resources available 'out there', consisting of transportation equipment, warehouses, shipping lines, distribution hubs, trucking routes, etc. Systematic exploitation of this infrastructure makes resource sharing possible, leading to increasing similarities in this type of 'customized' transvection.

Figure 4 illustrates a transvection (in bold) relying on four transformation resources (assembly equipment, trailer, logistics hub, and trailer) between conglomerate resources and the landing of the end product in the hands of the end user. After each transformation the output is sorted and directed to another transformation resource. Since the activities in this transvection are closely complementary they have to be coordinated. Making the best use of this infrastructure of transformation resources requires extensive exchange of information concerning details about product features with regard to place, time, form, and end user identity.

Sometimes these operations are conducted in different firms, thus making information sharing important. For example, Dell's data system can be accessed by other firms involved in the transvections, in order to support their sorting decisions concerning the utilization of the logistics infrastructure. Sorting decisions are based on information about the required features of the end product,

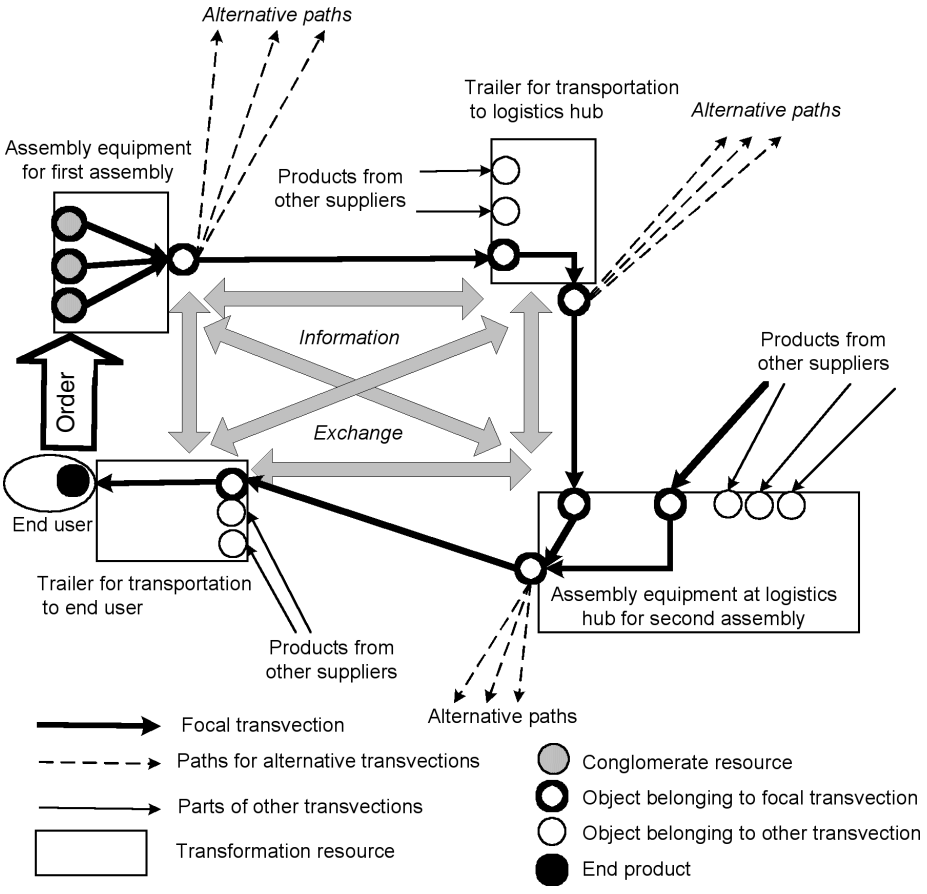

Figure 4

Four transformation resources as crossing points

the features of the transformation resources, the features of the transformation outputs in this transvection and those of other transvections that utilize the same transformation resource. In this respect the changing distribution conditions illustrate Alderson's view about substituting the movement of information for the movement of goods (Alderson, 1965: 275).

The sharing of information among firms makes it possible to coordinate the activities so that the end user's requirements in terms of individualization and value can be satisfied at the same time as similarities can be captured by joint resource utilization in the crossing points. In order for sorting to be efficient it is important for firms to be aware of resources both within and beyond the firm's boundary. Over time this capability has become a 'core competence' in itself.

The main reason is the increasing specialization of firms. Specialization requires integration, which is increasingly conducted by various types of 'integrators', such as 'logistics service providers'. For example, FedEx and DHL have powerful positions in the logistics infrastructure owing to their capabilities to simultaneously exploit similarities and integrate closely complementary activities. A manufacturer or an end user can even outsource all the transformations in time and place to a logistics service provider.

Figure 4 also illustrates that the resulting transvection represents one of many potential 'paths' among the transformation resources available. For each sorting there are alternative paths available and a realized transvection thus represents a particular way of utilising the infrastructure of transformation resources. In transvections based on speculation this utilization may be planned beforehand, because it builds on forecasts and predictions of demand. In transvections based on postponement the actual path cannot be predetermined since it is necessary to match the transformations in a particular transvection with those in other transvections, all of which are dependent on individual customer orders.

The example above primarily addresses postponement and interdependencies on the demand side and how suppliers may handle these issues. As we have argued, however, postponement and build-to-order also have consequences on the supply side of the firm. In the PC industry these effects are not very difficult to handle since: (i) 'the modular nature of PCs means that specifications for linking various components are freely available'; (ii) there is an 'availability of components on the market'; and, finally, (iii) 'a PC is assembled . . . with a few simple tools' (Curry and Kenney, 1999: 9–10). In the car industry, however, the situation is different and the implications on the supply side are more far reaching, as illustrated by a case study of the manufacturing system of Volvo Cars in Gothenburg (see Fredriksson and Gadde, 2005).

The number of car variants offered from this plant is more than one million, so tailoring each car in accordance with individual customer demands requires a flexible and well-organized activity structure for manufacturing and distribution. When a car body is put on the Volvo assembly line, it has been dedicated to a specific car buyer's order and given a unique end user identity. All the options chosen in terms of exterior colour, engine and transmission types, seats, interior trim, etc., must therefore be available at each station on the assembly line when the specific car body arrives. Modules are therefore produced in different variants, and so there are more than 3500 types of seats and more than 10,000 possible power-pack combinations. Most modules are physically large and represent considerable capital investment so it would be extremely costly in terms of both capital and space to buffer them. Module suppliers therefore have to deliver just in time to the assembly line in the same sequence as the car bodies. These planning conditions imply that module suppliers have only a few hours to assemble modules. They have therefore located their operative units very close to the Volvo plant. In these 15 module assembly units (MAUs) components and subsystems delivered from their large-scale manufacturing plants are assembled into ready-to-install modules (for an illustration see Figure 5).

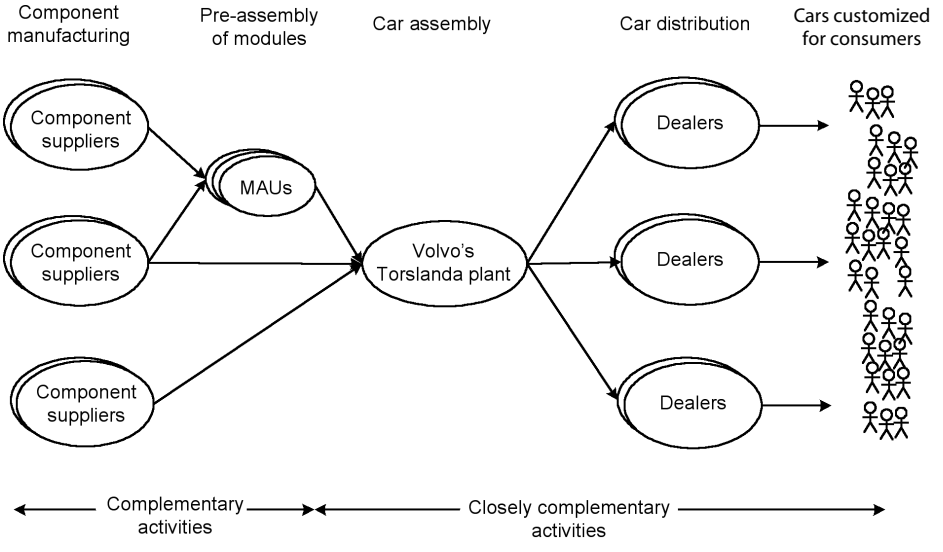

Figure 5

Volvo Cars' activity structure for build-to-order production (adapted from Fredriksson and Gadde, 2005)

Using the modularized process approach, Volvo Cars can supply customers with value-generating individualized cars at reasonable costs. As in the example from the PC industry, information sharing and joint planning are important performance determinants. Coordination of activities in the whole supply chain is crucial and 'the outcome of these efforts is strongly dependent on the information exchange between the actors in the network' (Fredriksson and Gadde, 2005: 699). The key to performance in this chain is the MAUs, which function as buffers between the other operations. MAUs decouple the customized operations at the assembly line and downstream from upstream operations where components and subsystems (of which the modules are composed) are manufactured in large-scale centralized supplier plants. In this way, end users benefit from value generating customization at the same time as component manufacturing can apply the logic of aggregation to derive economies of scale. The key to this favourable combination is the decoupling of upstream operations from the close complementarity downstream of the MAUs.

In relation to the car industry, customization has had a huge influence on the organization of the activity structure on the supply side of the car assembler, while end product distributive arrangements have been less affected. The assembled cars are still delivered to dealers before they reach the final end user, which is a major difference in comparison with the PC industry. The main reason for this difference is that in the car industry greater similarities are available through dedicated mass

transportation of cars to dealerships than through joint resource sharing in the 'common' logistics infrastructure. Moreover, the relationship with the end user is in the hands of the dealer.

Concluding discussion

Our analysis illustrates how 'old' – and somewhat neglected – concepts provide a relevant understanding of some important features of the changing reality of distribution.

The most significant characteristic of the evolving arrangements is the increasing interdependence between production and distribution. These features impact on the relationships between the firms involved in production and distribution in that they require coordination of activities. Moreover, these activities are allocated to an increasing number of firms, owing to specialization and outsourcing. These conditions require increasing coordination and impact on the roles of firms. The main driver of distribution dynamics is technical development where new resources make new distribution set-ups feasible. These changes also provide opportunities for – and require – reorganization among firms, which showed to be important in the examples used in the article. The restructuring in the PC industry, led by Dell, was mainly a reorganization of place and time transformations in distribution, while the value-added resellers became increasingly involved in form transformation. Moreover, these changes enhanced the role of logistics service providers and so 'companies such as Federal Express and UPS have been very successful in expanding their market space from simple delivery to an explicit emphasis on time/space management for other firms' (Curry and Kenney, 1999: 8).

In the fashion industry the reconfiguration of roles impacted mainly on the already established firms. The ongoing restructuring has implied that 'some retailers also become designers and they develop private labels, some designers build their own distribution channel, and the retailing activity has diversified' (Abecassis et al., 2000: 436). Finally, in the car industry distribution activities remained much the same as before when customization and build-to-order were introduced. The reorganization on the supply side necessitated the establishment of an intermediate level between the large scale suppliers and the car assembler. These intermediaries serve the single car assembler exclusively, implying reduced similarities in comparison with previous arrangements. On the other hand they are crucial for the handling of the increasing variety and close complementarity that are important for value generation in relation to end users.

Alderson's transvections and sortings are helpful for the understanding of the ongoing changes. The transvection concept is particularly useful for the analysis of distribution arrangements involving postponement and customization. As a transvection includes all actions needed to place an end product in the hands of a specific user, it is ideally suited to describe the chain of activities initiated through the first selection of this user. It is also interesting that the notion of transvection has become important in practice. In most industries suppliers are increasingly

required to document the origin of their offerings, for example in case a product needs to be recalled due to quality issues. Therefore, they need the ability 'to track a product batch and its history through the whole, or part, of a production chain from harvest through transport, storage, processing, distribution and sales' (Jansen-Vullers et al., 2003: 401).

The usefulness of the transvection concept is less obvious in what we identified as traditional channels, because in these arrangements the transvection cannot be observed in real time. It is probably these conditions that explain why the transvection concept has only received limited attention in distribution research. For example, it has been claimed 'to have had relatively little influence on the substance of marketing theory over the past thirty years' (Priem and Rasheed, 1997: 159). However, considering the increasing requirements for tracking and traceability it is most likely that the notion of transvection will also have a renaissance in relation to channels building on speculation.

The sorting concept is valuable for the analysis of the value generation in the activity structures underlying the two ideal types of transvections. Sorting is fundamental in transvections relying on speculation because it bridges the gap between production and consumption. According to Alderson (1950: 1), mass production is made possible 'by the vast and intricate system of sorting lying between the mass product of farm or factory and the unique requirements of individual consumers'. It should be noted, however, that these 'unique requirements' have to be formulated within the narrow limits confined of the assortment available. Cost efficient solutions are developed through enhancing similarities in transformations. These conditions imply that the main driving force in transvections relying on speculation is the assignments made at the manufacturing level, because the technology of production rules the game. The bridge between standardized production and the individual end user's requirements is established through the selections made by buyers. In these transvections there is no close complementarity among activities since inventories at various levels serve as buffers.

The main conclusion of this article is that sorting is also of utmost importance in customized distribution solutions relying on the principle of postponement. In these arrangements, however, the role of sorting is quite different than in traditional channels. A transvection building on postponement is activated when the end user specifies the features of the product. The subsequent assignments are governed by the close complementarity determined by the specific end user identity. Combining the value provided by individualization with the call for cost efficiency also requires that these assignments exploit the potential for transformation similarities in the utilization of the logistics infrastructure.

The two archetypes thus represent two different principles for value generation – one focusing on costs through standardization, the other on individualized solutions. Both approaches are important and necessary for distribution performance, and in reality firms try to combine the two. As was obvious from the examples representing 'evolving arrangements', the firms involved in these efforts do their utmost to be cost efficient in their customized operations. Similarly, firms relying on the logic of 'traditional channels' do whatever they can to individualize

their offerings. So even if the characteristics of one of the two ideal types may be dominant in a specific distribution context, the features of the other have to be taken into consideration. This means that the logic of aggregation residing in 'traditional channels' is no less important than it used to be. It is just as crucial as it has always been to reap the potential economies of scale. The main change is that in today's arrangements the logic of individualization sets the limit for these efforts, making the task of economizing different and more difficult.

The main issue in the evolving distribution arrangements is thus to combine the benefits related to the logic of aggregation with the benefits accompanying the logic of individualization. Neither the technology of production nor the technology of use should be allowed to rule the game completely. The key to efficient and effective distribution is finding the appropriate balance in the complex relationship between these two interdependent dimensions. Assessing the conditions for this balancing requires further research with a particular focus on these issues. For the understanding of this multifaceted interplay our exploratory approach has shown that Alderson's concepts from the 1960s are still very useful.

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