AMS Review (2025) 15:59–73
https://doi.org/10.1007/s13162-025-00307-y

THEORY/CONCEPTUAL

# Sustainable provisioning systems: Extending Alderson's transvection analysis to detect value loss, power asymmetry and underperforming markets

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Received: 14 January 2025 / Accepted: 5 May 2025 / Published online: 25 June 2025


**Abstract**
Business research has offered many tools to understand the opportunity for single firms to create or realise value in the provisioning system. The majority of sustainability tools also relate to single firms, or households. Sustainability is a whole of system shift and we require tools to understand the relationship between different members of the provisioning system and the distribution of costs (internal and externalities) and profits through the system. Building on the work of Wroe Alderson, we provide a tool—the extended transvection—to analyse a provisioning system that provides insights into: information flows, value creation/capture/loss, risk, externalities, equity and fairness, and underperforming provisioning systems. Together these insights allow us to see the sustainability of the provisioning system. The extended transvection also allows for considering scenarios regarding adjusted/alternate provisioning systems.

**Keywords** Macromarketing · Systems · Good health and wellbeing · Responsible consumption and production · Sustainable food production · Food value chain · Provisioning system · Information flows · Power · Channel · Transvection

## Introduction

Modern provisioning systems have become increasingly opaque at the same time as contributing to inequality, climate change and unsustainable outcomes. In an economy where goods are traded globally, frequently through long channels, it is difficult to see what has happened in the channel and what effects that channel is having on people and planet. It is important to note that the technology is available to make channels transparent, but it is seldom and selectively used.

Particularly since WWII we have seen "a global manufacturing system in which production capacity is dispersed to an unprecedented number of developing as well as industrialised countries." (Gereffi, 1994, p. 95). The associated channels have moved toward commodity settings, making producers, and in some cases intermediaries and countries, interchangeable. The power of the producer/manufacturer is reduced, along with their economic return and motivation to differentiate. Hingley (2005, p. 63) states that "the majority of control lies in the hands of large multiple retailers," and "power imbalanced business relationships are just as important to the understanding of business exchange."

As channel leadership, and with it provisioning system leadership, has moved from producer dominance to retailer dominance, the pressure to reduce production costs has grown at the same time that information flows from end consumers to producers has reduced (Chu, 1992). Postponement and speculation (Bucklin, 1965) choices have been driven by retailers to the point that the retailer frequently never owns the goods before they are sold (has possession and has paid for).

This paper provides a method to identify lost potential value in the provisioning system; costing producers and consumers opportunities to derive value from their production and consumption. Alderson (1965) developed the transvection as a tool to examine (in-)efficiency in marketing channels. Applying the transvection demonstrates whether there are redundant, and thus inefficient, sorts and/or transformations in the channel from producer to consumer. In essence is there too much being done in the channel and can we achieve the same goal with less steps (sorts or transformations).

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In extending Alderson's transvection we seek to understand the transfer of value, the identification of deficient and destructive sorts, value loss, power asymmetry and underperforming provisioning systems/channels. In combination these attributes drive sustainable, or unsustainable, provisioning systems.

We discuss the importance of channels and provisioning system to marketing from its early writing, and look at the place of distribution in macromarketing's past. The purpose of the provisioning system and associated issues are outlined before a review of Alderson's transvection, after which we present our analytical tool and discuss some of the insights that it provides, using examples, particularly the red meat industry.

## Background

Shaw (1912) is credited with writing the first marketing paper "Some Problems in Market Distribution" (Hunt et al. 2022). Shaw's paper deals with the channel of distribution as the central phenomena of the embryonic discipline of marketing—'how do goods get to market?' Hunt et al. (1985) contribute to the literature on channels noting the issues of cooperation, competition, power and bargaining, all micro level concepts. The provisioning system as a whole involves the aggregate of multiple channels and power relationships (Gaski, 1984), with much hidden from other, particularly non-adjacent, channel members and society as a whole. The problem of how goods get to market and how that might be improved remains macromarketing in its scope (Hunt et al., 2022).

Hunt et al. 2022 considered the five eras of marketing and the discipline of marketing's troubled trajectory. Hunt et al. 2022 state that Era 1, the start of the discipline, was shaped by the question "Do we need a discipline of marketing?" The answer was yes, as new forms of distribution arose with the combination of mass production and urbanisation, and current disciplines did not apply themselves to these problems (Hunt et al., 2022). Marketing at its birth as a discipline was concerned with distribution systems—channels of distribution (transvections) at the heart of the provisioning system (and marketing) (Hunt et al., 2022). Hunt (2020) also notes the need for marketing as a discipline to develop our own theories. In this paper we extend an extant indigenous theory, the transvection.

The goal of the provisioning system is to match demand and supply across the channel(s). It is required to allocate excess production from specialists to those who do not produce in that area. Through this matching process, mediated by information flows, the potency of assortment of participating members is increased. At a societal level nothing has changed since Breyer wrote,

> "Marketing is not primarily a means of garnering profits for individuals. It is, in the larger, more vital sense, an economic instrument used to accomplish indispensable social ends. Under a system of division of labor there must be some vehicle to move the surplus production of specialists to deficit areas if society is to support itself. This is the social objective of marketing." (Breyer, 1934, p. 192)

One aim of this paper is providing a tool for measuring how well Breyer's goal is achieved, 'has the social objective of marketing been realised?' Has the goal been realised in a manner that maximises value to potential customers and producers alike? Has the market resulted in a fair distribution of income? Are externalities built into the transvection that could be avoided? Is the provisioning system sustainable?

In his invitation to take part in the affairs of the *Journal of Macromarketing*, Fisk (1981) explicitly considered channels of distribution to be a macromarketing phenomena. The channel/transvection has had a special place in society's relationship with marketing. Among the most widely read of all marketing books up to 1939 was the study conducted by Paul Stewart, J. Frederick Dewhurst, and their associates, "Does Distribution Cost Too Much" sponsored by the Twentieth Century Fund. A sequel, "Distribution in a High Level Economy," by Reavis Cox and associates appeared in 1965 (Fisk, 1981, p. 5). Criticism of the costs of distribution remain to this day, with some channel members making super-profits while others barely cover the cost of production.

### Macromarketing and the transvection

Shapiro (2006) traces the origin of macromarketing to Wroe Alderson and the marketing theory seminars that he organised. Wroe Alderson was exposed to the inefficiencies of distribution in his studies into drugs and tires for the US Department of Commerce (Wooliscroft, 2006b). He saw the mis-sorting and poor assortments in retail as a result of sub-optimal systems and later developed the transvection (Alderson, 2006c), a tool for analysing sorting optimisation.

Alderson's transvection, while developed in a system's perspective and covering the length of the channel, and potentially more, is only concerned with one thread—sorts and transformations. Alderson (1965, p. 34) suggested that "the basic function of marketing is sorting. … sorting is the decision aspect of marketing whether seen from the standpoint of the supplier or the consumer. The supplier assigns items to classes which are to be treated in different ways thereafter." Alderson's (1965) four types of sorts are discussed later in the paper. The consumer also undertakes sorts in choosing the contents of their household. While sorts deal with the change in collections of products, or components, transformations deal with changes in form or function of the products or components.

Alderson's original transvection was designed for economic efficiency, minimising the number of sorts and transformations in a channel. Porter's (1985) value chain, a concept considered similar to Alderson's transvection (Priem et al., 1997) is similarly singular in the thread that runs through it—competitive advantage.

Echoing the call of Fisk,

"If macromarketing simply looks at marketing from a societal standpoint, why is it needed at all?... The answer is that macromarketing deals with managerial issues, with scientific-positive questions, and with normative value questions from a higher level of aggregation than the tactical or even strategic perspective of a single firm concerned only with direct impacts on customers, competitors, and stockholders." (Fisk, 1981, p. 6).

In proposing the extended transvection our goal is increased efficiency of value capture and realisation, while identifying unsustainable inequality in the channel, power asymmetries among other less than desirable outcomes, at a societal level. The extended transvection also allows the modelling of alternative channels. In extending the transvection we add additional transvection analysis channels (TAC) that provide insights into each TAC and the combination of the TACs. The interactions between the TACs are as important as the interactions within each TAC.

## The purpose of the market

Marketing and markets are designed to match heterogeneous demand and supply, within practical limits (Alderson, 1957). Markets are where information is exchanged to match heterogeneous supply and demand—the double search. This is because both demand and supply are heterogeneous (Alderson, 1957). That heterogeneity exists in all entities in the channel. To understand how well markets are serving society and members of the channel we need to consider the concept of value, externalities, potency of assortment, how value and potency of assortment impact on sustainability, revisit Adam Smith and his thoughts on price and value, information flows in the market, the problem of commoditization and marketing myopia and the provisioning system.

### Value

Value has been considered in two major forms—value in exchange (related to price) and value in use (value derived from consumption) (Alderson, 1957). Exchange value relates to consumer's expectations regarding use value. These two forms of value date back to Marx (2024), who contributed the duality of value to economic thought.

The value of a good/service/idea (product) is a relationship between its costs and its benefits, realised during consumption in its widest sense (that may include consumption of the search, the transaction, the ownership, the use of the product and its disposal). The benefits are made up of the sum of the attributes of a product multiplied by the weighting associated with each attribute by the consumer. There may be attributes of which the consumer is unaware. There may be attributes which the consumer doesn't care about. In both these cases the weighting would be zero and the attribute would add no value to the consumption experience.

There are also attributes that the consumer may care about/desire but that are not communicated to the consumer during the search, decision, transaction and ownership experience. In these cases the value contributed is also zero. Regardless of the weighting that the consumer has for these attributes, their absence means that the weighting is multiplied by zero.

### Externalities

All exchanges have externalities, positive and/or negative. *Macromarketing* and the *Journal of Macromarketing* has been the home of discussion of externalities in marketing. *Macromarketing* authors have identified:

- Externalities as additional outcomes of exchange (Laczniak, 2017; Layton, 2009; Mundt, 1993; Mundt & Houston, 1996, 2010)
- Externalities associated with brands and branding (Padela et al., 2021)
- Externalities and sustainability issues (Varadarajan, 2020; Van Dam & Apeldoorn, 1996; Kilbourne et al., 1997; Mittelstaedt et al., 2014)
- Distributive justice and externalities (Ferrell & Ferrell, 2008; Laczniak & Murphy, 2008)
- Marketing Systems and their failure, including externalities (Redmond, 2018; Harris & Carman, 1983; Williams et al., 2021)
- Externalities as a key module in a macromarketing course (Shapiro, 2008)
- The externalities of particular industries (Jayanti, 2022)
- The externalities of particular business models (Alon, 2004)
- Positive externalities (Cadeaux, 2000)

While macromarketing is good at discussing externalities at the firm or consumer level, it is often hard to see where they have originated in a provisioning system. The extended transvection makes many externalities origin's visible.

### Potency of assortment

Potency of assortment represents the stored utility associated with the assortment of goods, money and stored services an entity possesses. A nation with ten cans of food for each person, but no can openers is unable to realise the utility stored in the cans. From a societal perspective, maximising the collective potency of assortment is the job of the market and the marketer.

Alderson conceptualised the market as a place for information to flow to match heterogenous demand and supply (Alderson, 2006b). Once information had been matched the exchange of goods and/or services could take place. The provisioning system is first an information system. At the centre of the provisioning system is the law of exchange that demonstrates that healthy exchanges lead to an increase in well-being, as perceived by those exchanging.

The Law of Exchange, stated verbally, would be as follows:

"Given that x is an element of the assortment $A_1$ and y is an element of the assortment $A_2$, x is exchangeable for y if, and only if, these three conditions hold:

(a) x is different from y
(b) The potency of the assortment $A_1$ is increased by dropping x and adding y
(c) The potency of the assortment $A_2$ is increased by adding x and dropping y

In symbols the Law of Exchange would be stated as follows:

$x \simeq y$, if and only if $x \neq y (x e A_1$ and $y e A_2)$
$P(A_1 - x + y) > PA_1$ and $P(A_2 + x - y) > PA_2$" (Alderson, 2006a, b, c, p.237)

The aggregate provisioning system's goal is to increase the well-being of the members. There are different perspectives on the distribution of that increase in quality of life, from the neo-liberal freedom to accumulate at the expense of others through to the goal being the increase in the median quality of life, or the increase in the quality of life of those at the 'bottom' of a society. It is not the purpose of this paper to discuss how the quality of life improvements should be distributed. The purpose of this paper is to provide a conceptualisation and tool for understanding when provisioning technologies are under-serving members of a society. In doing so it extends Alderson and Martin's (1965) transvection, which focusses on economic efficiency.

## Potency of assortment and value as a sustainability issue

The citizens of Earth currently consume several times the capacity of the Earth to sustainably provide (www.theworldcounts.com). Building on the work of the Club of Rome the World Counts assesses the extraction above replacement rate of non-renewable resources from the Earth. They provide evidence based estimates of the number of Earths that are being consumed at the current rate. In 1970 humanity consumed one Earth from January 1 st to December 29 th. In 2019 one Earth had been consumed by July 29. Covid has provided a small relief and in 2020 the consumption of one Earth was complete on August 22nd. Current projections are for humanity to consume two Earths each year by 2030. Of course we only have one earth.

At the same time the distribution of consumption and impact on the planet is far from equitable. In 2018 the average number of Earths required should the entire population of the world live the same lifestyle as the average Bahranian would be 5.2 Earths. Australia has a high rate of impact on the Earth, likely due to extractive industries, at 4.8 Earths, should we all live like Australians. The USA's lifestyle, if shared across the globe would result in 3.9 Earths. Mathis Wackernagel, founder and director of the Global Footprint network is aware of the limitations of the data going into the model, and states "our numbers are certainly wrong. I'm convinced our numbers are underestimates" (online, https://www.bbc.com/news/magazine-33133712).

At the other end of consumption, if the world were to live at the same consumption level as the average Bangladeshi we would require 0.6 Earths, for Pakistan 0.5 and for Afghanistan or Guyanan 0.4 earths (www.footprintnetwork.org).

Within countries there is growing and, often historically extreme, levels of inequality (Wilkinson & Pickett, 2011), not just damaging the environment but also society and the individuals within (Wilkinson & Pickett, 2018). Given the dire situation of over-consumption and growing consumption inequality, the citizens of the world need to reduce/redistribute consumption.

Many, particularly, food provisioning systems find the producers barely surviving, while retailers make super profits. That split is often between North and South, or developed and developing countries, between powerful and sup/op-pressed. Coffee farmers live in poverty while coffee sells for $5 a cup (18 g of coffee) in a cafe. Exploitative channels are not sustainable—the exploited will not be able to participate long term. Particular attention should be paid to transvections that cross the global south/north divide. We illustrate our analytical tool with examples from food provisioning systems in this paper.

Consumption has moved well past providing required calories, for the majority of the population in most developed countries. The system needs to move to healthy food provision. It is time to revisit our provisioning systems, with a systems' lens. When reducing gross consumption, particularly in areas with high consumption levels, it will be important to replace high consumption of low value products with lower consumption of higher value products. Here value is defined, per Alderson, as providing a high contribution to the consumer's potency of assortment.

## Re-engaging with Adam Smith to consume more sustainably

Adam Smith (2005, pp. 537–38) described the purpose of the provisioning system as,

> "Consumption is the sole end and purpose of all production; and the interest of the producer ought to be attended to, only so far as it may be necessary for promoting that of the consumer. The maxim is so perfectly self-evident, that it would be absurd to attempt to prove it."

Adam Smith has been sometimes mis-quoted/translated/interpreted as saying that, "The sole purpose of all production is to provide the best possible goods to the consumer at the lowest possible price" (a quote that appears online, but doesn't appear in any edition of Smith's Wealth of Nations that I've been able to find). While Smith rails against producers passing on unnecessary costs to the consumer, he does not argue for the lowest possible price, rather the lowest reasonable price. Products should not be offered at the cost of labour or the environment.

If societies return to Smith's views they would move the system's purpose from putting the lowest priced commodity in the hands of consumers to putting the highest value products in the hands of consumers. This is a departure from Smith's commodity world view, but in line with his dignified production and consumption. Higher value does not necessarily mean higher price—it recognises that the bundle of attributes the consumer exchanges can be a rich or poor bundle of attributes. An example of a poor bundle of attributes is a house brand supermarket milk carton/bottle—that contains milk (low fat, full fat, homogenised or un-homogenised are the additional information on the packaging). A rich bundle of attributes example would be an organic, grass fed bottle of milk from a producer that acknowledges their geographic origin, perhaps even to the individual farm, the type of cows, the feeding and animal welfare practices, etc.. Both the poor bundle and the rich bundle are associated with a litre/pint of milk, but the value available to consumers has changed considerably. This difference recognises the heterogeneity of demand (Alderson, 1957).

We have to consume less to return to consumption rates which the world can support. Each act of consumption should have the maximum value attached to it—countering decades of consumption without meaning or importance. To achieve this we need to maximise the value of each offering and the efficiency of the value capture and realisation.

## Information flows in provisioning systems

Information is power and potential value. Controlling the information controls the power that different members of the channel hold. Dominant members of the channel may be invested in not passing on information, because that information would empower the producer (typically). Those dominant members may be processors (red meat), aggregators, or supermarkets (driving for increased house brand sales at the cost of private branded competitors).

A deficient sort occurs when a large collection of homogeneous products is made from multiple smaller homogenous collections, and information is removed from a products in that 'homogenous' collection. Potential value has been lost for the producer and the consumer. Potential reward (price/market share/preference) for quality is lost for the producer and the motivation for producers to improve, or differentiate their products is removed. Consumers are unable to select a "better" option when the differences are made invisible.

Information flows being disrupted by the channel have traditionally be dealt with through brand advertising direct to consumers. Coleman's mustard seal was famous for protecting against adulteration, as was common practice at the time. Information was attached to Coleman's product that it hadn't been interfered with—as long as the seal was intact.

Consumers seeking to choose better options are, sometimes, confronted with misleading claims and end up purchasing products that may not have the attribute that they have chosen. Fair Trade's mass balance approach, means that information may be attached to a product that doesn't have that attribute. Fair Trade considers the attribute to be fluid and transferable to produce from a non-fair trade farmer. At that point the consumer hasn't bought fair traded produce, they have paid a premium for a "warm glow," a fair trade label and so that someone, possibly themselves, can consume produce from a fair trade.

Agricultural cooperatives, set up to protect the producers and reach the consumer with information have failed to deliver in recent years (Fulton & Larson, 2009). There are many examples of cooperatives under-performing and/or going into liquidation (Fulton & Larson, 2009).

There are alternatives to the mass market and an alternate model is demonstrated by authors who establish direct to consumer/reader relationships through emails/newsletters/blogs/podcasts (c.f. https://whitehairedirishman.shop). The books are still published by a publisher and sold through a channel (including amazon) but the information flows are cleaner and more direct.

## The Commoditization Problem

The move to commodity products, which may, or may not, be branded towards the end of their distribution channel has many negative impacts. Commodities are not traceable, because they are collectively homogeneous and undifferentiated. Commodities remove power from producers to generate and/or capture value that they have produced through their efforts or differentiation. Having removed power from producers the producer also loses motivation to produce goods of a higher quality than those that meet the minimum quality levels to enter the commodity channel. Producer income is a function of quantity and not quality. Production moves towards extracting the most units from the environment, instead of the most value, likely to increase environmental degradation. Coe (2021) and Goffin et al., (2021) recognise the damage that being commodified creates for businesses and the necessity of moving out of commodity channels. Sadly many producers lack the power, or vision, to leave a commodity transvection that they supply.

Some channel members are invested in disrupting information flows to capture more of the value in the channel—demonstrated through the rise of in-house brands. Through stripping a product of its unique attributes and sorting products into collections the retailer can source from a commodity market, with price as the singular clearing attribute, once the product has met minimum required attribute levels.

Manno (2010, p. 164) has gone so far as to state that "Commoditization is a generalized Darwinian selection pressure in economic evolution driven by profit- and efficiency- seeking in the investment of key resources. By winnowing noncommodity opportunities to satisfy human needs, commoditization distorts development in ways that intensify negative social outcomes experienced by oppressed groups and undermines the possibility for sustainable development."

Commodities lead to customers consuming carelessly/mindlessly, choice is not available when products are standardized, undifferentiated, low information and externalities are hidden. Commodities lead to low value in use goods, there is nothing different or special about the goods being consumed, they merely meet the minimum standards of that commodity channel.

### Marketing myopia and the myopic provisioning system

Marketing myopia is related to the provisioning system (Levitt, 1960). While Levitt (1960) focused on firms and industries, the principle clearly applies to channels/transvections. Myopic channels will fail to deliver maximum value to consumers because they are unable to see that there is a different way of delivering value (planes/cars/trains/etc.). Members of myopic channels can't see beyond their current settings and are frequently trapped in a low value/commodity/volume mode.

### Research on provisioning systems

There is a paucity of research into the entire provisioning system. There is a lot of research on channels, with a focus on business to business. Research that includes both producers and consumers is rare.

Legun and Bell (2016) discuss conducers—their word for processors/wholesalers/etc.—who are a part of the provisioning technology that is the transvection/channel. They point out that most research has focused on the consumer or the producer, but middle actors have vital roles to play—replicating the work of Alderson and Sessions (1950), Alderson 1957 and Alexander et al., (1953).

Our observations would suggest that these middle actors are where deficient sorts (mentioned above and discussed below) are most likely to occur, or at least to occur first. The producer is quite capable of deficient sorts, but when a channel develops the deficient sorts are likely to emerge in the middle actors first.

## Alderson's transvection

Wroe Alderson's Transvection gives us a macromarketing concept to understand the entire path of goods from raw materials to final consumption (and potentially beyond). It is made up of transactions, transformations and sorts from the raw materials, through production, distribution, re-distribution, retail and the consumer.

"A transvection is a unit of action of the marketing system resulting in placing a final product in the hands of the consumer but reaching all the way back to the raw materials entering into the product." (Alderson, 2006b, p. 231). A transvection "can be shown symbolically as TV [transvection] = ST ST S…T S where S is a sort and T is a transformation" (Alderson, 2006c, p. 264).

In conceptualising the transvection Alderson (2006c, p.240) was concerned with,

> "The shortest route to market is not measured in either mileage or number of steps in the channel, although both of these are types of distance between producer and consumer. Rather the route to market is measured by cost or by some weighing of cost, time and risk. In a repetitive operation cost is the fundamental measure. Time is allowed for in part by the merchandise in the pipeline. In other words, time can be translated into cost. One of the savings in having fewer steps in the channel would be in reducing the amount of merchandise in the pipeline. The marketing process consists of a series of sorts each time the goods change hands, interspersed with a series of transformations affecting the conditions under which the goods will eventually be brought to market. One of the simplest models for this process is provided by a system in which the intervening activities always consist of shipment from one point to the next."

A transvection is a static representation (photograph) of a vertical provisioning system (video), which has reached its current form through the interaction between multiple agents including multiple feedback loops. Any change to the transvection requires a change to the provisioning system, which may be resisted by agents in that system and/or by the feedback loops in the system.

Each distribution channel is an aggregate of exchanges and sorts—a transvection (Alderson, 2006c). Each exchange is the result of a market, which is cleared through information (Alderson, 2006a). That information, in addition to what the product is, may be just price (in the case of a commodity) or may include other attributes, or a routinized transaction on the basis of previous information exchanges and market matching.

Alderson saw sorts as being key to efficient provisioning systems. The transvection was a tool to identify the minimum number of sorts required to achieve market clearance—the heterogenous demands of consumers sufficiently matched with the heterogenous offerings of suppliers.

## Lengthy channels and the transvection

The benefits, or otherwise, of short channels/provisioning systems have been studied:

- The benefits of local food systems (Bareja-Wawryszuk & Golebiewski, 2014; Malak-Rawlikowska et al., 2019)
- Short channels, farmers' markets and body mass index of the population (Bimbo et al., 2015)
- Consumers' preference for long distribution channels for dairy (Kusz et al., 2020)
- The challenges of short channels, particularly with regard to scalability (Bayir et al., 2022)
- Analysis of economic efficiency of long and short channels (revisting Alderson's work (1951, 1957, 1971) and reproducing one of his diagrams, instead citing a 2013 version from a different author, without reference to Alderson) (Anjelkovíc & Radosavljevíc, 2019)
- The European experience of short food channels (Marie-Laure, 2020)
- Different types of short food channels (Jarzebowski et al., 2020)

What has not been addressed is the importance of information in the channel, with each stage of the channel representing a market where information is exchanged to match heterogeneous supply and demand.

Table 1 demonstrates the impact of lengthy transvections on producers. Accepting that margin includes transaction costs and costs associated with sorts, applying an even margin of 50% demonstrates that producers, where ever they join the table (they will join further/lower from the retail price in a longer transvection, closer/higher in a shorter transvection) the less they will receive for their products.

The situation for most coffee and cacao bean farmers is a subsistence life where they receive around 5% of the retail price for their products. In a 50% margin transvection four sorts and transactions are expected. The removal of one sort/transaction from the transvection nearly doubles the income to the bean farmer with no change in retail price.

Highly differentiated channels are likely to have more homogeneous products in each category, but less of them. An extreme example is a bean-to-bar chocolate made with single estate beans. Only one sort has been done, at the cacao farm—assembling the beans from their own farm and packing for transport to the chocolate maker. There may be a distributor in the middle, or the chocolate maker, as is increasingly popular for high end products, has visited the farm and arranged transport from farm to factory. A factory that likely also doubles as a retail outlet (on- and off-line). Information on all aspects of the product are available throughout the provisioning system, and are frequently promoted (c.f. http://www.akessons-organic.com/).

## Aldersonian sorts

"The sorts (sorting out, accumulation, allocation, assortment) combined with transformations provide a means to understand the processes of the market place in providing a finished product which has the appropriate form, time and space utility for the end consumer" (Wooliscroft, 2006a, p. 40). There has been much interest in form, time and space utility in marketing, particularly in defending the costs of the provisioning system. Information flows, discussed by Alderson (1957) have received considerably less attention in considering the economic efficiency of distribution.

Alderson provides four types of sort:

1. "sorting out, the breaking down of a heterogeneous collection into smaller homogeneous collections; and
2. accumulation, the building up of a large homogeneous collection from several smaller homogeneous collections; and

**Table 1** Margin in the Transvection (Transvection 1 has one transaction, Transvection 2 has two transactions, etc.)

| | 50% of price is margin |
|---|---|
| Retail Price index (100) | 100.0 |
| Transvection with 1 transaction/sort | 50.0 |
| Transvection with 2 transaction/sorts | 25.0 |
| Transvection with 3 transactions/sorts | 12.5 |
| Transvection with 4 transaction/sorts | 6.3 |
| Transvection with 5 transactions/sorts | 3.1 |

3. allocating the breaking down of a large homogeneous collection into several smaller homogenous collections; and
4. assorting, the building up of a large heterogeneous collection from several homogeneous collections" (Hunt et al., 2006, p. 366)

Sorts either increase or decrease heterogeneity. It is important to make explicit that products have multiple attributes, or dimensions, on which they can be sorted. It is possible to perform an entire transvection while ignoring one of the dimensions. There are two main reasons that this would be done; 1) the attribute is a constant (all coal is made of carbon) or b) there is no, or little, value attached to the heterogeneity of the attribute. The problem arises when there is heterogeneity of an attribute, which is associated with heterogeneity of demand at the consumer end, and differences in value, but a sort removes or discards this heterogeneity. That dimension is now treated within the transvection as a constant, though it was not a constant and there is heterogeneity of demand. Each product has multiple attributes (or dimensions) and any of the four sorts can be made on each dimension.

The four types of sorts can be represented mathematically, where P is a product, the superscript represents attributes and the subscript represents the stock.

$$
\begin{aligned}
\textit{sorting out} &= P^{a,b,c}_{1-n} \Rightarrow P^{a}_{1-n}, P^{b}_{1-n}, P^{c}_{1-n}\\
\textit{accumulation} &= \frac{P^{a}_{1-n}}{3}, \frac{P^{a}_{1-n}}{3}, \frac{P^{a}_{1-n}}{3} \Rightarrow P^{a}_{1-n}\\
\textit{allocating} &= P^{a}_{1-n} \Rightarrow \frac{P^{a}_{1-n}}{3}, \frac{P^{a}_{1-n}}{3}, \frac{P^{a}_{1-n}}{3}\\
\textit{assorting} &= P^{a}_{1-n}, P^{b}_{1-n}, P^{c}_{1-n} \Rightarrow\\
&\left(\frac{P^{a}_{1-n}}{3}, \frac{P^{b}_{1-n}}{3}, \frac{P^{c}_{1-n}}{3}\right)\\
&\left(\frac{P^{a}_{1-n}}{3}, \frac{P^{b}_{1-n}}{3}, \frac{P^{c}_{1-n}}{3}\right)\\
&\left(\frac{P^{a}_{1-n}}{3}, \frac{P^{b}_{1-n}}{3}, \frac{P^{c}_{1-n}}{3}\right)
\end{aligned}
$$

## The deficient sort

Building on the work of Alderson and others, we provide the phenomena of deficient sorts, and its extreme form destructive sorts (see Table 2), which arise when an accumulation is undertaken on an attribute that loses the possibility of sorting on another important (to the consumer) attribute.

An example of deficient sort; a carcass enters the meat processing plant and is divided into a variety of cuts (for simplicity, legs, ribs and back steaks). Those cuts are accumulated so that in the processing plant there is a stock of legs, ribs and back steaks. While you can still, relatively easily, tell the weight of each item, unless you are tracing each piece of meat you have lost the origin of the animal, the breed of the animal, its age, etc. etc.. In essence the deficient sort has removed the possibility of that (origin, breed, age, etc.) heterogeneity being meaningfully transferred to the consumer. There is now a market for different cuts of beef, by weight.

Analogous to the second law of thermodynamics, once a process has occurred that reduces this heterogeneity, it will require additional energy from outside the system to regain it. In the case of the transvection, re-establishing the source of the beef, breed, etc. may require chemical or dna testing of the meat—a costly and time consuming process.

We can consider deficient sorts through mathematical notation:

$P^{abc}$ = a product with three attributes; a, b, c

When the attribute 'c' is important to the end consumers, but the products are sorted (accumulated) on 'a' and/or 'b' in such a way as to lose the ability to sort by 'c' or identify the quality of 'c' we have a deficient sort.

Deficient sorts lead to:

- Homogeneity of offerings in a market that has heterogeneous demand
- Substitution—if I can't see the value in X, then Y would do equally well
- Under realised utility/value for consumers
- Under realised returns to producers
- Power shifting from producers to middle agents

The loss of information about one or more attributes impacts on the efficiency of value transfer in the transvection. We end up with a transvection that delivers less value than it had the potential to deliver and thus a less sustainable consumption of resources.

The extension of a deficient sort is the destructive sort where value is intentionally removed from another channel member for the benefit of the member removing the (potential) value (see Table 2).

## The extended transvection

The extended transvection is designed to highlight inefficiency, power imbalances, lost aggregate value in the channel, risk imbalances, information loss in the channel (typically the source of a loss of aggregate value), and externalities. It is provided as a tool to identify macro level system successes, failures and opportunities. The tool can be further extended to include additional attributes of interest.

To undertake an extended transvection first the transvection channels (TC) of interest are chosen. Sorts and transformations (the Aldersonian transvection) is a natural inclusion. Information, Price, Time (possession), Ownership (possession and having paid for the item) are obvious TCs to include in an extended transvection analysis. Other potential TCs include carbon generation or sequestration,

**Table 2** Value capture, deficient and destructive sorts

| | Value capture | Deficient | Destructive |
|---|---|---|---|
| Accumulation<br>the building up of a large homogeneous collection from several smaller homogeneous collections | The accumulation is of truly homogeneous objects, without relevant information loss and the loss of a potentially valuable attribute | The accumulation of homogeneous objects without care for potentially valuable attributes | The accumulation of objects, homogeneous by an attribute that transfers power to the agent making the accumulation |
| Sorting Out<br>the breaking down of a heterogeneous collection into smaller homogeneous collections | Sorting out is undertaken on meaningful attributes that mean that the new collections don't require resorting to capture value | Sorting out is undertaken on attributes key to the agent undertaking the sort without regard to end consumers | Sorting out is undertaken in a way that denies the opportunity of suppliers to the sorting agent to leverage their potential value |
| Allocating<br>the breaking down of a large homogeneous collection into several smaller homogenous collections | This is bulk breaking and the contents of the collections don't change, so there is no opportunity to capture or destroy value | | |
| Assorting<br>the building up of a large heterogeneous collection from several homogeneous collections | Assorting creates variety in offerings—for example a retailer decides which products they will carry to serve the consumer—there is limited opportunity to capture or destroy value. The choice not to offer an attribute rich offering may distort value perceptions of customers, as they may believe that their desired attribute bundle is not possible | | |

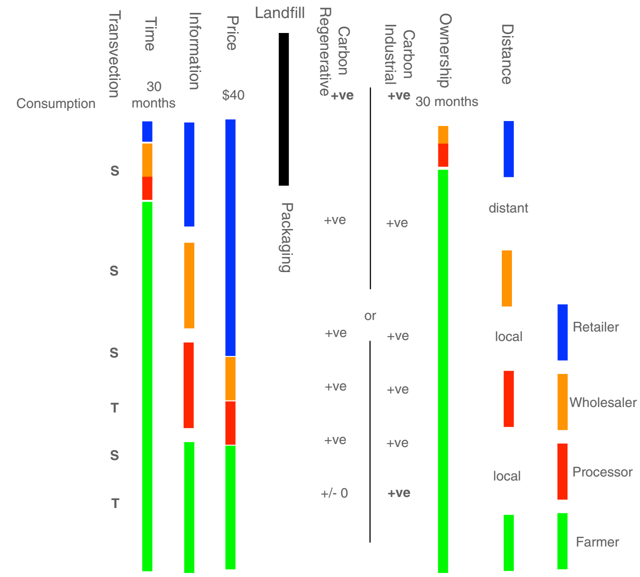


**Fig. 1** The extended transvection

distance and packaging. For each TC that is being included in the extended transvection the starting point (bottom of Fig. 1) is production (in the red meat example a calf being born or brought onto the farm). That might be extended back to ore extraction in the case of a metal based product. The end point of the transvection (top of Fig. 1) is consumption. The scale used for each channel relates to the channel: Time is the time from production to consumption, which each agent possessed the item; Price is the Retail price and what portion of that each agent receives (top of their block) and pays (bottom of their block). Some TCs may extend beyond consumption—packaging, for example, has a life that extends beyond consumption of the goods that were stored in that packaging. In extreme cases that packaging may be plastics that are not recyclable, or are not recycled, and take centuries to decompose. The lines in an extended transvection can be continuous, changing color for different agents, or broken, when information, for example, is not transmitted from one agent to the next (or not captured by the receiving agent). Lines can also curve to indicate that an agent is avoided (the color change would go from the previous agent to the agent that follows the 'skipped' channel member). Similarly a column (TC) that extends beyond the scale of consumption may require a scale break (normally signified by a jagged edge to each side of the scale break, not the lack of continuation signalled by a straight break), to indicate the extent of the phenomena, without distorting the scale of the rest of the extended transvection figure.

Figure 1 shows the concept of the extended transvection and Fig. 2 the exploded view of information flows. These exemplars are based on actual data relating to the New Zealand red meat industry. Given the importance of

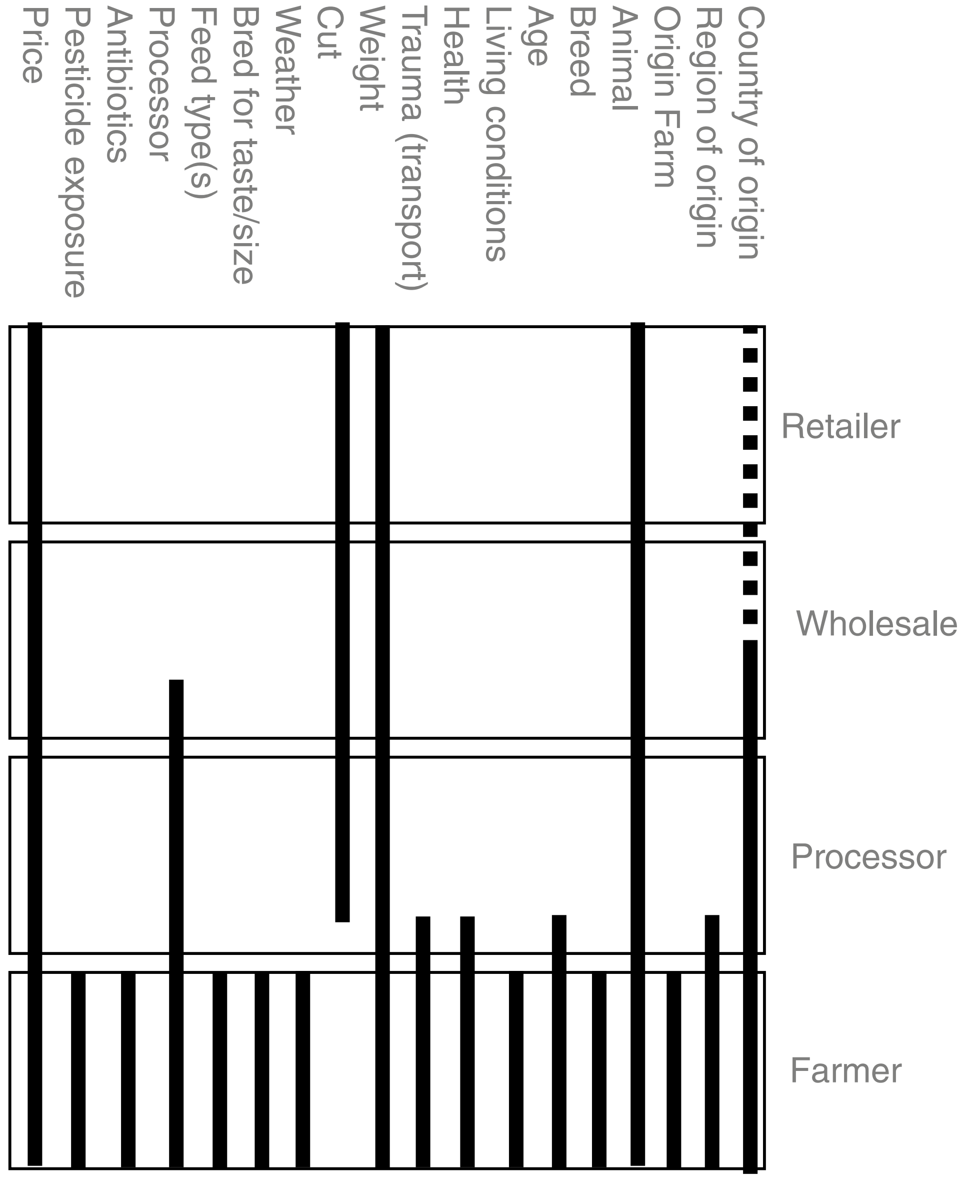


**Fig. 2** Exploded information flows from the extended transvection

information in each market along the transvection, TCs for each attribute of interest, or potential interest, is best kept separate. The Aldersonian Transvection is in the first column on the left in Fig. 1 with "T" being a transformation and "S" a sort. Alderson sought to reduce the number of sorts and to avoid repeated sorts. Clearly the transvection in Fig. 1, based on the red meat industry in New Zealand, is inefficient, with repeated sorts.

The original Aldersonian (Alderson, 2006c) objective is not lost by extending the Transvection. We are still able to see repeated sorts or repeated transformations, without intervening sorts. When inefficiency is built into a transvection the producer and the consumer lose potential value. The extended transvection allows us to identify a wider range of issues in the provisioning system.

Figure 2 shows the information held by each of the channel members as the product, in this case beef, proceeds towards the customers. The importance of information and its variety leads to the exploded figure as a diagnostic tool for lost value, particularly. Information that might be of interest to the customer and/or add value to the product that the consumer is considering purchasing is included. Clearly a lot of the information that the consumer is interested in is not taken through the channel. The aggregation that occurs at the processor deletes information held by the farmer and replaces it with the processor's proxy for quality, a meat grading score. This score is based on marbling in the meat—the distribution of fat within the muscle fibres. It does not relate to the taste or texture of the meat in a direct way, nor does it relate to the sustainability or animal welfare conditions under which the meat was grown.

**Exhibit 1** How to read the extended transvection

The extended transvection is complicated and simple at the same time. It has a large amount of information contained in one figure, designed for the reader to make comparisons.

Vertical lines can be continuous or broken and are made up of color coded sections for channel members. The broken lines indicate that there is a disconnection between the channel members. Figure 1 shows an extended transvection rich in information. To reduce the complexity, the reader might consider only the left four columns. Even in these columns we see a great deal of information and some interesting imbalances.

The easiest way to understand the information presented in the extended transvection is to first read the columns vertically. Are there channel players who have a dominant share of the attribute contained in the channel (price, time, etc.)? If the column is unevenly distributed where does that unevenness arrive? Is that unevenness justifiable (and for whom is it justifiable)?

The next step is to consider the extended transvection horizontally. How do the lengths of the various channel players compare across different attributes? It is immediately apparent in the example of red meat sold through the supermarket, that the supermarket has possession and has paid for the goods for zero days (often less than zero days), while their share of the retail price is very large. These types of anomalies surprise even marketing professors in many cases.

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## Mapping flows of ownership and possession

Marketing systems theory recognises there are competing flows in the channel (Fisk, 1967). The flow of possession and a separate flow of ownership are obvious in the example in Fig. 1. The possession flow is represented by time (time in possession) while the ownership flow's difference reveals that the risk to producers extends well past their possession, as it does for processors and wholesalers. This allows us insights into risk to parties in the transvection.

## Risk is related to time

Risk is related to the time that an entity/firm/person is responsible for/owns a product, or to contractual obligations. In the case of red meat the farmer makes a commitment to grow beef, for example, well over a year before it will be processed and consumed. The processor makes a commitment days before it processes the cattle. The supermarket makes a commitment to receive the meat to make it available for sale, days before it needs it on the shelves, and months before it intends to pay for the meat. It is normally the case that the supermarket has never paid for the meat before it has sold that meat—owned the product. The supermarket's risk is clearly lower than the processor, whose risk is considerably lower than the farmer.

As an example should, as a result of the latest COP26, the world's population decide to move *en masse* to a vegan diet:

- The supermarket would cancel indicative orders it had made. It would send back meat in stock, at the processor's cost. No loss.
- The processor receives back a small amount of meat from the supermarket—loss. Stock in process has no destination—loss. It refuses to take any more stock from farmers—no future losses. Its plant represents stranded assets, no longer having productive capacity. The assets are likely without worth, beyond scrap.
- The farmer finds all cattle in process, from birth through to harvest age, worthless. The farm has not generated any income from its core business—a total loss.

A normal assumption is that profit is related to risk. In the red meat transvection that seems to be far from the case. A ratio of percentage of time of ownership (including payment, and therefor risk) to percentage of the retail price for each member of the transvection gives enlightening results (using realistic examples):

The Risk to Profit Scores (related to the core product, not real estate and other plant) taken from the figures in Fig. 1:

$$Farmer = \frac{\left(\frac{34months}{36months}\right)}{\left(\frac{\$8/kg}{\$40/kg}\right)} = \frac{.94}{.2} = 4.72$$

$$Processor = \frac{\left(\frac{1months}{36months}\right)}{\left(\frac{\$6/kg}{\$40/kg}\right)} = \frac{.03}{.15} = 0.2$$

$$Wholeseller = \frac{\left(\frac{1months}{36months}\right)}{\left(\frac{\$6/kg}{\$40/kg}\right)} = \frac{.03}{.15} = 0.2$$

$$Retailer = \frac{\left(\frac{0months}{36months}\right)}{\left(\frac{\$20/kg}{\$40/kg}\right)} = \frac{0}{0.5} = 0$$

It is abundantly clear that the farmer carries the most risk in this transvection while receiving the lowest part of the retail price relative to their exposure. The retailer, in stark contrast, owns the goods for zero days while taking the largest portion of the retail price. In fact the retailer frequently owns the goods for negative days. The goods are delivered on day one and sold before day eight. Should the goods not sell, they are 'returned' to the wholesaler, who may even be charged a fee for the return of unsold goods. When the goods have sold, the supermarket will make payment on or around day ninety. They have had the use of the wholesaler's money for 81 days post sale.

### Identifying imbalances in the channel—power and profit

The visualisation of prices and differences of cost of goods in and out, allow the identification of power imbalances. Where super profits are being taken, relative to the channel norm, there is a clear opportunity to investigate alternative distribution channels.

### Identifying lost (aggregate) value in the channel

When a good with considerable potential value is put into a channel that is commodity focused, with assumptions of homogeneity of quality cleared by price, the value potential for the consumer is reduced to that of a commodity. The information about the product is lost, see Fig. 2. Fancy packaging will not restore the lost potential value—the commodity focus has stripped that out of the product and restoring it is either a) not possible, or b) prohibitively expensive.

The majority of lost aggregate value in the channel is the result of deficient sorts, a loss of information capture or retention during a sort.

### Following the information through the channel

Information provides potential consumers attributes that may add or subtract value from the offering. The failure to attach information to a product as it progresses through the transvection may be designed to avoid reducing the value of a product (e.g. information regarding poor conditions for workers, or information regarding how an animal was raised and fed).

The failure of information to remain attached to a product as it progresses through the transvection is also responsible for denying (potential) consumers value/utility that they would realise when they knew the positive attributes associated with the product that had been "forgotten" in the channel. It is also a good way to hide attributes with negative value associated with them, for example intensive factory farming that pollutes waterways.

There is clear evidence that channel members may be motivated to undertake deficient sorts to increase their power in the transvection, destructive sorts. Once the, for example, origin farm value has been stripped from a cut of meat, the processor can now treat the supplier as a commodity supplier. At the same time the processor is likely to attempt to create value through their information and branding (e.g. grass fed, New Zealand cattle) only for the retailer to strip that value out through deleting the information about the source of the meat on displays, or treating the source as interchangeable amongst a number of countries. In the race to the bottom no one wins. The dominant feedback loops driving the system for our example of beef are shown in Fig. 3.

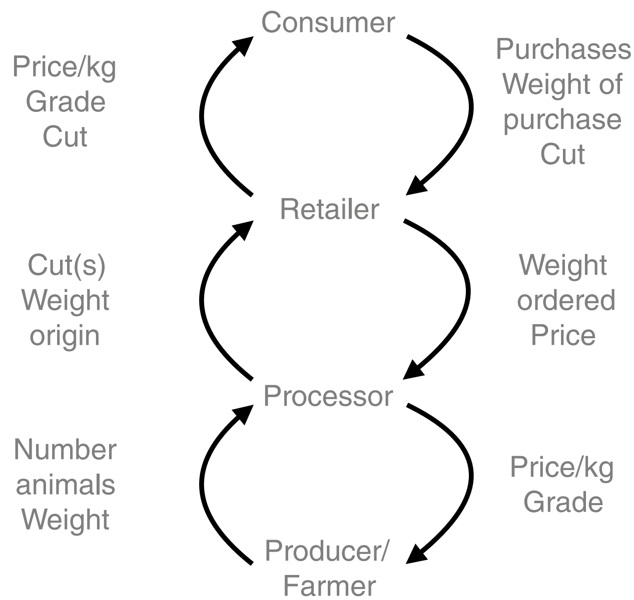


**Fig. 3** Dominant feedback loops

### Tracking (excessive) packaging

Packaging can be included in the extended transvection and then extend past the consumer into:

- recycling
- solid waste
- reuse
- compost

The extended transvection allows a researcher to see what packaging is used where in the channel. Are the goods being packed and repacked, likely associated with sorts, more than need be? Is the packaging single use or sustainable? Is there packaging of packaging—retail packs, packed in another layer of packaging, which in turn may be packaged? We can identify the source of externalities through the extended transvection analysis.

### Distance and place

The extended transvection can also be used to record where each stage occurs, how far apart they are, and whether goods are moved in an inefficient route. An example of inefficient travel in a transvection is the case of lettuces grown on the South side of Dunedin, New Zealand. Those lettuces are then shipped 370 km to Christchurch to the wholesaler, where they are sold, among others, to the supermarkets in Dunedin. The lettuce have travelled over 700 km to be sold to consumers 10 km from the place of growing. The lettuce have aged and the shelf life available to the consumer is reduced by multiple days.

### National/local value capture

What portion of the final retail price is achieved by the producer? What portion by institutions within the country of production? A transvection where the majority of the retail price is retained outside of the country of production, subject to significant transformations, is unlikely to be sustainable. The producers are not receiving a "fair" return. In the illustrated case (Fig. 1) red meat undergoes little adjustment once it leaves the processor. The processor has sorted the animal into cuts, or mince and packaged them for shipping. Retailers may repack, but typically don't. The margin captured outside of the country of production is difficult to justify to the producer.

In the case of coffee, the coffee is grown, picked, sorted, washed (or unwashed if that is the desired end state), dried and packed as green beans. On arrival in the destination country those beans are roasted, ground and the coffee extracted. Given that coffee ages and degrades once it has been roasted, the roasting process needs to stay close to consumption. A higher portion of the retail cost being captured outside of the land of production may be justifiable, but does that justify the current portion staying in coffee growing countries?

### Moving beyond the simple channel

The majority of consumer goods don't represent a single producer, single processor, single wholesaler, single retailer channel. The good has parts from more than one producer assembled, be they parts of the goods, the packaging, or the packaging of the packaging. The extended transvection has the capacity to capture and visualise these more complex provisioning systems, see Fig. 4. We can then see where deficient processes are occurring in the entire provisioning system.

## Discussion and conclusion

One of the key problems of the modern channel is its opaque nature, often intentionally so. Members of a channel may have no idea who is in the same channel as them, who is trusted to care for their produce, who is meant to be transmitting their information and protecting the value of their goods. Alderson (2006c) wanted to make the channel more efficient with transvection analysis. We extend his


**Fig. 4** The multithread extended transvection

conceptual model and analysis tool to broaden its scope and ability to inform and impact on the provisioning system. The individual channels in the extended transvection add value, but the interactions and insights available when you can see the channels side by side provide clarity and opportunities to improve the provisioning system.

Levitt (1960) suggested the preconditions for marketing myopia were:

1. The belief that growth is assured by an expanding and more affluent population
2. The belief that there is no competitive substitute for industry's major product.
3. Too much faith in mass production and in the advantages of rapidly declining unit costs as output rises
4. Preoccupation with a product that lends itself to carefully controlled scientific experimentation, improvement, and manufacturing cost reduction.

We propose that a fifth precondition can now be added. That precondition is the inability of member(s) of the channel to engage with the dynamics of the marketing provisioning systems responsible for connecting raw materials with consumers. A sixth condition, that emerges from Levitt's third, is the focus on price to the consumer instead of value. A price focus drives commodity thinking and moves us away from high value differentiated markets and offerings. It traps us in a race to the undifferentiated bottom instead of striving for high value. It is further compounded by Levitt's fourth condition which brings a focus on homogenous products.

We need to look at the whole system to optimise the market for the benefit of society, including, producers and consumers, and to minimise costs to the environment. The extended transvection gives analysts, be they business, government or social, insights into how well the market is working for each of its members and society. The application of the extended transvection connects us with Fisk's call for the study of marketing systems and channels to fall under macromarketing's domain (Fisk, 1981).

Society, producers, distributors and governments will not fix underperforming provisioning systems until we can see them, and compare different system opportunities. The extended transvection allows us to see what is and isn't under performing and to model alternative systems.

The extended transvection is a tool suitable for use by firms, academics, consumers, governments and NGOs. Its application quickly and clearly identifies systematic sustainability issues and opportunities to improve the provisioning system.

**Authors' contributions** All authors contributed to the study conception and design. The first draft of the manuscript was written by Ben Wooliscroft and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript

**Funding** Open Access funding enabled and organized by CAUL and its Member Institutions The authors did not receive support from any organization for the submitted work.

**Data availability** Not applicable.

## Declarations

**Ethical Approval** Not applicable.

**Competing interest** The authors have no relevant financial or non-financial interests to disclose.



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