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Not right or wrong, but different

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ABSTRACT

There exists a certain wisdom in management which accepts that there will always be problems which by their very nature are insoluble; nevertheless many remain which, due to the application of particular management skills, are potentially more capable of solution. This research programme is pitched at the latter category in the belief that at least some improvement in current practice is feasible provided a more fundamental level of understanding of the relevant (underlying) mechanisms can be achieved. Professor E.C. Zeeman of Warwick University confirms this view with the comment, made to the writer in conversation, that "explanation should reduce the arbitrariness of description". It is only through attainment of this 'explanation' level of understanding that meaningful strategic action becomes possible.

Primarily our aim here is to explain and, if possible, predict how channels of distribution react when subjected to the forces of change, and more specifically, change in the form of innovation.

A review of the literature pertinent to innovation reveals some disturbing knowledge gaps. In particular, there appears to be a general ignorance of the possible consequences of innovation, and a corresponding lack of any concerted attempt to suggest how innovation (and its consequences) may be managed in an interorganizational context. Similarly, a state-of-the-art review of the distribution channels literature leads us to conclude that, like so much of the general marketing literature, it is predominantly descriptive in nature. Many of the issues are developed in piecemeal fashion and hence there is no generally applicable conceptualization. Given these problems, any attempt at predicting the effects of innovation on channel behaviour patterns is premature and bound to fail.

In order to even approach our original objective therefore, it firstly becomes necessary to attempt development of a new conceptual scaffolding with 'explanation' and 'predictive' capabilities. To do this we chose to search well outside the accepted boundaries of management science literature, seeking concepts from a wide range of disciplines and inter-disciplines, building the bridges between these and observed behaviour, and using systems theory as the core around

which to develop a model with more general applicability. Our research orientation is therefore predominantly theoretical but, nevertheless has substantial practical relevance.

Two actual cases of significant recent innovations in the UK food/grocery industry are used as vehicles to partially test the model, and the analysis is extended into the predictive dimension using changes delineated by a Delphi futures forecast. The intention is to use the model to anticipate (or predict) what systemic effects can be expected subsequent to the introduction of innovation. The emphasis throughout is on assessing the implications of such changes using the language and concepts central to our model. Because the external environment is such a key influential in any 'open system' situation, considerable attention is paid to developing this aspect.

Since we are concerned with finding a new way of viewing distribution channel systems, we have adopted a macro orientation throughout in the belief that detailed refinements can be undertaken by future researchers working within the framework established here. As such soundness of the overall logic scheme is regarded as critical, and certainly of more fundamental importance than any requirement to measure individual parameters. The value of such a broad orientation should overshadow any imperfections in detail which will almost certainly emerge.

Generally, the model (and its component parameters) look promising, and our findings tend to indicate that it is no longer necessary to dilute the true complexity of distribution channel systems in order to achieve some understanding of what is happening within. It is now possible to evaluate in a conceptual sense, the effects of innovation on a channel system using stability criteria, and further, to assess the viability of such innovation in terms of Ashby's 'variety' principle.

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CHAPTER I

INNOVATION

Some laud a life of mild content;
Content may fall, as well as pride.
The Frog who hugged his lowly ditch
Was much disgruntled when it dried.

Saki

The above quotation offers a small but nevertheless valuable insight into the reason(s) why many organizations, commercial and non-commercial, pursue a course of innovation. They are interacting with their respective environments, and to survive let alone grow, they must adapt to continually changing conditions, and in certain instances, attempt to influence their environment through the adoption of relatively superior processes, products, and procedures.

According to Rogers and Shoemaker (1971, p.7), "change occurs when a new idea's use or rejection has an effect". Such change has become a central feature of the individual and organizational environments of modern man. "The creating of new attitudes, new ways of doing things, new forms of social relationships, new products, new industrial practices - in short, innovation in the broad sense of the word - demands our attention, but not only because of the results [consequences] of change[1] but also because of the extent to which the process of change is becoming a way of life", (Price & Bass, 1969, p.802). Understanding the innovative process is therefore of paramount importance, and we shall shortly examine it's various components in detail.

This thesis is principally concerned with studying the various sociostructural (and inter-organizational) rearrangements which may occur in channels of distribution as a direct (or indirect) result of change(s) generated either from within or external to the channel

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[1] Price and Bass (1969) appear to treat the concepts of 'change' and 'innovation' synonymously as do several other writers, e.g. Knight (1967, p.479). We prefer to consider 'innovation' as a special type of 'change'.

membership. The particular form or agent of change which we are interested in throughout this study is that of 'innovation'.

Along with other writers (see for example Rogers & Shoemaker, 1971), we have observed that a significant change in operating practices at one level in an industry tends to creat a chain reaction throughout the remainder of the industry, and in some extreme cases, even across industry boundaries. Hence, the ability and willingness of individual companies to anticipate, initiate, and adjust their operating practices to new conditions introduced by technological or institutional innovations, or shifts in consumer behaviour, is seen as a fundamental of the competitive process.

Two examples of significant innovative-type changes which have played a major role in formulating supplier-distributor channel relationships will be the subject of case study analyses in Chapter V. The particular objective of this chapter is to review the concept of innovation and its various sub-processes, in order to provide the necessary background for following analyses and discussions related specifically to events in the U.K. grocery industry. Because the cumulative body of literature on innovation is very well documented, our review will be brief and limited solely to issues with relevance to this thesis.

Innovation and Its Sub-processes

For the purposes of this review, we embrace the 'innovation cycle' approach which is "best regarded as three separate stages, whose end-products are successive in time. These are, respectively, invention - innovation - diffusion/imitation", (Curnow, 1969, p.314). Essentially, this is the way Schumpeter (1942; 1962) envisaged the innovation process. However, we would add explicit emphasis to the interdependent nature of the various phases. In addition, we will include Rogers and Shoemaker's (1971) concepts of 'adoption', 'adoption rate', and 'consequences'. As we proceed it will become apparent just how important development of the 'consequences' aspect is to this thesis.

Invention

Invention is the idea or process by which new ideas are created or developed; the conception of a new way to improve goods, services, or

processes. It is a necessary precondition for innovation, (Rogers and Shoemaker, 1971, p.7; Hollomon, 1969, p.5; Peterson, 1969, p.9; Price & Bass, 1969, p.802; Goldsmith, 1970, p.2; Archer, 1971, p.1-1; Gillett, 1973, p.9.2).

Adoption

Adoption is the decision to make full use of a new idea as the best course of action available, (Rogers and Shoemaker, op cit, p.26).

Innovation

Innovation is the bringing of the invention into widespread commercial use, hence there is economic impact, (Price & Bass, 1969, p.802; Goldsmith, 1970, p.2; Johnston, 1966, p.160; Archer, 1971, p.1-1; Gillett, 1973, p.9.3; Rothwell, 1973, p.22; Pizam, 1972, p.203; Whitfield, 1975, p.1; Evan & Black, 1967, p.520; Utterback, 1971, p.77). It is essential that the particular idea involved is at least perceived as new, (Kotler, 1972, p.506; Rogers & Shoemaker, 1971, p.19). We agree therefore with the specifics of Diehl's (1972, p.6) definition of innovation, i.e. "the whole process of idea selection, development of a business plan, funding the project, and carrying the idea to commercialization". Globe et al (1973, p.8) suggest a similar scheme.

If any one group of variables can be said to dominate as empirically determined correlates of innovation, it is the group of interrelated factors indicating size, wealth, or the availability of resources. Mansfield (1963c, pp.293-304), Mytinger (1965, p.212), Hage and Aiken (1967, pp.516, 517), Eisenstadt (1963, pp.27, 33-112) and Rogers (1962, pp.40, 285-292) all concur that organizational size and wealth are among the strongest predictors of innovation in terms of readiness to adopt new patterns of behaviour.

Hollomon (1969, p.3) considers "innovation or the introduction of change into the business enterprise system is the *sine qua non* for profitability. Without it, the enterprise system becomes conservative and stagnant".

Rate of Adoption

Rate of adoption is the relative speed with which an innovation

is adopted by members of a social system.[2] This rate of adoption is usually measured by the length of time required for a certain percentage of the members of a system to adopt an innovation, (Rogers & Shoemaker, op cit, p.27).

A number of studies have attempted to investigate the factors determining how rapidly the use of a new technique spreads. Maddala and Knight (1969) focussed on a single production technique in the steel industry and its rate of adoption across the world. They concluded that the major factors which explain or account for differences in rates and extent of adoption are "... lags, rigidities and inefficiencies in planning, and barriers to international competition", (Ibid, p.532). Griliches (1957) studied the factors responsible for the wide cross-sectional differences in the adoption rates of hybrid seed corn in the United States. He found that farmers generally "... behaved in a fashion consistent with the idea of profit maximization", (Ibid, p.522); in areas where expected profitability was lower, the adjustment to hybrid corn was slower and vice versa.

Mansfield (1961) developed a model of intra-industry innovation rate of adoption and tested it with twelve actual cases. He found a surprisingly good fit. The model indicated that the rate of adoption tended to be faster for innovations that were more profitable, and that required relatively small investment. Mansfield (Ibid) also drew the inference that the rate would be faster, the more competitive the industry although this assertion remains largely unsubstantiated by research.

Diffusion[3]

Diffusion is the process by which innovations spread to members of a social system[4] (Ibid, p.12), or more specifically, its potential

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[2] A social system is defined as a collectivity of units which are functionally differentiated and engaged in joint problem solving with respect to a common goal. The members or units of a social system may be individuals, informal groups, complex organizations, or sub-systems, (Rogers & Shoemaker, op cit, p.27).

[3] Alternatively called 'imitation'.

[4] Viewed this way, 'diffusion' is therefore a special case of communication; whereas diffusion is concerned with messages which are new ideas, communication encompasses all types of messages, (Rogers & Shoemaker, op cit, p.12).

population of users, (Pavitt, 1971, p.19). This population may be within a company, between companies, or across industries, (Hollomon, 1969, p.6).

Katz et al (1963, p.237) define the diffusion process as "the (1) acceptance, (2) over time, (3) of some specific item - an idea or practice, (4) by individuals, groups, or other adopting units, linked to (5) specific channels of communications, (6) to a social structure and (7) to a given system of values, or culture". Clearly, the impact of an innovation on a particular industry or larger section of the economy will to a certain extent be determined by the rapidity with which it comes into use via the diffusion process, (Gold, et al, 1970, p.218).

Two schools of thought are evident in the literature regarding attempts to explain the diffusion of innovation. Economists have tended to view the diffusion of an innovation in an industry as being the statistical result of some distribution of economic attributes of firms, interacting with those of the innovation, (Enos, 1958; Gold et al op cit; Mansfield, 1968a; Mansfield, 1968b). Others have felt that equally important insights can be gained by studying the phenomenon as a behavioural process in the tradition of the rural sociologists, (Allvine, 1968; Martilla, 1971; Ozanne and Churchill, 1968; Rogers et al, 1971; Webster 1967; Webster, 1971).

Economists in particular, have long displayed an active interest in the process whereby new techniques spread from firm to firm, but until relatively recently the conceptions of how this was achieved did not extend much beyond Schumpeter's (1942; 1962) simple assertion that once a firm introduced a successful innovation, a host of imitators would follow. However, much still remains to be learnt about the process despite substantial studies carried out by Bohlen and Beal (1955), Coleman et al (1957), Griliches (1957), Hildebrand and Partenheimer (1958), Mansfield (1961), and Sutherland (1959). Specifically, although it has often been observed that some firms begin using a new technique long before other firms, very few studies have attempted to isolate the factors responsible for these differences.

Unfortunately, studies of the diffusion process are relatively rare for industries other than agriculture. For studies bearing on the spread of innovation among industrial firms, Enos (1958), Healy (1954),

and Mansfield (1961; 1963b; 1960) and Sutherland (1959) are relevant. However, because each of these studies has tended to focus on various different facets of diffusion, no common thread or pattern emerges. For example, Enos (1958), working in the petroleum refining industry, found that improving a process contributed more to technological progress than its initial development; this obviously has implications for diffusion of the process. On the other hand, Sutherland (1959) concentrated on the diffusion of cotton spinning equipment in the cotton spinning industry and produced findings which indicated the type of firm more amenable to the adoption of such an innovation. Mansfield (1963b) restricted his attention to intrafirm rates of diffusion, i.e. the rate at which a particular firm, once it has begun to use a new technique, proceeds to substitute it for older methods. Coleman et al (1957) studied the diffusion of antibiotics use in the medical field. The study of diffusion of innovation between countries has received even less attention, (see Maddala & Knight, 1969, p.531 for comment in this regard).

According to Gold et al (1970, p.219), answers are still sought to such questions as:

1. Is there a common pattern of diffusion or are there widely different patterns?
2. How early in the diffusion experience of an innovation can effective prediction be made of its eventual importance and its long-term patterns of adoption?
3. In what respects, if any, are diffusion patterns in recent decades markedly different from those of earlier times?
4. Are the commonly assumed determinants involved in innovation adoption decisions valid?

In general, it appears that as communication increases between firms and their respective environments at each stage in the innovation process, the more effective they will be in generating, developing, and implementing new technology and practices, (Utterback, 1971, p.85). For successful innovations, transfer of information appears to occur more often through discussions and personal contact at each stage than through other means, (Ibid).

Consequences

Consequences are the changes that occur within a social system as a result of the adoption or rejection of an innovation, (Rogers & Shoemaker, op cit, p.7). It is this particular facet of innovation which first attracted our attention in the U.K. grocery industry and remains at the core of the research programme. We will therefore focus more attention on this particular sub-process under a later heading in this chapter.

Sources of Innovation

According to Gee (1974, p.32), "... innovation is initiated not just through the generation of an idea or invention, but can be stimulated from recognition of a need or technical opportunity". Corson (1962, p.68) holds a similar view. There is certainly evidence to suggest the validity of this conceptualization; NATO (1973) and Baker et al (1967) both report successful innovations which arose primarily from need recognition rather than idea generation or invention. This is demand-pull rather than technology-push innovation and is regarded as an important source of stimuli for innovation.

Fryers (1969, p.24) appears to support the above view with his assertion that "superiority in achievement tends to come from translating basic knowledge faster and more effectively into a useful product". In many cases it is the entrepreneur who, although not responsible for the basic knowledge, is aware enough "... to convert a promising concept into a soundly established business enterprise", (Congleton, 1969, p.24).

It is fair comment that "an innovation will only be successful if somebody makes use of it", (Wolff, 1970, p.124). Hence, a climate has to be created amongst the prospective user population which recognizes a good innovation as such, and has the will to make it work.

Although innovation may be generated internally from within a company, or other type of organization, it most often comes from outside the organization with a vested interest in the particular business involved or even traditional supplier-user sources, (see Hollomon, 1969, p.6; Bright, 1969, p.38). This is sometimes termed innovation by 'invasion'; such invasion tends to destroy existing markets, products,

and procedures, and is generally resisted by those who have vested interests in maintaining the *status quo*.

Whatever its source, innovation cannot be completely controlled or programmed. The actions of the technical entrepreneur, or the recognition of need or opportunity, by definition, involve creative type activities which do not readily facilitate detailed planning, (Globe, et al, 1973, p.15).

Innovation Characteristics

It is not essential for an innovation to have a great degree of advantage over the idea it is replacing; more importantly, the potential adopter must be aware of, or perceive, an advantage. Following Rogers and Shoemaker (1971, pp.22,23) we outline below the various key characteristics of innovation which largely influence the rate of adoption:

1. Relative advantage: the degree to which an innovation is perceived superior to the ideas it superceded. The degree of relative advantage may be measured in economic terms but there are other indicators. Generally, the greater the perceived relative advantages of an innovation, the more rapid its rate of adoption.[5]
2. Compatibility: the degree to which an innovation is perceived as being consistent with existing values, past experiences, and needs of the receivers (adopters). An idea that is not compatible with the prevalent values and norms of the affected system will not be adopted as rapidly as an innovation that is compatible.
3. Complexity: the degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood

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[5] Presumably the converse applies.

by the component members of a system; others are not and will be adopted more slowly.

4. Trialability: the degree to which an innovation may be experimented with on a limited scale. New ideas which can be tried as part of an instalment plan will generally be adopted more quickly than innovations which are not divisible.
5. Observability: the degree to which the results of an innovation are visible to others. The easier it is for an individual to see the results of an innovation, the more likely he is to adopt [that is, if those results appear beneficial].

Goldman (1970, p.15) adds the following two elements to the above list:

1. The benefits of a particular innovation do not necessarily accrue to the industry that spawned it.
2. The truly innovative organization is systems-oriented rather than simply product-oriented.

Classes of Innovations and Organizations

The work of Jewkes et al (1958) and Charpie (1967) points to a possible classification scheme for innovations, i.e.,

1. Those which bring about productivity gains[6].
2. Those which represent new contributions to existing products, processes, or industries.
3. Those which express themselves in the spectacular creation of completely new industries, (Goldsmith, 1970, p.3).

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[6] Productivity measures are potentially useful macro indicators of the rate at which innovations are being adopted, either at individual company or industry levels, (see Hollomon, 1969, p.3).

In this thesis, the two case studies to be reviewed fall under the first category.

In terms of degree of innovativeness, Carter and Williams (1959, p.87) suggest three classes of organization:

1. Those which are in the forefront of discovery in applied science and technology, quick to master new ideas and to perceive the relevance of work in neighbouring fields.
2. Those which are quite uninterested in science and technology, and are perfectly content to continue with traditional methods without even examining the alternatives[7].
3. A large middle group, neither outstanding leaders in technology nor wholly uninterested in it.

Management of Innovation

"... innovation is often viewed as an orderly process, starting with the discovery of new knowledge, moving through various stages of development, and eventually emerging in final, viable form", (Price & Bass, 1969, p.802). According to this 'linear' model, innovation is seen to be a rational process, essentially similar to the other, more systematic functions of an organization. The assumption is that it can be analyzed into component parts and controlled rationally, i.e. planned, programmed, and managed in similar fashion to other more routine activities. However studies by Price and Bass (Ibid, p.803) indicate that the 'linear' model is atypical - the innovative process is more non-rational in nature.

According to Bright (1969, p.36), "technological innovation - the process of translating technical knowledge into economic reality, involves four major functions",

- the scientific (search for knowledge)
- the engineering (reduction to practice)
- the entrepreneurial (introduction to society)
- the managerial (optimization of usage).

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[7] Recall the opening quote of this chapter.

"Management must realize that an innovation requires these four types of activities, roughly in the sequence mentioned ... and it must nurture the project by providing the necessary skills and leadership[8] at the right times", (Ibid).

Several writers have demonstrated a keen awareness of the problems faced by companies in attempting to manage innovation, (see Pavitt, 1971; Haggerty, 1970; Knoppers, 1970; Dean, 1974). However, in virtually all cases, the emphasis appears to be on managing the organization almost as an isolated unit rather than thinking more in interorganizational terms (the organization-environment interface) which is essential when considering channels of distribution.

Burns (1967) epitomizes this preoccupation with the organization *per se* in his comment that above all, an organization is concerned with its own survival "and for its own survival it must ensure that innovations which might render its processes or products obsolete or unprofitable, are developed by it and not by rivals or newcomers", (Ibid, p.16). Both Burns (1967) and Schon (1966) draw attention to the seemingly paradoxial situation faced by large organizations, i.e. the desire to maintain a stable state, and the ever present pressures to innovate in response to changing conditions which necessarily upsets previous equilibrium. The crucial fact about the innovative process is that it concerns the non-routine, the unfamiliar, and requires of the organization the capacity "... to act with confidence beyond the range of familiar beacons", (Schumpeter, 1942, p.132).

Perhaps the most challenging assessment regarding the management of innovation is provided by Lawrence (1964, p.7) when he asserts that "the companies which are going to succeed in the future are those which develop the ability not only to respond to changes but to initiate them".

Implicit in this statement is the recognition that companies will be called upon to extend their management skills beyond traditional corporate boundaries and further out into the industry sphere of influence. At times this may even require following a course of resistance to

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[8] "Successful innovation is, ... a task *sui generis*. It is a feat not of intellect but of will. It is a special case of the special phenomenon of leadership", (Schumpeter, 1928).

innovation if commitment to an existing technology is liable to make it too costly to support a proposal for early adoption of an alternative, albeit better. Managements must therefore be ambivalent about radical innovation in particular, and choose a strategy which will avoid putting their own organizations into a perpetual and perhaps fruitless 'shifting of gears'. However, the impression one gains from the literature is that strategic considerations are largely overlooked by managements dealing with innovation[9].

Buchanan (1964, p.87) suggests that "innovation can be managed to the real benefit of any company but "it requires a systematic approach which includes use of a planned discipline for present operations and continuing reappraisal of the business and the direction it should be taking", (ACME quoted in Bolz, 1969, p.22).

For the professional manager, innovation therefore presents as a complex problem-solving sequence which may produce something novel yet tangible and complete. The model of this cycle includes the following stages:

1. Perceiving some need or problem.
2. Gathering relevant facts and classifying the true nature of the problem.
3. Seeking new information and analyzing the whole picture.
4. Proposing alternative ideas for a solution; creativity is essential in this stage.
5. Evaluating and selecting a final solution for implementation.
6. Implementing the solution.
7. Verifying that the solution is satisfactory, (Whitfield, 1975, p.21).

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[9] One somewhat extreme example of 'strategic' use would be the way in which IBM stored up innovations and deliberately released these to coincide with competitors' new product launches. This particular case was recently the subject of a successful anti-trust suit in the U.S., brought against IBM by Texas Instruments and other companies in the computer industry.

Effects and Consequences of Innovation

In the context of an industry experiencing innovative pressures; Rockwood's (1967, p.395) view that "the development of innovative ideas is not without frictions" is a fair assessment of reality. Schon (1966) and Wormald (1969) appear to support this view; both see a fundamental tension between the nature of the established firm and the nature of radical innovation, i.e. established firms seek a certain kind of ordered, forseeable, planned change free of surprise or revolution. Yet innovation often goes hand in hand with uncertainty, commanding changes in production equipment, marketing and distribution procedures. For this reason, change, particularly that stimulated by innovative forces tends to run counter to vested interests and to violate certain 'territorial rights', (Shepard, 1967, p.47). These are the visible effects; what then of the ultimate consequences?

Rogers and Shoemaker (1971) have produced the most definitive recent work regarding the consequences of innovation adoption. The following discussion therefore draws heavily on their work.

By 'consequences' is meant "... the changes that occur within a social system as a result of the adoption or rejection of an innovation", (Ibid, p.319). In this thesis we will confine our attention to the special case of distribution channels as the social system, and emphasize the consequences of innovation adoption rather than rejection.

In reviewing the literature we reach a similar conclusion to Rogers and Shoemaker (Ibid) in that despite the obvious importance of consequences, the phenomenon has received only very scant attention. The assumption appears to be that innovation will automatically produce beneficial results for adopters. However, as Knight (1967, p.478) correctly points out, there can be negative (or dysfunctional) effects.

It is also clear from our own experience in the U.K. grocery industry that innovators or change agents do not pay much more than cursory attention to the possible consequences of their actions; this is difficult to understand, particularly as the effects on other organizations or industry sectors are liable to be significant and quite often dysfunctional. Even in an intra-firm context, there is little evidence of a more enlightened approach.

Rogers and Shoemaker (Ibid, p.324) offer the following reasons for the apparent neglect of this area:

1. Change agencies, often the sponsors of diffusion research, overemphasize adoption *per se*, tacitly assuming that the consequences of innovation decisions will [always] be positive.
2. Traditional survey research methods are inappropriate for the type of investigation required[10], i.e. extended observation over a period rather than a one-shot survey [which is the usual procedure] .
3. There is no doubt that consequences are difficult to measure and evaluate. Johnston (1966, p.163), makes a similar point - evaluation requires a subjective value judgement. In addition, attempts at measurement are often complicated and confounded with other effects which are difficult to isolate.

Rogers and Shoemaker (1971) offer a useful albeit incomplete classification system for the consequences of innovation and this will be explored under the following headings.

Functional Versus Dysfunctional

Functional consequences are desirable effects of an innovation; dysfunctional consequences are undesirable effects. "The degree to which consequences are desirable or undesirable ultimately depends ... on how the innovation affects the members of the system", (Ibid, p.331), i.e. determination of whether consequences are functional or dysfunctional depends on how the innovation affects its adopters.

However, it is possible to have a situation as witnessed with the cage pallet in the grocery industry, where the consequences are functional for one sector and dysfunctional for another. Rogers and Shoemaker (Ibid) clearly recognize this possibility as evidenced by their comment that "an innovation may be more functional for some individuals [or organizational unit] than for others; certain positive consequences may occur for certain members of a system at the expense of others".

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[10] Its not so much that such methods are inappropriate. Rather, extended longitudinal studies cost considerably more than one-shot surveys, and in addition, are difficult to manage and control.

It is therefore very important to indicate which members in the system are being considered when evaluating the effects of innovation, or indeed whether the net effect on the overall system is at stake. This latter perspective was used in the evaluative work undertaken by Christopher et al (1977) when studying the effects of the cage pallet innovation on the U.K. grocery industry. One of the incentives for early or first adoption of an innovation are the 'windfall profits' potentially available. However, the innovator must clearly take risks to earn these.

"... there are costs associated with the introduction of anything. These costs are immediate and definite. The benefits accrue later and are indefinite - they are the misty future. Risk is generated because of the sure knowledge of immediate cost and the sure uncertainty of future benefit", (Hollomon, 1969, p.6).

Direct Versus Indirect

The adoption of innovation in one part of a system "... often initiates a chain reaction of consequences", (Rogers and Shoemaker, op cit, p.333). This observation is central to the present thesis. Direct consequences are those changes that occur in immediate response to an innovation. Indirect consequences are changes that occur as a result of direct consequences of innovation.

Manifest Versus Latent

Manifest consequences are changes that are recognized and intended by the members of a social system. Latent consequences are changes that are neither intended nor recognized by the members of a social system, (Ibid).

Rogers and Shoemaker (Ibid, pp.333, 334) make the telling observation that:

> Almost no innovation comes without strings attached. The more important, the more advanced, the more 'modern' the innovation (and therefore the more desire by the change agent for its rapid adoption), the more likely its introduction will produce many consequences - some of them intended and manifest, others unintended and latent.

In considering the ideal rate of innovation adoption, Rogers and Shoemaker (1971, p.339) embrace the concept of equilibrium. They do this on the premise that "the intensity of promotional effort with which an innovation is introduced into a social system is related to the rapidity with which consequences are felt". Equilibrium is defined as "the tendency of a system to achieve a balance among the various forces operating within and upon it", (Ibid). Dynamic equilibrium occurs when the rate of change in a social system is commensurate with the system's ability to cope with it. Disequilibrium (or instability) occurs when the rate of change is too rapid to permit the social system to adjust, (Ibid).

Significantly, Rogers and Shoemaker (Ibid), in a footnote to their definition of 'equilibrium' comment how appropriate a systems analysis type approach is to the study of consequences of innovation". We agree with these sentiments and fully intend to develop and apply systems concepts to the analysis of innovation consequences in the context of distribution channels, later in the thesis.

Conclusions

To borrow a phrase from Marlow (1964, p.11), "the process of innovation and the actual acceptance of new ideas are some of the most talked about, and yet the least understood of contemporary problems". Our review of the pertinent literature has certainly confirmed this impression.

In this chapter, we set out to explore the concept of innovation and its various processes as a prelude to applying these in the specific situation of channels of distribution (which are effectively inter-organizational systems). It has not been our intention to discuss the desirability or otherwise of innovation *per se*.

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[11] Gouldner (1957) also discusses ways in which systems analysis may be utilized in applied social science. Firstly, systems models point out the possibility that a change in one part of a system may yield unforseen and undesirable consequences in another part of the system, due to the interdependence of its elements. Secondly, systems models suggest that changes may be secured in one part of a system, not only by a direct frontal attack, but also by a circumspect, indirect manipulation of more distantly removed variables.

The sub-processes of innovation have obviously been well 'turned over' by the theorists, particularly that of diffusion. Although diffusion studies by definition often involve considerations on a cross-industry basis (the behaviour of firms within an industry), the bulk of the literature focusses on the individual organization. Within this context all the issues are debated, e.g. acceptance, adoption, diffusion, obstacles to, initiation of, and to a lesser extent, management of, innovatory pressures and innovation.

If the literature is a true reflection of what has actually transpired, theorists and managements alike appear to have been very much preoccupied with innovation at the firm level (especially organizational innovation; see Thompson, 1965) although even here there is a general lack of appreciation of potential consequences. Where there is a distinct gap in the literature, is in the exact area we were looking to for guidance, i.e. the management, and awareness of the consequences, of innovation in an inter-organizational context. Almost by default, a gap exists. It is hard to find explanations for this apparent oversight.

Certainly, the poor treatment of 'consequences' is especially disappointing in light of what this thesis is attempting to do, and only serves to confirm a statement made by Midgley[12] in a written communication to the writer early in the research programme, i.e. "there is remarkably little known about the consequences of innovation ... despite the fact that these consequences are quite often dysfunctional".

It has therefore been impossible to analyze and evaluate the historical performance of managements in dealing with innovations which affect different sectors of the same industry in perhaps different ways. In fact, this type of situation is hardly more than alluded to in the literature. Nevertheless, we are convinced this is an important area of study because of our own experience and observations in the U.K. grocery industry.

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[12] Dr. David Midgley, of the University of New South Wales, in a letter to the writer on 23rd March, 1976. Dr. Midgley has himself conducted considerable research in the field of innovation while at the University of Bradford and Cranfield School of Management.

Another weakness in the general literature on innovation should be noted; this relates to the fact that 'failures' are largely ignored and 'successes' over-emphasized. One obvious exception is Project SAPPHO (1972) which considered failures equally with successes, and sought to highlight the differences between the two. Presumably, factors which consistently differentiate between success and failure will be useful indicators for future innovators and managers.

It seems inevitable therefore, that we will be forced to proceed with our study of the effects of innovation on channels of distribution without the benefit of any substantial theoretical or empirical underpinning. We are fortunate to have available the work of several channel theorists who have studied the specific circumstances of innovation and change in channel systems[13] and these will be introduced in Chapter IV. However, before proceeding further towards coupling innovation and channels of distribution, it is necessary to obtain a thorough working knowledge of channel mechanics, or at least as good as the literature on the subject can offer. This then is the function of the next chapter.

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[13] See for example, Dixon & Layton, 1971; Izraeli, 1971; Michman, 1971; McCammon, 1963; Hollander, 1960; Swan, 1974.

CHAPTER II

CHANNELS OF DISTRIBUTION CONCEPTUALIZATIONS: A STATE-OF-THE ART REVIEW

Introduction

Channels of distribution are basic to the marketing strategies of firms, (Fox, 1970, p.1), and were long ago identified by Borden (1965, p.390), as a key element in the marketing mix[1]. However, although channels are readily accepted as a variable aspect of the marketing mix, they have to date received considerably less attention than other elements such as product, price, and promotion, (Davidson, 1967, p.261).

In this chapter a comprehensive review of the channels literature is undertaken, primarily to identify and assess the adequacy (or otherwise) of the various mainstream conceptual schemes which have so far emerged. Of special concern are the dual aspects of channel structural arrangements (or patterns) and their corresponding operational mechanics.

The key criterion to be used for assessing 'adequacy' in the above context is quite simply that of explanatory power, i.e. does any particular conceptual approach improve our understanding of channel mechanisms; if so, how, and to what degree? Other facets of adequacy will also be taken into account, e.g. comprehensiveness, conceptual rigour, measurability, practicality (in an operational sense), and predictive value. We posit that the more fundamental the explanation in terms of the understanding it provides, the better its value as a predictor of channel reaction to the stimuli of change, irrespective of whether the source of perturbation is internal or external to the channel.

It is evident that several 'schools of thought' have emerged in the channels literature over the last sixty years; these range from the early economic orientation to the more recent systems concepts and behavioural

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[1] The phrase 'marketing mix' was originally coined by Borden about 1950. He developed the idea from a research bulletin on marketing costs written by Culliton (1948) although he had long recognized the need to find some formal description for the wide diversity of marketing activities, policies, and procedures possible between companies, even in the same industry.

refinements. The intention here is to examine each of these approaches in turn with a view to ascertaining their various bases, why they emerged, how they developed, what their particular contribution has been, and where applicable, why they were superseded.

Our classification of the various conceptual approaches into discrete categories is arbitrary but nevertheless essential for clarity in this type of review. We acknowledge that in reality no such clear-cut distinctions can be made, and in fact considerable overlap is present in many instances. However, the order of review is designed to facilitate a progressive (and cumulative) development of the major ideas which emerged over the time-span under consideration. Semantics or differences in terminology will largely be ignored in order not to distract or detract from the primary task.

Schools of Thought

Micro-Economic

In so far as channels of distribution have traditionally been regarded as flows of economic goods and services, then an economic school of thought has and still does exist. Micro-economic theory underpins most of the theoretical work undertaken in the field of vertical marketing networks.[2] Certainly, it is irrefutable that the explanation of channel alignments has for many years relied heavily on the idea of external economies, i.e. one type of institution allowing another to undertake certain functions (or activities) because the latter can do so at lesser cost; this is a recurring theme throughout the literature.

However, it is difficult to analyze economic arguments *in vacua* without being drawn into consideration of the institutions, functions and systems involved, all of which are themselves central elements in yet other conceptual approaches.

Coase (1937), in researching the nature of the firm, concluded that an enterprise would continue to perform certain activities for just as long as internal costs remained below the prevailing (external) market

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[2] Vertical marketing networks (or systems) are generally understood to be exhibited in the form of integrated channels of distribution.

prices. In effect, he envisioned the managerial task as one which involved a continuous series of 'make or buy' type decisions. He was convinced that availability or otherwise of external economies represented a feasible basis for explaining interfirm alignments.

Stigler (1951) followed up and extended the ideas introduced by Coase (1937). He postulated that a manufacturing enterprise simultaneously performs a number of activities, each of which has a uniquely shaped cost curve, i.e. costs plotted against corresponding output values. The firm's average cost curve is then the summation of all the individual cost curves constructed in this way. Of particular importance, Stigler (1951) contended that faced with such a situation, the firm would attempt to operate at a level of output where marginal cost equalled marginal revenue. This typically occurs at or just to the left of the minimum point on the average cost curve.

Stigler (Ibid) extended this notion by suggesting that the economies potentially available through the performance of specific activities may not necessarily be exhausted even when this minimum point on the average cost curve is reached; he contended that further economies were possible through delegation of a number of selected activities to external organizations which specialized in such activities. In this case the anticipated result would be a series of more steeply decreasing cost curves.

Under this regime, it becomes possible to see how channel intermediaries may represent a source of external economies for manufacturers because they may perform the delegated activities at a lower cost per unit than their clients, the manufacturers. Stigler's work therefore provides an economic rationale for the process of vertical disintegration in highly competitive developing industries. The analysis developed by Stigler also included an awareness that the reverse process could occur at some future point in time, i.e. when manufacturers might well find it desirable to reabsorb the previously delegated activities.[3]

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[3] The situation is somewhat different for mature industries. An industry may continue to expand until the maturity stage of output is reached at which point many firms may again find it feasible to perform previously delegated functions at a cost per unit comparable to specialist intermediary organizations.

In essence, the micro-economic approach, interpreted in a channels context, sought to achieve a minimum cost arrangement and this was generally assumed, perhaps erroneously, to equate to a condition of maximum operational efficiency.

In proposing the above conceptualization it is quite apparent that economists such as Coase, Stigler, and others laboured under formidable constraints. Following McCammon et al (1971, p.334) these might be summarized as:

1. Economists tended to view vertical marketing networks as an extension of the firm with the result that non-economic influences such as bargaining and political activities present within the overall network of firms were completely ignored.
2. Economists traditionally sought maximization or optimization models which consequently led them to focus on the issue of efficiency (or effectiveness) in existing networks. Consideration of the potential economies available through innovative institutional alignments were generally overlooked.

These early maximization and optimization models were subsequently refined by contemporary economists working in the marketing area, e.g. Lester's (1949) liquidity model; Katona's (1951) growth model; Chamberlain's (1955) market share model; and Baumol's (1959) sales maximization model. However, nothing specific to distribution channels was undertaken at that time.

A different tack was followed by Margolis (1958) and a number of other economists. They sought to develop a non-maximization model, apparently on the premise that business organizations generally lacked access to the information required to sustain either a maximizing or optimizing approach. This approach emphasized strategic, administrative, and operating alternatives evaluated in terms of ability to satisfy the organization's aspirational requirements. For reasons which are still not clear it gained no more than token acceptance and was never fully developed; the emphasis therefore remained on maximum or optimal efficiency models.

Bucklin (1960) is the most recent channel theorist to adopt a predominantly economic approach, at least in his early work. He extended Stigler's work by developing a series of analytically rigorous and elaborate network models. He proposed these as a basis for determining optimal institutional channel configurations in five progressively more complex environments. He introduced the concept of a 'normative' channel,[4] and argued that the forces shaping it should be assumed as largely economic in origin. This concept also assumed that the combined groups of organizational entities defined as the marketing channel would seek collectively to maximize their profits and therefore the channel system would select an optimal organization structure to achieve this.

It was Bucklin's (1971, p.2) belief that "within a competitive economy ... the channel ... emerges from the basic economic conditions and organizational capabilities which dictate the minimal cost route ...".

Like Stigler, Bucklin operated in the context of conventional economic analysis, hence his early models ignored many of the social realities of the market place. Perhaps the enduring contribution by Stigler and Bucklin was to dramatize the economies that could be effected through the process of restructuring vertical marketing flows.

Bucklin (1971) attempted to develop a decision model which would assist a firm to select the type of channel it should employ, and suggested how the set of firms in the channel could be managed, (Ibid, p.7). In essence, this is another example of an optimizing model; he visualized the problem in three parts:

1. Defining the nature of the cost functions for alternative channel types.
2. Defining the nature of the revenue opportunities for alternative channel types from two perspectives:

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[4] A 'normative' channel is that which would exist if all institutions in the extant (or real world) channel, and all potential entrants, were fully adapted to economic conditions in such a way that there would be no tendency for new firms to enter, old ones to exit, or to shift functions among themselves. In effect, it is a wholly theoretical or ideal concept embodying the idea of static conditions and therefore unlikely to occur in practice.

a. the number of customers reached by each, and
b. the extent of information impairment incurred by each.

3. Defining the nature of the factors which control the costs of product and information flows within a chosen channel so that these may be managed with optimal efficiency, (Ibid, pp.7-8).

Bucklin (Ibid) expressed the issues outlined above in the form of a simple optimization model. The revenues to be derived from the use of the i^{th} channel, R_i, are a function of the degree of marketing effort (I) the firm puts into that particular channel such that:

$$R_i = f(I_{ij}),\ j = 1, \ldots\ldots\ldots w, \tag{1}$$

The corresponding costs incurred in the same channel, C_i, are a function of the same set of inputs:

$$C_i = g(b_{ij}\ I_{ij}),\ j = 1, \ldots\ldots w, \tag{2}$$

where b_{ij} represents the unit costs of each type of input.

The intent of the firm is to maximize its profits by allocating its w types of resources to the n channel type alternatives that are perceived to be available to it. Specifically, this may be written as:

$$\text{Max. } \pi = \sum_{i=1}^{n} (R_i - C_i) \tag{3}$$

Therefore, the task facing management is to identify these costs and revenues so that the firm may select the particular channel types, or combination of channels that will permit achievement of its particular objectives.

Bucklin (Ibid, p.11) gives the impression that distribution cost accounting methodology has reached a stage in its development where ascertaining the cost inputs to the above model is a straightforward...

matter. In fact, despite the work so far undertaken,[5] it is our experience that many problems still remain to be solved in the thorny area of cost allocation, (Gattorna & Walters, 1977). Nevertheless, Bucklin (op cit, p.12) developed his argument and derived the following cost equation from (2), i.e.

$$C_i = a_i + b_{i1} I_{i1} + b_{i2} I_{i2} \ldots\ldots\ldots b_{iw} I_{iw} \qquad (4)$$

where a_i is the sum of the fixed expense allocated to channel i, and b_{ij} are the variable costs for each of the types of market effort and for the product itself.

Whether extracted from internal records or obtained from outside data sources, the b_{ij} coefficients of equation (4) have as their basis, the existing procedures used in channels, the implicit assumption being that these are the most efficient methods. Clearly, such an assumption bears querying, (Ibid, p.14)[6].

The economic *raison d'être* of distribution channels is an enduring concept despite its obvious shortcomings. Certainly there is nothing intrinsically wrong in wanting to achieve cost minimization or maximum operational efficiency; the problems associated with this approach are related more to what a purely economic focus omits to consider, for example:

1. The cost and efficiency elements of economic models are relatively mechanistic quantities, lacking personality. As a result, such models tend to oversimplify, and do not

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[5] See for example Longman & Schiff (1955); Dobson (1969); Christopher & Ray (1977); Schiff (1972); and a three-year (unpublished) sponsored research programme in distribution costing conducted by J.L. Gattorna, D.L. Ray and other members of the Marketing & Logistics-Systems Research Centre, Cranfield School of Management 1974-77.

[6] The suggested model is also linear and additive. However, costs may not necessarily be apportioned in this way. For example, advertising may serve to 'sell-in' or have a product accepted by retailers in the channel, but not function at the consumer level. Thus, at which level does one allocate costs? How is revenue calculated if advertising is working at the channel level but not at the consumer level? The effects of such a promotional campaign may well be both non-linear and non-additive.

therefore provide even a hint of the social constraints surrounding the achievement of economies in a channel sequence.

2. There are also serious practical problems associated with the economic approach. With the emphasis on achieving minimum costs and maximum or optimal efficiency we are led to question how it is possible to know when, in a particular channel configuration and for any given product category, the elusive marginal cost equals marginal revenue condition is reached. Stigler's (1951) notion of functional delegation subsequently refined by Mallen (1973) with his 'functional spin-off' concept largely depends on the ability of channel members to construct cost curves for their various corporate activities in order that decisions may be made regarding which of these activities should be placed with external (facilitating) agencies such as wholesalers, professional distribution service companies etc.. In practice, this 'delegation' does occur but decisions are mostly taken in the absence of adequate hard cost information. Despite much research in the distribution costing area, current accounting systems are simply not sensitive enough to make such fine judgements. McCammon and Little (1965) are among the few channel theorists who have openly acknowledged the difficulties associated with measuring costs and constructing cost curves for specific activities in order to meet the requirements inherent in any purely economic motive underlying channel design.

3. Even if we accept that the practical problems of cost measurement, allocation, and monitoring can be surmounted, we may still be making the implicit assumption that cost and efficiency considerations are the only important factors in a distribution channel. This is perhaps the most serious shortcoming of using a purely economic rationale for channels; it simply avoids the very real possibility that other <u>strategic</u> considerations may in certain cases, be of primary importance. For any number of marketing reasons, maintenance of market

share for instance, it may be preferable to operate a relatively costly distribution service for short or longer term periods. The spin-off benefits may appear elsewhere in the corporate structure of a channel member adopting such a strategy. In some cases, survival may be at stake in the face of intense competitive action mounted by rival channels. Changes may be taking place in an industry which dictate a holding action in the short term and adaptive behaviour in the longer term[7]. Unfortunately, many channel theorists, certainly the earlier ones, seemed to start with the assumption that a minimum cost/maximum efficiency objective was essential in all circumstances. Consequently they devoted all their energies to the search for ways to achieve a condition where market requirements are met at minimum cost. In other words, external environmental influences were virtually ignored or at best, taken as fixed. Schary (1972, p.20) supports this assessment. Certainly, any future conceptualizations offered should at the very least,attempt to correct this serious shortfall in the theory and corresponding major disparity with reality.

4. The traditionally heavy emphasis on cost economies has in practical terms led managers to modify their existing distribution systems using a piecemeal rather than global approach[8]. In the latter case we would expect everything that is currently being done to be questioned and either retained or changed. In fact what usually happens is that certain aspects of a distribution channel are put under the microscope and

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[7] The early success of the Sears Roebuck and Company pattern of mail-order distribution in the U.S. is an outstanding case of positive responsiveness to changing environmental conditions; refer McDonald (1964).

[8] Empirical work undertaken by Beattie (1973) is one of only a few recorded cases in the literature where the dual approach of refinements to an existing distribution channel versus a completely new approach were tested and compared.

progressively refined without any overall master plan for the total channel. The potential dangers are quite clear - competitors may emerge using a completely new channel structure and pose a serious threat. The worldwide growth of Avon with its direct door-to-door sales/distribution systems is a classic example of what can possibly happen.

In summary then, it is evident that economic theorists working in the marketing channels area have traditionally tended to take an economic perspective without due allowance for other non-economic issues; they have effectively considered their speciality in isolation. This is understandable to some extent because many of the early managerial economists were interested solely in the economics of the firm *per se*, treating it almost as a closed system and largely ignoring environmental forces outside the firm and the corresponding tradeoffs inherently available.

In their preoccupation with cost and efficiency factors at the firm level, economists have largely neglected the fundamental issues so important to the development of a coherent and realistic channels model, e.g.

1. How is a fully effective channel achieved? Surely there are structural and social considerations.
2. What does 'efficiency' in a channels context really mean? Surely the cost economy notion is too narrow, particularly if circumstances demand alternative strategies.

We would disagree with the assertion by McCammon and Little (1965, p.342) that economists have "... developed an important frame of reference for explaining and predicting the nature of interfirm alignments ...". At best their contribution is the provision of a part explanation because the functional delegation notion developed by Stigler (1951) is only one of a number of factors which bear upon the formation of inter-firm alignments; strategic and behavioural factors are equally important. A similar comment could be made about the predictive value of any solely economic rationale.

Significantly, in a later paper, McCammon et al (1971, pp.335, 338) appear to hedge away from their previous claim, arguing that because many of the economic models proposed have not in fact been tested under actual

operating situations, their potential for explaining and predicting business behaviour has not been fully ascertained or realized.

Boiled down, the economic school offers little more than the truism that to survive a firm should generate revenues greater than its costs, adding the rider that the differential should be maximized. This is equivalent to saying that to stay alive we must eat.

We would not question that the notion of cost minimization/ efficiency maximization is essential to successful channels design. However, too much of the literature places undue emphasis on this aspect to the detriment of other considerations. Is the economic dimension that all-pervading? If a company (channel member) is involved in developing a strategy for survival, efficiency is not as essential as the basic need for total revenues to simply outpace costs.

Efficiency is a relative or derived rather than fundamental quantity which in many circumstances may prove to be a useful subsidiary measure of performance, but it should not be allowed to outshine other major strategic type considerations such as channel organization, intra-channel relationships etc.. Certainly, investigation of efficiency in a channel is unlikely to warrant a full scale investigation in its own right. If for example a channel member is powerful enough, that organization may well be in a position to dictate and control to a large extent, the competitive environment in which it operates and thereby reduce many of the usual uncertainties. In such a situation where is the incentive to go on increasing efficiency?[9]

We will now continue the review of other conceptual approaches from the discussion platform developed above; it will soon be obvious that the economic rationale is evident in all of them, including the behavioural school.

Institutional

Despite the heavy emphasis on the institutional aspect in the channels literature, the institutional school, like most other conceptual

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[9] An extreme example of this situation is that of monopolistic competition, and the point being made about lack of incentive to go on increasing efficiency is supported by experience throughout the world with public transport systems.

approaches, is not self-contained. In particular, institutional arguments appear to be underpinned by micro-economic considerations and in many cases are difficult to separate from the functional approach which will be considered next. Indeed, it is difficult to find any discussion of marketing institutions which is unaccompanied by references to the functions they perform. This situation is amply reflected by Dommermuth and Andersen (1969, p.51) who maintain that "a marketing institution acquires its particular designation of retailer, commission merchant, food broker ... because of what it does - the functions it performs."

One reason offered for this almost universal association of institutions and functions is that "... because institutions are more visible than their functions, ... a common reaction evoked by the term channel of distribution is visualization of a sequence of institutions, generally middlemen, rather than a sequence of functions in a systems framework", (Ibid). Nevertheless, in the following review of the role of institutions in channels of distribution, the overlap with other schools will be confined to that which is essential for understanding.

A wide variety of interpretations are available in the literature on the issue of what constitutes a channel of distribution. However, until relatively recently most definitions have heavily emphasized the institutional aspect despite considerable differences of opinion on other issues.

The traditional concept is one which depicts a channel as simply a combination and sequence of physical agencies through which various marketing flows (specifically goods and information) move, and physical exchange occurs between production and consumption points. This interpretation tends to focus on intermediaries to the exclusion of producers and consumers, and envisions a loose coalition of member firms rather than a tightly integrated set of firms, (Vaile, Grether, & Cox 1952, pp.113, 121; Alderson, 1954; Alderson 1957, p.211; Howard 1957, p.179; Converse, Huegy, & Mitchell, 1958, p.119; Clewett, 1961; Balderston, 1964, p.176; Bucklin, 1960, p.379; Bucklin, 1971, p.1).

The actual length of the channel is one area of contention. Whereas the above quoted sources exclude producers and consumers from their definition, Davidson (1967, p.263) puts the case for including both end parties. Bucklin (1960, p.64) and Goble and Shaw (1975, p.283) both include the manufacturing party but not the consumer.

The other major area of disagreement concerns whether or not facilitating agencies[10], who do not generally take title, should be included within the scope of the channel definition. The case for making title flow an essential part of any channel definition (and by implication excluding facilitating agencies), is argued by a number of channel theorists, (Frey, 1965; Definitions Committee of American Marketing Association, quoted in Bucklin 1966, p.3; Stanton, 1967, p.252; Beckman and Davidson, 1967, p.230; Lewis, 1968, p.3; Walker, 1970, p.5; Fox, 1970, p.16). On the contrary, McCammon and Little (1965, p.326) and Goble and Shaw (1975, p.283) argue for inclusion of non-title taking facilitating agencies.

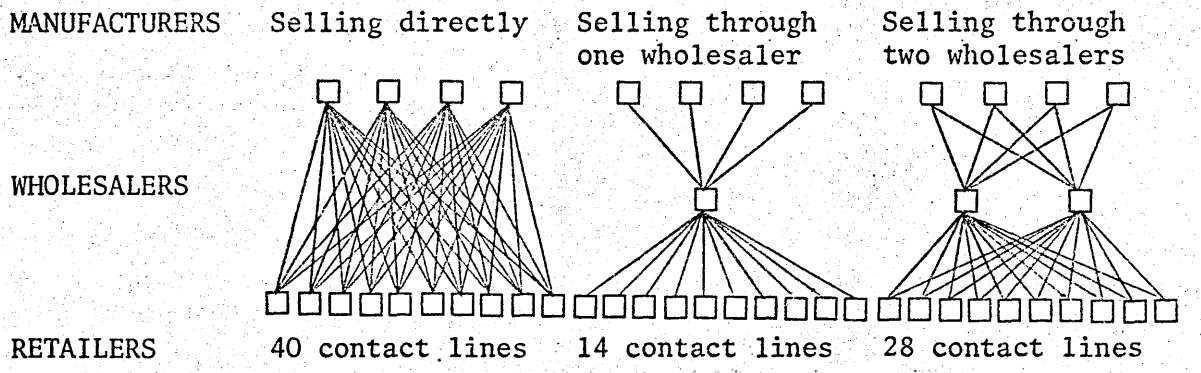
Why do intermediary institutions exist at all? As if in response to this question, one observer makes the point that intermediate institutions will, and do only exist in the longer term if their contribution to increased efficiency in the channel is sustained, (Schary, 1970, p.133). In a later article Schary (1972) expands on this view, claiming that "the intermediary improves the efficiency of the system by increasing utilization of the specialized resource". Exchange through intermediaries is said to arise out of considerations of efficiency (Alderson 1954, p.37). McCammon and Little (1965, p.358) describe this process as 'transactional proficiency', a phrase which describes the non-physical contactual role of intermediate institutions between producers and consumers.

Artle and Berglund (1959) provide a simple example which demonstrates the contactual rationale of channel intermediaries in reducing the number of transactions. Their essay, which focusses on the selling function, purports to clarify some of the considerations which underlie a manufacturer's choice of distribution channel. The numbers, which are illustrated diagrammatically on the following page, are impressive but there are severe limitations with their approach, namely, that it over

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[10] These may include financial institutions, common carriers, distribution service companies, public warehouses, advertising agencies, advertising media, and other providers of business services. A number of these may be involved in the physical exchange act without taking title, e.g. common carriers, distribution service companies, and public warehouses.

simplifies what in actuality is a complex situation.[11]



In the somewhat wider context of channel selection, Baligh and Richartz (1966, p.454) adopt the view that the optimizing decisions which an intermediary firm engages in, actually requires its membership in the channel.

Another factor which helps to explain why a sequence of marketing agencies hangs together in such a way as to deserve the designation 'channel' is the opportunity to minimize costs through routinization[12] of transactions between different levels. This approach is said to be made possible through the mutual confidence present between vertically related channel members, (Alderson op cit, p.40).

The intervention of middlemen in distribution channels is therefore justified largely on economic grounds. It is claimed that intermediary traders "... create time, place, and possession utility because transactions can be carried out at lower cost through them than through direct exchange," (Ibid, p.39). Retailers and wholesalers create time utility simply by holding stocks of goods available to be drawn upon by end users, the consumers.

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[11] In essence, their example involves 4 manufacturers and 10 retailers, the aim being to demonstrate how the number of contact lines vary according to the number of wholesale intermediaries inserted between the two end groups, e.g. 40 contact lines if sales are effected on a fully direct basis, reducing to 14 with one wholesaler present, 28 if two are present, etc.. This approach is obviously fairly crude because it fails to differentiate between the various types of contact lines in terms of cost, functions, and other properties; this weakness is however acknowledged by Artle and Berglund, (Ibid).

[12] Procedures designed in such a way as to obviate the need for specifying in detail what is wanted for every successive purchase of the same article.

It is possible that the most convenient or efficient association of goods may change at various stages in the channel. This has been recognized and embodied in Craig and Gabler's (1940) 'discrepancy of assortment' concept. For example, goods may be associated for efficiency in transportation because of commonalities in physical handling characteristics, origin, and destination. Similarly, goods may be associated for storage because of their storage time characteristics, or the conditions under which they have to be stored. However, the requirements inherent in the discrepancy of assortment concept tends to limit the degree of vertical integration in marketing channels. For example, retailers will typically rely on many different wholesale sources for the products within their entire range, and in addition, many of these products will require quite different storage and handling procedures at the wholesale level. The potential for vertical integration from manufacturer through wholesaler to retail distributor is therefore limited.

The discussion so far has tended to emphasize the transactional efficiencies available in channels through the use of intermediate middlemen. A somewhat similar argument applies to the other major role of intermediaries, i.e. the efficient (physical) exchange of goods. In this regard Bowersox (1975, p.289) highlights their potential. His view is that "by achieving time and place utility, exchange can enhance transaction capabilities." In effect he is saying that efficient physical distribution can be a significant factor in achieving sales penetration. Several studies have reflected this distribution service orientation, (see for example Stewart, 1965; Staudt & Taylor, 1965; Christofides & Watson-Gandy, 1973; Christopher & Wills, 1973/74; Cunningham & Hardy, 1974; Johnson & Parker, 1961; Willett & Stephenson, 1969).

In regard to distribution structure, the vertical and horizontal dimensions of channels served by intermediaries have come under extensive discussion in the literature. Typically, the vertical dimension is viewed as the route that title to a product takes in its movement from producer to consumer. Bucklin (1971, p.3) categorizes channel types by the number of levels present, e.g. the two-level model involves direct transfer between producer and retailer; the three-level model includes one wholesaler. The horizontal dimension is essentially the number and kinds of firms which operate particular levels in a given channel type.

Again, Bucklin (Ibid, p.5) uses the economic argument in attempting to explain how the two dimensions are organized. For example regarding the physical movement of goods in the vertical dimension, where producers and retailers are capable of dealing with large lot sizes, the cost per unit of distributing goods in a two-level channel are expected to be relatively low. With small lot sizes, a two-level channel will usually generate high distribution costs because of the higher unit costs for each contact. According to Bucklin (Ibid, p.6), "additional levels are required to concentrate the flows from a variety of producers into assortments of sufficient size to qualify for the transport savings in moving goods in volume".

Balderston (1958) attempted to develop, under simplifying assumptions, the ideal concept of optimal structure in intermediate markets using various communication network models.[13] He envisioned the principal function of the wholesaler as one of serving as a switchboard in a communication network between suppliers and their end customers, (Ibid, p.155). However, the various models he developed proved inconclusive.

Aspinwall's (1962) 'depot theory', initially formulated about 1945, was perhaps the first genuine attempt to explain the organizational structure of wholesaling institutions although it specifically dealt with the growing trend to manufacturers' wholesale branches at that time and the corresponding decline of general line wholesaling institutions.

The depot theory focussed on "the performance of all direct and supporting storage, handling, and transportation activities performed by middlemen in the channel of distribution, on an actual cost of service basis ...", (Ibid, p.652).

In a highly developed society, the constituents of any finished good will typically move through a number of channels, each linked sequentially. In such situations, the constituent materials may be bought and sold many times. Cox and Goodman (1956), in one of the few empirical studies of its kind, traced the path of wood in certain types

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[13] Balderston (1958) defined optimal structure as "... the proper adjustment of the number and types of intermediary agency, to the number and types of supplier, to the number and types of customer, and to the type of marketing task which is called for by the characteristics of the commodity", (Ibid, p.155).

of mill work through up to twenty transactions and thirty-three business agencies. Recognizing that some basic commodities such as sand and stone may be subject to only a single transaction in moving between two channel agencies, it is important to understand why different intermediary organizations exist for different products (and on occasions, the same product). Bucklin (1971, p.2) offers the stock answer that the difference generally "... reflects the adaption of channel organizations to different requirements for both processing and distribution, adaptions necessitated by the pressures of competition to attain the most efficient route".

A significant weakness of the institutional approach is that it does not reveal anything about the evolution of channels, e.g. how and why firms became involved in a particular arrangement? Baligh and Richartz (1966, p.455) comment that the buying and selling functions of channel intermediaries implies membership in some form of vertical marketing system, but agree that this membership has not been adequately explained.

It is also true that the current body of channels literature tends to over-simplify what is in fact an intrinsically complex network of institutions. Pictorial representations of the type found in Bucklin (1971, p.3a) are grossly misleading, as are most other attempts in the literature to present a schematic diagram of distribution channels. Quite simply, they give no insight into the very real complexities present. McCammon and Little (1965, p.327) are obviously aware of this shortcoming judging by their comment that "conventional analysis and description of marketing channels oversimplifies reality and obscures the nature and complexity of interfirm alignments."

In addition, this method of presentation and the accompanying descriptions, by implication, tend to treat the channel as a 'closed' system. Virtually nowhere in the literature can we find a discussion of the inputs to the channel mechanism, for example, via procurement and other outside sources or influences; and little more attention is given to the output end, i.e. the consumers. Clearly, more emphasis needs to be placed on environmental factors acting on the channel as a whole, and on the individual member firms within the overall channel framework.

Given that the institutional mechanism for dispersing goods in a free economy is the marketing channel, why has it been neglected? Following McCammon and Little (1965, p.321), two possible explanations are offered, both of which carry inferences well beyond the channels context in which they are used here.

1. Marketing scholars have been primarily interested in the theory of the firm. Hence in some analyses, the firm is implicitly assumed to operate in a quasi-vacuum, so little or scant attention has been paid to the environment within which it operates, or to relationships with other firms. Thus the primary system of which the firm is a member - its marketing channel - has received little attention.
2. Marketing channels have been neglected as a separate area of inquiry because their true complexity has discouraged investigators. This situation has been compounded because numerous theorists have investigated only selected aspects of channel behaviour in isolation.

Despite the empirical work of Cox and Goodman (1956), Cox, Goodman, and Fichtandler (1965), and others, we are still no closer to a fundamental understanding of why channels, sometimes in the same industry, have different numbers and sequences of intermediate agencies.

The economic underpinning of the institutional school of thought is perhaps its most important property; the drive for transactional and exchange efficiencies are essential to this approach. Taken in itself, this is not limiting, but it gives us an incomplete picture, and is perhaps somewhat hypothetical. The extreme case of a large number of contacts (N) in a distribution channel network has never been, nor is likely to be ever tested - it is just intuitively accepted by most writers that a system without intermediary participation would be less economical.

A system without any intermediaries at all would, we agree, be too richly connected, too complex, and perhaps intrinsically unstable because of this.[14] The response to this unacceptable alternative appears to have been the evolution of intermediaries but very much introduced according to 'natural law' rather than an overall scheme or set of

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[14] This theme will be more fully explored in Chapter III during the development of a new conceptual approach to channels, one of the core undertakings of this thesis.

underlying principles.[15] Certainly, it is conceded that in most circumstances intermediary participation will increase operational efficiencies, but surely anything is more efficient than the unmanageable chaos of a system which operates on the basis of full contact between all parties involved. What we do not know is where the equilibrium point is in terms of numbers of intermediaries; Balderston (1958) has come closest to determining this, at least conceptually.

In summary, it is quite apparent that intermediary institutions in the distribution channel exist because of the transactional and exchange economies they allow, albeit in many cases intuitively. However, despite the visible evidence of institutional configurations, very little more is known about this mechanism. Relatively few scholars have attempted to analyze the structure of distributive intermediaries, either empirically or theoretically, and those studies which have been undertaken have proved to be largely descriptive. Despite elaborate analyses of channels as institutional sequencies (e.g. Breyer 1964), many questions still remain unanswered, and a fundamental understanding of the mechanics involved is still an essential prerequisite for achieving viable answers and explanations.

Dommermuth and Andersen (1969, p.51) contend "... that an approach which treats a channel as a functional system rather than an institutional sequence is of greater value in generating ideas about the dynamics of channel structure, efficiency and profitability". In effect, they see the institutional approach as having no major conceptual or analytical value other than to act as a visible facade for the functions contained within institutions at various levels in the channel. Such a position tends to subordinate the channel intermediary's existence as a visible institution to its less visible role as a system functionary. We will now look more closely at this functional conceptualization.

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[15] In biology there is the principle of 'natural selection' via genetic processes to 'explain' the evolution of species. However, there is currently no known deeper level of explanation for channels evolution; the 'efficiency notion' is about as far as channel theorists have progressed to date.

Functional

Goble and Shaw (1975, p.283) warn that if undue attention is focussed on the institutional aspect of channels it is possible that the more important aspect of the functions performed by those institutions will be overlooked. Nevertheless, the marketing functions approach has long been recognized and used by economic and marketing scholars in attempting to conceptualize distribution channel structure, (Butler, 1911; Shaw, 1915; Weld, 1917; Cherington, 1920; Clark, 1922, Breyer, 1934; Converse, 1936). More recently, others have contributed to the extension of this functionalist orientation, (McGarry, 1950; Stigler, 1951; Vaile, Grether & Cox, 1952; Alderson, 1957; McGammon and Little, 1965; Bucklin, 1960 and 1966; Mallen, 1973). Because Dommermuth and Andersen (1969) view the channel as a 'functional system' their contribution will be analyzed under the 'systems' heading in a later section of this chapter.

Following Mallen (1973, p.19), the key elements of the functionalist approach are as follows:-

1. Marketing functions are the various types of job tasks or activities which channel members undertake.
2. These functions can be allocated in different mixes to different channel members.
3. The functional mixes will be patterned in a way which provides the greatest profit either to the consumer (in the form of lower prices and/or more convenience), or the channel members with the most power (which depends on market structure).
4. Should one or more channel members (or potential members) see an opportunity to change the functional mix of the channel in order to increase his profits, he will attempt to do so.[16]

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[16] See Chapter V. The introduction of cage pallets by major U.K. food industry retail multiples in 1974 provides a good example of this tendency, because certain functions/tasks and their associated costs were moved back up the channel towards the manufacturing sector. In this particular example however, it is doubtful that the scale and permanency of the change was significant enough to alter the existing institutional arrangement.

5. Should the attempt be successful, and if the functional mix change is big enough, it will (by definition) change the institutional arrangement in the channel, i.e. the channel structure.

The channel functionalist attempts to answer the two fundamental questions:

1. What is the most efficient functional mix in a given situation, and
2. How will this functional mix affect and influence channel structural arrangements?

Clearly, the drive for economic efficiency is again central to this approach. In fact, the fundamental premise of Mallen's (Ibid) paper is that for a given demand level, "... firms will try to maximize profits by designing or selecting a channel which will generate the lowest total average costs for their organizations".

Mallen (Ibid) postulates the following four dimensions of distribution structure as those for which change can be anticipated, i.e.

1. The number of channel levels.
2. The number of channels (whether two or more channel types should be used).
3. The types of middlemen that will evolve.
4. The number of middlemen that will develop at each level.

Further, Mallen (Ibid) contends that the apparent drive for efficiency and its anticipated effects on the above four dimensions can be evaluated through his concept of 'functional spin-off', a refinement of Stigler's original 1951 work. In essence, Mallen (Ibid, p.20) suggests that "it is economically beneficial to spin-off to marketing specialists, those distributive functions which have a decreasing curve as volume increases when the firm has a relatively small volume".

Bucklin (1960) attempted to construct a general theory of channel organization with predictive capacity, the basis of which lay anchored in the synthesis of two familiar concepts - the typology of marketing functions, and the theory of the firm. It was Bucklin's expectation that such a general theory might explain:

1. Why five different types of institutions are found in a channel for one good, while ten or twelve make up the channel for another.

2. Why two different channel structures exist for the same good.
3. What changes in existing channels for some commodity should be expected in the future, (Ibid, p.63).

In addition, Bucklin expressed the opinion that "such a theory should also be capable of throwing some light upon the kinds of relationships one finds among firms in a channel", (Ibid). Bucklin adopts the premise that since the structure of a distribution channel is formed by "a set of institutions performing certain kinds of work[17], the basis for any theory must lie in a methodology which can identify the kinds of work being performed by each institution", (Ibid).

Here he runs into difficulties because he finds there is little common ground among theorists as to how many functions[18] there are, and which activities each function should encompass. He is therefore forced to construct a new set for the purposes of his own theory, and to do this he established four criteria against which to evaluate different groupings of marketing activities. These criteria are reproduced below:

1. The activities included in each function must be so related as to make it necessary for some firm to organize and direct the performance of either all of them or none of them.
2. The activities must have sufficient scope as to make it possible for the firm to specialize in them to the exclusion of all others.
3. The activities should incur substantial costs.
4. Each marketing activity must be placed in one function and in one function only, (Ibid).

The functions he found which met the above criteria were:

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[17] Presumably he is referring to the tasks or activities which constitute certain 'functions'.

[18] For example, Kotler (1967, p.391) lists six channel functions - contactual, merchandising, pricing, propaganda, physical distribution, and termination; Dommermuth and Andersen (1969, p.52) list four, i.e. transportation, inventory, promotion, transactions; and Davidson (1967, p.263) lists six functions, i.e. exchange, buying, selling, transportation, storage and facilitating.

1. Transit (T) - All activities required to move goods between two points.
2. Inventory (I) - All activities required to move goods in and out of storage, sort, and store them.
3. Search (S) - All activities required to communicate offers to buy and sell, and transfer title.
4. Persuasion (P) - Activities incurred to influence the beliefs of a buyer or seller.
5. Production (Pr) - Activities necessary to create a good with any desired set of specifications, (Ibid).

Bucklin justifies inclusion of the production function on the basis that many marketing activities are practically inseparably related to production costs, (Ibid, p.64). He also makes the key point that the general characteristics of the production process has a significant influence on channel structure, (Ibid).

Bucklin claims that through the use of the set of functions outlined above, the manufacturer-wholesaler-retailer channel may be symbolically illustrated as follows:

(Pr I T S P)⟶(S I T S P)⟶(S I S P)⟵(S T I C)[19]

The manufacturer under this scheme is seen to be performing all five marketing functions, the wholesaler four, but he has to search twice, i.e. once to contact manufacturers, and once to contact retailers.

The (S T I C) grouping represents the consumer (C), who, although not a channel institution has an important role because his rate of use will materially influence the operating characteristics of other channel functions, and on occasions he may also integrate with a number of other functions that have previously been performed by other channel institutions.[20]

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[19] The arrows connecting the institutional symbols represent the direction of search.

[20] This happened with the introduction of self-service into retail institutions; consumers effectively performed some of the services for themselves which had previously been the responsibility of store staff, e.g. selection from shelves, carriage from store, etc.,

Bucklin's approach amounts to a systematic means for identifying channel structure according to his definition of structure. However, he acknowledges that in terms of analytic content, "it pushes no further than previous functional concepts", (Ibid, p.64).

Bucklin's specific contribution therefore is the suggestion that an advance will be achieved if it can be determined that a particular function should be operated independently, or integrated with others. Quantification of the economic characteristics of functions necessary to accomplish this task, he suggests, can be obtained through an analysis of the factors which control average costs of the activities performed within each function. Cost curves for institutions performing several functions may then be derived by aggregating the costs of each function. He posits that "integration will only occur when the cost of operating two or more of the required functions by a single firm is less, or at least no greater, than when they are undertaken by separate firms", (Ibid, p.66). This approach looks very similar to the concepts embodied in Stigler's (1951) and Mallen's (1973) work already discussed.

The predictive dimension of this methodology, that is, determination of what channel structure should be or is likely to be in the future led Bucklin to introduce his concept of a 'normative' or ideal channel[21], and then to predict what normative channel fits the economic conditions expected to prevail in the future, (Bucklin, 1960, p.64). By using the normative channel concept as a bench mark he posits that the behaviour of firms in real world (extant) channels operating under varying macro-economic conditions can be understood and explained, (Ibid, p.65).

Bucklin's normative channel is a theoretical predictor of channel structure, i.e. given a static environment (or channel in fully adapted mode), consideration of the internal economies of a channel will assist

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[21] A 'normative' channel is that which would exist if all institutions in the extant (or real world) channel, and all potential entrants, were fully adapted to economic conditions such that there would be no tendency for new firms to enter, old ones to exit or to shift functions among themselves. In effect it is a wholly theoretical or ideal concept embodying the idea of static conditions and therefore unlikely to occur in practice. It also appears to be similar to the long run equilibrium concept embodied in the economic theory of the firm.

prediction of channel structure at some future time (t_i), merely through a process of logical and economically rational progression. At that point in time (t_i), the extant or actual channel will have an observed structure which varies from that predicted. The difference in structure provides a measure of the environmental forces actually present. These forces or pressures continue to exist until change in the extant channel causes its structure to conform to that of the normative, or until the forces themselves change. A study of the normative channel consequently becomes the key, albeit indirect, to comprehending the behaviour of firms in the extant channel.

Bucklin's approach at the very least shows a pleasing awareness of the exogenous environmental factors in the form of economic, social, and political forces which operate on and influence the pattern of channel structure, and his attempt to simplify the analysis by introducing the notion of a normative channel concept is commendable. However, we are still left with the very real problems of quantifying the various functional cost curves in practice and so far this has not been a viable proposition because of the dynamic changing nature of the market and the generally backward state-of-the-art in management cost accounting.

Whereas the work of most contemporary writers in developing our understanding of the functions performed within the distribution channel has been of mixed value, there is little doubt that Alderson's (1949; 1954; 1957) study of wholesale intermediaries and his notion of an 'intermediate sort' represents a seminal and invaluable contribution. Along with Banks (1951), we find it difficult to understand why Alderson's work has not been more thoroughly explored and applied to the task of explaining channel mechanics.[22]

Alderson's work began after Stigler's (1947) fundamental postulate that economic activity consists in the allocation of scarce resources to the pursuit of desired objectives, and Zipf's (1949) explanation of the same basic concept in terms of economic activity matching tools and jobs.

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[22] I am grateful to Dr. Stanley Glaser for relaying to me a comment made to him in conversation by Professor F.M. Bass of Purdue University, the suggestion being that few channel theorists at the time really understood what Alderson was saying in his various writings. If this is a correct assessment it would seem Alderson's ideas were unfortunately 'before their time'.

Alderson understood the term 'matching' to have broader implications than Stigler's term 'allocation'; whereas allocation tended to imply purely quantitative adjustments, matching implied recognition that segments of demand and segments of supply are quite specific, (Alderson, 1949, p.150). In particular, he saw in the notion of matching supply and demand, a qualitative aspect which the economist appears to take for granted "... so that he can get on with his quantitative analysis", (Ibid). It was Alderson's contention that this qualitative aspect of matching should be made more explicit in order to provide an adequate perspective of the marketing process. For this reason Alderson divided it into three phases - shaping, sorting, and fitting.

According to Alderson (Ibid):

> The shaping of materials to serve particular functions is what takes place in ... production.
>
> The fitting of a product already fabricated to the specific needs of the individual or the use situation is characteristic of the service trades and many aspects of retailing.
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> ... sorting is the aspect of matching which is most characteristic of distribution and particularly of wholesaling. By sorting is meant the matching of supply and demand by manipulating products which have already been fabricated and without altering them in any way except to place them in the possession of the persons who demand them.

In effect then, Alderson envisioned the distribution function in its purest form exhibited in wholesaling as the function of sorting.

In a later paper Alderson (1954) named the four processes which he considered constituted the sorting function; processes fundamental to the adjustment effected as goods moved through marketing channels. Following Alderson (Ibid, p.38) these are:-

Sorting Out	:	Breaking down a heterogeneous supply into separate stocks which are relatively homogeneous.
Accumulation	:	Bringing similar stocks together into a larger homogeneous supply.

Allocation	:	Breaking a homogeneous supply down into smaller and smaller lots. Allocation at the wholesale level is sometimes termed 'breaking-bulk'.
Assorting	:	Building up assortments of items for use in association with each other. Both industrial and consumer buyers enter the market for the purpose of building up assortments.

Wholesaling is a manifestation of sorting as an essential marketing process. Goods are received from numerous suppliers and delivered to numerous customers, the essence of the operation being to transform diversified supplies into outgoing assortments for the use of customers further down the channel. The justification for an independent wholesaling operation therefore rests largely on the ratio of advantage growing out of the intermediate sort function, (Ibid, p.39). Again, viability is seen to be primarily an economic issue. Accordingly, the channel is used to overcome discrepancies of quantity and assortment through the application of scale economies and skill, (Fisk, 1967, p.298; Fox, 1970, p.24).

The functional conceptualization of channels, encompassing micro-economic and institutional schools of thought, is certainly the most useful contribution so far reviewed. Nevertheless, despite the work of Alderson, Bucklin, Mallen and others, there are fundamental weaknesses inherent in this approach.

Teleological (or functional) explanations generally "... take the form of indicating one or more functions (or even dysfunctions) that a unit performs in maintaining or realizing certain traits of a system to which the unit belongs, or of stating the instrumental role an action plays in bringing about some goal", (Nagel, 1961 pp.23, 24).

For example[23], an explanation of the function of the lungs in the human body usually draws attention to the indispensability of oxygen for the combustion of food substances in the body and the instrumental role of the lungs in conveying oxygen from the air to the blood and hence to

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[23] I am indebted to Dr. Stanley Glaser for drawing my attention to this example.

various cells of the organism. This explanation therefore describes the operation of the lungs as essential for the maintenance of certain biological activities. In doing so it (the explanation) exhibits a *prima facie* distinctive form and does not explicitly mention the conditions under which the complex events called 'the operation of the lungs' occur; instead this type of explanation describes the way in which the lungs, as a specially organized part of the human body, contribute to the continuance of some of the other activities of the body, (Nagel, 1961, pp.19, 20).

Functional explanations therefore suffer the considerable shortcoming of being unable to distinguish between the various possible mechanisms which may potentially be capable of achieving the 'observed' outcome. In the particular context of this discussion, the 'observed' outcome is the flow of goods and title through the channel from producer to consumer. To reach the explanatory level it is essential to understand more about the specific mechanism(s) involved; simply observing and describing the outcome is not adequate, particularly as these mechanisms are liable to change over time under the influence of innovatory and other environmental pressures.

Of the channel theorists, Schary (1972, p.9) appears to come closest to understanding what is entailed in finding a valid explanation of distribution channel mechanics, when he comments that "... while the channel may be described as an organization of enterprises and functions, this does not describe the functional purpose of the channel as an entity".

Apart from the persistent use of the micro-economic argument to explain why certain functions within institutions arise at various locations within the channel, and the seminal notions developed by Alderson, progress towards a valid explanation of distribution channel mechanics has not advanced much further with this school of thought. It is true also that despite claims to the contrary, the combined efforts of Bucklin (1960) and Mallen (1973) are not sufficient to warrant the designation of 'predictive' model to any of the conceptual schemes offered so far.

Organizational

Despite the fact that organizational theorists have taken a more eclectic approach in their investigation of marketing institutions, they

have nevertheless tended to confine their attention to behaviour within firms rather than between firms. Consequently, the potential utility of organizational theory as a vehicle for explaining inter-firm alignments has largely been unexplored and unrealized to date.

Of the three branches of organizational theory, namely bureaucratic theory, dynamic organizational theory, and administrative theory, only the latter has found direct application in the distribution channels literature, chiefly through the agency of Ridgeway (1957).

The origins of administrative theory may be found in the scientific management movement of the early 20th Century. Proponents such as Taylor (1911), and Gilbreth (1912), were primarily interested in improving the efficiency of relatively small closed systems (departments) within the firm. The scope of the movement was subsequently broadened considerably by contemporary administrative theorists to encompass large complex organizations.

Like the bureaucratic theorists, administrative theorists concentrated on describing and improving performance at the individual firm level rather than the interfirm networks of which they formed part. This preoccupation with the problems of internal organization generally "failed to show how the firm is connected to its environment via externally organized linkages", (Berg, 1962, p.482). Accordingly, this emphasis has largely been responsible for the development of an unnatural cleavage between internal and external aspects of structure in the management literature, (Ibid). In marked contrast, marketing theorists took the opposite stance and have been preoccupied with environmental forces and external trading channels "without clarifying how those tie into problems of internal administration and organization", (Ibid, p.483).

Ridgeway (1957) was the first of the administrative theorists to extend the findings of Barnard, March, Simon, Cyert, and others.[24] It was Ridgeway's (1957 p.483) contention that "a manufacturer and his dealers make up a competitive system which is in need of administration much as is a single organization". In effect he was suggesting that the body of theory and research accumulated for the purpose of understanding

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[24] For examples of their work see Simon (1957); March & Simon (1958); Barnard (1958); Cyert & March (1963).

administrative processes within single organizations could be extended to take in the inter-organizational situation, i.e. "in order for the system [manufacturers and their distributors] to operate effectively as an integrated whole, there must be some administration of the system as a whole[25], not merely administration of the separate organizations within that system", (Ibid, p.466). Recognition of this possibility was in essence the core contribution of the organizational school to the channels literature. The suggestion that members of a channel should behave in concerted fashion to assure its survival, and indeed to become an effective competitor against other channels has since been proposed by a number of channel theorists, for example Berg (1962), Mallen (1969), McCammon and Little (1965), and Stern (1965).

Although the organizational approach brought a new dimension to the search for an understanding of channel mechanics, and a valuable one, a number of problems are immediately recognizable. Specifically, the problem of divided loyalties between member firms is forseen as a major stumbling block. In fact, Rosenberg and Stern (1970, p.41) considered that the feasibility of administering a channel as a system "depends on each firm's commitment to the system's survival".

For Alderson (1965, p.44), "the real question is whether either side would assume any substantial costs or risks to ensure the survival of the other side". Certainly, McDonald (1964) adopted the opposite viewpoint, i.e. that distribution channels "... outside the company, and beyond managements' direct control ... cannot be administered ...", (Ibid, p.30).

The organizational school through the agency of contemporary administrative theorists showed an awareness of the need to 'manage' a collection of firms in a channel alignment, as an integrated whole. In this regard the movement was a forerunner to the 'systems' school. Despite some concern for conflict considerations evident in the work of March and Simon (1958), the driving motive behind this school of thought is clearly economic and in this respect it differs little from its predecessors.

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[25] About the same time (1957), Davidson and McCarthy used the term 'channel captain' to identify the leadership role of a single enterprise which is attempting to 'administer' the channel; see Fisk (1961, p.210) for a full description of this concept.

Systems

Perhaps the first use of the 'system' notion in a marketing context may be attributed to Clark who originally suggested that marketing activities could be viewed as a 'process', (Mackenzie and Nicosia, 1968, p.16). In this regard, it is Glaser's (1976, p.1) assessment that "Clark's acknowledgement of the interdependencies of structures and functions which exist within and between organizations appears to have stimulated the systems approach to marketing phenomena that emerged during the fifties and sixties". One such phenomenem was that of marketing (or distribution) channels.

Alderson (1950, 1957) and McCarthy (1957) were two of the earliest contemporary marketing theorists to suggest the possibility of viewing the channel as a 'behaviour system' which changes over time. In particular, Alderson (1957) envisioned the interaction between elements of such behaviour systems as similar to ecological network formations, (Ibid, p.323). However, the contention that marketing channels are organized[26] behaviour systems should not obscure the fact that they often consist of independent and idosyncratic intermediaries. Alderson (1957) and McVey (1960) in their respective analyses, both emphasized this condition as a potential source of disharmony in channel relationships. Alderson subsequently extended this holistic approach by developing a partial theory of marketing which utilized two basic concepts of marketing system behaviour, namely, transactions and transvections[27], (Alderson and Martin, 1965).

Alderson and Martin (1965, p.118) proposed the 'primitives' or fundamental building blocks of their theory as sets, behaviour, and expectations. In particular, the notion of a set as a 'collection of

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[26] However, 'organization' does not necessarily mean harmony, nor does it rule out the potential for conflict emergence.

[27] Whereas 'transactions' describe the successive negotiation of exchange agreements in moving a good through the channel, a 'transvection' is the unit of action or discrete output of the complete sequence of exchanges and transformations that occur in the marketing process. Symbolically then, a transvection could be depicted as Tv = STSTS ... TS where S is a sort and T is a transformation, (Alderson & Martin, 1965, pp.118, 123).

elements' was introduced. In their interpretation these elements were seen to represent either goods or people. This then led to their definition of a 'system' as "... a set consisting of people and the supporting facilities", (Ibid). Further, to qualify as a system, these sets had to necessarily be accompanied by interactions, (Ibid, p.119). In similar vein Bell (1966, p.455) describes channels of distribution as including both components and their interrelationships.

In its broadest sense then, "a system is a set of objects together with relationships between the objects and between their attributes", (Breyer, 1964, p.20). In the specific case of distribution channels, because they are composed of both human beings and machines, they are in effect 'man-machine' systems, (Ibid).

Viewing the channel as an organized behaviour system has distinct advantages, (McCammon and Little, 1965). Such an approach "recognizes that a channel is a purposive and rational assemblage of firms rather than a random collection of enterprises", (Ibid, p.330). It also "emphasizes the existence of co-operative, as well as antagonistic, behaviour within the channel", (Ibid). Perceived as a unique social organism, the channel "reflects the hopes, goals, and aspirations of its participants", (Ibid).

Dommermuth and Andersen (1969) define their understanding of a marketing channel "as a particular or unique system of functional performances", (Ibid, p.51). The institutions which participate are incidental - what is critical is the system design through which the functions can be best performed.

Childerley (1977, p.ii) conceptualizes distribution channels as "social systems with an economic *raison d'être*, treating political and economic factors as subsystems of the main social system".

More recently, Cox and Schutte (1972, p.232) have defined channels as "... an organized network of agencies and institutions which ... perform all the activities required to link producers with users". This definition incorporates the institutional and functional properties of channels already discussed, and is generally supported by Fox (1970, p.30) and Schary (1972, p.21).

Cox and Schutte (1972, p.234) showed an awareness of the dynamic changing nature of channels with their comment that "a channel of

distribution is not a static network". They may not have fully realized the importance of their statement because the time (or temporal) parameter of distribution channels had hitherto mainly been associated with the inventory function only. However, the time parameter should in fact be a key dimension in any conceptual model of distribution channels. Nevertheless, it is clear they apparently understood the need for a more global approach to conceptualizing relationships between parties in the channel,(Ibid, p.236).

It was expected that adoption of systems concepts would succeed in ridding channel analysis of its traditional institutional orientation and hence make "... it possible to speculate more meaningfully about the institutions themselves. New types of marketing firms will continue to develop in relationship to the performance of functions, typically offering an opportunity for improving the input/output ratio of a channel. Systems orientation holds the promise of expediting the development of such firms because its emphasis on functions[28] is less likely to limit one's outlook to the status quo", (Dommermuth and Andersen, 1969, p.56). Unfortunately, these somewhat optimistic aspirations have largely been unrealized to date because of the superficial level at which systems concepts have been applied to marketing in general, and channels in particular. In fact, Cox and Schutte (1972, p.237) consider the systems approach as "... in danger of becoming a superficial 'buzz word' ...".

Glaser (1976, p.1) makes a similar evaluation of the systems approach applied in the wider context of marketing theory. From an extensive review of the literature he finds that in texts which adopt the so called systems approach, "little more than superficial attention is given to the fundamental considerations of the logic and of systems, system-system, and system-environment interactions", (Glaser, Ibid).

The work of Magee (1960), Breyer (1964), Kotler (1967), Adler (1967) and Fisk (1961; 1967) typifies the cursory or shallow treatment afforded the systems approach. In essence, the general concepts involved have not

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[28] We would question the contention that a systems orientation emphasizes functions. On the contrary, the systems orientation would seem to emphasize organization, with functions as a subsidiary consideration.

been adequately transformed into particular meaning for the marketing and distribution channels areas.

Glaser (1976, Ibid) holds the opinion that theorists have been caught up in the semantic confusion of thinking they are adopting the precepts of systems theory but in reality doing nothing more than applying a systematic approach to their various analyses; of course there is a world of difference between the two. This direction may in part have stemmed from a general inability to come to grips with systems theory at a more fundamental level, and partly due to a preoccupation to be systematic in analyzing channels. Significantly, Stern (1971, p.302) expresses the concern that channel organization is often unsystematic.

Perhaps the most searching questioning of the use of the term 'system' to describe various processes in the marketing literature has come from Amstutz (1967). In his opinion, writers "frequently fail to establish even the most rudimentary characteristics of 'systems' with which they are concerned," e.g. are they open or closed, static of dynamic, rigid or adaptive, stable or unstable? What does use of the word 'system' really convey? Is it the description of a particular conceptual framework or is its structure of less concern than the various functions involved? These are the types of queries that he raises, (Ibid, p.300). He concludes that if it is a 'systems approach' which writers are enamoured with, then "more emphasis should be placed on methodology and the specifics of procedure", (Ibid). Answers to some of the questions posed above have been attempted, in many cases, with inconclusive results. McCammon and Little (1965, p.336) make the observation that "channels may be highly unstable systems" with their configuration changing dramatically over time. This type of comment, typical of the 'answers' prevalent in the literature, does little to enhance our knowledge of channel mechanics.

Clearly, an understanding of systems concepts is as vital to the explanation of channel systems as genetic structure is to our comprehension of living systems, i.e. without specifying the basic building blocks and understanding their interaction, our ability to describe, explain, and predict marketing channel phenomena is severely truncated. It seems that the idea of viewing the marketing function and channels of distribution within it as a 'system' has been mooted for many years, but marketing and channel theorists have generally failed to develop this

application to anywhere near the potential it offers. Indeed, considerable damage has been done to the credibility of the systems approach in marketing and channels applications by many writers who have obviously not been fully familiar with the mechanisms at work. In Chapter III, we will develop many of the basic building blocks of systems theory in the process of putting together a conceptual model of distribution channels.

Behavioural

So far we have surveyed several of the major conceptual approaches discernible in the literature, seeking a clearer understanding of how channels of distribution emerge, develop, and evolve. In all cases, one major shortcoming has been evident, i.e. an ignorance of the reality of socio-political behavioural influences in channel networks.

Although the primary concern of this thesis is with patterns of structural arrangements in channels, we recognize behavioural factors cannot be omitted from consideration albeit indirect. Nor for that matter should they receive undue emphasis at the expense of structural issues in the overall scheme of channels operation. As was the case with the approaches already reviewed, this approach adds to our cumulative knowledge of distribution channels.

Judging from the literature which has emerged over the last six years, it has become increasingly apparent that the emphasis has shifted to one of studying channels as behavioural systems, (Schulz, 1971, p.1). Indeed research activity in very recent times clearly indicates a growing awareness that "conduct of channel members as well as performance of channels are affected considerably by the behavioural interactions among channel members ...". The results of such interactions are manifested in various patterns of channel behaviour depending on the mix of behavioural factors present in a particular circumstance; each of these factors will now be reviewed in detail.

Power: According to Balderston (1958), an understanding of power alignments is a necessary prerequisite to the development of channels theory. What then does the notion of 'power' in channels involve? Despite significant contributions by several theorists[29] no generally

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[29] For example see Dahl (1957); Emerson (1962); Harsanyi (1962); Little (1968); Walker (1970); Stern (1971); Dixon & Layton (1971); El-Ansary & Stern (1972); Wilkinson (1972; 1974).

accepted and definitive conceptualization of power yet exists. For the purposes of this thesis we will adopt the El-Ansary and Stern (1972, p.47) definition, i.e. the ability of a channel member "... to control the decision variables in the marketing strategy of any member in a given channel at a different level of distribution". In the context of a complete channel situation, the locus of power in that channel "... is the net result of channel members' attempts to influence each other", (El-Ansary and Robicheaux (1974, p.7). In fact Emerson (1962), Walker (1970), and El-Ansary and Stern (1972) all appear to agree that power is a function of relative channel member dependence. Certainly, the power of the retail sector relative to the manufacturing sector is currently very evident in the U.K. food and grocery industry. It is interesting that Little (1968) used the concept of power as a criterion for excluding the consumer from his notion of the channel as an 'operating system', because he [the consumer] "... lacks the kind of power necessary to alter relationships within the system", and "... is indifferent to the structure of the channel beyond a specific point of exchange", (Ibid, p.2).

How is a power condition achieved? What are its sources? Davidson (1967, p.268) suggests that channel power is achieved through "... the use of sheer economic power, political, or legal means ...". Fox (1970, p.64) asserts that the root source of power is found in the process of institutional change.

Irrespective of source, Stern (1971, p.305) seems convinced that "some form of centralized power is a prerequisite for orderly behaviour within a channel system". However, he also acknowledges that capricious use of power may ultimately be counter-productive, (Ibid, p.306). Schulz (1971, p.2) makes the distinction between use of power and capability of use, i.e. "whenever one member of a system possesses valuable resources needed by another system member, there is necessarily the presence of power regardless of whether power is used or not".

Moyer (1971, p.162) lists a number of determinants of (bargaining) power in the channel; the one relevant to distribution is that of market structure, i.e. the number and size of sellers and buyers. Walker (1970, p.157) agrees that power and its distribution is indeed a structural property.

In his early work developing the concept of power, Dahl (1957) was quick to realize that the main problem was not so much determining its existence, rather, it was one of making comparative measurements, (Ibid, p.205). In this regard, it is signficant that very few attempts have been made to measure power relations empirically in distribution channels[30]; those that there are have mainly used perceived rather than absolute measures of power. Cunningham (1973) attempted to measure the effects of manufacturer imposed change in distribution policy on distributors, but with mixed results. There is obviously important potential in any breakthroughs in the area of power measurement. However, although it is now over two decades since Simon (1953) suggested that magnitude of the power source might well prove to be a useful indicator or index of influence in the channel, little progress has been made towards achieving a viable measurement scheme.

The urgency for a better understanding of the power dimension and its corresponding relationship with conflictful behaviour has long been recognized, (Craig & Gabler, 1940). Developments in the market place, which have followed a worldwide pattern of manufacturer domination giving way in relatively recent times to retailer domination, only tend to accentuate the importance of knowledge in this area. Severe knowledge gaps still persist however, particularly in regard to the relative backwardness of our understanding of the sources of power, its intrinsic nature, the means by which it is exercised, and the effect it has on relationships between the parties involved. The literature tends to describe these issues rather than offer any underlying fundamental explanations. In addition, many writers appear to employ assumptions about channel member motives which cannot be either verified or disproved.

Essentially, the literature relating to power is defective; it tends to adopt an arbitrary (and largely untested) classification scheme for the different 'types' of power which are postulated, and in effect employs tautological explanations whereby observed behaviour is used to explain itself, i.e. observations are made and 'explanations' are

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[30] See for example Beier (1969); Beier & Stern (1969); El-Ansary (1970); El-Ansary & Stern (1972); Wilkinson (1972); and Hunt & Nevin (1974).

offered but these are little more than descriptions of those observations.

It is reasonable to suppose that use of power will emerge as a viable strategy under certain preferred conditions; but what are these conditions? Some channel structures may well be more amenable to the use of power, but what are these likely to be? Or taking the opposite tack, if power is in fact exercised in conditions which do not seem appropriate, perhaps it is not real power we are seeing, only some perceived form?

Most workers in the field have been content to seek various correlates of power, hence the value of their work has been severely limited. Many papers written on the subject are micro-issue orientated and consequently lack an overall purpose. What the literature badly needs is an overall conceptual scheme, part of which would offer an explanation of power alignments in the channel.

Conflict and Co-operation: In both the marketing and organizational theory literature there is a general lack of agreement concerning what is meant by the term 'conflict'; it has been used at various times in the literature to describe:

1. Antecedent conditions of conflictful behaviour, e.g. scarcity of resources, policy differences;
2. Affective states of the individuals involved, e.g. stress, tension, hostility, anxiety;
3. Cognitive states of individuals, e.g. their perception or awareness of conflictful situations; and
4. Conflictful behaviour, ranging from passive resistance to overt aggression, (Pondy, 1967, p.298).

Walker (1970) accepted the concept of the channel as a social system and focussed his attention on the 'conflictful behaviour' aspect which he defined as "any action by one channel member which is inconsistent with the goals[31] and objectives of some other member or members at a different channel level", (Ibid, p.5). Pearson (1971, p.27), building on earlier work by Gettell (1950) adds marginally to the

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[31] These goals may be those of an individual channel member or the common channel objectives pursued by most channel members.

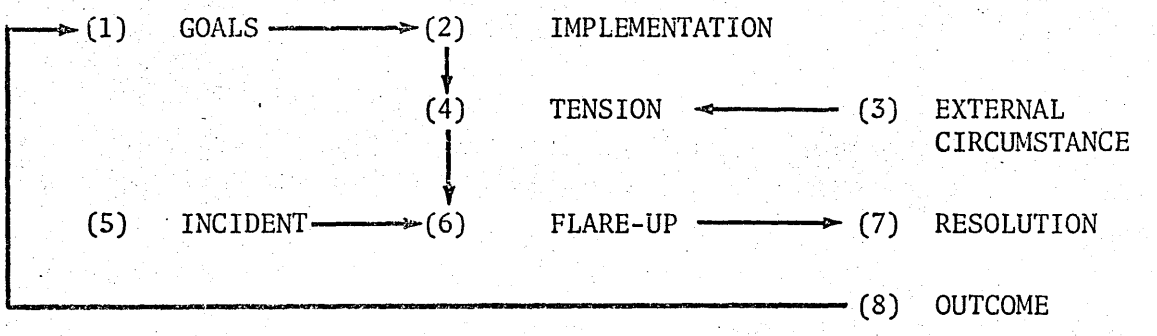
above definition, referring to conflict as the "struggle or clash between individuals or institutes occasioned by differences in opinion, goals, or attitude". A good example of this interpretation would be bigger more powerful members of a channel wishing to pursue a goal of growth while smaller less powerful members at the opposite end of the channel might be content with a goal of stability and 'good living', (Mallen, 1969, p.179). So, when a system component (or channel member) "perceives the behaviour of another component to be impeding the attainment of its goals or the effective performance of its instrumental behaviour patterns, an atmosphere of frustration prevails" (Stern & Gorman, 1969, p.156), giving rise to a conflictful situation. Little (1968, p.2) agrees with the general reasoning used in this assessment.

Assael (1969) conceptualized channel conflict between interdependent business organizations as an attempt to achieve a reallocation of system resources. He envisioned that "in any equitable resolution, organizational responsibilities must be redefined for the benefit of the total system", (Ibid, p.579). While accepting this view, we will demonstrate through case studies in Chapter V that this equitable 'reallocation' process is not easily achieved in practice.

Rosenberg and Stern (1970) conceptualized conflict as a "pervasive and inherent element in channel systems characterized by behavioural interdependence", (Ibid, p.40). Rosenberg (1974) later expanded and refined this earlier work into a fully descriptive model of the intra-channel conflict process.

The process view of intra-organizational development and outcome which forms the basis of Rosenberg's (1974) conflict model was originally outlined by Pondy (1967) and later adapted by Stern and Gorman (1969) to distribution channels. This model can be represented

diagrammatically as follows[32]:



Source: (Rosenberg, 1974, p.69)

The above model depicts conflict as covert in the form of underlying tension which takes on an overt form when an incident occurs, and lasts while the flare-up maintains intensity. This is usually not for very long, either because specific actions of conflict resolution are taken (e.g. negotiation or mediation), or the conflict level simply slowly dissipates in some instances, even if the core issues have not been fully resolved, (Rosenberg, 1974, p.70).

Whatever the outcome, there will be some feedback to modify the original goals, and the process begins a new cycle at the tension stage. Rosenberg (Ibid) posits that this type of conflict iteration procedure permits the channel to 'learn' to cope with the onset of conflict. Because of the cyclical process from submerged state to flare-up, it is difficult to identify and monitor, consequently, firms tend to react to conflict rather than plan for it. The sudden flare-up or 'discontinuity' in behaviour depicted in Rosenberg's model bears considerable resemblance to the 'catastrophe model' which will come under attention in the latter part of Chapter III.

Accepting that goal differences between channel members is one source of conflict, are there alternative sources? A number of possible circumstances giving rise to conflict are summarized below in no particular order:

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32 Model Description: Goals, which may differ between members in the distribution channel and are often misunderstood (Wittreich, 1962, p.147) give rise to implementation of planned and unplanned actions. Unless there is substantial agreement and co-operation among channel members, tension is created. This could be the result of competitive action, decreasing sales, technological change, etc.. At this stage, an incident may occur, or the build-up of tension may simply reach a threshold at which it can no longer be contained, and this triggers a flare-up into open confrontation between the parties involved.

1. Communications, structure, and decision processes, (Walton, 1966; Ackoff, 1966).
2. Manipulation of channel members by other members of the same channel, (Little, 1968, p.5).
3. Innovation introduction including new technology resisted by barriers to change, (McCammon, 1963; Rosenberg, 1974, p.70).
4. Denial of legitimate claims for reallocation of power and functions, (Assael, 1969, p.579).[33]
5. The exchange act itself, specifically related to reaching agreement on terms of trade, (Mallen, 1969, p.177).
6. Differences in primary business philosophy[34] between channel members, (Mallen, 1972, p.47).
7. Theparticular structural alignments of participating firms, (Rosenberg & Stern, 1970, p.40; Moyer 1971, p.166).

Certainly, several writers consider the functional interdependency between institutions in the channel has an inherent conflict potential, (Stern & Gorman 1969, p.156; Ridgeway, 1957; Berg 1962; Assael 1968). Rosenberg (1974, p.70) takes this point further, asserting that "the greater the number and the faster the change of shipping and receiving points within the channel system, the more vulnerable it is to conflict".

Does the presence of conflict in the channel have beneficial or detrimental effects? There is considerable disagreement in the literature on this important point. Although the exact nature of conflict experienced may vary depending on the particular circumstances involved (Rosenberg, 1974, p.70), there is little doubt that the weight of opinion in the literature contains an implicit assumption that all

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[33] In such situations, a 'countervailing power' force may emerge as channel members who are adversely affected, organize to build up their own economic and political bases as a neutralizing force, (Palamountain, 1955; Galbraith, 1956).

[34] Differences possibly reflect historical or environmental factors.

conflict is dysfunctional[35], hence the preoccupation appears to be with finding ways to overcome it, (see McNair & Berman, 1967; Mallen, 1972; Stern, 1970). Writers such as Little (1968), Moyer (1971), Walton (1966), and Ackoff (1966) support the view that the effects of conflict are manifested in efficiency losses in channels operation. Baligh and Richartz (1966, p.468) seem convinced that co-operation free of conflict in channels will almost surely lead to increased efficiency.

Stern (1970, p.1) has few doubts that excessive conflict is anything but dysfunctional, producing a disequilibrating effect on the whole system in which it occurs. There are however, a number of theorists who do not share the view that conflict is necessarily bad, (see Assael, 1969, p.573; Pearson, 1971 p.29). In fact, Assael (1969) attempts to establish criteria for identifying constructive conflict. His work is based on premises about intergroup conflict derived from the sociological literature and applied to a specific case in the automobile industry to test its validity. Essentially, conflict is regarded as potentially beneficial to a system if "it brings about a more equitable allocation of political power and economic resources by the formation of new countervailing forces and a greater stability within the system", (Assael, op cit, p.573). Nevertheless he does concede that conflict may be considered as destructive if there is a lack of recognition of mutual objectives, or the continued coercion by more powerful members tending to drive the less powerful (but functionally essential) members out of the system, (Ibid). Pearson (op cit, p.16) draws attention to the fact that situations and acts evaluated as 'conflict' by an observer, "might actually have been situations of other phenomena besides conflict".

Rosenberg and Stern (1970, p.45) use the simple criterion of observing the consequences of conflict to decide whether it is 'benign or malign'. In fact, it has been been suggested that "where no conflict exists, there may be situations of complacency in which innovation would not be generated", (Stern and Heskett, 1965, p.292). So here is an implication that conflict in some undefined measure is a necessary

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[35] By 'dysfunctional' we mean having disadvantageous or unwanted consequences. The 'dys' prefix is a convention denoting 'impairment', one which has been borrowed from medical language and has become customary in conjunction with 'function', in preference to the looser 'dis'.

pre-condition for innovation. Boulding (1961, p.11) considers conflict to be an essential and at times useful element of social life, but nevertheless expresses concern at the problems it may pose for all parties concerned when it is 'unmanaged'.

Pondy (1967) dismisses both polar (good or bad) positions, commenting that conflict may be neither functional nor dysfunctional. Accordingly, he suggests that the argument against those who seek uniformly to abolish conflict, "is not so much with their *a priori* assertion that conflict is undesirable, as it is with their failure to make explicit the value system on which their assertion rests", (Ibid, p.307). Although Pondy's comments were originally set in the context of organization conflict, his qualification should be capable of extension to the interorganizational situation found in channels.

We accept Ackoff's (1966) assessment that to design a system structure free of conflict potential is an extremely difficult if not impossible undertaking. If we also accept the view that conflict may be harmful in certain situations, then we can understand the motives of writers such as Boulding (1964) and Stern (1972) who call for the development of conflict-resolution machinery to deflect system participants from making 'pathological' moves towards each other in a given contested situation. According to Little (1968, p.3) the presence of conflict across channel organizations will be associated with "... attempts to reduce or eliminate it" so there is more than likely a use of power in response to conflict emergence.

Three broad approaches for managing conflict are identifiable in the literature. The first assumes that participants in a particular system are not working properly together, through no specific fault in the system itself; the second requires development of additional conflict - resolution machinery; and the final approach requires alteration of the existing institutional structure in order to lessen the inherent conflict, (Katz, 1964, pp.107-108). The first two methods outlined above preserve the existing system, and the third alternative requires system change. Just how practicable any of these suggested approaches are is not clear because to our knowledge no empirical testing has been carried out.

Stern (1972, p.34) takes the second approach mentioned above and

outlines a series of possible conflict management mechanisms[36]; all appear to rely on establishing positive superordinate goals[37] for the affected channel system, apparently in the hope that these will overshadow the other issues under dispute, and draw the parties involved closer together, i.e. distract their attention away from the issues which initiated conflict. Certainly, if the chosen superordinate goal is designed to meet an outside threat to the particular channel's survival or growth, then it is quite feasible to expect channel members to set aside their differences for the sake of staging a joint defence effort, at least in the short term. However, the logic of this approach appears to suffer two major shortcomings. The tacit assumption that establishing superordinate goals for channel parties to focus on will have the desired effect of permanently reducing conflict in other disrupted areas and thereby lead to a higher overall level of co-operation, is a worthy but untested proposition. It may work in certain situations and conditions; it may not in others.

The second objection arises because what in fact is being offered is a series of suggested remedies to a problem, seemingly without first coming to grips with the more fundamental issue(s) of how does the conflict mechanism itself works, and what are the important and necessary parameters and conditions involved.

The process of meeting a threat external to the system will serve to displace or transfer hostility between and among channel members to the 'common enemy', (Etzioni, 1968, p.431). However, there is every chance that the prior conflict will surface again after the crisis has subsided, despite the temporary unity of the parties involved.

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[36] The mechanisms proposed may be broadly classified as follows. Bargaining and Negotiation; Boundary; Interpretation; Super-organizational. The actions of bargaining and negotiation are regarded as essential to all other mechanisms, (Stern, 1972, p.34).

[37] Superordinate goals - goals greatly desired by all those caught in dispute or conflict which cannot be attained by the resources and energies of each of the parties separately, but which require the concerted effort of all parties involved, (Stern, 1972, p.33). See also Sherif (1967, p.457), and Sherif et al (1961, p.202).

> The condition under which superordinate goals will produce co-operative effort, without resolving the intergroup relations problem, is when the assumed superordinate goal is really a superordinate threat .... In this circumstance, the groups put aside their own conflict until the greater enemy has been annihilated. But, the differences that were set aside earlier, return once the threat or superordinate need has been removed. In truth, then, the problem has not been solved. It has only been deferred under conditions of more pressing need for co-operative effort, (Blake, Shepard & Mouton, 1964, p.89).

Stern (1972, p.34) concludes that the "two general limiting conditions of conflict resolution with distribution channels are the non-permanency of the channel relationships and the asymmetric interdependence of the members on each other". The second of these conditions is particularly pertinent, e.g. conflict may threaten the autonomy of one organization while having only a marginal effect upon another. Similarly, the mutual benefits apparently available through co-operation, may be of little significance for one organization and a matter of survival for the other, (Guetzkow, 1966, p.28).

Significantly, Walker (1970, p.158) asserts that all channels experience conflict, "... but the structural characteristics of the channel influence the form of the conflictful behaviour that occurs". Rosenberg and Stern (1970, p.40) agree that conflict can be attributable to certain identifiable causes related to the structural alignment of participating firms, and further, that a measurable level of conflict is generated, (Rosenberg, 1969). In fact, Rosenberg (1974, p.69) bases much of his later work on the premise that conflict occurrence in distribution channels exhibits a pattern of some sort, and hence "... can be identified, anticipated, and possibly controlled". The most common approach used to date for studying power and conflict in channels has been to observe a 'real world' distribution channel and describe the situation in behavioural terms[38]. Schulz (1971), based on his own work regarding

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[38] Examples: Kriesberg (1955); Ridgeway (1957); Wittreich (1962); Assael (1968).

the relationship between power base usage and the conflict level produced (Ibid, p.21), confidently asserts that as the number of empirical studies of power base conflict relationships in channels increases, it will become feasible to pinpoint the threshold at which power base use and the corresponding conflict produced becomes dysfunctional in terms of performance, (Ibid, p.125).

We are not entirely convinced by the above assertions. In fact it would be fair to say that relatively little attention has been given to developing empirical measures of conflict, (however, see for example Rosenberg & Stern, 1971). Most of the literature has not been based on empirical research, partly due to difficulties of measuring conflict, and also to 'the conflict is bad, co-operation is good' syndrome subscribed to by so many theorists who appear to consider this 'self-evident'.

For the purposes of this review, we will simply treat co-operation as the opposite to conflict. Certainly, there is evident in the literature "a curious mixture of co-operation and conflict - co-operation in that both parties with a certain range of possible solutions will be better off with a solution ... than without one, and conflict in that within the range of possible solutions, the distribution of the total benefit between two parties depends on the particular solution adopted", (Boulding, 1962, p.314). Always it seems, theorists in discussing the presence or otherwise of conflict or co-operation are primarily concerned about the effect either may have on the 'efficient' operation of the channel. The prevailing view appears to be that the goal to pursue should be one of conflict minimization and co-operation maximization[39].

Again, as is the case of conflict, little attention appears to have been focussed on developing empirical measures of co-operation. Impressive lists of possible co-operation methods have been proposed (Weiss, 1958, p.68), but few if any of these have been validated empirically. Pearson's (1971) research aimed at assessing whether a conflict or co-operation mode in the channel led to operationally superior results has come closest to field testing the theoretical concepts

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[39] This view is expounded in various articles by Drucker (1962); Alexander, Cross & Cunningham (1961); and Ridgeway (1957).

involved, although the results were inconclusive because of the limited scope of his empirical work.

Most social relationships have a degree of underlying stress or tension which upon reaching a certain threshold level, is likely to break out into overt conflict. For example, in interpersonal terms, conflict requires the presence of at least two people, richly connected in their particular relationship. It is a fact that homicides are most common among people who know each other well or are at least acquainted.

In a social system such as a distribution channel, the strength of inter-relationship (S) is high between two or more elements. This high degree of interdependency makes it difficult, if not impossible to exit from the relationship, hence an issue which arises where differing viewpoints are taken between the parties will be conflictful. Obviously there will be a spectrum ranging from full conflict to full co-operation. Survival potential of channel members will be an important determinant as to where they should be located on the conflict/co-operation scale, on any particular issue[40]. Indeed, a manufacturer may decide to adopt a strategy of forward integration into retailing if survival is threatened because of poor distributive coverage for his product range, or through some unresolved conflict with current independent distributors.

These and other strategic type considerations are simply ignored in the current crop of literature on conflict. The approach mostly adopted appears to be one of simply accepting the reality of conflict existence and then working from this premise, seeking conflict resolution procedures.

A revised approach might:

1. Map the distributive channel system to ascertain <u>if</u> it is possible that conflict <u>may</u> exist in the given conditions; if so,
2. Field test to <u>validate</u> its existence.
3. Then, endeavour to explain <u>why</u> it is present.

The channels literature reviewed for the purposes of this chapter

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40 For example, in the context of the U.K. grocery industry, strong retail companies like Asda Stores Ltd., and Tesco Stores Ltd., will be less concerned about survival if denied certain manufacturers' products, than would say a small regional retail chain.

appears to largely ignore the implications of varying types of system arrangement. It seems that theorists have not, or have been unable, to relate dependence, symmentry, and other similar concepts to the system concept. They appear to see these simply as variables in limbo rather than as variables to be used in mapping and describing organized relationships.

Leadership: In an obvious allusion to 'leadership', Stern (1971, p.305) makes the pertinent observation that "some form of centralized power is a prerequisite for orderly behaviour within a channel system". Little (1968) had previously defined the channel leader or captain as "the member institution with the greatest power; he has more values or values of greater magnitude to exchange", (Ibid, p.5). Note the emphasis on institutions here. About the same time, Little (1968) suggested that leadership given by a member or members within the channel could possibly reduce the level of 'unnecessary conflict' although he did not define his understanding of 'unnecessary'. His idea was that a reduction in conflict may be achieved through a "division of system functions among the various members that will further their own as well as system goals", (Ibid, p.9). To our knowledge this proposition has not yet been tested.

Usually however, no mutually acceptable source of authority exists in channels, hence disagreements have to be resolved by the members themselves via one of the methods already outlined, broadly classified by Walker (1970, p.22) as 'bargaining'. Perhaps the major stumbling block is that whereas authority in a single organization may flow in a continuous chain from top to bottom, it is unable to do so in a channel system constituted of manufacturers, retailers, and intermediaries, (Ridgeway, 1957). Stern (1971, p.308) introduces the concept of 'charisma' in the case of particular channel members (e.g. a very progressive and innovative organization), and this may lead to it assuming a leadership role, albeit by default.

In conclusion, it appears from our above review of key behavioural factors active in the channel perceived as a social system, that much of the literature does not even warrant the status of theory, is conjecture, and is certainly not based on any fundamental premises supported by empirical validation.

The concepts of power, conflict, and others appear to have been tackled largely in isolation and this severely detracts from their value. Robichaeaux and El-Ansary (1975/76) confirm this impression with their comment that "much of the empirical channel research has focussed on particular behavioural constructs in isolation (e.g. power, control, conflict, communication or roles)", (Ibid, p.13). This helps to explain why the early promise of the behaviouralist school has largely been unrealized to date.

Micro issues have therefore been pursued in isolation at the expense of more (macro) strategic considerations and any evaluation of under what conditions particular alternative strategies would be best. Certainly, there has been little attention given to integrating the 'structural' theories of earlier theorists with the 'social' concepts contained in the behavioural school.

We are left with the impression that channel theorists specializing in a study of power, conflict, and other social system factors have in many cases been 'trying to find air pressure where in fact a vacuum exists'. They have suggested reasons and correlates for the conditions which they have perceived to exist when such conditions may not have existed in the first place.[41]

Nevertheless, and despite the lack of rigour in the behaviouralist approach, it has added to our steadily cumulating body of knowledge on distribution channels. It has introduced new socially based concepts to supplement the wholly mechanistic schemes proposed by most if not all previous theorists with the possible exception of the administrative and systems schools.

Conclusions

It is apparent that while theorists have experienced few difficulties in recognizing the outward signs of a distribution channel, few

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[41] For example, we are thinking here of the investigator who makes up his mind prematurely that there must be conflict present. He then develops his variables, correlates these with his results/findings, and draws conclusions about the 'relationships' present. All this may have been carried out without the actual presence of conflict - perhaps other causes or symptoms are responsible for the observed actions.

have even approached any fundamental understanding of the mechanics which underlie observed behaviour. Further, many theorists in using a largely descriptive approach have attempted to pass this off as explanation.

Economic based arguments have largely been at the core of all the channels literature so far. It has been used to 'explain' how intermediaries emerge, what functions they perform, and on occasions to predict channels structure. The economic rationale is important but nevertheless incomplete; equally important strategic considerations are ignored.

The largely mechanistic orientation of the economic, institutional, and functional schools is partially offset and supplemented by the organizational and behavioural schools which introduce a necessary social element into the overall scheme.

Whereas every conceptual approach reviewed has added something to our cumulative knowledge of distribution channels, no single approach, or for that matter the sum total, has reached a point of adequate conceptualization based on the criteria set out at the start of this chapter. Despite its volume and apparent comprehensiveness therefore, the channels literature is curiously deficient; it is mainly descriptive in nature, lacks explanatory power, and has virtually no predictive value.

One major detraction from the work so far is the piecemeal way in which it has been approached. Correspondingly few attempts have been made to integrate into an overall scheme, all the various concepts uncovered. This is where the 'systems' approach, with its holistic quality and emphasis on interaction of system components shows great promise despite its somewhat disappointing application so far. This situation is largely due to the way it has been used by marketing and channel theorists rather than any inherent weakness in the systems approach *per se*.

There is obviously an urgent need to explore entirely new avenues in an effort to achieve a more meaningful conceptualization of channel structure and mechanics. A much more eclectic approach is required, drawing on relevant concepts from other more established disciplines within and outside the boundaries of the management science literature. We intend to follow the idea promoted by Davidson (1967, p.284) "that distribution breakthroughs ... come from a new approach to an existing

channel and from applying concepts or capabilities perfected in other fields".

For this reason the following chapter will attempt to develop a new conceptual model, drawing particularly on the specialist fields of systems, cybernetics, information theory, and theoretical ecology.

Because of its originality, this new conceptualization will necessarily be developed along broad logic lines; refinements at the micro level may be fruitfully pursued by future researchers. One further qualification should be mentioned, i.e. the comprehensiveness of the new conceptual scheme is unlikely to be such that it will be able to overcome all the criticisms made against existing models in the identified literature. Nevertheless, if it provides a more adequate basis of understanding, some progress will have been achieved.

CHAPTER III

CONSIDERATIONS IN DEVELOPING A SYSTEMS MODEL

The world is not made up of empirical facts with the addition of the laws of nature: What we call the laws of nature are conceptual devices by which we organize our empirical knowledge and predict the future.

R. B. Braithwaite

Introduction

The main objective of this chapter is to develop a scaffolding in systems theoretic terms which will form the basis of a new[1] conceptualization of distribution channel mechanics in general, and more specifically, help to explain the behaviour of channels under the particular influence of innovation pressures. The sheer scope of this task dictates a global approach rather than the development and testing of what would at best be an incomplete series of *ad hoc* hypotheses.

In terms of organization, the chapter is divided into three segments. Part A attempts a review of the main body of systems literature in order to obtain a coherent base (in terms of traditional systems concepts) from which to launch the ensuing investigation of key systems parameters. Much of this first part draws heavily on the excellent integrative work recently completed by Glaser (1976) in the systems subject area.

Part B adopts an eclectic approach in extending the search for usable systems concepts to the multi-disciplinary dimension; literature in such diverse fields as sociology, cybernetics, theoretical ecology, information theory, and living systems is surveyed. Finally, Part C briefly reviews 'catastrophe theory', and illustrates its utility as a theoretical framework for explaining the special case of 'discontinuous' patterns of behaviour in systems.

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[1] We say 'new' conceptualization because we are unaware of any similar approach offered by previous writers in the field.

Essentially, we are concerned with behaviour within a given (open)[2] system rather than the cases of system-system or system-environment interaction. Nevertheless, the importance of environmental considerations is recognized, and with this in mind it is intended to incorporate environmental considerations in Chapter IV. Although the heuristic model developed in this chapter should necessarily be of sufficient generality to cope with the major issues confronted in a study of distribution channels, we are not claiming that all the shortcomings identified in Chapter II will be met and immediately overcome.

PART A

Traditional Systems Concepts

The current attempt to use systems concepts as the basis of a heuristic model of distribution channels, has to a large extent been encouraged by, and follows on from, Glaser's (1976) success in using a similar approach to develop a environmental model of another marketing phenomenon, advertising; more specifically, advertising effectiveness. We are not aware of any comparable work in the general area of marketing.

Glaser (Ibid, p.1) was able to trace the notion of a 'marketing system' back to Clark (1922) who initially suggested the construct of 'process' to describe the full spectrum of marketing activities[3].

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[2] According to Hall and Fagen (1956, p.23), "most organic systems are open, meaning they exchange materials, energies, or information with their environments". On the other hand, a system is said to be closed "if there is no import or export of energies in any of its forms ..., and therefore no exchange of components", (Ibid).

[3] In the context of marketing 'process' or 'system', distribution, the area of special interest in this thesis, is conceived as a facilitating function which has the ultimate objective of ensuring end consumers have goods to choose from at the retail level. In a fully decentralized economy this would not be a problem because producers and consumers would by definition ideally be situated in close proximity to each other. The requirement for a distribution function, would in these circumstances, be minimal. However, because such high order proximity is not a realistic model, and because of the technology and scale economies necessary in production, the distribution function comes into its own as a very important element in the overall marketing process.

Other scholars in the discipline followed suit (see for example Steward & Dewhurst, 1939; Duddy & Revzan, 1947; Breyer, 1949; Vaile, Grether & Cox, 1952; Palamountain, 1955; Barger, 1955; Alderson, 1957, 1965; Fisk, 1967; and Kotler, 1967).

However, in his review of the literature pertinent to the application of systems concepts to marketing, Glaser found that it gave "... little more than superficial attention ... to the fundamental considerations of the logic and properties of systems, system-system and system-environment interactions", (Ibid). From this he concluded that many theorists were confusing the application of genuine systems concepts with what was to all intentions, no more than a systematic approach to the analysis of marketing activities, (Ibid).

We share Glaser's (1976) concern for the pervading superficiality with which marketing theorists, and among them distribution channel theorists, have applied systems concepts to their respective specialities. In addition, we fully support his contention "... that an understanding of systems concepts is as vital to the explanation of marketing systems as genetic structure is to our comprehension of living systems. Without specifying the building blocks of the 'marketing system' our ability to describe, explain and predict marketing phenomenon is severely truncated", (Ibid, p.2). The same sentiments apply in our specific area of interest - distribution (or marketing) channels.

Faced with obvious shortcomings in the marketing literature, we follow Glaser's example in initially resorting to the traditional body of systems literature in an attempt to achieve identification and clarification of key concepts.

Hall and Fagen (1956) define a system as "a set of objects together with relationships between the objects and between their attributes", the implication being that it "has properties, functions or purposes distinct from its constituent objects, relations and attributes", (Ibid, p.18). Objects are defined as "parts or components of a system"; attributes as "properties of objects"; and relationships as the bonds that "tie the system together", (Ibid).

Similarly, Ackoff (1971, p.662) defines a system as "a set of interrelated elements", at least two in number, "and a relation that holds between each of its elements and at least one other element in the set. Each of a system's elements is connected to every other element, directly or indirectly. Furthermore, no subset of elements is unrelated to any

other subset". It is quite apparent that neither of the above two definitions provide any significant additional insights into the fundamentals of systems concepts.

According to Glaser (1976, p.4), "a major problem in establishing an objective map of a 'system' is "..... the ontological status of the concept". He reinforces the point by commenting how, in contemporary systems theory, the notions of 'set' and 'system' are regarded as synonymous, (Ibid). This confusion is understandable when Cantor's (1895, quoted in Kleene, 1962, p.9) authoritative definition of set[4] is studied, i.e. a set is "any collection M of definite well distinguished objectives m of our perception or our thought [which are called the 'elements' of M] into a whole". This definition, and set theory in general, subsequently came under searching criticism, (see Fraenkel and Bar-Hillel, 1958, p.19).

Of more interest however, is Bridgman's (1922) work on dimensional analysis in the field of physics, which in essence provides an alternative approach to systems. Our attention was initially drawn to Bridgman's work by Glaser (1976, p.5), who recognized in it the degree of fundamentality and rigour necessary for founding a substantive theory. According to Bridgman (1922, p.17), "the purpose of dimensional analysis is to give certain information about the relations which hold between the measurable quantities associated with various phenomena".

The usual procedure is to "..... make a list of all the quantities on which the answer may be supposed to depend; ..... the dimensions of these quantities" are sought, and then "..... combined into a functional relation in such a way that the relation remains true no matter what the size of the units in terms of which the quantities are measured", (Bridgman, 1922, p.1).

The numbers that are assigned to the quantities measured can reflect magnitudes of two kinds - fundamental or derived. "A fundamental magnitude is one whose value is unaltered by any change in the process of measurement, or in the chosen unit, of any physical quantity other than the one to which the fundamental magnitude refers. A derived

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[4] Lipschutz (1964, p.1) offers the intuitive definition of set as "any well-defined list, collection, or class of objects". These objects are called 'elements' or 'members' of the set.

magnitude is one whose numeric is in general altered by such a change", (Focken, 1953, p.22).

A length measured in terms of the standard metre is an example of a fundamental magnitude, i.e. no change in the method or unit of measurement of any other physical quantity makes a difference to the result. In contrast, the value of a derived magnitude as specified by its numeric is changed by altering the measurement of one of its component magnitudes. An example of the latter would be density (ρ) which is constituted of mass (M) and volume (V) dimensions, i.e. $\rho = {}^{M}/_{V}$. Since volume must be measured in units of length (L), the equation becomes $\rho = ML^{-3}$. If the unit of mass or length is changed, the numeric specifying the density (ρ) of a body is also changed, (Ibid).

It is Bridgman's (1922, p.52) view that "we must know enough about the situation [being investigated] to know what the general nature of the problem is, and what the elements are which would be introduced in writing down equations determining the motion (in a general sense) of the system". However, Glaser's (1976, p.7) retort to this is that "in the mapping of open, living systems this is precisely the nub that is difficult to grasp. In addition, the nature of the dependent variable (phenomenon) may also be obscure".

Despite these caveats, Glaser (Ibid) concludes that dimensional analysis has made a contribution to the study of systems by forcing recognition of the fact that fundamental quantities and a listing of parts is an essential prerequisite to any analysis. In addition, we are led to believe that system mapping need not be a wholly speculative venture, but should involve observation, experiment, and/or deduction, (Ackoff & Emery, 1972).

Glaser (1976) has developed four heuristics for systems mapping which will now be reviewed[5].

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[5] Our somewhat truncated exposition of the four heuristics in question and their accompanying argument is, unless stated otherwise, derived virtually intact and in places verbatim from Glaser's (1976, pp.8-22) excellent treatment; there seems little point in trying to improve on it here. For a more detailed awareness of the subtleties of logic used in developing these heuristics, the above reference should be consulted.

I Systems mapping begins with an identifiable outcome

An outcome is an 'non-random' event or process, the distinction being essentially arbitrary. In addition it is assumed that an outcome does not exist or occur *in vacuo* but must be 'explained' by at least one other element of the system of which the outcome is a part. In a closed system the outcome may be 'explained' by reference to the element of the system of which it is a part.

In an open system, the system elements used to explain the outcome will do so imperfectly, leaving unaccounted some variance in the outcome. In such a system its state and environment at a moment in time must also be considered in order to explain an outcome, (Nagel, 1961; Ackoff & Emery, 1972). In contrast to closed systems it is Glaser's (1976) contention that complete data on the system, system state, and environment of a living system will not ever yield a Laplacian solution to system outcomes.

Glaser (1976, p.10) argues to two conclusions:

1. Outcomes need not be observable, repetitious or similar; there is simply no necessity for the system (elements) to have these attributes. However, if the system is to be used as an instrument to explain and predict an outcome, the system and outcome must eventually be linked to 'observable materials', (Nagel, 1961, p.93).
2. Systems mapping begins with an identifiable outcome. Since Kuhn (1962) regards such identification as an inductive process, the system may effectively be mapped by working back from the outcome.

II A system is a distribution of the members in a dimensional domain[6]

Nagel (1961) and Angyal (1941) both support the proposition that elements of a system are not related by way of the diversity or similarity of their properties. Rather, it is held that elements enter into a system because of their 'positional value', (Angyal, Ibid, p.248). Simon (1970, p.22) appears to share this view. "... it is the organization of

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[6] Attributed to Angyal, 1941, p.249.

components and not their physical properties, that largely determines behaviour ...". The positional value of elements will be determined by their standing on some metric or dimension.

Bridgman (1922) related elements (parts) to known dimensional domains, e.g. length, mass and time in mechanical systems. However, where dimensional manifolds are not established it would seem reasonable to proceed as follows:

1. Reach consensus on the outcome and then detail the universe of parts which appear to be relevant in 'explaining' this outcome. The problems one is confronted with in this stage are basically those associated with 'levels of analysis' and an adequate detailing of variables (parts).
2. Establish the dimensional manifolds by statistical, mathematical, logical, or other techniques.

III Members (elements) of a system are connected to each other with reference to the whole (or outcome)

According to Angyal (1941, p.250), "in a system the members are, from the holistic viewpoint, not significantly connected with each other except with reference to the whole", (or 'outcome' in Glaser's (1976) terminology). Angyal (Ibid) emphasizes this point as follows: "System-connectedness of the parts cannot be expressed as a-b, b-c, a-c, but as



",

which appears to be an implicit endorsement of the preceding arguments about the outcome, and also emphasizes the (causal) connectedness between parts in relation to the whole. It is a somewhat oversimplified conceptualization in that it ignores the reality of more complex relationships involving intervening elements (variables), suppressors, etc., but goes part of the way at least towards resolving the issue of on what bases elements interact.

IV There are eleven identifiable groups of relationships between elements (parts). These groups integrate to define two basic forms of organization, whole or system.[7]

The groups of relations referred to above are as follows:

a. Transitivity: two parts are related to each other by a middle (common) part.
b. Connexity: two parts are related without the mediation of a common part.
c. Symmetry: an interchange of parts does not involve any change in the relation of parts.
d. Seriality: a relation which is transitive, asymmetrical and connected.
e. Correlation: the relation between two series such that for every part of one series there is a corresponding part in the other series. Accordingly, no part of either series is without a corresponding part in the other.
f. Addition: parts are joined to increase their number.
g. Multiplication: parts are joined and involved with each other.
h. Commutation: the relation in which addition and/or multiplication is asymmetrical.
i. Association: a relation which is commutative and connected.
j. Distribution: a relation which is commutative and intransitive.
k. Dependence: a relation in which the existence of one part is conditioned by some other part.

Each group has an antonym, e.g. intransivity, non-connexity, etc.

The foregoing represent the bases of organization, i.e. wholes, parts, sub-parts, and the elements of relations between parts. We may now list the rules of organization which determine how the parts and relations are combined.

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[7] Glaser (1976) derived this heuristic and associated arguments almost totally from Feibleman and Friend (1945); this primary reference should therefore be consulted directly for a more detailed treatment.

1. Structure is the sharing of sub-parts between parts. The linkage of parts is accomplished by means of common sub-parts and not by mere juxtaposition or external linkage.
2. Organization is the one controlling order of structure. It is not simply the fact of linkages but rather the principle according to which all linkages fall together into one controlling order, which makes an organization.
3. One more level is needed to constitute an organization than is contained in its parts and sub-parts. No number of sub-parts and parts constitutes an organization, which is essentially a property of the whole. The organization is one level above its analytic parts and sub-parts, and thus the whole involves another level.
4. In every organization there must be a serial relation. The serial relation is the essential one in every organization. Other relations may and usually do exist in organizations but they are not necessary to the constitution of an organization. In the analysis of every whole there must be found a controlling relation which is asymmetrical, transitive, and connexive.
5. All parts are shared parts. There is nothing in an organization except parts which have sub-parts in common. Any item which is not so shared is extraneous to the organization and not a part.
6. Anything in an organization which is related to part of that organization is, by virtue of that relation, itself part of the organization, and not a foreign body.
7. Sometimes there are things in an organization which are not related to any single part of the organization, but which may be related to two or more parts. That is, the thing in the organization may be related to a complex of parts without being related to any one of the parts in the complex. In this case, the thing so related is part of the organization.
8. The number of parts and their relations, i.e. sub-parts, constitutes the complexity of an organization. This rule and the yardstick of integrality, or kinds of organization form a pair of criteria, (Feibleman & Friend, 1969, pp. 35-36).

It is now possible to identify two basic classifications of 'systems' differing logically and structurally.

1. Agglutinative: the governing relationship is aseriality, i.e. parts have intransitivity, connexity and symmetry.
2. Participative: the governing relationship is seriality. These systems can be subdivided into:
   (i) Adjunctive: symmetrical independence is the governing relationship, where parts can survive their separation.
   (ii) Subjective: asymmetrical dependence is the governing relationship, where a sharing of parts is necessary to one of the parts but not to both.
   (iii) Complemental: symmetrical dependence is the governing relation, where the sharing of parts is necessary for both parts.

Following Glaser's (1976, p.19) format, the groups of relations previously outlined can be matched to the above four 'systems' using the following tabulation.[8]

TABLE 1

SYSTEM - PARTS RELATIONSHIPS

SYSTEM	RELATION OF PARTS																			
	Trans (a)		Conn (b)		Symm (c)		Ser (d)		Corr (e)		Add (f)		Mult (g)		Comm (h)		Assoc (i)		Dist (j)		Dep (k)	
	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Agglutinative		x	x		x			x	x		x			x	x		x		x			
Adjunctive	x		x			x	x		x		x		x			x		x			x	x
Subjective	x		x			x	x		x			x	x			x		x		x		x
Complemental	x		x			x	x		x			x	x			x		x		x		*

The above "division of organizations into various kinds is not arbitrary, although there are other classifications which could be made", (Feibleman and Friend, 1969, p.36).

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[8] The positive and negative signs refer to positive relations (e.g. transitivity) and negative relations (e.g. intransitivity) respetively. The asterisk (*) refers to an exponential relationship.

Glaser (1976, pp.21, 22) concludes that "in order to talk meaningfully about marketing systems [and we presume distribution systems within marketing systems] it is necessary to define the nature of marketing (the outcome), the dimensional manifolds of marketing, the positional values of the elements within those manifolds and the 'system form' into which those elements are organized".

PART B

Identification and Selection of Key Systems Parameters

In this section we attempt to build on the foundation of traditional systems concepts already established in Part A. Specifically, the task is one of identifying additional systems concepts from an array of disciplines, and forging them into a coherent set of heuristics by building the bridges between them.

As far as we are aware, and apart from the work of the general system theorists, this has not previously been done, certainly not in the marketing/distribution field. The idea is in itself not new however; other writers have previously called for some integration of existing systems concepts. Typical is the plea by Ackoff and Emery (1972, p.15), for "a system of concepts ... general enough to cover inquiries into many types of phenomena by different disciplines ... [leading to] genuinely interdisciplinary research". Ackoff (1971, p.661) claims that the current lack of a unified set of system concepts is due to the pertinent literature being widely dispersed and therefore difficult to track. In his opinion, "researchers in a wide variety of disciplines and interdisciplines are contributing to the conceptual development of the systems sciences but these contributions are not as interactive and additive as they might be", (Ibid). We fully concur with this assessment.

We have previously implied that the concept of a 'system' has for some time been identified and used in a large number of disciplines. Several authors (Buckley, 1968; Simon, 1970; von Bertalanffy, 1960, 1969), recognizing a common thread in the logic of various fields, have identified that core and the resulting movement has become widely known as General Systems Theory. The systems related aspirations of this thesis are nowhere as ambitious as those of the general system theorists, but the

idea of extracting the commonalities from a number of disciplines in order to form a singular cohesive theory, albeit perhaps a limited one, and in this case for a very specific purpose, carries some overtones of the general systems approach at least. This we acknowledge without apology although it is not our intention here to become embroiled in debating the pros and cons of General Systems Theory *per se*.

The Miller Scheme of basic concepts

As a method of entry into this investigation of basic systems concepts we have chosen Miller's very extensive work on living systems[9] as the vehicle for developing a broad conceptual framework, (see Miller, 1955; 1965a; 1965b; 1965c; 1971a; 1971b; 1971c; 1971d; 1971e; 1972; 1973a; 1973b; 1975a; 1975b; 1976; 1977). In our opinion these combined works represent a major contribution to the systems field, especially as the emphasis throughout is on developing a theoretical structure using the most fundamental building blocks possible. As in the case of Alderson's various works in the area of distribution channels (see Chapter II) we are again mystified as to why Miller's seminal work has not apparently been more widely accepted and applied.

Concepts even more basic than 'system' are those of 'space', 'time', 'matter', 'energy', and 'information', because living systems "... exist in space and are made of matter and energy organized by information", (Miller, 1975, p.344). Following Miller, these supportive concepts are defined as follows:

> Space: in the most general mathematical sense, is a set of elements which conform to certain postulates. Physical (or geographical) space is the extension surrounding a point. The modern general theory of relativity has shown that physical space-time is more accurately described by a geometry of four dimensions, three of space and one of time.

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[9] Living systems "are a special subset of the set of all possible concrete systems composed of the plants and the animals", (Miller, 1965a, p.203). Living systems are of special relevance because the facts are importunate; the effectiveness, the cohesion of the living system *qua* system is greatly superior to the non-biological examples, (Beer, 1967, p.20).

Time:[10] is the particular instant at which a structure exists or a process occurs, or the measured or measurable period over which a structure endures or a process continues.

Matter: is anything which has mass (m) and occupies physical space. Energy (E) is defined in physics as the ability to do work. Because of the known relationship between matter and energy,[11] Miller adopts the joint term matter-energy.

Information (H): in the technical sense suggested by Hartley (1928),[12] is simply the degrees of freedom that exist in a given situation to choose among signals, symbols, messages, or patterns to be transmitted. The total of all these possible categories is called the ensemble. The term marker refers to those observable bundles, units, or changes of matter-energy whose patterning bears or conveys the informational symbols from the ensemble.

Communication of any sort requires that the marker move in space, from the transmitting system to the receiving system, and this movement follows the same physical laws as the movement of any sort of matter-energy. The advance of communication technology over recent years has been in the direction of decreasing the matter-energy costs of storing and transmitting the markers which bear information. Matter-energy and information always flow together, and information is always borne on a marker, (Miller, 1975, pp.344-347).

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[10] Time is also regarded as a property of events "that is sufficient to enable one individual to individuate any two changes in the same property of the same individual", (Ackoff and Emery, 1972, p.257).

[11] The principle of the conservation of energy states that energy can be neither created nor destroyed, but it may be converted from one form to another.

[12] Later developed by Shannon (1948) in his mathematical theory of communication.

Miller adopts von Bertalanffy's (1956, p.3) definition of system, i.e. "a set of interacting units with relationships among them". Although use of the word 'set' implies that the units should at least have some common properties, it is their positional value which is more important, a point made earlier in this chapter.

In this thesis we are primarily interested in what Miller (1975, p.348) terms 'concrete systems', i.e. "a nonrandom accumulation of matter-energy, in a region in physical space-time, which is organized into interacting, interrelated subsystems or components". He goes on to offer the following subsidiary definitions:

> Units: subsystems, components, parts or members of these systems, [which] are also concrete systems themselves.
>
> Relationships: concrete systems have various sorts or relationships, e.g. spatial, temporal, spatio-temporal, and causal, (Miller, 1975, p.348).

An open system is a concrete system whose boundaries are at least partially permeable, "permitting sizeable magnitudes of at least certain sorts of matter-energy or information transmissions to cross them", (Miller, Ibid). A closed system is a concrete system with impermeable boundaries. The structure of a system is the arrangement of its sub-systems and components in three-dimensional space at a given moment of time, (Weiss, 1958, p.140). This will always change with time. All change over time of matter-energy or information in a system is process, (Miller, Ibid, p.350).

All process involves some sort of transmission among subsystems, within a system, or among systems. These may be in the form of:

1. Input across the boundary into a system,
2. Internal processes within it, and
3. Outputs from it, (Miller, 1975, p.358).

"When opposing variables in a system are in balance, that system is in equilibrium[13] with regard to them. The equilibrium may be static and unchanging or it may be maintained in the midst of dynamic change.

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[13] Equilibrium is the condition "in which the influence exerted by the organization upon its available environment and the influence of the available environment upon the organization are in balance", (Feibleman and Friend, 1969, p.40).

Since living systems are open systems with continually altering fluxes of matter-energy and information, many of their equilibria are dynamic and are therefore referred to as steady states. These steady states may be:

> Unstable: in which a slight disturbance elicits progressive change from the equilibrium state.
> Stable: in which a slight disturbance is counteracted so as to restore the previous state.
> Neutral: in which a slight disturbance makes a change, but without cumulative effects of any sort.

All living systems tend to maintain steady states (or homeostasis) of many variables, keeping an orderly balance among subsystems which process matter-energy or information, (Miller, Ibid).

Certain processes are regarded as necessary for life and must be carried out by all living systems that survive, or alternatively be performed for them by some other system. Following Miller (1975, p.355), Table 2 provides a listing of critical subsystems; their corresponding definitions[14] are outlined and developed in subsequent pages.

TABLE 2

CRITICAL SUBSYSTEMS

Matter-Energy Processing Subsystems	Subsystems Which Process Both Matter-Energy and Information	Information Processing Subsystems
	Reproducer	
	Boundary	
Ingestor		Input Transducer
		Internal Transducer
Distributor		Channel and Net
Converter		Decoder
Producer		Associator
Matter-Energy Storage		Memory
		Decider
		Encoder
Extruder		
Motor		Output Transducer
Supporter		

Source: Miller, 1975, p.355

[14] Definitions drawn from Miller, 1975, pp.355-356. Examples demonstrating each type of critical subsystem are extracted from Miller, 1972, pp.16-18. Miller's definitions are in effect functional descriptions of nodes and as such are of use in the particular orientation taken in this thesis.

In presenting Miller's suggested list of critical subsystems, it is also appropriate and timely to draw certain analogies which illustrate the concepts embodied in the theory; in this way we attempt to relate the abstract to the pragmatic. The intended format therefore, is to list each subsystem, offer a definition, and illustrate this with general purpose examples (GE) drawn largely from Miller's (1972) own work. However, wherever the opportunity arises, we will also offer a specifically industrial interpretation (II) of what a particular subsystem represents in the narrower framework of an actual industry situation, e.g. in the U.K. food/grocery industry which is of particular interest in this thesis.

SUBSYSTEM	ILLUSTRATIONS
Subsystems which process both matter-energy and information	
Reproducer (Re): the subsystem which is capable of giving rise to other systems similar to the one it is in.	(GE) Any organization or group that produces an explicit or implicit charter for a new organization. (II) Could possibly be represented by biological production of enzymes as used in detergents etc.
Boundary (Bo):[15] the subsystem at the perimeter of a system that holds together the components which make up the system, protects them from environmental stresses, and excludes or permits entry to various sorts of matter-energy and information.	(GE) Such subsidiary organizations or groups as guards, doorkeepers, police, personnel officers, admitting officers, admissions committee, membership committee, purchasing department, personnel at receiving and loading docks,

[15] Ordinarily, where a step function or sudden change in rate of flow of matter-energy or information is found, there is a boundary, (Ashby, 1954, pp.87, 232-235). This is true because the boundary is usually denser than the environment or centre of the system, (Miller, 1965a, p.343). We contend that it is possible to arbitrarily draw the system boundary where there is a change in dimensionality, e.g. at the interface between retailer and consumer. In this example, as soon as final purchase of a good takes place there is the additional dimension of usage. Up to this point, form and place utility have been the basic product dimensions of the system.

		inspectors, receptionists, tour guides, ticket sellers and takers, maintenance staff, janitorial staff, military censor, security officer, library committee, loan committee, credit department, organization officer, mailroom employee; artifacts[16] such as building, fence, city wall, dyke.
	(II)	Subsystem could be visualized as the outer limits of the industry and within that, the limits of industry sectors or individual manufacturer and retailer subsystems. May even be the perimeter subsystems which store and distribute matter-energy, e.g. electricity generators, wheat silos at ports, fuel dumps, etc.
Matter-energy processing subsystems		
Ingestor (IN): the subsystem which brings matter-energy across the system boundary from the environment.	(GE)	Such subsidiary organizations or groups as receiving department, loading dock workers, purchasing department, buyers, selection committee, receptionists, admitting officers, admissions committee, orientation groups, missionaries, guides, porters, recruiters, doormen.
	(II)	Really the mechanisms used to import raw materials and commodities for manufacture.
Distribution (DI): the subsystem which carries inputs from outside the system or outputs from its subsystems around the system to each component	(GE)	Such subsidiary organizations or groups as operate organizational transportation facilities such as traffic bureau and police; supply officers; drivers; helicopter or airplane pilots; train engineers in mine; elevator operators; waiters, bus boys, ushers;

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16 An artifact is an "inclusion in some system, made by animals or man. Spider webs, bird nests, beaver dams, houses, books, machines, music, paintings, and language are artifacts", (Miller, 1965a, p.223).

car, truck, and bus drivers; quartermaster department of army; artifacts such as road, trail, passageway; bus, subway, train, truck; moving sidewalk, escalator, stair, fire escape, elevator, conveyor belt, chute, pipeline, pneumatic tube, dumbwaiter; traffic control system, service facility, check-out counter, toll booth; tray, plate, bucket, cup

(II) The transportation function, moving raw materials into the system, but more importantly, physically moving goods around the system from manufacturer to intermediary and/or retailer.

Converter (CO): the subsystem which changes certain inputs to the system into forms more useful for the special processes of that particular system.

(GE) Such subsidiary organizations or groups as operate electrical generating plants, oil refineries, steel mills, glass factories, packing plants, canneries, flour mills, dairies, many chemical plants, textile mills; artifacts such as knife, axe, hammer, refining equipment, ore conversion machinery, cotton gin, threshing machine, grinder, chopper, melter, crusher.

(II) The mechanism employed in breaking down raw materials received from outside industry into suitable form for manufacture. This subsystem may not be necessary if raw materials are received in processable form.

Producer (PR): the subsystem which forms stable associations that endure for significant periods among matter-energy inputs to the system or outputs from its converter, the materials synthesized being for growth, damage repair, or replacement of components of the system, or for providing energy for moving or constituting the system's outputs of products.

(GE) Such subsidiary organizations or groups as production workers in factory, cooks, bakers, binders; artifacts such as manufacturing machine, tool, assembly line.

(II) The manufacturing stage, producing the finished product(s). It is also possible that producer and reproducer subsystems are linked, e.g. in the case of a company reproducing enzymes to put in a detergent which it produces.

Matter-energy storage (MS): the subsystem which retains in the system, for different periods of time, deposits of various sorts of matter-energy.

(GE) Such subsidiary organizations or groups as factory personnel in charge of supplies; personnel in charge of warehouse, garage, parking area, reservoir, stock room, cattle pen, storage tank, grain elevator, coat-room, waiting room, dock, holding area, airport airway; supply clerks; artifacts like parking lot, barn, silo, warehouse; storage room; shelf, closet, file, container.

(II) The physical storage/warehousing function which occurs across the industry at various levels in distribution. Pertinent variables would be location, storage capacity, assortment carried, changes over time.

Extruder (EX): the subsystem which transmits matter-energy out of the system in the forms of products and wastes.

(GE) Such subsidiary organizations or groups as city departments of sanitation, street cleaning, and sewers; personnel that operate garbage, trash, express, and delivery trucks; bus, train, boat, and plane crews; packing and shipping departments; police or others empowered to expel intruders from organization or its territory; discipline committees that discharge or expel employees or members; personnel officers; janitors, custodians, maids, cleaning women; doctors and nurses who participate in discharge of patients from hospitals; college officials who graduate students; artifacts such as dump trucks and other vehicles, barges, sewer pipes, smokestacks, waste cans, mops, brooms, street cleaning equipment, dollies, chutes, conveyor belts, firearms.

(II) This may be the retailer subsystem, wherein products are sold to consumers, and waste such as outer packaging etc., is discarded.

Motor (MO): the subsystem which moves the system or parts of it in relation to part or all of its environment, or moves components of its environment in relation to each other.

(GE) Such subsidiary organizations or groups as crews, pilots, drivers, operators, or maintenance personnel of man-animal or man-machine systems; domesticated animals; artifacts such as ships, aircraft, spacecraft, trucks, buses; tools and machines such as earthmovers, tractors, saws, shovels.

Supporter (SU): the subsystem which maintains the proper spatial relationships among components of the system, so that they can interact without weighting each other down or crowding each other.

(GE) No living supporter known at this level, but organizations must make use of parcels of land or artifacts like buildings, platforms, ships, roads, vehicles.

(II) The physical facilities and services which support all activities in the industry.

Information processing subsystems

Input transducer (it): the sensory subsystem which brings markers bearing information into the system, changing them to other matter-energy forms suitable for transmission within it.

(GE) Such subsidiary organizations or groups as military intelligence agencies and units; guards, lookouts, fire watchers, meteorologists, astronomers, and others who observe and report upon environmental conditions or changes; market research departments, persons that report on product or service acceptance, or economic and social trends which may affect the organization; sales departments and others that take orders for the organization's products or services; intake departments of social service or other organizations; medical personnel who take histories and examine patients on admission to clinics or hospitals; complaint departments; legal departments that obtain patients or licenses; radar, radio, telephone operators, library acquisition staffs; solicitors of money or credit for an organization, ticket sellers, dues collectors, tax collectors, bank tellers; artifacts, including such communication and detection devices as telescope, field glasses, radar, radio, telephone, television.

(II) The collection and processing of information inputs from outside sources for use by organizations within the industry.

Internal transducer (in): the sensory subsystem which receives from all subsystems or components within the system, markers bearing information about significant alterations in those subsystems or components, changing them to other matter-energy forms of a sort which can be transmitted within it.

(GE) Such subsidiary organizations or groups as make reports within an organization or ascertain needs, attitudes, or efficiency of components or subcomponents; spokesmen for components, like committee chairmen, department heads, union stewards, and other officials, public opinion pollers, inspectors; bookkeepers, comptroller's offices, payroll departments, accountants; operations analysts; citizens' groups or organizations; artifacts such as computer, other business machines, microphone, telephone, closed circuit television, typewriter, other writing materials, time clock, suggestion box.

(II) All intra-industry communications which would include order placement by retailers on wholesalers and manufacturers, and wholesalers on manufacturers.

Channel and net (cn):[17] the subsystem composed of a single route in physical space, or multiple interconnected routes, by which markers bearing information are transmitted to all parts of the system.

(GE) Such subsidiary organizations or groups as telephone switchboard operators, communications maintenance men, messengers, executives, liaison officers, department heads, supervisors, officers of citizens' groups, heads of households, secretaries; artifacts such as letter paper, electronic channel and related equipment, vehicle that distributes publications, armored car that carries money and securities, computer.

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[17] "In living systems, a channel is a route in a spatial region, like a neuron or a courier, by which markers bearing information can be sent from a transmitter to a receiver. Channels may intersect at points called nodes, and may thus be interconnected to form a net. This net is similar to the distributor in that the former conveys markers bearing information and the latter conveys matter-energy to all parts of the system", (Miller, 1965a, p.352).

(II) Channel is the route taken by goods and information moving through the distribution system; nodes are intersection points of such distribution channels, e.g. at field depots, warehouses, wholesale premises etc. Net or network is simply the 'system' of channels and nodes.

Decoder (dc): the subsystem which alters the code of information input to it through the input transducer or the internal transducer into a 'private' code that can be used internally by the system.

(GE) Such subsidiary organizations or groups as foreign language translators, cryptographers, signal officers, telegraphers, radar and sonar operators, experts in reporting technical and scientific findings; persons who use confidential business codes; religious leaders and mystics; meteorologists, other interpreters of signs; artifacts such as teletypewriter, print reader, computer, other data processing machines, pattern-recognition machines like check-readers and punched-card readers.

(II) This activity is performed by all channel members, changing information inputs into a form compatible with their own particular internal procedures.

Associator (as): the subsystem which carries out the first stage of the learning process, forming enduring associations among items of information in the system.

(GE) No system at this level has an associator subsystem; an artifact such as a computer may do some associating for an organization.

(II) Firms in their respective channels of distribution learning the best most successful ways of performing their various activities/functions. In this sense the subsystem is more a function of people in the firm.

Memory (me): the subsystem which carries out the second stage of the learning process, storing various sorts of information in the system for different periods of time.

(GE) Such subsidiary organizations or groups as filing department, bookkeeping department, secretaries, computer experts, bibliographers, librarians, curators; artifacts such as paper, book, film, microform, magnetic tape, computer memory, filing cabinet, container, teaching machine.

(II) Companies keep records/files of business operations mostly stored in electronic memory systems.

Decider (de):[18] the executive subsystem which receives information inputs from all other subsystems and transmits to them information outputs that control the entire system.	(GE) Such subsidiary organizations or groups as board of directors, executives, judges, rabbis, bishops, commanders, captains, stockholders, members, voters; artifacts such as computer. (II) Key executives in the various companies participating in a channel of distribution are effectively the 'deciders' (or decision makers).
Encoder (en): the subsystem which alters the code of information inputs to it from other information processing subsystems from a 'private' code used internally by the system into a 'public' code which can be interpreted by other systems in its environment.	(GE) Sub subsidiary organizations or groups as write and edit speeches, publications, other communications; code communications; translate languages; design trademarks, buildings, other artifacts; act as lawyers, labour relations experts, lobbyists; advertising, public relations departments; may be joint decider, output transducer subsystems; artifacts such as writing materials, paints, computer. (II) The process of putting internally generated information into a form suitable for communicating with other channel members, either up or down the channel relative to own position.
Output transducer (ot): the subsystem which puts out markers bearing information from the system, changing markers within the system into other matter-energy forms which can be transmitted over channels in the system's environment.	(GE) Such subsidiary organizations or groups as public relations departments; spokesmen; labour negotiators; salesmen; missionaries; lobbyists and pressure groups; secretaries; publication, mailing, and circulation departments; printers; actors, performers; media departments; broadcasters; maintenance men

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[18] "A decider differs from a node in a channel or net in that the number of alternatives or degrees of freedom in the output of a decider is smaller than in the input and it is the same as in the input for a node", (Miller, 1965a, p.358). According to Miller (1965a, p.356), the 'decider' subsystem is the only one which is essential in the sense that a system cannot be dependent on another system for its deciding. The idea of a decider comes from Platt's (1956) work in electronic amplifier theory. Amplifiers increase the volume of a specific output, but along with amplification there is necessarily selection or discrimination, i.e. the amplifier's output has fewer variables than its input.

for electronic equipment; may be joint with decider or encoder components; artifacts such as electronic answering device, public address system, television, radio; printing, duplicating, mailing equipment; computer.

(II) This is what happens at the retailer/customer interface, e.g. advertising, promotions, sale of finished product; the customer is regarded as part of system environment. Could possibly equate to manufacturers' dealings with their respective raw material suppliers who are also regarded as part of the system environment, i.e. outside system boundary.

Miller (1972, p.15) uses the example of a modern ocean liner to demonstrate all the above subsystems in a very visible way; it is included here because it should aid the reader to understand the various relationships which constitute Miller's overall scheme.

> Subsystems which process both matter-energy and information: Reproducer (Re), representatives of the owning corporation; Boundary (Bo), ship's hull and personnel who guard and maintain it. Subsystems which process matter-energy: Ingestor (IN), hatchway into ship's hold and personnel who load passengers, baggage, and freight into the ship; Distributor (DI), gangways, decks, staircases, and stewards, waiters, and porters who carry food, beverages, baggage, and various other sorts of matter-energy on them, as well as passengers who move about the ship on them; Converter (CO), galley personnel peeling vegetables and preparing other food for cooking; Producer (PR), chefs cooking food and bakers baking in ship's galley; Matter-Energy Storage (MS), ship's hold and fuel tanks and personnel in charge of them; Extruder (EX), smokestack for gaseous wastes and garbage and sewage output for liquid and solid wastes, and operating personnel responsible for seeing that wastes are properly removed; Motor (MO), ship's engines, drive shaft, propellers, and the entire hull of the ship, which moves passengers, crew, and freight in the sea, as well as engineers responsible for managing this movement; Supporter (SU), hull, sides, walls, and decks of ship and personnel who maintain them. Subsystems which process information: Input Transducer (it), radio operator and other members of communications team who receive messages to ship; Internal Transducer (in), officer who reports to senior officer of the watch on states of various components

> that make up the ship; Channel and Net (cn), air between watch officers on the bridge of the ship over which they transmit and receive messages; Decoder (dc), radio operator in communications team who decodes Morse code messages into English after they are received; Memory (me), log books of past trips, charts of the seas, and those personnel who consult them in the ship's chart room; Decider (de), captain and other ship's officers; Encoder (en), radio operator in communications team who encodes English messages into Morse code in order to transmit them; Output Transducer (ot), radio operator and other members of communications team who transmit messages from ship.

Of the subsystems offered by Miller, several are of particular relevance to the present thesis, e.g. boundary (industry and industry sectors), producer (manufacturer), distributor (transportation), matter-energy storage (warehousing), extruder (wholesalers and retailers), and channel and net (the route network followed by goods and information; equivalent to distribution channels).

However, despite their obvious conceptual value, these and other concepts developed by Miller are still too general for our immediate purposes and will have to be supplemented by recourse to other sources. Miller's real contribution is that he has indicated an overall skeletal framework of systems concepts, definitions, properties and critical subsystems which go at least as far as facilitating development of numerous hypotheses. Because many of his hypotheses have not been empirically validated, it does not yet represent a fully tested theory. Nevertheless we do not wish to detract from his efforts - what he has given us is a very useful guiding framework. Miller himself has demonstrated in a general sense how this framework can be applied to various system levels in living society.[19] We will now proceed from the base established using his work to a more detailed investigation of concepts of specific relevance to distribution channel systems.[20]

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[19] For example, the cell (1971b); the organism (1973b); the group (1971e); the organization (1972); the society (1975b).

[20] Glaser (1976, p.7) showed, using Bridgman's (1922) work in dimensional analysis, how apparently 'derived' (or secondary) quantities can in special circumstances be 'fundamental' (or primary) quantities. In this thesis, some of the concepts we will explore such as variety, stability, redundancy etc., are regarded as in this category; they may not always be regarded as fundamental quantities but they are for the purposes of the model being developed to explain distribution systems.

Space-related concepts: nodes and networks

> A network is a set of elements related to one another through multiple interconnections. The metaphor of the net suggests a special kind of interconnectedness, one in which several connecting strands meet, i.e. nodes. There is the suggestion both of each element being connected to each other, and of elements connecting through one another rather than to each other through the centre, (Schon, 1971, p.190).

The notion of a network of nodes joined by interconnecting links is well established in natural (biological) systems. Such a network is represented in the food or trophic web which is "an abstraction of the different paths of matter or energy transfer [matter-energy in Miller's terminology] within a community [of species] from primary producers to consumer organisms", (Gallopin, 1972, p.241). The web structure effectively represents the various feeding relationships showing for each kind of organism its food sources and predators, (Ibid, p.242). "Because energy and material flows are important ecological processes, and because feeding relations are a principal cause of such flows, the food web of a community reflects essential structural organization", (Ibid). It is not difficult to see the analogy between the structure and functions of food webs and that of distribution systems in industry. The food web description also provides a useful insight into the structural complexities of such 'distributor' systems; this point is readily glossed over in the current distribution channel literature, presumably in the cause of simplicity for modelling purposes.

> "... a food web can be represented as a collection of points and a collection of links connecting the points. The points represent kinds of organisms and the links, which may be with or without direction, define the pattern of feeding relations. The set of points may be subdivided into subsets representing trophic levels; each subset corresponds to a group of organisms which eats or is eaten by another such group", (Ibid, p.242).

Again, at least a partial analogy with distribution systems is evident.[21] The points or nodes represent manufacturers, wholesalers, retailers facilities located throughout the food/grocery industry on a national scale. The connecting links are the relationships which exist between the various parties; these have physical and communicational dimensions.

Graph theoretic approaches (see Busaker and Saaty, 1965 for a résumé of technique and terminology) have been used by writers such as Gallopin (1972) to pictorially represent the mathematics involved in network structures. However, for our particular purposes in this thesis we do not feel this is either desirable or necessary; our viewpoint is shared by Stinchcombe (1968).[22] Nevertheless, we should mention that one of the central concepts in both food webs and graph theory is that of 'connectivity' or as we have variously called it, 'connectance' or 'connectedness'.

Returning to the context of distribution and distribution systems, the concepts of node, nodal activity, and related information and decision processes have also been developed by Stinchcombe (1968) in a

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[21] Where the overall analogy appears to break down is in its zero-sum emphasis, i.e. survival of one (species) is very likely to be at the expense of another. However, despite this acknowledged incompleteness, the food web analogy nevertheless provides a useful framework for modelling the distribution system.

[22] "Because a graph or map of a transportation system is so elegantly simple, and the 'order' of nodes so obviously related to activities, there is an intuitive temptation to treat networks by graph theory. This is unsatisfactory because usual graphical properties do not correspond to transformative activity. By the usual graph-theoretical treatment of networks, for instance, a node's being near another node increases its connectivity. But in fact it decreases its functions as a node, because more of the inputs to it are already transformed. [This may be of theoretical/predictive importance. If two nodes are close and connectivity is increased we would anticipate that one of these nodes, the intermediary, would cease to exist.] Network properties derive their importance in sociology from their significance for structures of activities, and hence conceptions of network properties (e.g. nodality) should correspond to the sources of activities and not necessarily to formal graphical properties. We lose mathematical elegance but gain theoretical economy by electing not to follow a graph-theory strategy," (Stinchcombe, 1968, p.289).

classic piece of conceptual work. The key distinguishing characteristic of a node in a network "is that the number of options about further paths increases, and decisions have to be made about which option to take", (Stinchcombe 1968, p.267). Note the similarity between this definition and Miller's (1965a, p.358) 'decider' subsystem. One decision would involve the degree of 'break-bulk' to be carried out. Closely related to this is the notion of changing the product mix of flows.

"When a flow of goods leaves a producer it is organized according to technical interdependence of production. When it arrives in a household, it needs to be organized according to the mix of consumption. At some point in the transportation network, the mix must be changed", (Stinchcombe, 1968, p.268). This point will be taken further under the next heading. Note the similarity of this notion with Alderson's (1954) notion of sorting.

Variety

'Variety' is a cybernetic[23] concept first developed by Ashby (1956) during his examination of the process of regulation. He had observed the presence of many different types of regulator in nature, and his objective was to get to the core of the subject and determine what was the common denominator in all regulators. The outcome of his work, now known as the Law of Requisite Variety, is one of the dominant laws common to all systems.

According to the Law of Requisite Variety, "there must be as many actions available to the system's controller as there are states[24] in the system", (Schoderbek et al, 1975, p.348). Alternatively stated, "the

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[23] Cybernetics is the science of communication and control. "The applied aspects of this science relate to whatever field of study one cares to name: engineering, or biology, or physics, or sociology .... The formal aspects of the science seek a general theory of control abstracted from the applied fields, and appropriate to them all", (Beer, 1967, p.7). Since cybernetic laws may be regarded as universally applicable (where communication and regulation are involved) we have used them in this thesis.

[24] By 'state' we mean, a recognizable condition of a system which may involve "some specific set of values of all the attribute variables ...." of the system, (Cherry, 1966, p.309).

number of possible states of a system is called variety", (Beer, 1974, p.10). If, for example there are 'n' people in a system, and each of them has variety 'x' (i.e. each can adopt 'x' possible states), then the variety of the total system thus defined will be x^n, (Ibid, p.16). In this sense, variety is a measure of complexity, and as we will demonstrate later, this has important implications for system stability.

> "... although a social system is a purposeful system, all of whose elements are purposeful, there is a constant tendency toward increasing or decreasing variety in the range and level of the behaviour of the elements", (Ackoff and Emery, 1972, p.215). "A set of elements that collectively neither increase nor decrease variety would have to consist of identical elements ...", (Ibid, p.216). Because a system must be either variety increasing or variety decreasing, it must be either more or less than the sum of its parts. This property of systems justifies study of them as individuals and study of the interrelationships of their parts. If systems were variety maintaining, [static] such studies would be unnecessary. We would need to study only their elements as individuals, (Ibid).

When varieties in a system are out of balance as is the usual case, organizations are structured to cope with this situation. Fundamentally, there are two ways of doing this.

> 1. "... to reduce the variety generated by the system so that it matches the available supply of regulatory variety, i.e. variety attenuation", (Beer, 1974, p.23).
> 2. "... to amplify the variety of the regulatory part of the total system", (Ibid, p.24).

So, in order to control and regulate a system, it is necessary for the regulator to absorb variety. Failure to do this allows the system to move towards instability which at best means a system out of control, or at worst, a catastrophic collapse. Variety absorbs variety, nothing else can. So, for example, if there are many customers in a store choosing various items to purchase, the ultimate 'control' situation is to have enough members of staff available to serve each and every customer simultaneously.

Controlling (or managing) the variety present is effectively what distribution channel members are doing (or attempting to do) all the time although this is not often consciously realized. The drive to improve cost-effectiveness (and hence gain a competitive edge) is a visible manifestation of the continuing search for ways to improve one's ability to manage variety. For the individual channel member, variety considerations would include the range of products produced or carried, the respective unit load sizes these products are handled in, and the different functions which have to be performed; all three will obviously vary according to location within a particular distribution channel configuration. However at a more macro level, for example, an industry or national economy, the presence of variety is equivalent to the uncertainties present in the operating environment. Beer (1974, p.90) sums up this situation with the comment that "the future, ... is unpredictable, because there is too much variety in the air. It is called freedom".

In the distribution channel context, variety should always be viewed in relation to system nodes. What then constitutes high or low variety will depend very much on the capacity of any particular node (nodal capacity). Capacity in turn will depend on certain physical constraints, e.g. a facility may reach a limiting size after which 'diminishing returns' become evident. For a retail outlet such as a hypermarket/superstore this condition may well occur as a result of limitations on the potential customer catchment area available. Although there are a number of retail location models available, little or no work has been undertaken towards establishing what is the optimum size of various types of retail nodes.

In the special case of distribution systems, the physical flow of goods from manufacturer to wholesaler and/or retailer is variety increasing primarily because the handling unit becomes progressively smaller between production and point-of-sale. Because of this 'fragmentation' process, control becomes steadily more difficult. In the reverse direction, there is the flow of communications (e.g. in the form of orders, delivery instructions, payment, etc.). These communications emanate from a large number of sources (all retail outlets) and tend to be funnelled into a comparatively smaller number of streams on the way to the manufacturers involved in the transactions, i.e. a variety decreasing process.

We are here more interested in the former case because it encompasses the physical movement of goods through the system. Under our scheme, such movement through the channel from production to point-of-sale by definition necessarily involves a progressive increase in variety.

Amplification of variety occurs at each node in the system where a given variety level on the input side is transformed or boosted into a relatively higher output variety through the performance of various functions which are characteristic of the particular type of node involved. The simplest example of this is the 'break-bulk' function performed by wholesale intermediaries (note the similarity with Alderson's (1954) notion of 'sorting'). Hence, at each node in the channel or network (i.e. manufacturers' warehouses or field depots, wholesale intermediaries facilities, or retail outlets), the transformation from low to higher variety occurs. In other words, the nodal function is to transform the number of states of a given system into a higher number of states.

Associated with this additional variety is the requirement to cope with and manage it. This may involve the deployment of additional manpower and machinery. However, simply because variety does increase in such proportions the control aspect becomes more difficult;witness the progression from highly automated procedures at the production end to the highly labour intensive procedures at the retail end of the channel. Inherent in this situation is one possible explanation why so many distribution innovations have originated at the retail end. Certainly, this is a feasible interpretation of events in the U.K. grocery industry; we will look at this matter in more detail in later chapters.

The variety equation outlined above also provides useful insights regarding possible reasons for the emergence or demise of distribution channel intermediaries although we are not attempting to specify what degree of variety disparity is necessary for either situation. If for example, an intermediary cannot provide a relatively low variety input to the next level in the distribution channel, and can only offer an input variety about the same as that which the retailer is capable of ingesting directly from a manufacturer, there is no purpose served in having the intermediary in the system at all; this type of situation is approached when larger stores such as hypermarkets receive large full-load deliveries direct from the manufacturer. It is possible an intermediary could

exist in these circumstances for a time, adding costs perhaps, mainly because the actual situation would not be immediately evident. However, if say a takeover occurred by an organization intent on streamlining the overall operation, such uneconomic links would possibly be identified and quickly eliminated.

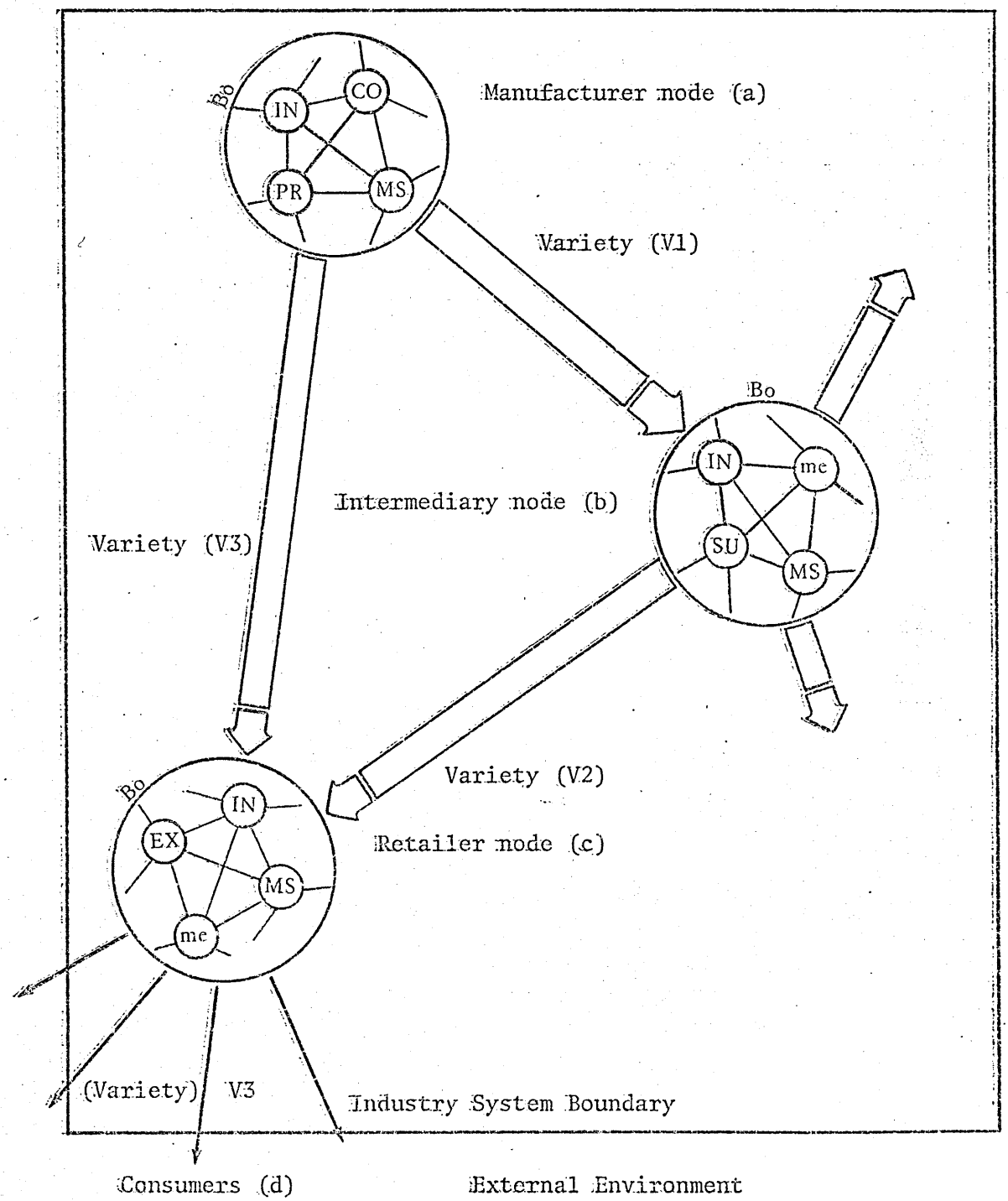
Figure 1 is a simplified schematic of a distribution system depicted in terms of variety differentials; each of the nodes considered have various (internal) subsystems which are identified according to Miller's terminology. The subsystems shown are representative only - many more would in fact exist. It is apparent that several subsystems are common to the various different nodes shown, but in our view it is the dominant subsystem which gives the node its unique characteristic, e.g. the manufacturing node (a) is dominated by the producer subsystem (PR). Likewise, the intermediary node (b) has matter-energy storage (MS) as its dominant subsystem, and the retailer node (c) has the extruder subsystem (EX).

The channel a-b-c is regarded as INDIRECT compared with the channel a-c (DIRECT); both are assumed to exhibit a significant degree of spatial and temporal separation. We would expect variety V1 to be less than V2. If however, V1 = V2, the existence of the wholesaler node (b) would be open to question. Similarly, if variety V3 = V1, the intermediary node would appear to serve no useful purpose. There is evidence to suggest that large superstore/hypermarket retail outlets in the U.K. grocery industry are capable of ingesting variety inputs comparable to wholesale intermediaries.

A direct delivery configuration along channel a-c would probably not have the same in-built temporal lags as the indirect channel a-b-c and hence would have to be more time-responsive. This may or may not be an advantage. Certainly, in times of industrial relations problems at the point of production, the buffer stockholding which is a characteristics of intermediary nodes would be a significant advantage.

Production and distribution functions are at the core of many industrial companies, but a recurring problem is the mis-match of production rate and the rate of consumer offtake. This is where intervening buffer stocks can play a role, smoothing out the cascading effects which seem to ripple through a distribution channel system, often the result of some amplification of a relatively small disturbance at the retail level.

FIGURE 1 A DISTRIBUTION CHANNEL SYSTEM DEPICTING DYNAMIC VARIETY DIFFERENTIALS



KEY to subsystems: (IN) In gestor; (CO) Converter; (PR) Producer; (MS) Matter-energy storage; (me) Memory; (SU) Supporter; (EX) Extruder; (Bo) Boundary.

In this regard, advances in technology have brought many advantages, e.g. air transport effectively allows management to think in distances of thousands of miles just as easily as say fifty miles. This is an example of technology which has helped to overcome spatial and temporal separation, and many of their attendant problems. With access to such devices the amplification of effects through a distribution channel due say to changed consumer patterns does not reach such significant proportions as previously experienced.

The classic work of Beer (1974) leads us to the conclusion that, in a distribution channel context, ignorance of the variety concept in the current literature is a gross oversight. Variety amplifiers and attenuators are being used unconsciously in channel systems, often in the wrong places.[25] The channel literature is as we showed in Chapter II, constrained within the current 'culture' of channel theorists, and is making little headway towards increasing 'real' knowledge in the area. Recognition of a concept such as 'variety' with all its potential, would be a great boost to the distribution channels discipline and no doubt an effective management device in both operational and strategic senses as well.

The cybernetic concept of 'variety' is, as we have seen, generally applicable to many situations in the systems area. Stinchcombe's (1968) notion of 'mixing demand' does not however have this same generality, but is of particular relevance to distribution systems. He defines 'mixing demand' as "the difference in heteorgeneity of the flow when it enters the node[26], compared to its heterogeneity on leaving the node", (Ibid, p.282). He gives the examples of shipments of nuts coming in

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[25] "Examination of institutional systems often reveals that the attenuators and amplifiers have been installed in the wrong loops - on the wrong side of the equation", (Beer, 1974, p.31).

[26] "A node in a network is a place where multiple paths can be taken by a flow of goods or people. This high, discretionary connectivity between lines of transportation allows great flexibility in mixing goods from different flows, assembling them (either by 'wholesaling' or by 'manufacturing'), and sending them out in proper mixes along different lines of transportation", (Stinchcombe, 1968, p.280). Again we can detect overtones of Alderson's (1954) concept of sorting here although we are convinced Stinchcombe's work was developed independently.

separate from bolts, presumably to a wholesaler or retailer, and going out as a mixture of nuts and bolts, (Ibid). In Stinchcombe's terminology, 'mixing demand' varies for each segment in the distribution channel.

According to Stinchcombe (Ibid, p.283), the mixing demand is channeled into that transportation segment which has the greatest mixing potential, and the attractiveness of segments is proportional to the total number of other transportation lines to which the flow can connect by taking that particular segment. The greater the mixing demand, the more attractive the highly connected line. "The mixing demand on a particular node would then be an aggregation of the mixing demand flowing into the node along each of the channels leading into it", (Ibid). Accordingly, Stinchcombe outlines four implications of his notion:[27]

> 1. The greater the mixing demand (e.g. manufactured goods versus coal, oil, and ore, the latter group being the more homogeneous), the greater the attractiveness of highly connected nodes (compare the predominance of New York in shipping manufactures with the predominance of Norfolk in shipping coal or of Baltimore in shipping ore).
> 2. The greater the mixing demand of the goods, the greater the degree of inequality between nodes, i.e. the hinterland of the most connected node will be larger for manufactured goods than for bulk goods.
> 3. Highly connected nodes will decrease the mixing or wholesaling function of nearby nodes, even if they are also quite highly connected. Hence the concentration of wholesaling should decline at nodes [located] near greater nodes, compared with that to be found at comparable nodes elsewhere.
> 4. If one were to compare the mixing activities for flows of goods coming from one central node to

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[27] Recall that mixing demand is a function of the difference in heterogenity of a flow of goods between origin and destination.

> another with flows coming from non-central nodes, there should be less mixing activity on the receiving end of intermetropolitan flows, (Stinchcombe, 1968, pp.283-285).

One crucial function that takes place at transportation nodes, i.e. harbours, railroad yards, truck terminals, is commonly called 'breaking-bulk'. This essentially consists of adding to the information and decision burden of goods, (Ibid, p.267). The inference which may be drawn is that this progressive increase in 'information' content is equivalent to increasing variety.

We have included a brief discussion of Stinchcombe's 'mixing demand' notion here because of its uniqueness; it comes from a source well outside the traditional channels literature and yet is an extremely good attempt at offering some fundamental explanation of how physical distribution (i.e. mainly handling/transportation) is effected. In Stinchcombe's terminology, nodes are generally major commercial centres or cities/ports. Connectivity of a particular node is simply the number of other centres it is linked to in a transportation sense. In general however, we would prefer to concentrate on the more generally applicable 'variety' concept while acknowledging the conceptual value of the 'mixing demand' notion.

Stability

Stability is defined as "the propensity, following a perturbation, to return to the deterministic equilibrium point", (May 1973, p.5). Stability is therefore the "... capacity of an organization to remain in equilibrium. Instability is the absence of this capacity", (Feibleman and Friend, 1969, p.39). 'Organization' used in this sense may be any level, e.g. in this thesis we are interested in the industry level and various sectors (subsystems) within. It is true that many natural systems, particularly living systems, possess the ability to react to their environment in such a way that ensures continuance of the system. This is the ability to learn, adapt and evolve, and is obviously related to the notion of stability, (Hall and Fagan, 1956, p.23). Implicit in this process of remaining stable is the requirement for negative

feedback[28] to correct any deviate tendencies.

Because of its open nature, a dynamic system is in constant flux and the higher its variety the greater the flux. Its stability therefore "depends upon its net state reaching equilibrium following a perturbation. The time this process takes is the relaxation time. The mode of organization adopted for the system is its variety controller", (Beer, 1974, p.11). The environment is a source of many perturbations one form of which is change; innovation is a special case of change. Hence it is quite probable that an innovation, if significant enough, could affect the stability of industrial organization. Problems arise because the currently explosive rate of change produces perturbations at intervals that are shorter than the relaxation time of institutional systems, hence the potential to move towards unstability.

Beer (1974, p.11) makes the observation that "all our major societary institutions are high-variety systems; all of them need to have a finite relaxation time; but all of them are subject to constant perturbation ...". According to Beer (Ibid) there is only one way to cope with this situation "and all institutions use it - although they use it in many forms. They have to reduce the variety of the system", presumably using various mechanisms of variety attenuation.

"... homeostasis is the tendency of a system, especially the physiological system of higher animals, to maintain internal stability, owing to the co-ordinated response of its parts to any situation or stimulus tending to disturb its normal condition or function", (Langley, 1973, p.1). There are two essential ideas contained in this concept, i.e. internal stability, and the co-ordinated response necessary to maintain this internal stability.

A system that, through the deployment of variety amplifiers and attenuators, is able to achieve a stable condition in the face of all

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[28] Feedback - when there exist two channels, carrying information, such that Channel B loops back from the output to the input of Channel A and transmits some portion of the signals emitted by Channel A. When the feedback is such that it increases the deviation of the output from a steady state, positive feedback exists. When signals are reversed so that they decrease the deviation of the output from a steady state, it is negative feedback, (Miller, 1975a, p.227).

perturbations, is called a homeostat,[29] it can resist perturbation, not only against disruption, but also against unexpected disruption too, i.e. it is ultrastable. - Whatever happens, provided that its relaxation time is sufficiently short, it will not go into oscillation, and still less will it explode into catastrophic instability.

Following Forrester's (1961, p.66) advice we are avoiding the simplifying assumption that all systems are simple and linear in nature; we would prefer to approach reality by acknowledging that many system forms are in fact quite non-linear and complex in nature. In taking this position we are forced to abandon most of the management and economics literature and seek clarification in other fields which have not so readily adopted simplifying assumptions for the purposes of ease in model-building. One such field is that of theoretical ecology and the study of ecosystems.[30]

Gardner and Ashby (1970, p.784), in a pioneering piece of research into the factors which affect the stability of large complex dynamic systems, concluded that such systems "... may be expected to show the property of being stable up to a critical level of connectance, and then, as the connectance increases, to go suddenly unstable". They define connectance (C) (or connectedness) as the probability of a pair of system elements interacting. In practical terms the number of links emanating from a particular node could be taken as a gross measure of connectance;[31] this therefore is equivalent to the connectivity notion contained in our earlier discussion of 'mixing demand'.

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[29] A homeostat "... is a control device for holding some variable between desired limits. The classic biological example is the homeostasis of blood temperature. The same mechanism, homeostasis, is found everywhere in nature", (Beer, 1967, p.22).

[30] Ecology is essentially the study of systems at a level in which individuals or whole organisms are considered as the interacting elements, either among themselves or within a loosely organized environmental matrix. Systems at this level are called ecosystems, (Margalef, 1968, p.4).

[31] Connectance (C) is important because it is in effect an indication of structural arrangement, e.g. for a given number of nodes, connectance may be weak or strong, depending on the number of links between pairs of nodes present.

May (1972) carried this work further with the object of clarifying the relation between stability and complexity in ecological systems with many interacting species. He introduced the additional notion of the average strength of interaction (S) between the number of components (n) in the system. May's (1972, p.414) instability equation can therefore be given as:

$$S = {}^{1}/\sqrt{nC}$$

where n = number of system components

C = probability of any pair of elements interacting; for each pair of nodes being considered this is either 1 (if connected) or 0 (if not connected).[32]

S = average strength of interaction

The implications May drew from this mathematical model, in an ecological context, were that for a multi-species community in which the population of each species would by itself be stable:

1. Too rich a web connectance (i.e. C too large), or
2. Too large an average interaction strength (S too large),

leads to <u>instability</u>. The larger the number of species (n), the more pronounced the effect, (Ibid).

In a follow up to this work May (1973, p.74) concluded that "in general mathematical models of multi-species communities, <u>complexity tends to beget instability rather than stability</u>". Emery et al (1974), p.31) have subsequently applied May's instability equation to study of different environmental possibilities. They noted that "n is not independent of C; if for any element C drops to zero, that element cannot be regarded as a component of the system, i.e. the system becomes n-1; and vice versa for any element for which C becomes greater than zero". McMurtrie (1975, p.3) transposed May's original instability equation into the following form, i.e.

$$S\sqrt{nC} \quad \begin{matrix} \text{unstable} \\ \gtrless \\ \text{stable} \end{matrix} \quad 1$$

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[32] In ecological terms, the web connectance (C) expresses the probability that any pair of species will in fact interact. It is measured as the percentage of non-zero elements in a matrix, or equivalently, as the ratio of actual links to topologically possible links in a trophic web, (May, 1973, p.63).

According to McMurtrie (Ibid, p.5) the above stability criterion equation implies "that the probability of stability ... decreases with the increase in complexity attained by increasing either n or C". He goes on to make the point that in real life systems, complexity is not necessarily attained at the expense of stability, the inference being that stability is enhanced by an increase in organization (or decrease in entropy).[33] McMurtrie (Ibid, p.8) concludes that "random systems with well developed hierarchial structures can tolerate a much larger connectance than systems without such structures".

In terms of distribution systems, n represents the numbers of nodes, C is the number of links connecting those various nodes into a network, and S is the strength of interaction between pairs of nodes; S is therefore effectively a behavioural parameter which could be used to explain the presence of power and conflict relations in channels.

High S effectively means a high degree of interdependency between given nodes. A good example of this is the now defunct relationship between Tesco Stores (a powerful retailer) and Green Shield (a stamp company). When Tesco decided to drop stamps from their sales strategy, the effect on Green Shield was of almost catastrophic proportions - two-thirds of its business (£20 mil) was lost overnight. We would suggest that Green Shield was too strongly connected and too dependent (high S) on this one major customer; the implications for its stability and survival have since become very clear.

Beer (1974, Ch. 1, pp.1-17) uses the simple example of a tennis ball suspended by strings to demonstrate the notion of 'connectance' and its implications for system stability, e.g. if the system is relatively simple and slack with only a few strings suspending the ball, it is said to be loosely connected and have low connectance. If disturbed, the ball will oscillate for a short period and return to its equilibrium position; its stability is relatively good. If however, the ball has many linkages (more complex), it is said to be highly (or richly)

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[33] "In a descriptive sense, entropy is often referred to as a measure of 'disorder' and the Second Law of thermodynamics as stating that systems can only proceed to a state of increased disorder ; as time passes, entropy can never decrease . The properties of a gas can change only in such a way that our knowledge of the positions and energies of the particles lessens; randomness always increases. In a similar descriptive way, information is contrasted, as bringing increasing order out of chaos. Information, then is said to be 'like' negative entropy. But any likeness that exists, exists between the mathematical descriptions which have been set up; between formulae and method", (Cherry, 1966, p.216).

connected. If disturbed, it will take much longer to regain its former equilibrium position.

So if we have a relatively complex system with a large number of elements and highly connected (many linkages), it has the criteria for moving towards instability. For this reason this type of system is not very prevalent in nature or society at large; one particular example, the pyramid type of sales/distribution organization, will be reviewed in Part C to follow.

Channel capacity

All channels, whether transmitting physical goods or non-physical information, have a finite capacity, as does the total system network which is itself the aggregate of those channels. Any tendency to exceed capacity limits and overload a channel may result in dysfunctional consequences. The channel capacity concept is therefore somewhat analogous to the notion of the conservation of energy; it has a definite limit which no practical system can exceed, "and its principal value is that it provides a standard against which efficiency may be assessed", (Cherry, 1966, p.52). This concept has been developed furtherest in information theory.

The classic equation for information amount (H) is as follows:

$$H = -\sum_{i} p_i \log p_i$$

where p_i is the probability of choice of the i^{th} symbol or message. The capacity of a channel is "... described not in terms of the number of symbols it can transmit, but rather in terms of the information it transmits", (Shannon and Weaver, 1949, p.16); or capacity of a channel can be described in terms of its ability to transmit what is produced from a given source of information, (Ibid). Binary digits or 'bits' are the elementary units of information capacity. 'Noise' is the ultimate limiter of information transfer, and refers to "any disturbance or interference, apart from the wanted signals or messages selected and being sent", (Cherry, 1966, p.42).

Balderston (1958, p.155) likens the communication link between any two actors in the market to "... a pipeline which is set up to connect any two points. Once built, it can carry variable flows of information

(up to some maximum limit) but its current operating costs per time period will be assumed independent of the amount of information carried or the number of messages".

Again we can draw analogies with distribution systems. Every unit of good transferred through the system is in effect a 'bit' of information. The notion of 'noise' in a communications system could be equated to wasted or unused capacity (or redundancy) in a distribution system, i.e. the non-utilized volume in transport and storage phases of channel operation.

Redundancy

Redundant relationships are those "that duplicate other relationships. They increase the probability that a system will operate all of the time and not just some of the time", (Schoderbek et al, 1975, p.348). Redundancy is a valuable property in all types of system, e.g. communications (see Cherry, 1966, p.186), cybernetic machines and the brain (see Beer, 1967, pp.100, 102). In essence, it involves duplication within a particular system which in turn allows greater flexibility[34] or resilience of operation in the sense that certain failures of system elements can be tolerated without affecting its overall performance. It provides systems with the ability to adapt to change and hence increases their survival potential. Obviously, where there is little or no redundancy present in a system the system is brittle, i.e. its mechanism is liable to break-down, and does so suddenly.

"The brain is a highly adaptable instrument; there is considerable flexibility in its functionings, and plasticity or give-and-take between its parts as forced by circumstances such as damage, or difficult or unusual circumstances", (Cherry, 1966, p.61).

In a distribution system context, redundancy could take various forms, e.g.

1. An excessive number of nodes and/or links between certain nodes (high connectance), e.g. additional intermediate locations,
2. Excessive stock holdings at various nodal locations i.e. buffer stocks.

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[34] Flexibility "is the capacity of an organization to suffer limited change without severe disorganization", (Fiebleman and Friend, 1969, p.41).

Both these situations would help to match actual production with end consumers' needs and hopefully smooth out potential surges in the channel system. The cost of supporting redundancy to achieve such smoothing may well be regarded as acceptable. The cost of such a strategy may even be less than the alternative of less stocks but more disruptions and stock-out situations.

The people resource is perhaps the most multi-functional of all components in a distribution system. In situations where cost efficiencies are sought, managements have to be aware that reducing redundancy may be dysfunctional in certain parts of the system, e.g. computers are effectively uni-functional and generally require back-up facilities; removing such back-up in the name of cost-efficiency would be of dubious value.

However, in dealing with people, it is easier to add or subtract staff because people can be switched between various tasks, often without seriously affecting the end result. It is a sad reflection on the current channels literature that so much emphasis is given to improving cost-efficiency in purely economic terms (see for example Fox, 1970, p.1), which by implication means progressively trimming back any inherent redundancy in a given system. We contend, in the light of our studies here, that such an approach is unnecessarily simplistic and may ultimately prove counterproductive.

PART C

Catastrophe Theory

Catastrophe theory, created by Thom (1972)[35] in the 1960s is a new mathematical method for modelling discontinuous phenomena in nature.

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[35] The theory's originator, Professor René Thom, is one of the world's greatest intuitive mathematicians. Whereas he takes a somewhat philosophical approach, Professor E.C. Zeeman at Warwick University, adopts a much more applied approach. The writer was fortunate to spend some time with Professor Zeeman discussing the proposed application of the theory to distribution systems. See Appendix A for an introductory treatment of the theory of 'elementary catastrophes'.

It applies to situations where gradually changing forces produce sudden effects. Normally, one expects continuous causes to produce continuous effects, and when they produce discontinuous effects, the result is often so unexpected we are liable to call it a 'catastrophe'. It is not necessary for the 'catastrophe' to always be of the magnitude of war, or an earthquake or other natural disaster, in order that the model may be applied. All that is needed is a situation where the states of the system under inspection change very rapidly and are therefore not describable in terms of continuous differential equations. An ocean wave breaking off-shore is a splendid example of catastrophic behaviour. The massive electrical blackout in New York City on 14 July, 1977 is another.

In essence what happens is as follows. A physical, biological or social system may be sitting quietly in equilibrium; meanwhile, the underlying forces may be changing slowly, causing the equilibrium position to alter gradually. Eventually a point is reached where that equilibrium breaks down, and the system suddenly snaps into a new equilibrium position, i.e. there is a quantum jump or step-function.[36] This sudden snap is the catastrophic change.

In qualitative social terms, such events are happening around us all the time; people are suddenly losing their tempers, prison riots are occurring, stock exchanges are fluctuating widely, and nations are declaring war on each other. What is new is the recently acquired mathematical ability to model such discontinuities which by their very nature have defied prediction. The simplest elementary catastrophe of any subtlety is the cusp catastrophe.[37] One of the most visible and practical demonstrations of its use so far is described in Zeeman et al (1976) where the sudden outbreak of prison disturbances are modelled; in this particular model there is demonstrable predictive ability.

Our decision to include a treatment of 'catastrophe theory' in this chapter is simply to offer it as a potentially useful explanatory

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[36] Ashby (1954, pp.88-89) had previously recognized that step-functions occur abundantly in nature. He was generally concerned with a single variable whereas the mathematics of catastrophe theory attempts to cope with many variables.

[37] Read Zeeman (1971), Zeeman (1976a), and Isnard & Zeeman (1976, pp.70-74) for a detailed description of the cusp catastrophe model.

framework in the case where systems, and specifically distribution systems, move rapidly from stability to unstability, ultimately coming to rest in a new state. This condition would seem to correlate with the May-Ashby model discussed in the previous section.

In point of fact, because of negative feedback effects, distribution systems as we know them tend to evolve and change gradually without apparent catastrophic-type behaviour. In effect, people working in and especially managing the distribution function are learning to adapt to environmental changes and taking what amounts to continuous corrective action. This is not always the case as is readily demonstrable in the case of 'pyramid' selling/distribution organizations. In fact this example presents a good opportunity to demonstrate the utility of catastrophe theory, because such organizations are a fine example of distribution systems which have a well documented history of collapse.[38]

Sales/distribution pyramid systems grow on a geometrical scale as depicted schematically on a very limited scale in Figure 2. Using the three variables, n, C, and S developed in Part B from the work of May-Ashby-Gardner-McMurtrie, it is possible to say that:

n, the number of nodes, is very high and growing geometrically.

C, the connectance is also high.

S, the strength of interaction is very substantial because if the chain is broken at any point through non-sale or non-supply, a large section of the system will collapse; interdependency is high.

If we represent the three parameters (n, C, and S) of the instability equation on Thom's three-dimensional cusp catastrophe in Figure 3, the implications become clear. With all parameters increasing, the system moves towards a point R_1 at which the system's previously tolerated level of instability is suddenly overshot and the system moves to a new position, R_2 on the behaviour surface, at which a new higher order stability condition is achieved. In terms of the pyramid organization we would posit that at point R_1, the bottom of the chain has been reached - in theory everyone has bought stock and no more buyers can be

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[38] For further details of pyramid selling/distribution, refer Imberg et al (1972), and Greenel (1973).

FIGURE 2 PYRAMID DISTRIBUTION ORGANIZATION

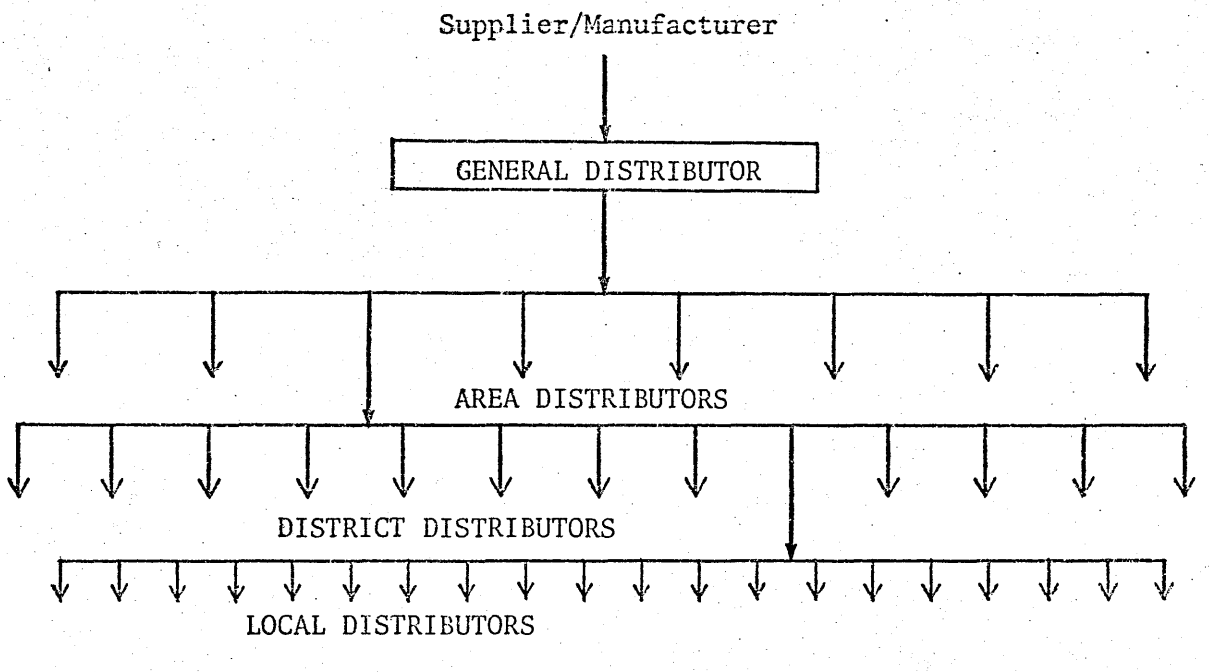
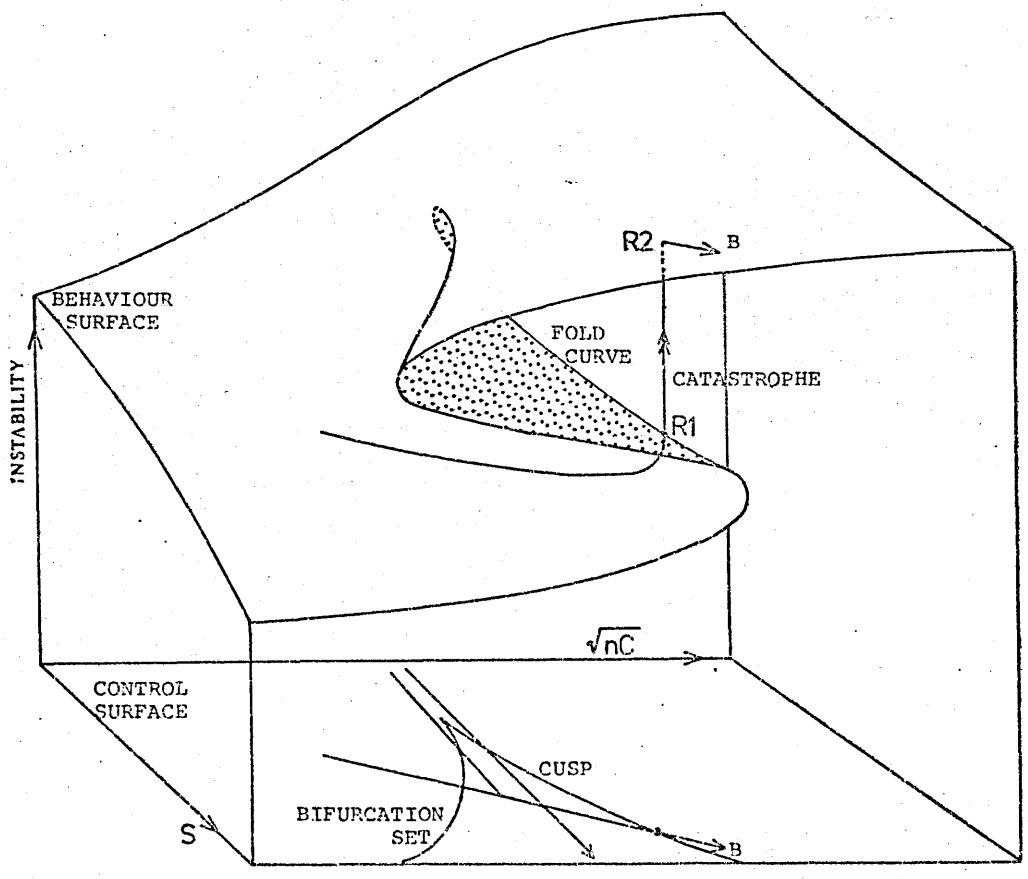


FIGURE 3 CUSP CATASTROPHE



found to progress the chain reaction further. At that point the system collapses. Point R_2 most probably represents a new attempt to begin another pyramid organization, possibly with another range of products, but now operating in a society which has already suffered the consequences of the previous collapse so the starting point of the new organization will have an inherently higher level of instability even if it is apparently in an equilibrium condition at its inception.[39] In Chapter VII, we will attempt to demonstrate a similar succession of events with this model for particular cases of innovation introduction.

Conclusions

We are now in a position to outline our 'systems' model in the form of several heuristics as follows:

1. Systems mapping begins with an identifiable outcome.
2. A system is a distribution of the members or nodes (n) in a dimensional domain (or network).
3. Members (or nodes) of a system are connected to each other with reference to the whole (or outcome).
4. There are eleven identifiable groups of relationships between system elements which dictate the system form.
5. For any system there is a well defined number of critical subsystems necessary for its operation and survival.
6. The Law of Requisite Variety generally applies.
7. In any system, the relationship between numbers of elements or nodes (n), their connectance (C), and the strength of interaction between nodes (S), is of critical importance to its stability in the face of perturbation.

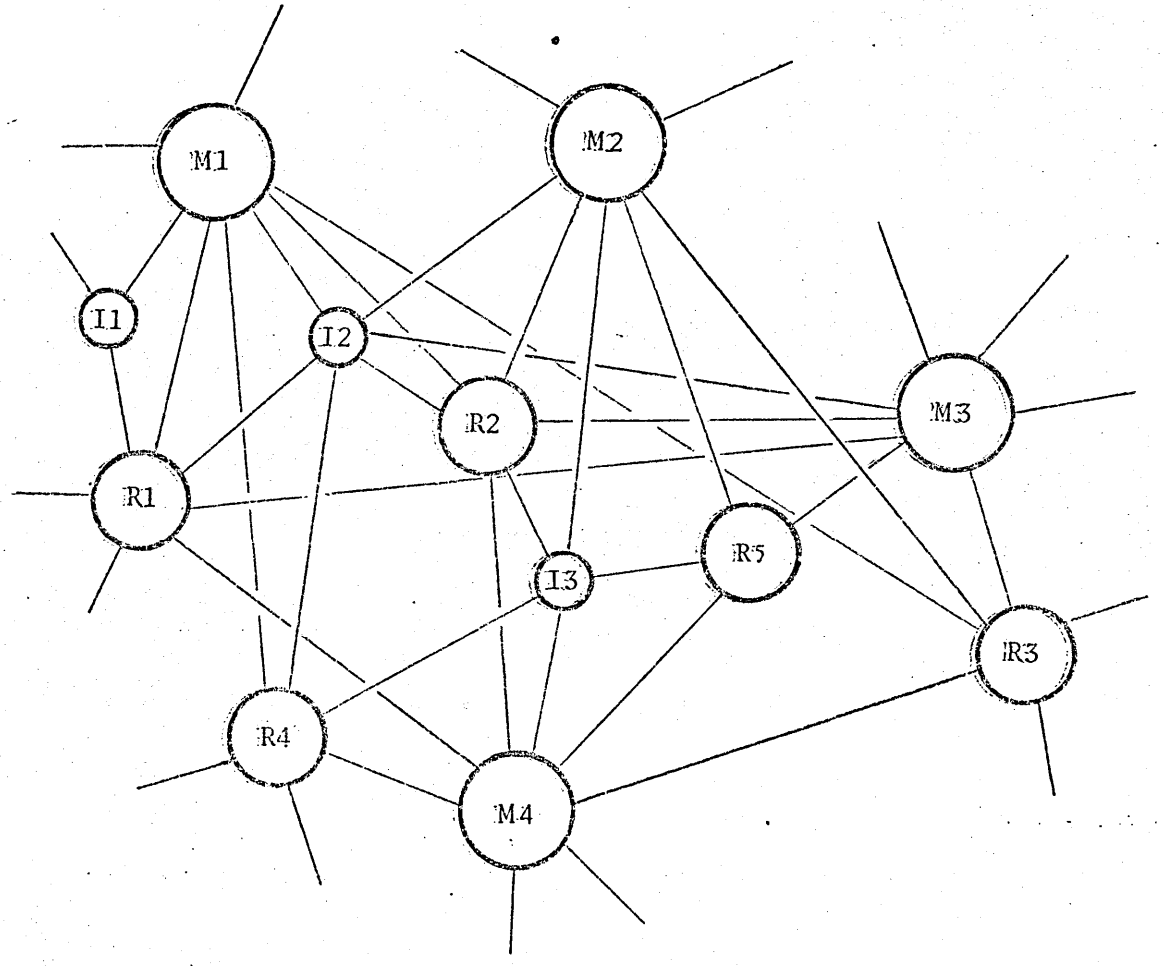
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[39] The only examples which come to mind which demonstrate successful application of direct sales/distribution techniques are Avon (cosmetics) and Tupperware (kitchenware). However, both of these companies use a relatively shallow organization and avoid the deepening, widening pyramid approach. They therefore avoid the potentially dangerous mixture of high n coupled with high C and high S.

8. Every system has a definite upper limit in terms of its capacity; a tendency to overload may lead to dysfunctional consequences.
9. Some degree of redundancy in a system's configuration is necessary for flexibility and resilience in face of externally generated change.
10. It is possible for certain conditions to combine and build up in such a way that a system may become grossly unstable and undergo sudden and catastrophic change.

In order to integrate the above heuristics (and the concepts they embody) into a composite systems model which will adequately explain and possibly predict distribution channel behaviour, a "typical" distribution network (see Figure 4 below) is used to demonstrate the utility of each concept separately and important inter-relationships between them. Subsystems within each node will not be covered; the emphasis is more on inter-nodal activity.

FIGURE 4 DISTRIBUTION CHANNEL NETWORK



M = Manufacturer; R = Retailer; I = Wholesale intermediary

In terms of distribution channel operations, the identifiable outcome is the physical transfer of goods from production to point-of-sale. For a particular industry there exists a network of nodes of various types (M, I, R, ...) which combine in various configurations to achieve this required outcome. These nodes are facilities owned and operated by channel members; each performs a certain pattern of functions/activities. If any innovation introduced into the system has the effect of upsetting the existing allocation of functions/activities, the potential for inter-party conflict immediately rises. In other words, each channel member is so deeply imbedded in the system, that any action by one sector of an industry will almost certainly have repercussions on the system's performance as a whole. As we have already demonstrated in Figure 1, a distribution system, and the nodes (members) within it have a number of critical subsystems which are necessary for survival and continuity.

Variety, whether in the form of physical units of products, or functions/activities performed on the original production unit, will increase as the product flow moves from manufacturer(M) through wholesale intermediary (I) to retail outlet (R) or directly from manufacturer to retailer. As variety increases, it becomes more difficult and costly to manage and control. Our observations in the U.K. grocery industry confirm that many retail companies in particular are still struggling to 'control' their respective operations in a cost effective manner.

Perhaps one of the most important parameters of a distribution system is its ability (or otherwise) to remain in a stable state in the face of externally generated influences which tend to have a disequilibrating effect. Innovation is an important source of such influences. Following work in other disciplines we have been able to establish that the three primary factors which determine system stability are system size in terms of numbers of nodal elements (n), the degree to which these nodes are connected (C), and the actual strength of interaction (or interdependence) (S) present between pairs of nodes. We believe all three are measurable quantities. If changes in all three occur, and in a direction which will lead to instability, it is possible this condition will occur suddenly and catastrophically.

However, even without absolute measurements, it is possible to gain relative impressions, e.g. in the U.K. grocery industry, although it is

possible to ascertain the actual number of nodes, what is more important is an awareness of the trend to retail concentration. Many small stores are being eliminated and being replaced by a lesser number of larger stores. Effectively, the distribution network in terms of nodes (n) is contracting.

Connectance represents a more difficult measurement task but for any particular innovation it is possible to at least assess the direction in which C would move, e.g. any large-scale trend to direct deliveries from manufacturer to retail branch obviously increases the connectance of the overall system; this fact is just as important as the actual size of increase.

From a purely behavioural viewpoint, the strength of interaction between channel parties is perhaps the most important; it also presents the most difficult measurement task. If in our schematic, retail outlet R4 receives products from manufacturers M1, M3, and M4, the relative importance of each manufacturer to R4 is a key factor in how each party interacts. If, for example, R4 had become very dependent on M1 for a large proportion of its product range, it is obviously in a relatively weaker bargaining position compared to its dealings with M3 and M4.

The current situation in the U.K. grocery industry is however generally the reverse, i.e. manufacturers rely heavily on major retail customers for continued prosperity. Hence, any innovation introduced by the retail sector has more chance of being imposed than one which originates in the manufacturing or wholesaling sectors, especially if the major share of the benefits remain with the innovating party which is usually the case.

Each particular channel of distribution in a given network has a finite capacity which, if approached or even surpassed, will result in many operational problems. Generally, this is not a usual experience because there are usually several alternative channels (direct and indirect) between a pair of nodes. Use of an indirect channel, although it may not be as time-responsive as the direct alternative, has much to offer in strategic terms. It introduces redundancy into the network via the 'buffer' stocks held at each storage node, and provided the degree of redundancy has not become unworkable and unacceptably costly, it injects into the system a very necessary flexibility and resilience

capability which is so essential in times of imposed change; it gives room to manoeuvre and either absorb or reject the change (innovation) in question.

We will be using many of the above concepts and similar terminology when we analyze several examples of distribution innovation in Chapter VII.

CHAPTER IV

SYSTEMIC CHANGE & THE ENVIRONMENT

What, in the end, is management's most fundamental task? It is to deal with change. Management is the gate through which social, political, economic and technological change - indeed, change in every dimension - is rationally and effectively spread through society.

Robert McNamara

In Chapter I, the process of innovation was examined and the inference promoted that it was an externally sourced instrument of change. We found scant evidence to suggest that this particular form of change agent was being consciously 'managed' in an interorganizational sense; most emphasis appears to be given to the intraorganizational level. Coupled with this lack of 'management' emphasis, we found somewhat surprisingly, that the consequences of innovation were rarely considered in the flush and excitement of the adoption phase; we still do not fully understand this vital oversight, especially when writers such as Seiler (1967) indicate from experience "that while some actions we take produce the effects we want, others do not, i.e. there are unexpected consequences produced", (Ibid, p.1).

The principal implication from the deficiencies revealed in Chapter I is that something needs to be done to close the ignorance gap. Perhaps the answer, in part at least, is to focus more on 'planned change'. However, although it is possible that systems analysis procedures may prove to be a useful aid in planning, we cannot pursue this theme very far without first examining the key influential in any planning scheme, the environment.

Systems Environment

The systemic view should always look beyond the given boundaries of a system in order to see the interaction of the system with the environment, (Rapoport, 1976, p.238). Warren (1967, p.397) expresses a similar view in developing his concept of 'interorganizational field'.

As already depicted in Figure 1, the environment is everything that is outside the system; the two are separated by a boundary condition.[1] As suggested in the previous chapter, the boundary is identifiable because it occurs where there is a change in dimensionality, or where "there is a marked drop in commonness of purpose, unity of function, or interdependence", (Haberstroh, 1965, p.1174). With systems of the type we are interested in, open systems, there is a matter-energy exchange between system and its environment across what is effectively a permeable boundary. Much of this exchange is in the form of information flows.

"In general ... the environment is conceptualized in terms of a simple listing of factors outside the firm's control which may affect its performance", (Glaser, 1976, p.49). In this regard, the following classification (in informational requirement terms) offered by Ross (1970, pp.109-110) is not atypical:

1. Political and governmental considerations.
2. Demographic and social trends.
3. Economic trends.
4. Technological environment.
5. Factors of production.

A widely quoted definition of the environment describes it as that "set of all objects, a change in whose attributes affect the system and also those objects whose attributes are changed by the behaviour of the system", (Hall & Fagan, 1956, p.20). This and similar definitions by Schoderbek et al (1975, p.348), Ackoff (1971, p.662), Kotler (1972, p.52), and others add little to our understanding of the environment. Glaser (1976, p.49) sums the situation up well when he remarks that these various conceptualizations of the environment "go little further than saying that everything 'out there', beyond the skin of the organization or product, is, in some way, worthy of management attention". According to March (1972, p.26), viewing the environment "as an infinite array of phenomena, and a check list, offers few guidelines for the selection of a limited number of phenomena for study".[2]

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[1] Recall Footnote 15 of ChapterIII defining 'boundary'.

[2] McWhinney (1968, p.272) calls these "domain problems".

This assessment is a valid criticism because the environment is generally characterized in terms of its phenotypical qualities which are the outward and visible manifestations of its underlying constitution, (Glaser, 1975, p.50). However, simply observing "the phenotypical characteristics of the environment alone is potentially misleading because the phenotype may not consistently reflect the constitution of the environment. For example, the environment may show certain sets or patterns of phenotypes which stem from different constitutional characteristics of the environment", (Ibid). In fact Emery (1967) maintains that a reduction to genotypical characteristics is necessary; "with living systems, the most fundamental genotypical characteristics are the system-environment relations that determine survival (i.e. continued living)", (Ibid, p.207).

Causal Texture of the Environment[3]

This is an important concept re-introduced by Emery and Trist (1965) following earlier work by Tolman and Brunswik (1935), and Pepper (1934). Essentially, it involved characterizing the environment in terms of the distribution and organization of goals and noxiants ('goods' and 'bads') for the constituent systems involved. They distinguish four levels of environment on this basis and these will be briefly outlined below.

Type I Placid Random Environment: This is the simplest type of environmental texture - goals and noxiants are relatively unchanging in themselves and distributed randomly and independently over time and space.

Type II Placid, Clustered Environment: Static, but a degree of 'texturing' of the environment is evident. While the environment is still essentially placid, the goals and noxiants cluster together in

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[3] By causal texture is meant "... the extent and manner in which the variables relevant to the constituent organizations (organisms) are, independently of any particular part, causally related or interwoven with each other", (Emery, 1967, p.218). It is a function of the interdependencies among a set of organizations which form an inter-organizational system, (Metcalfe, 1974, p.643). The more closely the activities of organizations are interrelated, the more complex and dynamic (Duncan, 1972) the causal texture of the environment becomes and the greater the area of uncertainty the component organizations have to cope with.

time and space "with varying probabilities that are knowable for the system", (Emery et al, 1974, p.23). "In such environments it is possible to identify sources (causes) of events; one can make [probabilistically] useful statements about future occurrences and can select 'best' actions. Most of our physical science knowledge assumes and/or bears on such environments. The process of study is typified by the near independence of the observer from the observed", (McWhinney, 1968, p.270).

Type III Disturbed-Reactive Environment: This is a dynamic rather than static environment. It is a placid, clustered environment "in which there is more than one system of the same kind, and hence the environment that is relevant to the survival of one is relevant to the survival of the other", (Emery et al, 1974, p.26). "In such environments an interactional relationship exists between the observer and his environment such that one cannot make statements about the world independent of the knowledge of the position and intents of other individuals and organizations which populate such dense environments", (McWhinney, 1968, p.271).

Type IV Turbulent Environment: This is again a dynamic environment, its dynamic properties arising not simply from the interaction of identifiable component systems but from the field itself (the 'ground'). The turbulence results from the complexity and multiple character of the causal interconnections. Individual organizations, however large, cannot adapt successfully, simply through their own direct interactions, (Ibid).

In order to study the relationship between levels of systems and levels of environment, four potentially lawful connections (L) between the system and the environment must be specified, (Emery and Trist, 1965, p.22); the suffix 1 refers to the organization and the suffix 2 to the environment. Using this notation, L_{11} refers to the relationships between parts of the system; L_{22} is the relationship between parts of the environment, its causal texture; L_{12} and L_{21} refer to the terms of exchange between the environment and the system - from system to environment (L_{12}) and environment to system (L_{21}). Glaser (1972, p.56) depicts the various possible relationships as follows:

L_{11}	L_{12}	L_{21}	L_{22}
Functional	Capacity	Conditioning	PLACID RANDOM
Goal directed	Satisficing	Meaningful learning	PLACID CLUSTERED
Purposeful	Optimizing	Problem solving	DISTURBED-REACTIVE
Ideal seeking	Adaptive Planning	'Learning to learn'	TURBULENT

In moving from Type I placid random to Type IV turbulent environment, there is an increase in the complexity and connectedness (connectance) of system environment relationships, (Gardner and Ashby, 1970; May, 1972). Changes in these fundamental parameters are reflected in increased dynamism in the interaction between system and its environment, (Duncan, 1972).

Following Feibleman and Friend (1945) these dynamic conditions of interaction may be described under the following terms; one or more of these terms may be used to characterize systems at different levels of causal texturing of the environment.

1. Action-Reaction: Refers to the system's effect on the environment and the environment's effect on the system. Functional systems display reaction only.
2. Availability-Indifference: Availability is a characteristic of a limited part of the environment which affects, and is affected by, the system. Indifference is where that limited part of the environment does not affect, and is not affected by the system.
3. Equilibrium-Disequilibrium: In this case the influence of the organization (system) on its environment and the influence of the environment on the system are in, or out of, balance.
4. Saturation-Insufficiency-Superfluity: A saturated system is one which hardly reacts with the available environment - it is in equilibrium. A system which is insufficient will need to take on and/or re-organize parts in order to reach equilibrium. A superfluous system is oversaturated and can achieve equilibrium by interacting with the environment and shedding its superfluous parts.
5. Flexibility-Rigidity: A system which is flexible can suffer change without severe disorganization; a rigid system cannot. Change occurs in a flexible system without concommitant disequilibrium.

6. Stability-Instability: Refers to the system's capacity for remaining in equilibrium. A system which is unstable will lack this capacity. Stability will depend upon the system's flexibility or rigidity depending upon the relative dynamism of the environment in which the system operates.

Having completed the above discussion on the environment we now return our attention to the planning aspect introduced earlier.

Planning Orientation

"Planning is defined as the guidance of change within a social system", (Friedman, 1967/68, p.225). It is the design of a desired future and of effective ways of bringing this about. Planning also "implies some commitment to bring into being a state of affairs that does not presently exist and is not expected to occur naturally within the desired time", (Emery, 1976, p.10). But planning is becoming increasingly difficult as the environment becomes more complex, approaching the Type IV turbulence suggested by Emery and Trist (1965). Hood (1962, p.73) points to this increasing complexity and accelerating rate of change in organizational environments. In business circles there is a growing conviction that the future is becoming even less predictable. Drucker (1964, pp.6-8), and Gardner (1963, p.107) both assert that the kind and extent of change precludes prediction of the future.

"Increasingly, the rational strategies of planned-innovation and long-range planning are being undermined by unpredictable changes", (Terreberry, 1968, p.595). McNulty (1962) suggests that built-in flexibility may be the most efficient method of coping with such changes. Lloyd (1970) fully concurs on this point: "a high rate of change of products, processes, markets, distribution, materials, technology and transportation require organizations that are flexible, and have the capacity for responding quickly to changes in the environment, (Ibid, p.49).

Such flexibility could be achieved by deliberately building redundancies into an organization system, e.g. in a channels context this may mean buffer stocks and additional stocking locations or transport arrangements over and above the calculated optimum level.

From our investigations so far it has become quite apparent that the piecemeal presentation of problems narrowly defined to meet immediate operational requirements is no longer sufficient in an environment which is becoming increasingly complex. This is particularly true in the specific case of innovation adoption in channels of distribution.

Innovation in a Channels Context

In a strictly distribution channels context, few writers have even attempted to couple innovation and channel development; McCammon (1967), Michman (1971), Izraeli (1971), and Swan (1974) are perhaps the only exceptions in this respect. Michman (1971) regarded channel innovation as beneficial "to the extent that usually a wider market can be served or such change meets the convenience of a special group of consumers", (Ibid, p.46). From this remark we can only assume he was referring to the particular case of establishing new channels to sell new products. Our own interest ranges much wider than this.

Swan (1974) studied the correspondence between the emergence of an innovation in distribution channels for groceries (in a U.S. context) and a general (challenge-response) model of change in industrial systems developed by Parsons and Smelser (1956). The model considered innovation as a process involving the solution of a problem over time and the re-organization of the industrial system to make better use of resources. Swan (Ibid) found that innovation as a sequential response to a problem stood out clearly but the re-organization of grocery distribution could not be analyzed unambiguously.

McCammon (1967) viewed the evolution of channels as a process "... in which firms and channels manoeuvre for short-run advantage and in which they adapt almost imperceptibly to environmental disturbances", (Ibid, p.75). This is what we have previously referred to as the piecemeal approach. McCammon did not however overlook the special case of major changes which are capable of disrupting prevailing practices, e.g. "the sudden appearance of new products, new methods of distribution, ... may imperil existing institutional relationships", (McCammon, 1967, p.75).

Izraeli (1971) traced the historical development of marketing channels from as far back in history as the Industrial Revolution and

claims there is evidence which suggests a cyclical process.

> In each cycle the economic position of 'weaker members' in the marketing channels (whether they be manufacturers, wholesalers, retailers or even customers) is threatened by the growing concentration of some other member in the channel. A characteristic feature of the cycle is that the disadvantaged component or member of the channel mobilizes to countervail both the vertical and horizontal competitive pressures. It then reasserts its position through either internal growth or affiliation, (Izraeli, 1971, p.137).

This conceptualization of channels development is a useful general guide to the broad changes taking place in a given industry but we are seeking something of a more detailed nature.

We have now reached a stage in the development of this thesis to empirically test some of the assertions made in the first two chapters, and apply the heuristics subsequently developed in Chapter III. The following chapter carries two excellent examples of distribution innovation - each will now be fully developed and later analyzed to determine how actual observed behaviour in each case equates with what the model would have suggested.

CHAPTER V

CASE STUDIES IN DISTRIBUTION INNOVATION

Introduction

The industry selected for specific examination in the context of this thesis is the U.K. grocery industry,[1] which in 1976 accounted for a consumer expenditure of £14,180 millions, and in terms of distribution channel structure has perhaps the biggest most comprehensive network in the country. Before proceeding with our case study analyses some industry background is in order.

The food industry employs 539,000 people in the manufacturing sector, and a further 836,500 in the distributive trades sector[2], (Lambert, 1977, p.6). In 1974/75, the latest year for which a detailed breakdown of figures are available, the total output of the industry was £13,814 million at retail prices. This output came from two main sources of inputs; £6,707 million (48.6%) in food purchases (at the farmgate and shipside), and £7,107 million (51.4%) in manufacture/processing and distribution, (MAFF).[3] These inputs are represented diagrammatically in Figure 5.

Structure

Unfortunately, because of definitional problems and methods of statistical collection, no figures are available on the number of manufacturing establishments or their distribution infra-structure,

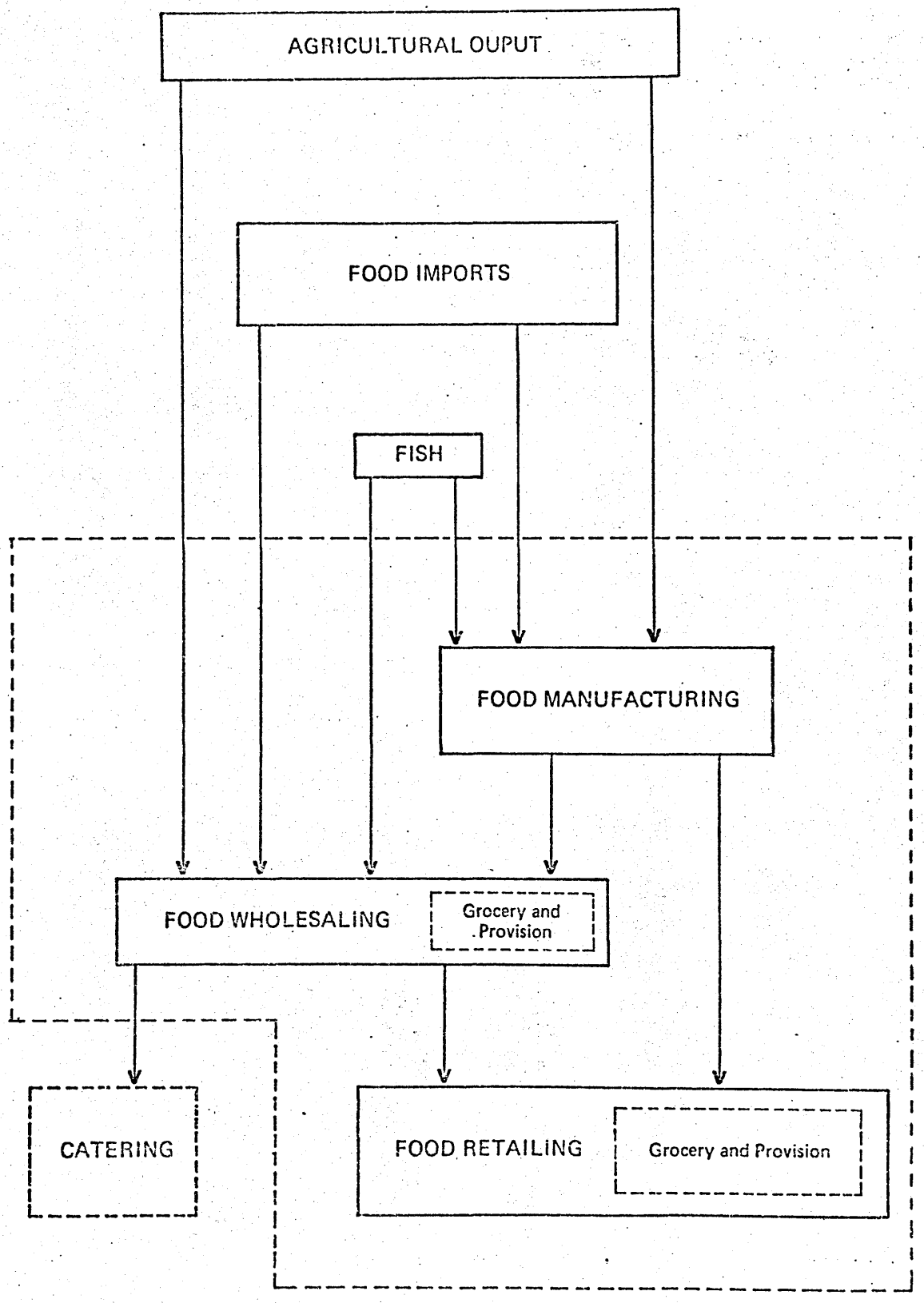
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[1] Grocery industry: this industry is best defined by the products it produces and distributes. These include all packaged and bulk prepared foods, fresh meat, fresh fruit and vegetables, and the usually accepted range of non-food items such as basic household requisites e.g. polishes, and detergents, toiletries, cooking aid products, and a limited range of other miscellaneous fast-moving consumer items.

[2] Distributive trades sector includes all wholesale and retail establishments.

[3] Ministry of Agriculture, Food and Fisheries is the source of these statistics.

FIGURE 5 STRUCTURE OF INDUSTRY INPUTS



i.e. warehouses, depots etc. However, in the distributive trades sector of the industry, a survey by the Institute of Grocery Distribution estimates that there were 90,230 retail shops at the end of 1976; 7,960 operated by multiple chains, 6,270 operated by co-operative societies, and 76,000 independent operating either inside or outside voluntary symbol organizations, (Lambert, 1977, p.13). The total of 90,230 represents a fall of 14.3% from the Census of Distribution figure of 105,283 shops in 1971. Two structural changes are evident; the large-scale closure of small self-service and counter service stores being replaced by a lesser number of larger developments, and the broadening of the product range in the latter to include non-food items. "Grocery retailing is therefore contracting into fewer larger units offering a wider range of product choice", (Ibid, p.2).

Operating Environment

The industry as a whole has been experiencing a most difficult last few years. In manufacturing, raw materials, which traditionally represent around two-thirds of the production cost, have been subjected to large increases in costs arising from world shortages and the effect of the EEC Common Agricultural Policy. Labour costs have also risen. At the same time the manufacturing sector has generally been unable to recoup the additional costs because of government prices control measures and the depressed market conditions, (Beaumont, 1977, p.1). The inflationary cost of labour has been particularly severe in the retailing sector because of its labour intensity. Coupled with this have been government measures restricting prices and large store developments, both of which have seriously reduced the potential for commercial manoeuvre. Consequently, gross margins in both sectors of the industry have come under severe pressure.

Falling margins have in turn led to a widespread reappraisal of operational methods, particularly in the retail sector. It comes as no surprise then to find that the two distribution innovations we are to investigate in this chapter are retailer sponsored.

Research Approach

For the purposes of testing the channels model developed in Chapter III the case study technique has been selected to develop two scenarios of distribution innovation; there were few if any alternatives.

Both innovations to be investigated affect the whole industry and have recently become key interfaces of supplier-distributor[4] relationships. Many organizations are involved hence the sheer scope of the undertaking dictated use of a method which would draw largely on documentation supported by limited field work rather than require a massive field study.

The weaknesses of the case study approach are well documented (see Clark, 1972; Evan, 1971; Walker, 1970), but we reaffirm the point made by Evan (op cit, p.1), to the effect that "as a strategy for generating insights and propositions, the case study is invaluable". Since our model is conceptual in nature, we consider output from a case study type analysis, albeit relatively subjective, is adequate input to test the propositions made, at least in this preliminary stage of theory development. We remained convinced that the open stance facilitated by the case study method will on balance be an asset, providing a rich unbiased overview of the subject area and ensuring that key variables are not screened out for any reasons of identification (lack of) or measurement. In Chapter VI we readily adopt the panel technique for a different part of the research programme, again on the basis of its suitability for the particular task, the circumstances involved, and the objective sought.

Choice of Case Study Subjects

We set out to find at least two examples of recent distribution innovations which had, and were perhaps still having, a significant impact on distribution channels in the U.K. grocery industry. The other proviso was that they should have significant rather than trivial economic implications. For the purposes of our study, a

> *distribution innovation* - is regarded as something which leads to change(s), initially in the innovator's own

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[4] *Distributor*: usually regarded as the retailer who sells to the ultimate consumer, but in cases where a wholesaler intermediary is interposed between manufacturer and retailer, the wholesaler becomes the distributor in the manufacturer-wholesaler sub-system.

Supplier: generally regarded as the processor/manufacturer who supplies wholesale or retail distributors, but in the case where the retailer buys from a wholesaler, the latter is then acting in the capacity of a supplier for the wholesaler-retailer sub-system.

> distribution sub-system and subsequently in the sub-systems of other channel groups, and is generally introduced for the purpose of producing economic benefit within the innovator's subsystem.

This definition therefore makes the important distinction between innovations which lead to economic benefits and dis-benefits respectively, and in which part of the total system these occur.

Two retailer sponsored innovations fulfilled all the above requirements, and will now be the subject of a full scale case study analysis.

Case Study 1
Cage Palletization: A Technological Innovation

Perspective

This case study attempts to outline the issues, events and thinking prevalent during the first four years of cage palletization in the U.K. grocery industry. It draws on all the available literature and our own first hand experience of sectional reactions to this particular distribution innovation. Because of the lack of hard quantitative cost data during the first few years of introduction and adoption, many of the arguments documented here are in fact no more than perceptions about the likely implications cages may have for manufacturers and retailers in their channel relationships.

However, these same arguments accurately portray the type and quality of thinking which has prevailed, albeit misguided and confused in many instances. Typical, are unfounded statements such as "cages offer a real chance to reduce distribution costs in the long term", (Drury, 1975, p.5) and, "the cage pallet is seen as one method by which some of the pressures on all sides of industry may be relieved through reduced overall distribution costs", (Moore, 1976, p.32). In Chapter VII, some of the 'assessments' mentioned in this chapter are challenged in the light of subsequent research undertaken by the writer, and upon application of the conceptual model developed in Chapter III.

Background

The cage pallet is a retailer sponsored innovation which first came under notice in the U.K. grocery industry in 1972; in the intervening

four years it has been the major cause of underlying tensions in supplier-distributor relations. Indeed, one commentator has called it potentially "... the most divisive innovation so far seen ..." in the industry, (Walters, 1975, p.11).

One definition of the cage pallet is that "it is a unit designed to transport goods easily in bulk form from manufacturer to retailer at which point it coverts to a point-of-sale display unit", (Harker, 1975, p.2). Some of the largest retail multiple chains[5] in the industry have sponsored its development because they perceive it to offer positive economic advantages in their own respective distribution-selling sub-systems.[6]

The concept of a 'through unit-load' between point of production and point of sale originated in the U.S. in 1960 and was the subject of research carried out by Cornell University for New York State apple growers; it was subsequently applied in French hypermarkets during the mid-1960s. This latter development did not go entirely unnoticed by the local retail trade, and in 1972 two major home based retail multiples Asda Stores Ltd., and Key Markets Ltd., began to experiment independently with a view to assessing the usefulness of cage pallets in the U.K. grocery trade.

The manufacturing sector of the industry, faced with the prospect of cage palletization as a *fait accompli* by retail proponents, began with and have continued to sustain a steady opposition to its introduction and widespread adoption because they perceived it attracted on-costs to the producing end of the distribution channel. Some smaller manufacturers with lesser brands however, saw in the issue a potential opportunity to gain market share through co-operation with retail customers, and have therefore maintained a much more fluid negotiating position.[7]

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[5] Retail multiple chains are defined as retail organizations (other than co-operative societies and voluntary groups) which operate ten or more branches.

[6] Asda Stores Ltd., J. Sainsbury Ltd., Tesco Stores Ltd., Fine Fare Ltd.

[7] Examples: Dri-pack Salt Ltd; Associated Biscuits Ltd; Carnation Milk Ltd; Kimberly-Clark Ltd.

The issue has proven to be a complex one and little progress towards resolution had been achieved up till the end of 1976. The prevailing concentration of (bargaining) power in the industry currently lies with the major retail organizations[8] who seem determined not to be denied a potentially significant means of improving the cost-effectiveness of their own subsystems in a commercial environment which is becoming increasingly hostile, particularly towards businesses which are labour intensive.

Opinions have tended to become polarized at retailer and manufacturer ends of the distribution channel system, and in effect conflict has flourished. Until the publication of the Cranfield Report (Christopher et al 1977) in February 1977, the only other investigations which had previously been undertaken were conducted at individual company level using what was in many instances dubious cost data and assumptions; the availability of cross-industry quantitative data relating to factual costs and benefits was virtually non-existent. In this atmosphere, the debate continued to ferment from 'soft' ground on both sides of the industry. The foregoing briefly describes the case subject which will now be developed in more detail.

The General Principle

There is a basic principle which must operate if unit loads are to be used effectively:

> Unit loads must be formed at the earliest possible moment in the transport cycle, and must not be broken up until the last possible moment at its ultimate destination, (Sardo, 1969, p.7).

If, at any point, this principle is broken, the advantages and economies of the unit-load method of handling begin to diminish.

Sardo (Ibid, p.2) described the above principle as the 'throughout concept', i.e. the idea of the same unit going through all the links in

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[8] For the twelve weeks ending 31 August 1976, the nine major multiple groups in the U.K. held a 40.6% share of the domestic grocery trade. Individual shares were as follows: J. Sainsbury 8.6%; Tesco 7.7%; Allied Suppliers 5.4%; Asda 5.3%; Fine Fare 4.1%; International 3.3%; Kwiksave 2.6%; Mac Markets 2.0%; Key Markets 1.6%; total multiples share was 56.8% and co-operative societies 20.4%, (Harker, 1976, p.3).

the transportation chain without change. Although he was thinking more in terms of long distance transport by sea and land for international trade, the same principle applies to the shorter trunking distances within national boundaries. He referred to the 'through-pallet', a (flat) pallet which accompanied the merchandise from production line through all storage and transport operations to final delivery, (Ibid, p.6).

Early Development and Application of the 'through unit-load' concept

The origins of the 'through unit-load' concept currently manifested in the form of a wire cage pallet can be traced back to 1960 in the U.S. when it was first recognized that the then method for harvesting and marketing fresh apples offered considerable scope for efficiency improvement, especially in New York State where the consuming markets were close to the production areas, (Cunningham, 1964, p.1). Direct delivery from producer to retail store in effect involved harvesting applies into retail containers, and palletizing these at the orchard in the form of attractive store displays for direct movement onto the supermarket floor, (Kallerges, 1961). Earlier experiments (Van Waes, 1951) conducted at Cornell University had established that the amount of bruising in McIntosh apples increased at each transfer point from orchard to consumer. The implication was that a reduction in the number of transfer stages proposed under the Kallerges concept would lead to a corresponding reduction in the physical damage to the apples, with a proportionate increase in product quality and reduction in overall distribution costs, (Cunningham op cit, p.2).

Three years of experimentation followed, culminating in findings which confirmed the practicality of the concept. The selected transporter-display unit consisted of two 40 × 24 ins fibreboard trays set on a 40 × 48 ins flat pallet base; each tray held 30 × quarter-bushel cartons and the complete unit weighed around 600 lbs. This particular example differs in one important respect to the current cage pallet innovation in that the apple transporter-display unit development was sponsored by the grower/producer rather than the retailer, and in this instance it was the retail produce buyers who had to be persuaded that the concept was sound. Initially they were not enthusiastic, although interest increased as field tests continued.

Emergence of Concept in Europe and the U.S.

'Cage' is the English name given to a unit known on the Continent as 'box' pallet. These were first introduced into French hypermarkets in the mid-1960s. Caddie and Technifil were the main manufacturers of the equipment on the Continent. An alternative name to 'box' pallet is 'hyperbin'. Carrefour, the biggest hypermarket chain in France currently receive 25% of grocery lines from manufacturers in hyperbins, the majority of which have already been price-marked.[9] The module in common use is the full-Euro size (800 × 1200 mm).

Initially in France, hyperbins were supplied by hypermarket companies, but most are now the property of supplying manufacturers. In the U.K., retailers own virtually the entire cage population and this situation is unlikely to alter. In the U.S. the concept of a unit-load processor from producer to retail outlet display has been linked closely with the Continental hypermarket approach and tried in 1975 with some success by Jewel's Bazaar at Grand and Kostner in Chicago, ("An American Hypermarket Experiment", 1975, p.53).

Parallel Developments in the U.K.

The retail cage pallet appears to be a derivative of the collapsible wire pallets or industrial stillage which have been widely used in the automative engineering, and pharmaceutical industries in the U.K. for many years quite independently of similar pallets used in the grocery trade on the Continent. In fact the 'box' or 'post' pallet as it is sometimes referred to, is fully specified in B.S.2629 as follows:

> A pallet with or without a lid, having a superstructure of at least three fixed, removable or collapsible, vertical sides, solid, slatted or mesh which permits stacking, (British Standard Institution, 1967, p.18).

The maximum overall plan dimensions for these pallets after allowing for manufacturing tolerances have been specified not to exceed those given in the table below, (Ibid, p.8).

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[9] Compare this with Carrefour in the U.K. where only 5% of grocery lines are received in cages, a quarter of which have been price-marked.

Designation	Maximum Overall Plan Dimensions (mm)
A	835 × 1240
B	1040 × 1240

However, the external plan dimensions and limits of the bases for the box pallets have to conform to the corresponding nominal sizes of flat (wooden) pallets, i.e. 800 × 1200 mm (A), and 1000 × 1200 mm (B) to ensure inter-stackability.

The U.K. Retail Grocery Environment in the Early 1970s

In the early 1970s, several major influences were coming to bear on the domestic grocery industry including:

1. Increasing costs of raw materials.
2. Raw materials availability problems reflected in corresponding shortages in produce and packaging.
3. Increasing rate of inflation in the economy.
4. Production and distribution cost-push inflation.
5. A higher level of Government intervention via price and profit control mechanisms.

The principal ramifications of the above factors were:

1. Changing patterns of consumer purchasing behaviour as a reaction to shortages and shortage scares; brand loyalty, and in some instances store loyalty, weakened. Consumers exhibited a readiness to accept a more limited choice, but this was combined with a greater awareness of value for money.
2. High interest rates in the period immediately following the 3-day week led to cash flow problems for many retail groups. In turn, they reacted by cutting the proportion of stock held in storage.

Every facet of the interface between suppliers and distributors came under close scrutiny, particularly from the retail distributor end, e.g. product range, stock levels, space allocation and utilization in storage and display, promotional activity, pricing, and distribution/handling activities. Each of these key areas were subject to more

stringent cost-effectiveness tests. In this atmosphere of higher productivity requirements, the idea of introducing the cage pallet was first formulated and applied.

Introduction and Adoption of the Cage Pallet

The two retail multiples which first initiated an assessment of cage pallets with a view to possible application were Asda and Key Markets. Both companies began studying cages in 1972 although each has since followed a markedly different approach because of differing philosophies regarding the role of the cage. Asda saw in the cage a labour-saving device with significant potential savings for its own distribution-selling subsystem. Early estimates of tangible cost savings indicated a total of 7p per case saving over conventionally packed goods or 75.9p per cage equivalent of 11 cases. Intangible benefits were also perceived, especially in terms of a reduction in customer disturbance by staff trying to restock fixtures during trading hours.

Convinced the innovation was favourable to its type of operation, Asda began approaching suppliers on the matter in early 1974, requesting goods to be delivered direct to their stores in cages supplied for this purpose. This marked the beginning of the 'experimental' phase as far as manufacturers were concerned.[10] However, Asda has vigorously promoted the spread of cage palletization ever since and sees the innovation in a much more permanent light. On the other hand Key Markets saw the cage primarily as a more efficient form of in-store shelving; it was perceived to be more visually attractive, allowed better cube utilization by reducing warehousing space requirements, and led to improved staff utilization.

The current Key Markets policy is to use a combination of shelving and cages for display, and store back-up stocks in cages supported by overhead racks on the sales floor above the display gondolas. Few cages are filled and shipped directly from factory to store by manufacturers; most cages are loaded with price-marked products at the rear of their stores, following receipt in larger unit load form. Nevertheless, a labour saving is still claimed for this particular method, which generally does not require any additional co-operation from manufacturers because

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[10] It is fair to say that many early trials conducted by manufacturers using the new cage pallet were unfavourable because of the antiquated methods employed.

they are only involved in the conventional aspects of the operation. Regarding the actual use of cages as a display merchandiser, the above two companies vary on one important detail. Asda requires its fast moving products to be caged and positioned in specific display locations, leading in many instances to separation of similar products. Key Markets use the more traditional approach which ensures a grouping of like products in the overall store display scheme. In both cases however, the impact of the cage pallet innovation has been sufficient to change traditional trading methods by altering traditional break-bulk procedures.[11]

The Cage Pallet

The cage pallet is simply a cubic wire basket, manufactured of heavy gauged wire and steel rod with a galvanised zinc finish. It is used by certain major retail multiples for merchandising their fastest moving lines. See Appendix B for a pictorial presentation of the cage and Appendix C for the draft U.K. standard specification. Used in the direct delivery mode, it reduces the number of links or transfer points in the distribution chain and in effect makes the superstore/supermarket act as its own warehouse. Functionally therefore, the cage is a hybrid between the conventional flat pallet and a retail display unit. It is an integral unit constructed to travel through the entire distribution system with loads of up to 300 kg; it is interstackable, and has locating devices to ensure safety when stacked.

The heavy gauge wire and steel rod makes the cage strong and durable, and the electro-galvanized bright zinc finish is designed to protect it from the elements and make it easy to clean. This ensures it remains a presentable unit for display purposes. The manufacturing tolerance of cages is particularly critical if the units are introduced into automated high-rise warehouse complexes. A British Standards Institution Working Party[12] was formed at the end of 1976 to look into the safety/

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[11] As long ago as 1951 Banks (p.334) contended that a lot more research was required to find the optimum size of Alderson's (1949) 'index of bulk-breaking'. It was obvious to him that as soon as a wholesaler or retailer breaks into the original shipping containers, warehouse and handling costs immediately rise. In the intervening twenty-six years little original research work has apparently been undertaken to follow up this important line of thinking.

[12] This Working Party will prepare performance standards for cage pallets, and develop a Code of Practice for their use.

structural aspects of cages. This will involve looking at design, manufacture and quality aspects, as well as safety practices governing transport and stacking of cages, particularly in areas accessible to the general public.

Operational Factors

The effective application of cage pallets requires:

1. The pre-pricing of goods prior to cage filling[13], and
2. Direct delivery of the cage unit load.

Theoretically the optimum location for the two activities outlined above is at the point of production. In practice, there are problems such as lack of space, and increased stock levels. However, these disadvantages are counterbalanced by significant savings in packaging which are not available if these operations are carried out at a remote field depot. If price-marking and cage loading is undertaken at the rear of the retail store, even by manufacturers' merchandisers, much of cage's value as a form of unit-load is eroded.

Each store has to have a cage population sufficient in number to service its requirements. If direct delivery procedures are involved, generally 20% of all cages are held by the supplier, and the same proportion are in transit, on display, in back-up stock, and held as empties (for contingency reasons). Loaded cages are received at the goods reception door of retail stores and check-weighed to an agreed weight list. The chief cause of weight variation found to date has been due to the variation in the gauge of tin plate used with canned goods.

In-store handling of cages (e.g. replenishing the display) can easily be achieved using pedestrian stacker trucks; most restacking is done outside trading hours to avoid disturbance to customers. It is likely that retail developments in the future will lead to the more traditionally 'industrial' handling equipment being used in-store on the sales floor. The introduction of overhead racking above the actual

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[13] Price-marking of goods prior to cage filling is currently one of the most costly activities in the whole operation. This requirement will to some extent be eliminated (depending on breadth of application of front-end automation) within the next 2-3 years when a machine readable product coding system is introduced. Major retailers with electronic point-of-sale cash registers equipped with a price look-up facility will then be able to control product pricing at the retail end of the distribution channel. Most manufacturers will welcome this development.

sales display has been a major boost to the use of cages because warehouse space relieved in this way is converted into additional selling area. The current procedure used to re-supply manufacturers with empty cages involves collection by manufacturers' transport on a one-for-one exchange basis at the time of product deliveries. The expected life of cages is 60 load-journeys (in a direct delivery situation) or approximately 5 years. In view of experience over the first few years of operation, this figure is now regarded as a conservative estimate.

Cage Pallet Versus Conventional Distribution: A Comparison

The major feature of the cage pallet in operation is its ability to reduce the amount of handling in the distribution system which links supplier and distributor, and particularly at the retail outlet itself. Figure 6 provides a comparative schematic of the activities typically carried out under both conventional and cage methods for a direct - direct delivered distribution system,[14] i.e. direct in the sense that goods are not processed through retailers' own warehouses but are delivered direct to retail outlet from factory warehouse or field depot. Each sector of the grocery industry affected by the cage pallet innovation will now be reviewed in more detail.

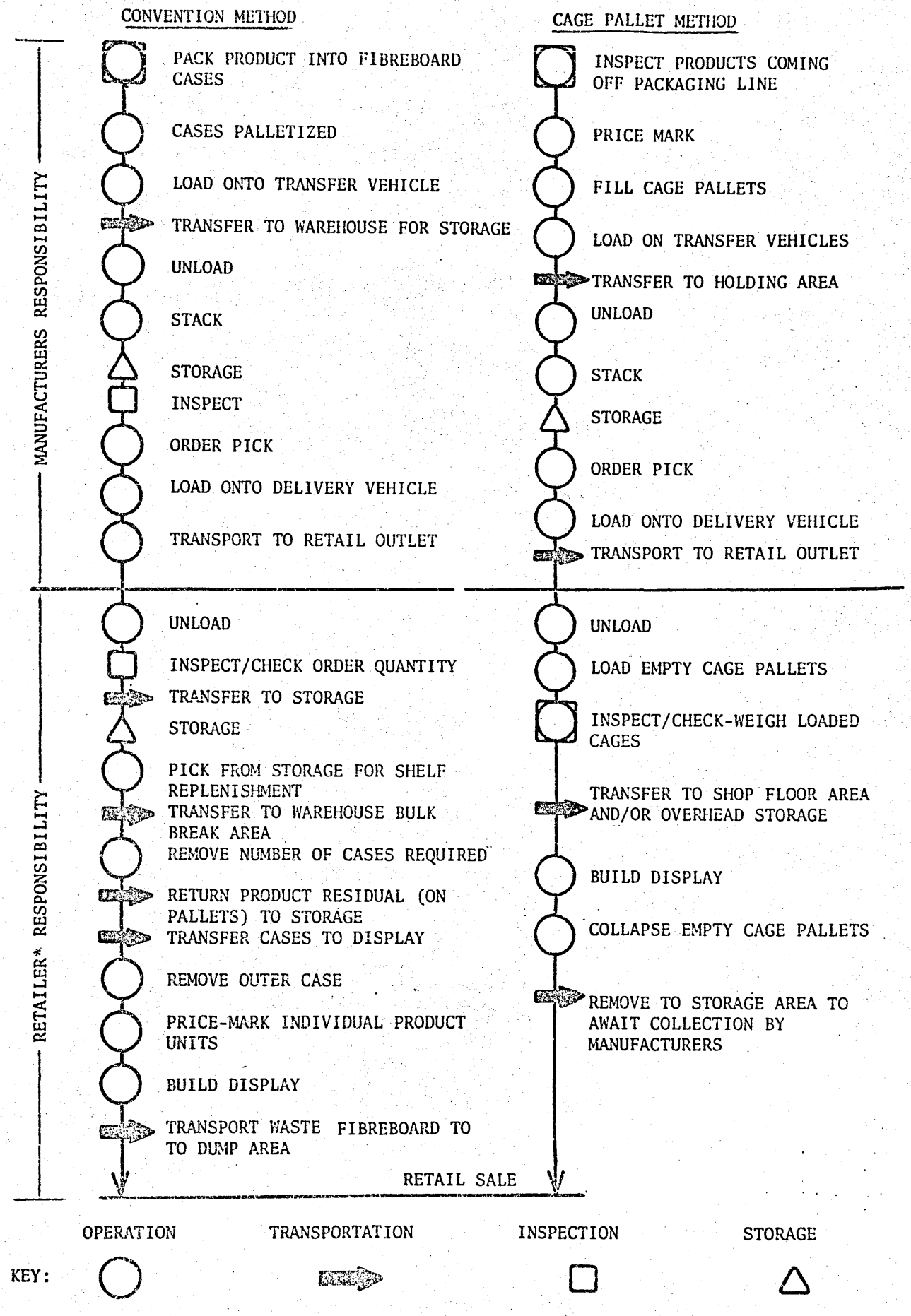
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[14] There are four possible combinations of delivery type as follows:

direct-direct:	when goods move from manufacturer's factory warehouse direct to retail branch without any intermediate warehousing.
indirect-direct:	when goods move to retail branch via manufacturer's own intermediate depot system (this sequence is sometimes regarded as direct from retailer's point of view).
direct-indirect:	when goods move to retail branch via retailer's own intermediate depot system (which is itself supplied direct from manufacturer's factory warehouse).
indirect-indirect:	when goods move to retail branch via both manufacturer and retailer intermediate depot systems.

It is possible that the intermediate depot systems mentioned above in each type of indirect delivery configuartion may in certain instances be owned and operated by a third party distribution service company.

FIGURE 6 FLOW PROCESS CHART OF GROCERY PRODUCTS DISTRIBUTION



* With the conventional method, manufacturers representatives often assist in the merchandising activities on the sales floor.

Manufacturing Sector

Introduction: when the wooden pallet was introduced to food distribution some thirty years ago, it was the manufacturers who had to persuade the retailers of the potential benefits involved. For cage pallets the reverse situation applies, with retailers endeavouring to persuade manufacturers of the benefits of participation. Manufacturers have from the outset openly expressed doubts about whether the promised sales increases and other 'benefits' attributed to caging justified the extra costs incurred in the production-distribution sub-system. The major obstacle to acceptance of cage palletization by manufacturers has always focussed on resolving how a new system can be successfully superimposed onto an existing system - specifically, cage pallets superimposed onto a system which uses case outers and wooden pallets as basic units; such a situation inevitably creates problems and increases system complexity. The leading questions manufacturers have been asking include:

Have production costs been altered? If so, how?
What are the effects on distribution costs?
How are costs reallocated throughout the channel system?
Is the net result a cost saving or a cost increase?

Whilst accepting the realities of cage pallets in the market place, albeit in smaller numbers than first projected, most manufacturers remain fully convinced that extra costs are indeed involved. Many manufacturers have consequently followed a policy which might be described as a 'holding strategy', at least until the direction and scale of the concept becomes clearer. Most manufacturers have adopted the attitude that to be involved, even belatedly, is a better policy than not being involved at all. At least in this way the progress of this new unit can be followed and mapped out, perhaps even influenced.

A number of companies have also experienced differences of opinions within their own organizations on the subject of cages, e.g. the attitude of sales staff (favourable) has sometimes differed from those of production and distribution staff (hostile). Within the manufacturing sector itself some of the smaller suppliers with lesser brand names have capitalized on the reluctance of larger competitors to supply caged goods and

in certain instances brand market share changes have been effected.[15] Smaller manufacturers are generally less reliant on automated processes and are able to use this greater flexibility to advantage. These differences in the way manufacturing companies have reacted to the cage innovation has made it more difficult to achieve a proper overall assessment of cage pallet acceptance.

Pros and Cons of Manufacturer Participation: manufacturer dissention with the adoption of cages does not stem from the use of cages as merchandising devices, but the wider role of moving goods in bulk from production point to the retail premises. In fact, it represents a trading-down in degree of unitization for manufacturers familiar with the standard flat pallet module.[16] Manufacturers have therefore maintained that the cage is a poor load carrier and effectively costs more than the conventional system. They have maintained it should be used by retailers exclusively as an in-store display fixture and not in the overall distribution system.

Manufacturers outline the disadvantages of cage pallets as follows:

1. Fundamentally, the cage introduces additional operations (and therefore complexity) into the production-distribution sub-system. Cage filling procedures, because of the relatively small quantities involved, can disrupt high-speed packaging lines; expensive manual handling techniques have to be used, at least as an interim measure in the early stages of developments.

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[15] Although there are indications that the total universe for a particular product group remains fairly constant, changes in the market share of particular manufacturers with particular retail customers have been reported although the exact influence of cages in this change is difficult to isolate. One major biscuit manufacturer gained 4% in share over 12 months; a major manufacturer of paper products lost 9% share in 6 months which coincided with the time cages were not being used. This situation has since been recouped by adopting alternative but similar mass merchandising methods.

[16] Example: 102 cases of 1 lb. canned goods, stored on a standard 1000 1200 mm wooden pallet compared with four cages with 15 cases each, i.e. 60 cases total.

2. Duality of task; a two-tier system has to be maintained to control and fulfil orders which are to be shipped in cages and/or by conventional cases/wooden pallets. Communications are complicated, additional administrative costs are incurred, and increased space requirements are necessary.
3. Inventory levels (and the associated costs) increase because of price-marking requirements and the inflexibility of having to load particular cages which contain products designated for certain retail customers. Completely new stock-keeping units are created. The price-marking operation is essential if the 'through' concept is to work at all, but is relatively costly. It is also a difficult task to control because of the continual changes in retail pricing, especially in inflationary periods. At least when a commonly accepted standard product numbering system is operational on a broad scale, much of the individual price-marking will become redundant.
4. Lower cube utilization in warehouse storage and transport is a costly factor,[17] particularly in transport; the current cage module does not readily fit existing vehicle specifications. Side loading is not always possible. Cages are not therefore ideal for long trunk trips, and are better used on short radial hauls from depot to store; stock damage tends to increase with the longer trips. A relatively large weight of empty cages needs to be shuffled back to the manufacturer on the return leg of each delivery to the store.

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[17] It is important to remember however, that the arguments against cage pallets on the basis of cube utilization losses are at times more theoretical than actual. It becomes academic in those instances where storage of partly filled wooden pallets in a warehouse or transport vehicle in itself represents lower than full potential cube capacity. Indeed, in a retail store situation, cages may even lead to better space utilization of the warehouse at rear if conventional picking procedures for shelf replenishment have traditionally allowed much of the available space to remain empty.

5. Despite the widespread use of a particular size module (½-Euro), no specification has yet been agreed by the industry as the accepted standard.
6. Product damage can be caused through:
   (i) inaccurate fork entry
   (ii) dust and infestation
   (iii) transport/handling procedures
7. Greater accessibility to the product means a higher risk of pilferage.

Perceived Advantages of Cage Palletization: the advantages listed below are those claimed by retailers to accrue to manufacturers using caging; they therefore do not necessarily coincide with manufacturers own perceptions:

1. Fewer out-of-stocks.
2. Increased sales (not fully substantiated).
3. Savings on case outer packaging and brithene film (this only realized if cages loaded at the factory).
4. Savings in merchandising costs at the store of up to 20p per case. However, this saving has to be balanced against a corresponding increase in costs in the production-distribution system.
5. Sales polarization, i.e. the volume brands gain ground at the expense of 'uncaged' brands.
6. Damage levels in transit of 0.20% of total throughput have been recorded which is lower than that achieved with conventional means. However, damage figures are likely to vary widely according to the type of product(s) involved.

The Volume Throughput/Investment Dilemma: Uppermost in the minds of virtually all manufacturers affected by cage palletization is the question of forecasting the growth in caged volumes, and when to change over from a manual handling system to automated procedures. Even if volumes do grow sufficiently to warrant in-line palletizing and pricing equipment, the economies will only begin to appear gradually as depreciation allowances and interest payments begin to diminish, which for equipment with a 10-15 year life, may take several years. An important qualification when discussing possible on-costs in the manufacturing sector is to note that the actual costs experienced are conditional upon the particular method of

handling used, and the particular type of distribution channel followed from production point to sales floor.

The Question of Size Compatability: The current module being used extensively by U.K. retail grocery companies is known as the ½-Euro pallet, with maximum external dimensions as follows: 850 mm (wide) × 600 mm (deep) × 670 mm (high). The nominal carrying capacity of this unit is 300 kg. The original ½-Euro pallet from which this was derived however, had plan dimensions of 800 mm × 600 mm so the designation '½-Euro' pallet is not strictly accurate. A similar situation applies with the larger size full-Euro pallet; the U.K. module is 1150 mm × 850 mm (high) compared with a 1200 mm × 800 mm base used in Europe. This unit has a nominal carrying capacity of 500 kg.

Accepting the current draft U.K. module dimensions of 850 mm × 600 mm × 670 mm, the fundamental issue at the core of manufacturers' resistance to the widespread adoption and use of cage pallets is that the above module is incompatible with the U.K. standard module base of 1000 mm × 1200 mm used so extensively throughout the country. This is a severe drawback, and has dire implications for warehouse storage and transport systems designed around the 1000 mm × 1200 mm module, e.g. lower utilization factors reflected in increased unit costs.

However, the solution to this problem involves more than simply changing the module size to make it compatible with the 1000 mm × 1200 mm standard. Most possible combinations would lead to unsatisfactory display unit sizes on the retail sales floor, and in turn this would lead to fewer products per linear foot on display in retail outlets, and relatively higher stock holdings of individual products. Retailers chose the 850 × 600 × 670 mm size to overcome this problem, but in doing so created a major problem at the producing end of the channel system. In addition the current design of the cage is such that use of automatic filling equipment would be difficult even if manufacturers had the machinery to autofill. Other unforseen technical problems are beginning to emerge, e.g. tins filled hot from a production line can be subject to 'rim-riding' which causes pin-prick holes in the cans. One possible solution to this danger would be to increase the gauge of tin plate used in manufacture of the cans, but at an additional cost. More teething problems will almost certainly emerge in due course, many of which could have been circumvented if a proper period of

experimentation had been undertaken before widespread adoption of cages.

Current Cage Filling Procedures: existing production and packaging equipment cannot be utilized to price individual packs and fill cages. Price-marking could possibly be undertaken at the time labels are printed, but because of rapid price changes in the current inflationary environment, this is impractical. Existing packaging machines have been purpose designed for handling flexible lightweight containers (fibreboard cases) so are unsatisfactory for application to cage filling.

Consequently, all but a few manufacturers are adopting a current policy of pricing and filling at intermediate depots using the following procedure; this would be termed a indirect-direct delivery system as defined in Footnote 14.

1. Pack stock in conventional cases.
2. Transport to a repacking point.
3. Unpack by hand (some proportion of outers salvaged for reuse).
4. Price-mark.
5. Repack into cages by hand.

This method obviously increases labour costs and eliminates any possibility of packaging savings; it is in fact the most expensive method a manufacturer could adopt, but in the short-term the least disruptive. If cage volumes grow to more significant levels, obviously capital funds will have to be invested to bring filling from the production-line closer to reality.

Retail Trade Sector

Introduction: the emergence of the cage pallet must be seen against a background of two decades in which methods of food retailing have undergone considerable evolution. The motive force for change has been the retailers' perception of the gain potentially available through improved efficiency at the retail store. The cage is regarded as one of the more recent ways by which this objective can be achieved, and there is little doubt that cost savings have already accrued to the retailer through its use although many would argue, at the expense of shifting the costs back upstream to the supplying manufacturers. Indeed, the

retailers who co-operated in this venture took manufacturers by surprise; the latter were just not prepared or briefed for such a development. The ensuing period of confusion has allowed retailers valuable time to refine their procedures and reap significant financial rewards.

Retail Benefits: retailers claim that the benefits from using cage pallets are shared by both sides of the industry; following is a list of advantages related particularly to the retail sector.

1. Savings in area allocated to the warehouse can be converted to additional selling area. This is achieved by the straight through movement of cages with minimal delay in the warehouse, and the use of the airspace above the display area to stack cages for back-up stock. Up to 4% of gross plan area has been reported saved in this way which for a 50,000 sq ft store represents 2000 sq ft in additional selling area. The ratio of selling area to warehouse area (for Asda, 50/50 at end of 1972) is progressively increasing and an ultimate target of 80/20 is not unrealistic.
2. Cage pallets give many of the merchandiser advantages and few of the problems associated with conventional procedures, e.g. control of manufacturer merchandiser staff, space discipline, and security. Merchandising replenishment at the store is completed in 5% of the time taken for conventional procedures. As an actual merchandise container, it is useful as a regular size display unit for irregularly shaped packages.
3. Store flexibility; changes in layout can be achieved easily and quickly.
4. The cage is an ideal promotional device, and used extensively for this purpose on the Continent.
5. Reduces labour costs by eliminating labour intensity of conventional break-bulk operations. Because this was perhaps the prime motive for introducing cages, product selection for caging has focussed on high volume products rather than sales value contained by the unit. Labour savings of 0.57% gross store sales turnover have been reported. This is made up of savings in such activities as off-loading, inspection, storage, merchandising, and empties handling. Asda reported a 5.61p per cage total saving on these particular activities

in July 1975, and on the basis of 11 cases to the cage, this represents a saving of 71p per cage.

6. Fewer out-of-stock situations. The cage concept allows more stock to be held at the point of sale, i.e. on the sales floor adjacent to or above the actual display area. There are none of the traditional shelf replenishment problems such as interference with customers.
7. Effect on sales: Asda claim field experiments have proven that sales increases of up to 24% can be achieved with individual product lines switched from conventional gondola fixtures to cages. The reason for this is said to be the greater customer appeal and impact of the mass display. Cages are said to enhance the 'atmosphere' within the store and are visually pleasing.
8. Polarization of sales within a commodity group is claimed to occur, with caged products increasing their share. The implications of this is that store productivity on a greater proportion of sales will be possible, and in addition there will be an opportunity to rationalize product ranges leading eventually to production and inventory economies.
9. Damage losses reduced.
10. Elimination of outer packaging obviates the problem of arranging collection of waste cardboard.

Retail Disadvantages:

1. The high capital investment cost of owning a cage population and the continuing interest charges.
2. If not carefully controlled, cages can lead to increased stock holding levels at the store.
3. It is difficult to record physical stock-take figures, especially if goods are in tumbled display form.
4. Price changes could possibly cause some confusion among customers.

Some outstanding issues: because the cage pallet is still in what appears to be an early part of its life cycle, several key issues related to the operation have yet to be satisfactorily resolved:

1. Ownership: Manufacturers contend that the responsibility for ownership of the cage pallet population must lie with the retail users because (i) they are receiving the cost savings; (ii) capital investment in cages by manufacturers would clearly worsen the latters situation; (iii) the cage is regarded as an in-store display fixture and as such should be owned by the retail users.
2. Hygiene: As cages begin to wear and become dirty through use, then there will be a requirement to clear and restore them to a condition suitable for display goods at the retail outlet; this is important to the store image. Contamination of products will also have to be watched for:
3. Maintenance: with use, there will obviously be damage sustained to cages, so a continuing maintenance/repair programme needs to be initiated by cage owners which in this instance are virtually all retailers.
4. Safety: actual movement of cages on the shop floor will require considerable care to ensure no injuries to shoppers. In particular, damaged cages will need to be kept away from the sales area for fear of causing injury, e.g. unsafe in stacking, wire protrusions etc.
5. Standard specification: The current lack of a properly accepted U.K. standard in size and design/manufacture has led to varying qualities of construction. This is a problem for retailers using check-weighing procedures because tare weights for cages from different manufacturers vary significantly.

Do cages increase sales at the retail store: one major manufacturer, United Biscuits, have carried out several tests on this matter over a period of three years. In early tests of four weeks duration, sales of biscuit products were found to increase in the range 11.5-28.0% for individual product lines, representing an average of 18.9%. Later tests resulted in much wider spread, e.g. 166% gain through to 40% loss in share. Several facts have emerged on this matter:

1. In-store siting of the cage pallet display in relation to total product range display is critical.

2. Because cage pallets generally represent a wider facing unit in the available display footage, some product range rationalization appears inevitable.
3. The effect of cages on total turnover for any particular product category looks to be minimal, with any increase volume generated from cage pallets being eroded by a corresponding reduction from shelves and stacks. Whether cages actually do increase total sales of a particular product line or group should be the subject of a comprehensive field test programme, because in a practically static economy and zero population growth, any means found to increase total sales penetration would be regarded as a major boost to the industry, and if proven, ensure that cages received wider industry support.

Number of stores, size, and cage population projection: Asda consider, quite rightly, that the concept embodied in the cage is one of high volume product lines rather than big stores. The only limiting factor to this philosophy concerns the suitability or otherwise of the physical facilities at each store, especially in the receiving and storage/handling area at rear of the store itself, e.g. if a fork-lift truck cannot be manoeuvred, then cages are unlikely to be successfully deployed. United Biscuits estimate that 45 stores will be using cages by the end of 1976 and 150 by 1980, (Hurren, 1976, p.3). Store size is almost irrelevant if the above criteria are used and there is no reason why stores down to even 8,000 sq ft cannot utilize cages in the same albeit limited way, as the larger superstores are now doing. In terms of total cage population, early estimates (IGD, 1974, p.8), forecast 500,000 cages in the U.K. by end of 1976; later estimates revised this to 250,000, (Drury, 1976, p.193). A survey carried out as part of the Cranfield study (Christopher et al 1977) at the end of 1976 found that the actual number was in fact 55,500, over 50% of which were owned by Asda. Obviously much of the early momentum for cage palletization has evaporated.

The Supplier-Distributor Interface

The conventional distribution system linking the supplier and his retail distributor in effect works in two-halves:

1. The manufacturer packs relatively small units into an expensive one-trip outer package (case) that can be manually handled and later distributed on a larger base unit (wooden pallet) which would be mechanically handled.
2. On receipt of the bulk unit at the retail store, the retailer breaks bulk and manhandles numerous cases into storage for subsequent transfer to the shop floor display area. The merchandising process destroys and eliminates the expensive outer packaging so that the products can be attractively displayed to the consumer. With the large quantities of individual units sold, the physical function of placing goods on shelves or stacks is the most labour intensive in the store.

The cage pallet was introduced in order to reduce the amount of handling, particularly in the second half of the two-part description given above.

Most manufacturers immediately perceived additional costs accruing in their sub-systems although a number saw the issue as a potential marketing opportunity, the result of which (increased sales) might well cancel out the additional costs involved. Retailers replied to objections by suggesting that manufacturers progressively automate to offset any increased unit costs of handling. A lack of cross-industry costing and understanding of the implications for both manufacturing and retail sectors continued to cloud the issue. The exact magnitude of the relative costs and benefits available were not determined until 1977, (see Christopher et al, 1977). The suggestion that a net benefit was available to be equitably distributed among the two industry groups was accepted but never reached the negotiation stage because of the lack of independently assessed costings. Other physical factors such as the chosen size and design of the cage pallet further complicated relations in the industry.

Whatever the ultimate outcome of the cage pallet movement, it has had the desired effect of stirring up a high level of activity in all sectors of the industry on the subject of a 'through unit-load', and this could well lead to a significant break-through in bulk packaging

in the next few years.[18] If this is the case, relationships soured by the cage innovation are likely to improve radically, especially if cost savings can be realized in the manufacturing sector as well as the retail sector, and the innovation responsible has been developed through a process of joint consultation rather than imposed by one section of the industry on another. In the meantime, a number of possible solutions have been suggested for the cage pallet dilemma, e.g.

1. Re-organize at the retail store to undertake caging on a more cost-effective basis; inverter equipment to mechanically break-bulk and load cages is one way this may be achieved.
2. Alter the display module at the retail outlet to a size more compatible with existing U.K. standards, in spite of the problems this will cause in the actual display area (referred to earlier).

Distribution Service Company Sector

"One man's problem very often creates another's opportunity", (Smeeton, 1976, p.1). This is true of the cage pallet issue in which the professional distributor could in some instances, provide an economical caging service to manufacturers which includes price-marking, cage loading, and radical delivery. If the professional distributor can secure several major manufacturing clients for such a service, the combined volume involved might well be significant enough to make an attractive rate schedule possible. A larger scale cage filling, handling, and delivery service by a contractor who has national coverage and the necessary resources is likely to be competitive for a number of reasons:

1. Not all manufacturers will be able to physically fill cages at either factory or even intermediate depot locations.

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[18] The dual requirements for any container selected to operationalize the concept are difficult to satisfy because they could well be incompatible, i.e. (i) to act as a unit-load container in the distribution stage; and (ii) to act as a bulk display merchandiser unit at the retail point-of-sale.

2. Cages need to be filled as near as possible to the store because of the ordering and price-marking lead-times and to ensure cages are shuttled over the shortest possible route distance.
3. The actual number of lines that each manufacturer cages is likely to be small and the idea of mixed loads may not be the best solution.
4. Cleaning, inspection, and repair facilities can be operated on a relatively large scale.
5. There is the possibility that service companies would also finance the purchase of cages.
6. For such companies, specialized machinery and vehicles are a much more economically viable proposition.

Service companies would need to avoid large scale cross-subsidization of their activities, and endeavour to make the service pay for itself.

Initially, the actual caging service would involve the various physical activities listed below:

(i) Reception in bulk from manufacturer
(ii) Maintenance of buffer storage
(iii) Case opening
(iv) Price-marking
(v) Cage filling (neat stacked or tumbled)
(vi) Scheduled deliveries to retail stores
(vii) Collection of empty cages
(viii) Inspection, repair and cleaning

The rate schedule for the above service(s) would vary according to type of product being caged, volume of movement, and customer store locations.

From the service company's point of view, the factors which influence the cost are as follows:

1. Opening cases: if a sleeve pallet system could be used, up to 15% of the total cost might be saved, (Ibid, p.4).
2. Type of product: bottles cost more to load than a can or packet.
3. Scale of operations: is it big enough to warrant automatic palletizing?
4. Load size: full loads to a single drop provide the best situation.

5. Proximity of stores to the cage-fill point.

Cory Distribution, one of the major distribution service companies in the U.K., have begun a caging operation and encountered minimum operational problems so far - few breakages and minimal pilferage.

Role of Trade Associations

The Institute of Grocery Distribution[19] originally addressed itself to getting the parties involved to agree on a module size seemingly making the implicit assumption that cage pallets were a permanent feature, and that the main problem was to ensure standardization.

By its own admission the first report on the issue of cage palletization, (IGD Working Party, 1974, p.1) gave as its purpose, "to ... form the basis for discussion of the terms of reference that the Working Party will decide upon". It purported to attempt to outline the operating features and cost profiles of cage pallet operations but then went on to consider only the retail aspect in any quantitative detail (and for direct distribution systems only) because data for the manufacturing sector was practically non-existent at that time. One immediate conclusion reported was that "the cost savings, both for individual retailers and the industry as a whole, are extremely attractive", (Ibid, p.9). In the light of the limited evidence available at the time (1974), and the Cranfield Study conclusions three years later, the above conclusion was, to say the least, premature. It would appear that there was too much early emphasis on agreeing to a module size before all the affected parties had in fact agreed to the concept involved, how it would work in practice, and the likely systems implications.

The Food Manufacturers Federation[20] is the other major trade organization interested in cage palletization. Its main achievement has been

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[19] The IGD is an organization funded by retailers and manufacturers to promote education and research in grocery products distribution, and to provide a forum for an exchange of views between various sections of the grocery industry.

[20] The FMF is a trade Association sponsored by food manufacturers with the express purpose of looking after their commercial interests *vis-a-vis* pressure from government and distributors.

to gain support for the idea of conducting a fully comprehensive and independent investigation of the whole cage palletization issue on a cross-industry basis; this study was completed in early 1977, (see Christopher et al, 1977). Even as early as September 1975, it was being said that the manufacturers' call for a more comprehensive investigation of cage palletization was pointless, (Wemms, 1975, p.26), despite the fact that such a study had not hitherto been undertaken. It was maintained that cages were already fully established in the strategy of retailers and they therefore had nothing to gain by marking time awaiting a fundamental review of the concept. The only other group to become involved in the cage pallet debate was the Distribution Consortium, a group of distribution managers from over 20 U.K. food/grocery companies, who meet informally to discuss issues of common interest and concern.

Case Study 2
Emergence of the hypermarket: an Institutional Innovation

Perspective

The hypermarket (or *hypermarché*) is a remarkable European discount retailing innovation (Weiss, 1974, p.20), which is currently making a significant impact on the structure of distribution in the U.K. grocery industry and has brought a new dimension to supplier-distributor relationships in the industry. The hypermarket is effectively the third generation of retail institution, following eras in which the chain store (providing personalized counter service), and the self-service supermarket have dominated the scene.

As in the case of the cage pallet, this innovation is retailer sponsored and has important implications for manufacturers. It is significant that just before the beginning of the hypermarket era in the U.K., Pickering (1972, p.257) somewhat prophetically commented that "of the present range of innovations in retailing in Britain, the proposed development of hypermarkets and other forms of out-of-town trading activity is probably going to cause most controversy." Now five years later, the potency of this prediction is quite apparent.

Development of Retail Distribution Institutions

With the advantage of a retrospective view it is quite evident that development of retail distribution institutions is an evolutionary rather than revolutionary process although this does not make prediction of the next phase of development any easier.

Appel (1972, pp.40-47) provides a useful expose of the chronology of retail institutional development in the U.S. Briefly, the stages he identifies are as follows:

1. Pre-1930: Counter service in small specialty stores operated by both independents, but chains fast developing.
2. 1930-1935: Birth of the 'self-service' supermarket[21] employing the high-volume, low-price principle.
3. 1936-1941: Rapid spread and acceptance of the supermarket innovation. Manufacturers accepted it as the key retail distribution for distribution of nationally branded merchandise.
4. 1942-present: Rapid growth of the supermarket and gradual evolution towards progressively larger mass merchandising outlets.

Appel (1972, p.40) makes the observation that the 'supermarket' institution did not suddenly appear - "it was the culmination of evolutionary and revolutionary changes in retailing". He cites self-service, cash-and-carry operations, national branded merchandise, and the drive for greater volume and profit through more efficient retailing, as examples of such changes, (Ibid).

In the U.S., as the early supermarket movement began to gather momentum, many traditional wholesalers were forced out of the distribution channel as supermarkets dealt directly with manufacturers. Some wholesalers countered by moving into retailing themselves. Similarly in the U.K., Wheatsheaf Distribution and Trading Ltd., a company with predominantly wholesaling interests, adopted this strategy, and formed

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[21] Phillips (1938, p.188) describes the 'supermarket' as "... a large departmentalized store in which the food sections are the only, or at least among the most important, sections operated. The importance of non-food departments varies widely from one supermarket to another.

a joint retailing venture with the French company Carrefour in the 1960s to become the first operator of hypermarkets in this country.

Phillips (1938, p.199) noted very early in the development of retail institutions that it seemed "to be characteristic of new types of distributive enterprise that in the first stage of their development they gain a foothold primarily by means of low prices, in the second stage they 'trade-up' the quality of merchandise carried, and in the third stage they compete by offering services". Alternating cycles of price and non-price competition occur in many types of retailing and has been described by McNair (1958; 1962) as the 'wheel of retailing'. The wheel has four distinct stages:

1. Emergence of a new retail institution with low operational costs, offering low prices. Such institutional developments only arise because the innovators anticipate that the differential competitive advantage will last long enough to justify the substantial investment and risk involved,[22] (Beem & Oxenfeldt, 1966, p.85).
2. Diffusion of the innovation as other retailers imitate the innovator.
3. The emergence of non-price forms of competition to replace price competition. Retailers add services and promotions to win additional patronage.
4. Eventually, adding services and trading-up has an adverse effect on gross margins and prices have to be raised in order to remain viable.

The way is then clear for another innovation to move in safely below the price umbrella established.

Goldman (1975) has researched the process of trading-up in the level of services and concludes that although this process is an important element in fostering the appearances of new type retailing institutions, there remains some doubt about exactly what causes or prompts stores to

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[22] The advantage arises primarily because of the inertia rival competitor firms have to overcome, i.e. they are locked into their existing facilities and methods, and cannot therefore respond immediately to the innovator's low costs and prices.

trade-up. He further concludes "... that although the wheel of retailing theory appears to have rightly identified the margin reduction phenomenon as the major aspect of the appearance of new retailing institutions, it does not provide a good explanation of this phenomenon. The main flaw in the theory is the failure to realize that service addition and service reduction are not the only causes of important margin changes", (Ibid, p.62).

Definitions

Surprisingly, there are no official definitions for the hypermarket although retailers and planners seem to have their own ideas on the subject. In fact, there are probably few more controversial planning issues at the moment, (Gilham, 1976, p.883).

Hypermarkets are a French concept though it should be noted that the first out-of-town mass merchandising stores aimed directly at catering for the motorised shopper opened in 1962 in Belgium and Sweden. The leading French hypermarket operator, Carrefour, opened its first true out-of-town hypermarket of 55,000 sq. ft. in 1963 at St. Genevieve-des-Bois near Paris. The actual idea of out-of-town locations being used for shopping centres is however an American concept dating back to 1932 when the Country Club Plaza in Kansas opened a retail development out of town. However, Europe and the U.K. are now well ahead of the U.S. in this particular type of retail distribution outlet, (see " America's 1st Hypermarket", 1975; "U.S. retailers not sold on hypermarket concept", 1975).

Continental experience and British[23] applications indicate that a hypermarket may be defined as:

- a large free-standing retail outlet with a net sales area of at least 25,000 sq. ft., but normally considerably more[24]

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[23] See Davisworth et al (1977) for a good comparative analysis of French and British hypermarkets.

[24] Many traders regard 100,000 sq. ft. of gross floorspace as a desirable for a true hypermarket though there are several on the Continent that are over 200,000 sq. ft., e.g. Carrefour at Vitrolles near Marseilles (213,000 sq. ft.) and Sogara at Portet-sur-Garonne near Toulouse (250,000 sq. ft.).

- operates on one level
- operates on a cut-price basis
- sells a complete range of convenience goods, with at least 30% of the area devoted to foods, (Cynog-Jones, 1974, p.49)
- also offers a more limited range of hardware, electrical goods, and clothing
- some hypermarkets also have facilities for the sale of petrol and a cafeteria
- self-service methods are mainly used, and free car parking around the store is an integral part of a hypermarket development
- customer services are kept to a minimum, (Pickering, 1972, p.257).

In the above definition two aspects are particularly critical, i.e. size and location. Many traders consider that the 25,000 sq. ft. net sales area, which in effect means about 50,000 sq. ft. gross area, deserves the designation of 'superstore' rather than 'hypermarket'. In addition, the distinction between whether a particular store is located in the central business district of a town or out-of-town is important, the general view being that the designation 'hypermarket' should only be accorded a free-standing unit out of, or on the edge-of-town.

The distinction between hypermarkets and superstores according to location rather than size is a crucial one in terms of planning control. It led the Department of the Environment and the Welsh Office (1972) to issue their Development Policy Note 13. This requires all planning applications for shops of more than 50,000 sq. ft. gross area to be referred to the Secretary of State for the Environment or the Secretary of State for Wales, unless the proposed shop is to be located in an established town or district centre. This restriction has tended to limit the size of new store developments to just below the 50,000 sq. ft. (gross) barrier although several above this figure have been allowed after extended enquiries.

For the purposes of this case study we will consider both hypermarkets and superstores in the same general category because apart from definitional problems, they are both a manifestation of the new era in large-scale mass merchandising concepts used in retail distribution.

Justification for Hypermarkets

Reasons for the popularity of hypermarkets and superstores are not hard to find, i.e. access and economics.

Access: From the customers' point of view, out-of-town locations are generally easier to reach and free parking is plentiful. Suppliers also find it easier to deliver goods to this type of store where there are seldom traffic or space problems.

Economics: Out-of-town sites are undoubtedly cheaper than in central district (see MacLaurin, 1974), hence the developer can usually afford to buy more land for a given budget. This allows him to have a single story building which further cuts costs, and to provide surface parking adjacent to the store. These savings and other savings in operational costs resulting from bulk buying, and economies of scale in distribution, staff, and equipment, are all factors which contribute to lower retail prices to the customer. "Without a doubt the most efficient method for the retail distribution of goods to the consumer is through the hypermarket ...", (MacLaurin, 1974, p.37).

Scale Economies

Perhaps the key question which needs answering is whether hypermarket operations, relying on establishments of around 100,000 sq. ft., are necessary to attain any scale advantages that are not available with smaller sizes of establishment. Unless it can be demonstrated that such establishments would facilitate substantial change in methods of handling (and hence a discontinuity in the cost function) that are not conceivable at the large supermarket size, the answer is probably no, (Pickering, 1972, p.258).

In fact, operators of the new large stores in the U.K. are claiming there is a saving related to size. MacLaurin (1974, p.37) claims that Tesco's calculations indicate "that the ideal size of store which will give the public maximum benefit is between 100,000 and 130,000 sq. ft." This effectively means a total coverage of 160,000 sq. ft. and parking facilities for 2,000 cars. This question of store size versus the scale economies potentially available has to date not been satisfactorily resolved although several writers have been active in the area, (see Hall, Knapp & Winsten, 1961; McClelland, 1966; Walters, 1963; Padberg, 1968; RORU, 1977).

Opportunities and Constraints

The hypermarket development offers opportunities to manufacturers as well as the retail operators. As these stores encroach upon the markets of traditional supermarkets, new opportunities are bound to arise for manufacturers whose products are classified as routine purchases but have not previously been sold through food channels of distribution, (Salmon, 1974, p.1). In turn this represents a whole new strategy of product diversification by the retailer. In addition, because of the trend to fewer, larger, outlets, manufacturers will have the opportunity to rationalize their sales forces. However, manufacturers with secondary and tertiary brands will come under pressure to improve their position because retail operators will be keen to select predominantly fast moving products for their ranges in order to keep the throughput high.

The constraints involved in the development of large mass merchandising stores are primarily of a political nature, i.e. resistance from smaller competitors, the environmental lobby, and the attitude of local and central government planning authorities. In regard to the latter, there are currently signs that the Department of the Environment and local authorities are beginning to view this type of development more favourably. The original policy note requiring proposed out-of-town developments of 50,000 sq. ft. or over to be referred to the Department has been relaxed to a higher ceiling of 100,000 sq. ft., (Retail Review, 1976, Item 33). The various objections raised in the early days of the adoption of this new style of retail distribution are well summarized in Gilligan et al (1974).

U.K. Innovators

The first true hypermarket in the U.K. was opened under the Carrefour name at Caerphilly in Wales on 13 September, 1972. This store is owned and operated by Hypermarket Holdings, a company jointly owned by a British public company, Wheatsheaf Distribution and Trading (90%), and the French company, Carrefour (10%). The gross floor area of the store is 110,000 sq. ft. of which 55,000 is selling area. There are parking facilities to accommodate 1,000 cars, and an on-site petrol station. The store is an exact replica of the Carrefour hypermarket at Chambery, in France. Since the Caerphilly opening, three more Carrefour

hypermarkets have subsequently been opened, at Telford (52,000 sq. ft. net; 110,000 sq. ft. gross), Eastleigh (50,000 sq. ft. net; 101,500 sq. ft. gross)[25], and Minworth (70,000 sq. ft. net; 148,000 sq. ft. gross), the latter being the biggest in Britain; plans are afoot to open an even larger unit at Bristol (90,000 sq. ft. net; 204,000 sq. ft. gross sales area).

No store was originally planned at Caerphilly; sites at Eastleigh and Newcastle/Sunderland were initially chosen but continual delays in obtaining planning permission resulted in Hypermarket Holdings reaching a situation where they were ready and willing to open a store but nowhere to build. In order to force hypermarkets onto the British retail scene, and to convince local government officers that this type of retail institution is a valid and reasonable concept, the decision was taken to go ahead at Caerphilly on a site offered to Hypermarket Holdings by developers who had already managed to obtain planning permission for a large store. Turnover in the first year was £7.9 million.

A number of other major retail companies in the grocery industry have subsequently opened hypermarkets, e.g. Tesco at Irlam near Manchester (73,000 sq. ft. net; 102,000 sq. ft. gross); Fine Fare at Hyde near Manchester (72,000 sq. ft. net; 105,500 sq. ft. gross); and the Royal Arsenal Co-operative Society at Broadstairs (62,000 sq. ft. net; 105,000 sq. ft. gross). However, mainly because of planning restrictions the biggest increase in store openings has been in the superstore category, i.e. around 50,000 sq. ft. gross area. The leading company with stores in this category is Asda Superstores Ltd, a division of Associated Dairies Ltd., which currently operates 56 stores with an average gross area of 55,000 sq. ft.

To provide some indication of the growth of large mass merchandising developments of at least 50,000 sq. ft. gross area (i.e. superstores and hypermarkets), the following tabulation has been prepared (Table 3). The total of 152[26] may be compared directly with the figure of 320 hypermarchés in France as at 1 July, 1976, i.e. stores with a selling area greater than 2500 m^2 (or 25,000 sq. ft.).[27]

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[25] See Walters (1977) for a detailed operational analysis of Carrefour's hypermarket at Eastleigh.

[26] Source of French hypermarché statistics: C.C.C.N., D'apres I.F.L.S.-L.S.A.

[27] See URPI (1977) for most recent survey, by operator, geographical location, and net sales area.

TABLE 3

SUPERSTORES & HYPERMARKETS, 1977

Retail Organization	Operational	Planned	Total
Asda	32	9	41
Tesco	26	7	33
Co-op	15	9	24
Fine Fare	15	9	24
Woolco	11	3	14
Allied Suppliers (Presto)	10	2	12
Hillards	11	-	11
J. Sainsbury	4	4	8
Morrisons (Bradford)	5	2	7
International	3	1	4
Carrefour	3	1	4
Whelans	3	1	4
Debenhams (Scan)	2	2	4
Stewarts (Belfast)	3	-	3
Tower	3	-	3
Caters	2	-	2
Supa Centa	1	1	2
New World	1	-	1
Romart	1	-	1
Consuma	1	-	1
	152	51	203

Sources: The Grocer; Institute of Grocery Distribution; Co-operative Wholesale Society; Company Reports and other published statements.

Logistics Implications

The three most significant physical distribution factors to emerge as a direct result of these new large scale retail institutions are:

1. Increased emphasis on direct delivery channels from manufacturer to retail outlet,
2. Method of merchandising
3. Warehouse storage area requirements.

Direct Delivery: with the high volume throughput of certain products, hypermarkets/superstores can in many instances receive regular full-loads direct from manufacturers. Drop-size economies have always been recognized as a element in the cost of distributing, so regular full-load deliveries would appear to be more cost effective from the manufacturers point of view, at least up to a point as yet undefined, and provided waiting time and refusals are largely eliminated. Certainly, under this scheme there are virtually no opportunities for wholesale intermediaries to function, and experience in Europe indicates many are forced out of business, (Breach, 1975, p.8).

Merchandising: larger stores allow product to be moved through the distribution channel in larger basic units and onto the sales floor in the same degree of bulk. In this regard the preceding case study of cage palletization is particularly pertinent. Essentially, the use of the cage pallet and emergence of large-scale discount stores such as superstores or hypermarkets are causally linked, i.e. large stores facilitate the use of cage pallets as a transit-merchandising unit load vehicle. Through the use of a larger basic unit than the traditional fibre case, and utilization of mechanized materials handling equipment in the store, considerable gains in productivity have been reported by a number of major retail operators. In turn, the new bulk procedures have implications for packaging, (see Tobolski, 1975). This is a potential cost saving area for manufacturers, (see Christopher et al, 1977, p.55).

Storage: The Asda Company is unique in that it operates over fifty large retail outlets without any separate warehouse system; goods are delivered direct to all Asda stores. This reduces the group's distribution costs and allows sites for new stores to be chosen without having to allow for geographical location and capacity limitations of an existing warehouse system, (Buckmaster & Moore, 1976, p.18).

In addition, by using high bay mobile racking and narrow aisle techniques in the storage area adjacent to the store itself, and treating the air space above product displays on the actual selling floor as additional storage, it is possible to reduce the proportion of total area devoted to warehousing from around 20% of gross area to as little as 10%. In this regard Asda are the leading innovators.

Supplier-Distribution Relationships

Fifteen years ago, Tallman & Blomstrom (1962) wrote how the then development of new retail institutions, and the consistent reaction of consumers to these, had become a considerable factor in manufacturer-retailer relations. Yet, it was their experience that very few manufacturers had made any sort of analysis of the best ways to adapt "operational methods, products, price lines, packaging, inventory, and delivery system in order to serve the special requirements of large-volume self-service stores and to minimize the cost of moving the product from factory to consumers via these institutions, (Ibid, p.139).

Has the manufacturer recognized that he must analyze and plan for the inevitable changes in retail outlets, (Ibid, p.130)? From our researches it is apparent not enough is being done. Events are happening, in many cases taking manufacturers by surprise or at the very least unprepared.

While the rapid movement now apparent in the subject industry towards fewer, larger, units is in some sense an answer to economic constraints, it also carries its own special difficulties. Capital requirements associated with such developments are extremely high (Barrett, 1976), and in a period of markedly reduced gross profit margins there are severe implications for cash flow management. Less obvious but of equal importance is the need to absorb the rapid transition in methods of operation - this is true for both manufacturer and retailer. "Trading, storage, and distribution strategies which have often been evolved over many years are having to be re-thought and changed in a very short time", (Beaumont, 1977, p.17). The transition period is therefore a difficult one for manufacturers and retailers alike.

Effect on Trade Structure

Much has been written about hypermarket developments (see Dawson, 1975), but few empirical studies have examined their impact on existing retail structure. According to Dawson and Kirby (1976, p.25), the few field studies which have been undertaken have rarely used a 'before' and 'after' perspective to determine the direct impact on existing retailers, have not allowed sufficiently for natural change over time, and have not gathered substantial enough evidence upon which to gauge changes in consumer behaviour.

In fact, Appel (1970, p.64) makes the point that despite the obvious importance of institutional innovations, little is known about the process of consumer acceptance responsible for the success or failure of a new type of retail institution; this is an environmental factor of utmost importance. We would have thought this is the kind of knowledge major retail organizations would find absolutely necessary before committing large amounts of funding to building new stores. Tallman and Blomstrom (1962, p.139) appear to share this viewpoint. We suspect in fact a considerable amount of research of this type is being done by individual retailers but of course is never published.

Studies of the impact of the Carrefour hypermarket at Caerphilly suggest that contrary to expectations, the impact has been least on the small independent trader, and greatest on co-operatives and small multiple operations, (Thorpe & McGoldrick, 1974). In this particular example it appears there has been little decline in the long-established shopping centres in the hypermarket's nominal catchment area because it draws its trade from such a wide area the impact is finely dispersed, (Lee & Kent, 1975).

Although all the leading hypermarket/superstore operators claim that the development of out-of-town and edge-of-town stores need not necessarily damage existing shopping facilities, there is clearly a practical limit as to how far new large-scale developments can continue before an over-supply situation is reached. Certainly, while ever they are able to maintain a price advantage of up to 12% below the national median, they can expect to receive continued patronage.

Conclusion

In this chapter we have attempted to offer a comprehensive coverage of two important distributions innovations which have appeared relatively recently in the U.K. grocery industry. In the following chapter it is proposed to extend our examination of distribution innovations into the predictive dimension, seeking some vision of other changes similar to those already discussed which may in future become an influential factor in supplier-distributor channel relations. The case studies contained in this chapter and the results of our Delphi futures forecast in Chapter VI will be fully analyzed in Chapter VII using the heuristics devised in Chapter III.

CHAPTER VI

FUTURE DEVELOPMENTS IN DISTRIBUTION

> *What we want the future to be and what the future will actually be are not entirely unrelated. We cannot determine our future any more than we can predict it precisely. But we can influence it, we can narrow the range of uncertainty, and we can expose and analyze the model of the future we carry in our heads, (Rothstein, 1972, p.188).*

So far we have been operating in the past tense by:

- making the observation that the consequences of innovation introduction have at times reflected a divergence from expected outcome(s), (Chapter I);
- assessing the conceptualizations so far offered for channels of distribution as lacking in explanatory power and predictive capacity, (Chapter II);
- proposing a new basis for conceptualizing distribution channels, (Chapter III);
- preparing to test this new approach with <u>two</u> relatively recent but nevertheless historical examples of distribution innovations, (Chapter V).

This chapter will therefore attempt to develop the material to enable us to test the predictive capability of the model constructed in Chapter III although the actual analysis will mostly appear in Chapter VII. It is thought this approach will prove infinitely better than simply waiting around until enough data has accumulated on a number of innovations/changes as yet undefined, before being in a position to undertake such a test, albeit a limited one.

It is considered important in the context of this thesis, to seek some vision of possible future events relevant to the distributive sector of the U.K. food/grocery industry, before these become so imminent as to again make meaningful planning impossible as instanced with cage palletization in Chapter V. Delineating future changes which have a

reasonable probability[1] of eventuating buys valuable time to focus on any contentious issues which may be perceived to be involved, and opens the way at a relatively early stage for joint dialogue between the affected channel parties. In effect this is planning for change rather than simply reacting to its onset and suffering the potential dysfunctions of the latter course, i.e. 'influencing' the future rather than merely following it, (Teichner, 1975, p.70; North and Pyke, 1969, p.69).

Essentially, the ultimate aim is to outline a scenario for the future in which the U.K. food/grocery industry will have to operate. The changes forecast, both external and internal, will obviously affect the industry as a whole, and distributive arrangements in particular.

Given that certain future changes can be defined now, the newly developed model may usefully be applied to the task of predicting what systemic changes in the structure of distribution channels may be expected, and possibly some idea of their likely consequences.

However, before we can reach the stage of possibly predicting systemic change as outlined above, it is first necessary to generate a forecast of, and map, the causal changes and associated innovative developments which may occur.

Choice of Forecast Technique

The alternatives available for conducting a forecast exercise have already been adequately outlined, appraised, and evaluated by a number of writers, (see Centron & Monahan, 1967; Stoney, 1975; Turn, 1974; Walters, 1973; and Fourlis, 1976).

However, because our particular forecast is exploratory in nature, and likely to be largely qualitative in content, the choice is considerably narrowed to techniques classified as 'intuitive'; within this group are three alternatives, all of which are consensus based, i.e. (i) polls; (ii) panels; and the Delphi technique. Given this choice, the more

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[1] The question of very low probability events or events which occur suddenly through some unexpected 'discontinuity' in current behaviour patterns will be confronted in Chapter VII using the 'catastrophe theory' already referred to in Chapter III.

disciplined procedure of the Delphi technique appears to be the most suitable. Rowlands (1969, p.79) would clearly agree with this choice.

Since commitment to this decision, and in fact completion of the actual forecast itself, we have become aware of a new technique which appears to offer great promise for qualitative type forecasts; this is the 'search conference' outlined in Emery (1976). It is open ended, explores interdependencies, allows improbable suggestions to be fully explored, and in many ways overcomes the deficiencies inherent in the Delphi technique. Faced with the same choice again we would undoubtedly favour use of the 'search conference' approach.

The Delphi Technique

We accept that "the opinion of experts can give important insights into the future, particularly in the identification of potential innovations likely to disturb the path of progress away from the extrapolated trend", (Twiss, 1974, p.84). The Delphi technique is a method of eliciting and refining group judgements. Broadly, the rationale for the procedure is based on the age-old adage that 'two heads are better than one', particularly when the issues involved are in areas where no exact knowledge is available[2], (see Dalkey & Rescher comment quoted in Fusfeld & Foster, 1971, p.64). This is the realm we are operating in with the proposed forecast of innovative developments in the domestic food/grocery industry. Turoff (1970, p.149) defines the Delphi technique as "a method for the systematic solicitation and collation of informed judgements on a particular topic".

Dalkey (1969, p.v) outlines the three main features of the Delphi technique as follows:

1. Anonymous Response - opinions of members of the group are obtained by formal questionnaire.
2. Iteration and Controlled Feedback - interaction is effected by a systematic exercise conducted in several iterations, with carefully controlled feedback between rounds.

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[2] Dalkey & Rescher reinforce this idea with their contention that there are certain fields of knowledge, which, by their nature, commonly require the opinion of an expert. These fields are termed 'inexact', meaning that absolute answers are not known or possible, (quoted in Fusfeld & Foster, 1971, p.64).

3. Statistical Group Response - the group opinion is defined as an appropriate aggregate of individual opinions on the final round.

These features are designed to minimize the biasing effects of dominant individuals, of irrelevant communications, and of group pressure toward conformity, (Ibid).

The intention of the exercise is "to promote convergence of the panelists' predictions: that is, to facilitate agreement among the experts on the most likely date of occurrence for the events under study", (Hill & Fowles, 1975, p.180).

A Delphi exercise, properly managed, can be a highly motivating experience for respondents - such was the experience with this particular project. However, "while it is apparent that the technique is extremely useful, a certain amount of caution should be used in applying it ...", (Fusfeld & Foster, 1971, p.63). The specific areas of caution may be discussed under the following headings:

Areas of Caution

Panel: Selection of panel members is critical, (Wills, 1975, p.90; Jain, 1974, p.26; Parker, 1969). In the subject area of our forecast, it is essential to have experts, but as Wills (Ibid) rightly points out, using experts has its hazards; they tend to see the world through their own speciality and this blinkers appreciation of other contributing areas, and even of the impact on their own technology. Nevertheless, there are occasions when experts have to be used (Quinn, 1968, p.185; Fusfeld & Foster, 1971, p.64), and this is one of them. At least we were aware of the potential dangers outlined above when making the panel selection.

Group Size: Dalkey (1969, p.7) has demonstrated how average group error decreases as group size increases, rapidly up till about 15 members, and thereafter only marginally.

Questionnaire Formulation: This has two aspects:

(a) Definitions and terminology - it is essential that all respondents interpret each event statement (and the words and phrases which constitute it), in the same way, (Parker, 1969, p.1318; Salancik et al, 1971, p.65).

(b) Complexity - the overall phrasing and length of the event statement should facilitate clear meaning, (Wills, 1975, p.94; Twiss, 1974, p.86). According to Salancik et al (1971, p.72), the statement length should ideally be between 20-25 words.

Interaction: The original Delphi procedure tended to view events in isolation, without taking cognizance of the potential or actual interdependencies present. Subsequent refinements have largely removed this flaw, (see Gordon & Hayward, 1968; Wills, 1975, p.97; Fusfeld & Foster, 1971, p.66; North & Pyke, 1969; Lickider & Taylor, 1968).

Response Evaluation: It is essential to differentiate the degree of "expertness that each panel member applies to each answer", (Wills, 1975, p.91); this is now commonly achieved through the use of a weighting system, the basis of which is the respondent's self-perceived competence on a particular issue and/or his confidence in the forecast he is making.

Reliability and Validity: On the question of validity (in terms of accuracy of forecast), some work has been done with mixed results, (see Ament, 1970; Hill & Fowles, 1975). Perhaps it is still too early to pass final judgement either way. Regarding reliability, the originators of the technique Gordon & Helmer (1964) have never made exaggerated claims, (see Kimble, 1968, p.3). Suffice to say that Dalkey's (1969, p.12) work indicated that reliability tended to increase as group size increased.

Ultimately, it is the investigator co-ordinating the exercise from the centre who must take responsibility for the quality of the forecast achieved. He must set the limits based on a thorough knowledge of what is required (Rowlands, 1969, p.78), and follow a disciplined procedure throughout the course of the study, avoiding abuses of the technique at all costs.

Initial Planning

Initial planning for the Delphi forecast took place during the period October 1975-January 1976. This involved panel selection, defining the salient subject areas, and questionnaire formulation. Pilot testing took place during February 1976, and launch the following month.

The ideas around which the whole forecast was designed were derived from three sources - the available literature, a postal 'brainstorm' using several hundred industry personnel, (see Appendix D), and an idea generation session held at Cranfield at the end of January 1976 to which prominent industry executives were invited, (see Appendix E for list of attendees and Appendix F for a summary of the ideas generated at that meeting).

The forecast proper involved three Rounds conducted over the period March 1976-February 1977. In the last round five supplementary questions were introduced to gain opinions on a number of specific issues not adequately covered in the original questionnaire, but nevertheless considered pertinent to the final analysis; no quantitative estimates were requested for these questions.

Of the 94 panelists (from 85 companies) who received Round 1 questionnaires, 69 replied (73%); see Appendix G for the list of companies represented. Response to successive rounds was 47 (68%) and 42 (61%) respectively, the lower return being mainly due to pressure of work and holiday interruptions; these response rates have been calculated allowing for withdrawals as the exercise progressed. Nevertheless, the panel of 42 in the final round was more than adequate, and still well above the suggested minimum of around 15 for this type of forecast exercise, (see Dalkey, 1969, p.7).

Methodological Note

Research Approach

Throughout the forecast exercise, keen emphasis was placed on methodology; in fact, a number of improvements over the classical Delphi technique were incorporated[3].

In terms of panel size and selection, development of a computer program[4] (see Appendix H) to process the quantitative portion of the

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[3] The major improvement relates to calculation procedures used - see Footnote 8 for full details.

[4] The program was originally developed by J.W. Kendall in the Operations Research Dept. at Unilever Research, Sharnbrook, Bedfordshire, during 1976; to him, my sincere thanks for allowing its use in this forecast, and helping to modify it for running on the Institute's ICL 1900 Series computer.

forecast results made it possible to bring together a massive panel; every level and every interest in the subject industry was represented, e.g. manufacturers, retail multiple chains, co-operative societies, symbol voluntary groups, cash and carry wholesalers, third-party distribution contractors etc., as well as a number of peripheral interests such as computer and packaging companies. All participants in the forecast exercise were senior managers, and in the selection process a genuine attempt was made to achieve a reasonably balanced mix of policy makers, planners, decision makers, implementers, and those most likely to be on the receiving end of change.

Event statements were carefully designed and pretested before the start of the forecast proper to minimize problems with interpretation. Salancik's et al (1971) advice on statement length was heeded and a weighting system adopted for assessing respondents' answers. The matter of introducing an interactive element into the study is more fully developed in Chapter VII under the heading Factor Analytic Evaluation of the Environment.

It was recognized very early that simply going out and asking even industry experts to forecast changes/innovations which may materialize at some time in the future was unlikely to prove of much value; this is expecting too much, particularly where a relatively specialized subject is involved. The particular approach adopted in an attempt to overcome this problem involved offering the panel a wide range of event possibilities for consideration, some of which have an obvious direct bearing on the central issues of innovation and supplier-distributor relationships, while others are of more indirect relevance. This approach helped to keep the actual forecast open, free wheeling, and as free of bias as possible.

Although the forecast was vitally concerned with delineating distribution-type innovations pertinent to the physical transfer of goods and the corresponding information flows (particularly in terms of technology-based developments, institutional, and procedural factors), cognizance was also taken of factors with less obvious relevance, e.g. macro-economic climate, social factors, consumer behaviour, the regulatory influence of Government (at all levels), and environmental (quality of life) matters. The expectation was that the quantitative and qualitative responses received from the panel would, upon analysis, yield

plausible inferences about the possible future train of events and their corresponding implications.

Procedure[5]

In *Round 1* (see Appendix J), the initial questionnaire, comprising 62 predetermined event statements, was circulated to participants requesting estimates of the year-date each may be realized by; an answer of NEVER was stated as being quite acceptable. Some accompanying qualitative comment was also requested, the details of which are given below. The resulting quantitative answers were processed and the MEDIAN YEAR and INTER-QUARTILE RANGE[6] calculated for each event. Eighteen of the original event statements were withdrawn from further consideration at this stage, mostly because of a heavy NEVER consensus.[7] Forty-four (44) event statements, amended as necessary for clarification, were returned to the panel along with the aggregate results of Round 1, i.e. medians, inter-quartile ranges, and an edited version of the qualitative answers received.

In *Round 2* (see Appendix K), each participant was requested to reconsider his previous estimates in light of the feedback received on the panel's aggregate opinion. Qualitative comments were again requested, and in addition, the probability of each event occurring at all. The results of these new deliberations were analyzed, and new medians and inter-quartile ranges calculated for return to the panel along with an edited version of the qualitative comments received.

In *Round 3* (see Appendix L), participants whose answers were regarded as extreme (i.e. fell outside the calculated inter-quartile ranges in Round 2), were asked to provide a defence statement if they wished to hold

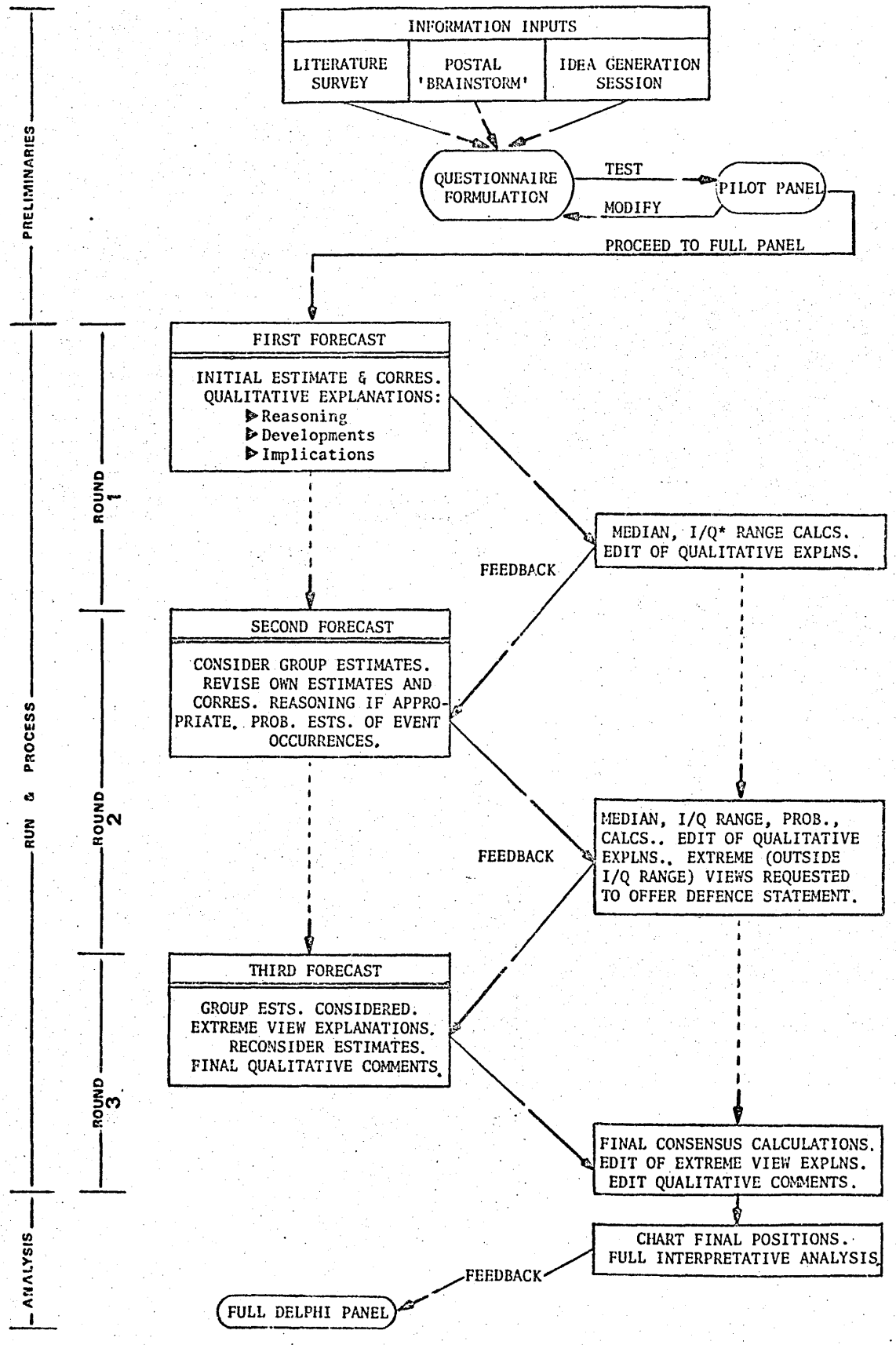
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[5] Read in conjunction with Figure 7.

[6] MEDIAN YEAR: is the central forecast if all responses are placed in rank order. INTER-QUARTILE RANGE: is the interval or period containing the middle 50 per cent of all responses.

[7] Events (01, 03, 05, 08, 14, 19, 23, 25, 30, 31, 36, 38, 39, 42, 48, 50, 54 and 62) were DELETED, generally because of the relatively large number of NEVER (2025) responses received. However, the combined effect of residual panel responses has in many cases produced a median date closer than 2025.

FIGURE 7 DETAILED LOGIC FLOWCHART OF Delphi FORECAST PROCEDURE



*INTER-QUARTILE

that position, or alternatively, modify their estimates to fall within the inter-quartile range. The entire panel was asked for a final assessment. The median of these final responses were taken as representing the group consensus on the issues under examination.

As mentioned above, in addition to providing various quantitative estimates, each participant was encouraged to offer brief comments on the REASONING used in each case, to outline possible on-going DISTRIBUTION DEVELOPMENTS which might follow if the particular event under consideration was realized as predicted, and to indicate the likely IMPLICATIONS these may have for supplier-distributor relationships. These comments needed to be in key word or key phrase form only, and could well be modified as the exercise proceeded if so desired. Where difficulty was encountered in thinking of suitably pertinent comments, panelists were encouraged to write 'don't know' in order to save time.

Clearly, not all participants were equally competent to offer estimates on all event statements so they were asked to indicate a self-perceived competence to answer each question, on a 0-5 scale, i.e. 5 = highly competent, 0 = know nothing about the subject. These ratings were used to calculate weighted values of the answers received. If it was considered that the particular event being considered would NEVER eventuate during the time-scale of interest in the forecast, 2025 was inserted in the year-date estimate column. Panelists were encouraged to discuss their estimates and feedback with company colleagues as long as the latter were not part of the panel.

Results

Since 62 events are involved, it is obviously desirable to break this number down into a series of homogeneous groupings for ease of presentation and to facilitate understanding in the analysis stage. Three necessarily arbitrary groups have been selected for this purpose:

1. A set of broad, economic-political-social-technological events whose occurrence would presumably be largely independent of developments in the U.K. food/grocery industry, but

whose impact on the distribution function could nevertheless be substantial. These are called EXTERNAL events; there are 28 of these.

2. A set of market and competitive type events that are more directly related to the distribution function. These are termed MARKET-COMPETITIVE events and number 19 in total.
3. A set of internal, cost reduction type events that are related to such controllable issues as service levels offered, costs of distribution, investment requirements, etc. These are INTERNAL-CONTROL events of which there are 15.

External Events

Results for the 28 events in this category are summarized pictorially in the following table, arranged in chronological order of the median year of forcasted occurrence across the full period under review. Following this tabulation each individual event is reviewed in detail using the following format throughout:

- Exact EVENT statement
- Computer print-out showing MEDIAN date, INTER-QUARTILE RANGE[8],

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[8] In fact 'calculated' MEDIAN (or log mean) and calculated INTER-QUARTILE RANGE values are used in order to improve the forecast. Normally, many Delphi estimates are 'round' (e.g. 1985, 1990 rather than 1987, 1991) dates and this causes the distribution of estimates to be 'spiky'; in turn this can adversely affect how good the true median is as an indicator of the centre of opinion, and also bias the inter-quartile range. One method of overcoming the problem is to take the log mean of estimates. This approach is based on the assumption that people regard 'nearness' of an event in time along a logarithmic scale - how else could we simultaneously comprehend events that happened hundreds of years ago, decades ago, last year, last week or this morning? The calculated median (or log mean) tends to agree well with the true median and is seldom more than a few years different. However, the former is based on all the replies, not just the middle few. The computer print-out of results for every event gives 'true' as well as 'calculated' values for the median and inter-quartile range although we have used the latter throughout. The finally accepted consensus dates are shown in boxes on each print-out to facilitate easier recognition.

and distribution of panel estimates[9]

- A summary of the panel's REASONING in support of the majority view expressed (R)
- A summary of panel's expectations in regard to resulting DISTRIBUTION DEVELOPMENTS (DD)
- A summary of panel's opinion regarding the possible IMPLICATIONS to follow (I)
- Where appropriate, a short statement of significant DIVERGENT views expressed by panel members outside the consensus group (DV)

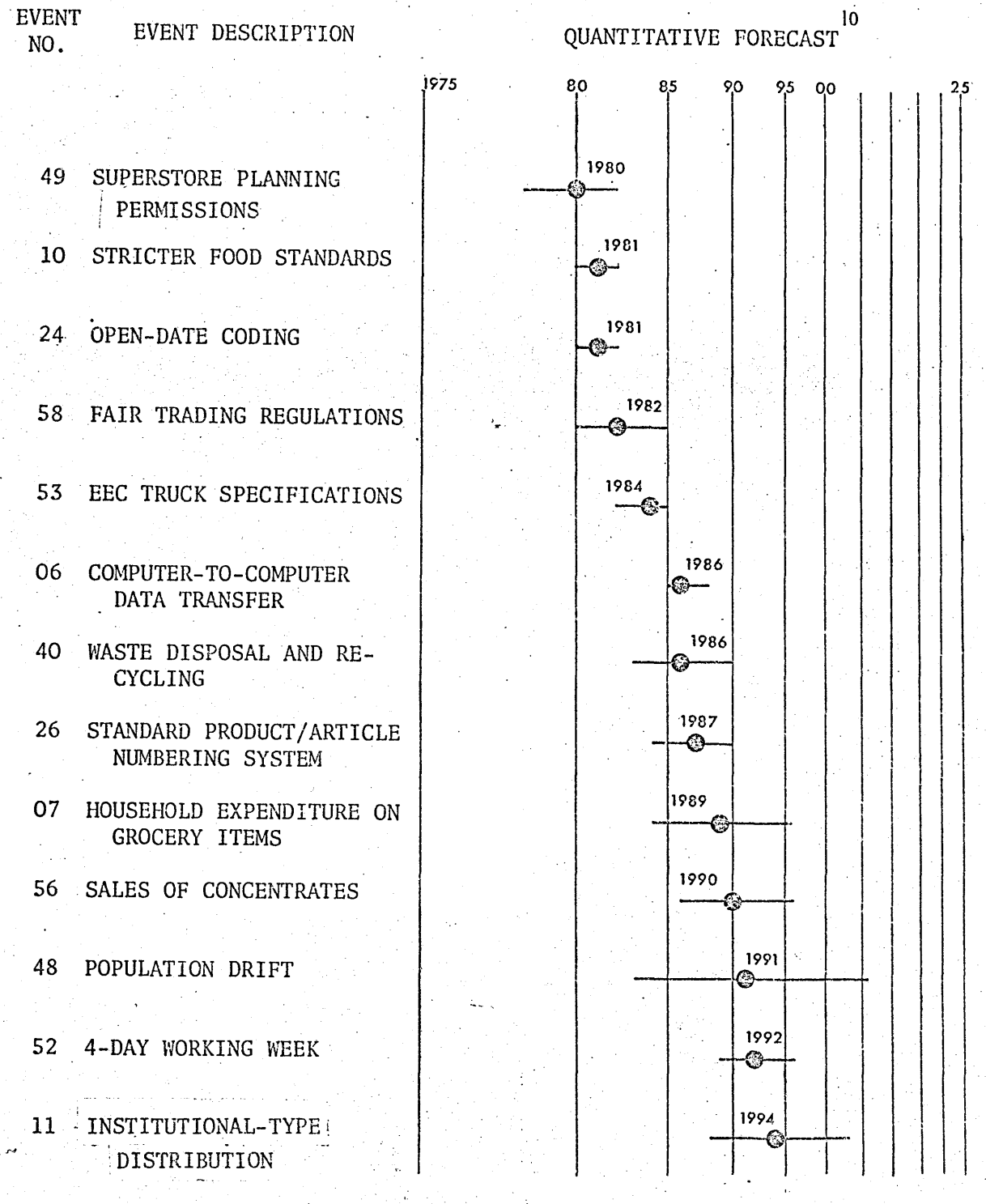
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[9] The computer print-out of results provided for each event may be interpreted as follows:

(i) Consider only year estimates opposite the headings LOG MEAN, and CALCULATED RANGE;

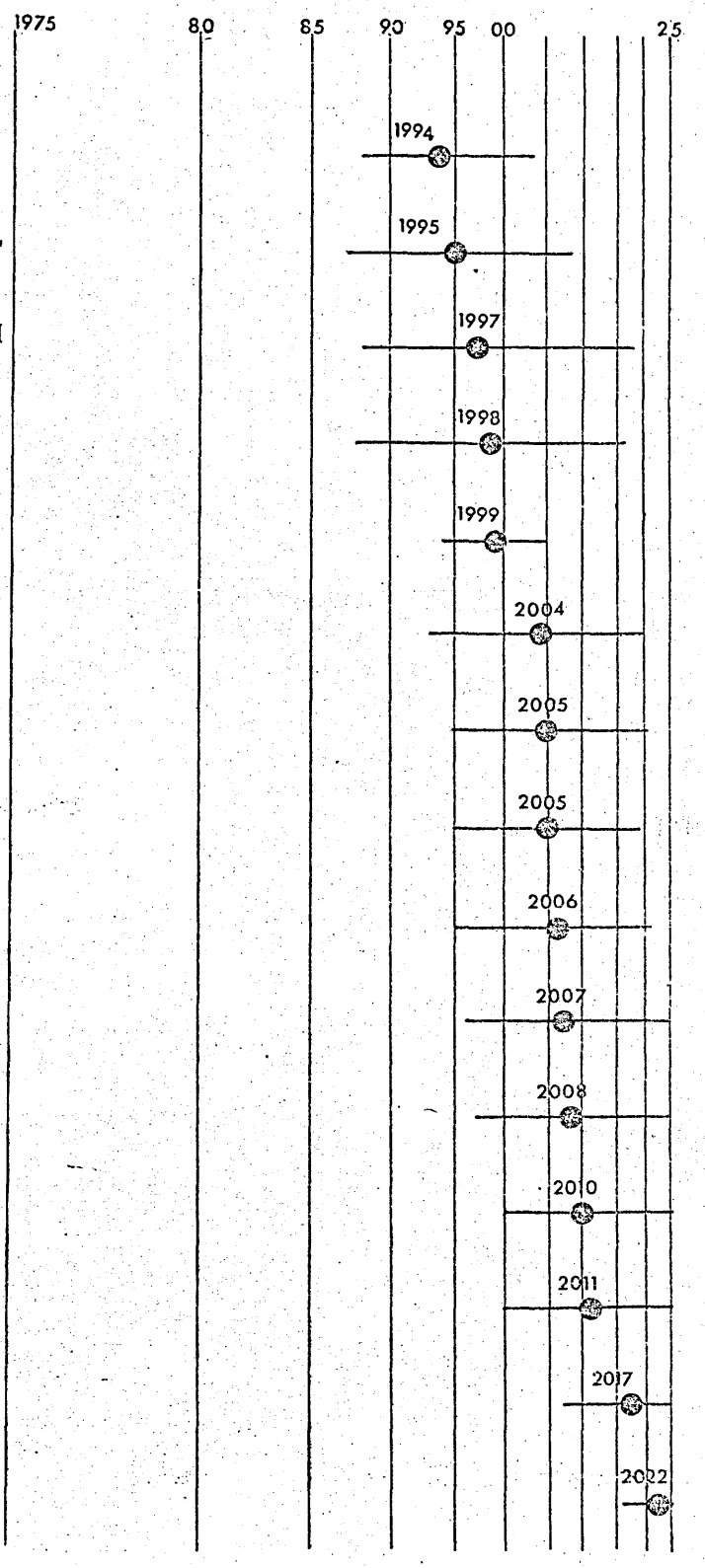
(ii) in moving from left to right across the columns, the estimates offered are being weighted on a scale, 0 to 5 according to respondents' self-perceived assessment of competence, and the final column is the fully weighted aggregate of all estimates received;

(iii) the tabulation below the year estimate columns indicates the distribution of respondents in terms of their year-date estimates and the corresponding competence rating which is zero in the top row increasing to 5 in the second last row. The bottom row is the aggregate result obtained by multiplying above numbers by the appropriate competence rating.



[10] The forecasts are shown on horizontal bar-charts as is now conventional practice with Delphi studies; note the time-scale used is logarithmic. The *blob* represents the median or central forecast when all individuals' forecasts are placed in rank order. The lateral extent of the *bar* records the divergence of 25 per cent of panel members in both directions from the median value. Accordingly, the total visual forecast covers 50 per cent of all panel members and is the consensus opinion.

EVENT NO.	EVENT DESCRIPTION	QUANTITATIVE FORECAST



20 EFTS and CBTS[11]

16 GOVERNMENT PRICES CONTROL

45 COMMODITY BUYING APPROACH

62 HOME GROWN FRESH FOODS

34 ROAD TRANSPORT MODE

03 BREAK-BULK CENTRES

08 FRESH FOOD

19 CAR OWNERSHIP

01 FOOD CONSUMPTION OUTSIDE THE HOME

23 GOVERNMENT OPERATED NATIONAL PALLET POOL

05 GOVERNMENT OPERATED RETAIL STORES

25 NUMBER OF HOUSEHOLDS

39 INTER-CITY PRODUCT MOVEMENT BY PIPELINE

30 U.K. FOOD PURCHASES FROM EEC

36 U.K. POPULATION

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[11] Electronic funds transfer system (EFTS); customer-bank terminal system (CBTS).

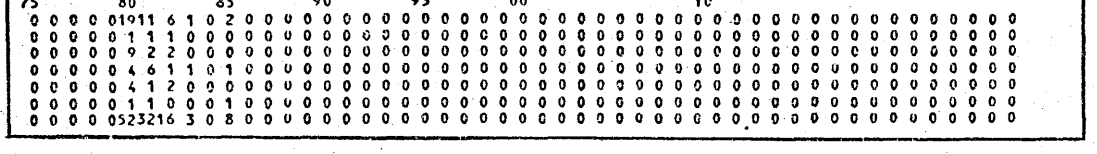
49 *Planning permission applications for superstore developments will begin to receive a generally favourable response from Government planning authorities*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	40	2	12	13	11	2	119
	49 MEAN	1981	2002	1980	1981	1979	1978	1980
	LOG MEAN	1980	1988	1980	1981	1979	1978	1980
	CALC RANGE	1978	1981	1979	1980	1978	1978	1978
		1983	2005	1980	1982	1980	1978	1982
	MEDIAN	1979	0	1979	1979	1978	0	1979
	RANGE	1977	0	1979	1979	1977	0	1977
		1979	0	0	1981	1979	0	1979

75	80	85	90	95	00	10	
0	0 2 9 119 1 4 1 0 2	0 0 0

10 *Government will legislate significantly stricter food standards regulations than currently in force, particularly in the area of temperature controls, and specifically aimed at safeguarding chilled and frozen foods in-transit between production and selling locations.*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	39	3	13	13	7	3	111
10 MEAN	1981	1981	1980	1981	1981	1982	1981
LOG MEAN	1981	1981	1980	1981	1981	1982	1981
CALC RANGE	1980	1980	1980	1980	1980	1980	1980
	1982	1982	1981	1982	1981	1983	1982
MEDIAN	1980	0	1979	1980	1979	0	1980
RANGE	1979	0	1979	1979	1979	0	1979
	1980	0	1980	1981	1981	0	1980



(R) Increasing consumerism will force Government to act in this area, coupled with EEC legislation. Politically useful. Upsurge in freezer use and ownership is prelude to upgrading health safety standards. Trend is already evident but still lags U.S. and European standards.

The fundamental question is: does much of this legislation actually result in greater general consumer satisfaction or just a sense of achievement for lobbying consumer associations? Expect temperature indicators on frozen and chilled food outer packs to come. Will ultimately lead to improved equipment in warehouses, transport, and retail stores. Scope for distribution service companies to cater for smaller manufacturers who cannot afford all necessary facilities. Quality control will become even more important, at all stages in distribution channel. This event linked to open date coding. Ultimate justification will be reflected in increased consumer satisfaction.

(DD) Will increase (vehicle and storage) costs unless matched by a gain in efficiency of distribution. Improved technical developments, particularly in temperature control safeguards at individual product level, vehicle design and environmental controls. Possible greater use of professional distributors. Greater discipline required in handling. Reduction in flat-top truck transit, and replacement by insulated vehicles. Similar specifications for transit packaging. Government licensing and inspection of vehicles.

(I) Increase in waste/returns percentage. Necessarily clearer definition as to interface of responsibilities for goods. Higher standards may ultimately lead to higher prices throughout distribution chain. Set delivery times arranged to reduce time goods held in

unsuitable conditions. Possible agreement on sharing of specialist vehicles and storage facilities. Training in new methods and equipment. Need for close agreement at unloading interfaces re timing, equipment, condition checks etc. Stricter stock control. Generally closer liaison between suppliers and distributors. Costs will inevitably be incurred in:

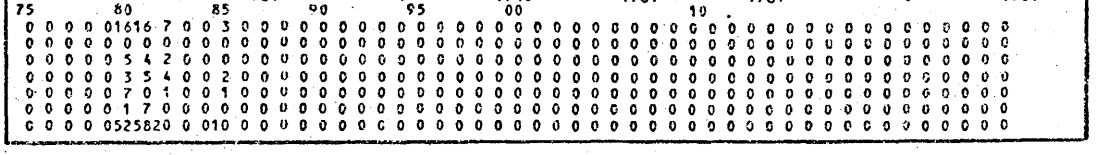
(a) monitoring devices; and

(b) more efficient storage facilities.

(DV) Government already has such a heavy legislative programme that this matter will not receive any priority. Growing disenchantment with consumer pressure groups. Recession could delay any proposed legislation which has widespread capital investment implications.

24 *Open-date marking of product packs will become standard practice with most major manufacturers by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	42	0	11	14	9	8	140
24 MEAN	1981	0	1981	1982	1981	1981	1981
LOG MEAN	1981	0	1981	1982	1981	1981	1981
CALC RANGE	1980	0	1980	1981	1980	1981	1980
	1982	0	1981	1983	1982	1981	1982
MEDIAN	1980	0	1980	1980	1979	1980	1980
RANGE	1979	0	1979	1980	1979	1980	1979
	1981	0	1980	1981	1981	0	1980



(R) Already in evidence. Consumer pressures will ensure open-date (or equivalent) coding becomes widely adopted by grocery suppliers. For many products, this measure has no relevance, so emphasis will be mainly centred on perishables. EEC sure to have regulations on this matter which U.K. will be obliged to follow. Likely to involve most product groups, not just perishables. Will require suppliers and distributors to ensure they have good stock rotation systems otherwise wastage of product will occur. EEC labelling directive dated 29 March 1976 is very relevant. Potentially more out-of-stock situations as stock holdings reduced. Quick frozen food not included; agreement already reached by Government and frozen food industry on the "star" marking system.

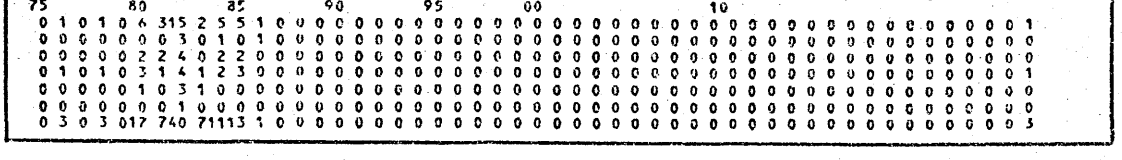
(DD) Improved stock control and speedy deliveries become even more critical. Stockholding of affected lines to be reduced. Perhaps distributors will want smaller deliveries of these lines, more often. Could make peak demands less profitable and more difficult to maintain service. Likely to increase production and distribution costs; distribution service companies may be more involved in merchandising.

(I) Very real legal implications and financial risk unless sophisticated stock rotation measures adopted by all parties in distribution channel. Will probably promote friction at interfaces of goods transfer. A wastage on-cost may emerge. Changes in buying patterns. Supplier may have difficulties in production control area if buffer stocks are held to a minimum. A good opportunity for suppliers and retailers to co-operate and tackle what is really a common problem. Likely to have major impact on marketing/selling and distribution operations, e.g. Austrian experience where small volume lines virtually eliminated, and promotions much reduced. Emphasis to change from 'push' distribution to 'pull' distribution. Could result in consumer becoming hypersensitive to dates, resulting in freshest stock being taken first. Ultimately, better utilization of storage facilities due to higher stock rotation.

(DV) Do not agree with 'most' because manufacturers of canned and frozen products will rightly fight decision; principle of canning and freezing negates need for open date coding. Those with a shelf-life of about 12 months are obvious candidates but both manufacturers and retailers are resisting these being open-dated due to potential problems in store displays.

58 *Government regulations pertaining to fair trading practices will be in operation by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	5	12	17	5	1	105
53 MEAN	1983	1983	1982	1984	1982	1982	1983
LOG MEAN	1982	1983	1982	1982	1982	1982	1982
CALC RANGE	1980	1982	1981	1979	1981	1982	1980
	1985	1984	1983	1987	1982	1982	1985
MEDIAN	1981	1981	1981	1981	1981	0	1981
RANGE	1980	1981	1980	1979	1981	0	1980
	1983	1985	1983	1984	1982	0	1983



(R) Will probably develop as an essential part of price control systems, and be aimed at preventing the reduction in numbers of retailers and manufacturers below a competitive level. Almost inevitably part of EEC legislation.

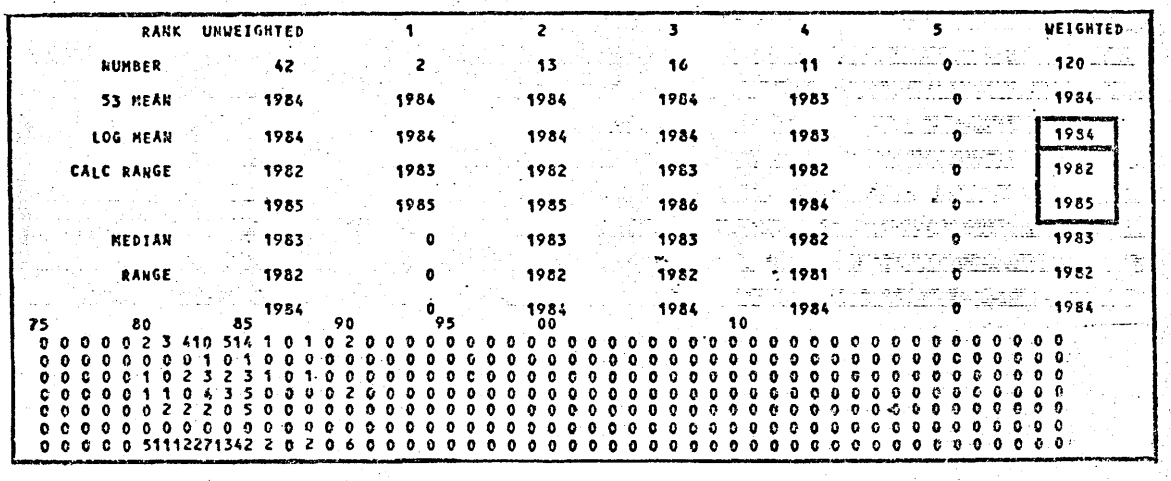
May only be voluntary agreements under auspices of a fair trading act. Complex legislation would be of dubious value, if all it does is maintain inefficient companies at consumers' expense. Taken to extreme, could possibly lead to retardation of such developments as product numbering systems if they are seen to place sections of the industry at a disadvantage. However, existence of SPNS may not necessarily disadvantage anyone who chooses not to use it in conjunction with front end point-of-sale equipment.

(DD) May slow the growth of major multiples and thereby have an indirect effect on distribution economies/practices.

(I) May be the means of throwing major manufacturers and retailers closer together in terms of co-operation. Manufacturers are particularly vulnerable to this type of legislation.

(DV) Disagree with the principle of Government interference, but have to concede such regulations will probably eventually prevail.

53 Agreement will be achieved among EEC countries in regard to the design specifications of most large road trunking vehicles by



RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	42	2	13	16	11	0	120
53 MEAN	1984	1984	1984	1984	1983	0	1984
LOG MEAN	1984	1984	1984	1984	1983	0	1984
CALC RANGE	1982	1983	1982	1983	1982	0	1982
	1985	1985	1985	1986	1984	0	1985
MEDIAN	1983	0	1983	1983	1982	0	1983
RANGE	1982	0	1982	1982	1981	0	1982
	1984	0	1984	1984	1984	0	1984

75 80 85 90 95 00 10

(R) Will come, but may take a little longer than necessary due to the complexities of inter-nation political-type negotiations. This agreement is necessary to simplify the trade relationships which are growing in size and importance every year. Work on an EEC specification already under way. The relatively small number of vehicle manufacturers involved should ease the process of introduction. Inter-changeability of equipment will lead to significant cost savings, if this can be achieved by the vehicle manufacturers involved. The major political issue requiring settlement will be maximum allowable gross weight per axle. May take some time for any agreement to be actually implemented. Should ultimately help to restrain transport costs.

(DD) Will enable greater interchangeability of vehicles and equipment, introduction of demountable bodies etc. May pose problems in some areas if vehicle sizes (weights and dimensions) increased.

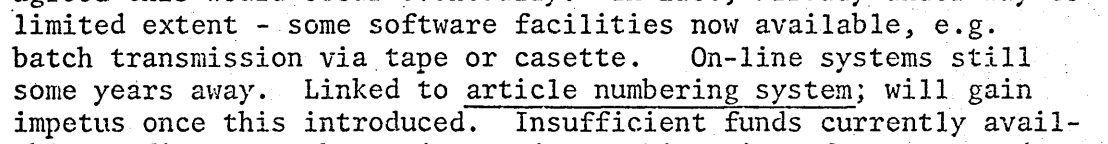
(I) Increased commonality of transport equipment should assist both supplier and distributor operations. Changeover will be phased-in gradually so expect few problems.

(DV) With so many interested parties, agreement not likely in the 1980s. Considerable argument expected between French and other members on the issue of allowable gross weight per axle.

06 *Direct computer-to-computer data transfer systems will be in use with most major multiple chains and most major manufacturers for purposes of expediting inter-firm transactions (order placement, delivery acknowledgements etc.)*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	40	2	10	16	7	5	125
	G MEAN	1987	1986	1989	1987	1986	1986	1987
	LOG MEAN	1987	1985	1988	1987	1985	1986	1986
	CALC RANGE	1985	1985	1986	1985	1984	1985	1985
		1989	1986	1991	1989	1987	1988	1988
	MEDIAN	1985	0	1985	1986	1984	1985	1985
	RANGE	1984	0	1985	1984	1983	1984	1984
		1988	0	1994	1989	1985	1988	1988

75 80 85 90 95 00 10



(R) Initiative has to come from retail distributors. Most panelists agreed this would occur eventually. In fact, already under way to limited extent - some software facilities now available, e.g. batch transmission via tape or casette. On-line systems still some years away. Linked to article numbering system; will gain impetus once this introduced. Insufficient funds currently available to finance such a major project. Diversity of currently available hardware will be one of the early problems to be faced and overcome; present systems not easily inter-connected. Major problem is to get companies thinking in a total systems context. Time needed to change attitudes across the industry. Ultimately, expect such a system would be cheaper and quicker than present methods, and to lower stock holdings by distributors. Mainly a question of cost/benefit assessment by parties concerned; major issue is one of costs benefits allocation. Activities of standard documentation pressure group relevant - this is an extension of that. Major problems are cost of data transmission lines, fear of security breaches, and managements ability (or inability) to control the span of operations at an increased speed.

(DD) Lead to development of minimal stock holding and ordering procedures. Paperwork documentation and corresponding costly errors decreased. More shared transport. Better loading planning - automatic scheduling. Improved communications. Ultimately, funds transfer may be possible. Reduced administration costs.

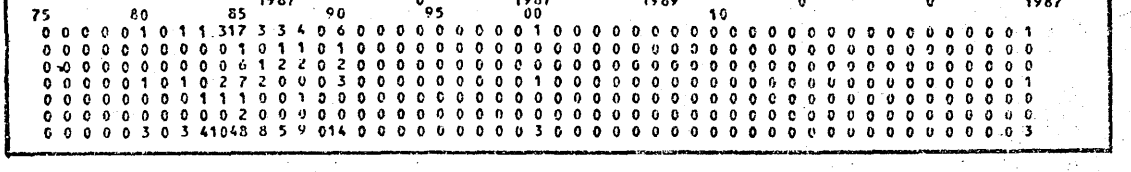
(I) The virtual end of special personnel relationships - fewer personal inter-faces. Possible reduction in field sales forces and quicker response to price changes. Fewer wasted journeys because of duplicate ordering. Will demand closer contacts between supplier and distributor management services departments. Suppliers will have to program production to achieve best available production economies. Both parties to co-operate closely in forecasting area and monitor for necessary changes. Stronger ties; more inter-dependence; perhaps less flexibility as result. Joint planning

should create better atmosphere and relations. More professional operations management needed on both sides but particularly in the case of retailers. Improved credit control facility will be to suppliers advantage. Suppliers representatives to become more merchandisers than order-takers.

(DV) Complex problems to be overcome, not just technical, but inter-organizational. Also, not sure that extrapolation of present limited evidence is possible. Managers will try to delay because a threat to individual decision-making. Don't believe companies want this degree of integration otherwise would have developed expertise earlier.

40 *A much greater emphasis will be placed on waste disposal matters; re-cycling of packaging materials, bottles etc., will become a legal requirement*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	4	13	16	4	2	110
40 MEAN	1987	1988	1987	1988	1985	1985	1987
LOG MEAN	1986	1987	1986	1987	1985	1985	1986
CALC RANGE	1984	1986	1985	1983	1984	1985	1983
	1990	1989	1988	1992	1986	1985	1990
MEDIAN	1984	0	1985	1984	0	0	1984
RANGE	1984	0	1984	1984	0	0	1984
	1987	0	1987	1989	0	0	1987



(R) Environmental lobby will force Government to legislate in this area, the results of which will take many years to phase into full implementation. Existing materials will continue to be depleted and the search for alternatives will go on. Biodegradable materials in packaging/containers not favoured. Shortages will force action. Legislation not necessarily the best way of dealing with such an issue. Consumers likely to welcome use of re-cycling processes. Cost of implementation may dictate speed of introduction. The collection of waste materials for re-cycling poses the biggest problem; really reverse distribution. The users of re-cycled material will have to modify their manufacturing plants to handle such materials - costly. A greater emphasis in this area will gradually be evident, but slow to reach effective action.

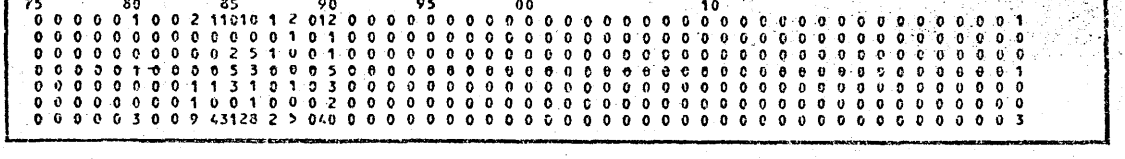
(DD) In distribution terms, rationalisation (less waste) in packaging will become a necessity. May lead to industry sponsored collection networks (the reverse process to distribution), i.e. a two-way distribution system. Possible opportunities for professional distribution companies; contractural re-cycling arrangements perhaps similar to paperboard industry. Clear agreement necessary on just which type of containers should be re-cycled.

(I) Is in the mutual interest of suppliers and distributors to co-operate in looking for ways to recycle packaging materials etc., in a manner which will lower costs. Standardisation of returnable containers. Some pressure from various quarters to reduce packaging specifications. Would need to overcome some initial resistance to products distributed in legally recycled packs. Administration of returnables will incur some cost but who pays will be a matter of some contention. Collection by manufacturers for re-use, doubtful.

(DV) Recycling uses more energy than new manufacture, so pressure for these procedures will be associated with shortages of ingredients rather than energy saving. Could possibly create new collection specialists.

26 *A joint U.K.-European article/standard product numbering system (SPNS) in conjunction with a machine readable symbol system (for use with retail electronic point-of-sale systems) is likely to be in use with a significant section of the U.K. grocery industry by*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	40	2	9	15	10	4	125
	26 MEAN	1988	1989	1986	1989	1987	1987	1988
	LOG MEAN	1987	1989	1986	1987	1986	1987	1987
	CALC RANGE	1984	1988	1985	1984	1985	1985	1984
		1990	1990	1987	1993	1988	1989	1990
	MEDIAN	1985	0	1985	1985	1985	0	1985
	RANGE	1984	0	1985	1984	1984	0	1984
		1989	0	1986	1989	1989	0	1989



(R) This development is on the way but as always with any multi-company or multi-national scheme, it takes a long time to finalise and agree on the approach to be adopted. The technology is already available. The rationalisation of intra-EEC marketing and product group policies will have some bearing on progress. Benefits may be seen as accruing to distributor, but so also will the major capital outlay. Certainly, suppliers would favour a product code in preference to price-marking. Full implementation likely to take many years even if only because of capital requirement at retail outlet. Consumer resistance will have to be overcome with 'education' campaigns. Benefits possibly available to manufacturer also in terms of internal movement through his warehouse and order picking procedures. More time needed to develop reliable hardware. Perhaps should be thinking <u>across</u> industries on this subject.

(DD) Suppliers may be able to use coded format on package in inventory control and order picking activities. Product coding will make

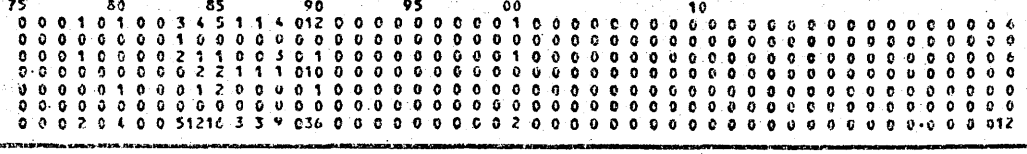
cage palletisation more viable to suppliers. More up-to-date sales and stock movement information for management. Some packaging redesign may be necessary to accommodate code-symbol. Direct computer links between companies will become more feasible. Automatic replenishment programs a step closer. Additional benefits to manufacturer in inventory control, reduction in theft, and reduction in loading errors.

(I) Flexible store-pricing policies. Less tension between suppliers and distributors on price-marking issue as this should largely disappear, at least where major multiples involved. Consumer reaction, if adverse, will have to be won over by joint supplier-distributor promotional activity. Agreement on allocation of costs and benefits of new system may be difficult. Easier recognition of products. More up-to-date information on sales and stocks. Reports will show 'slow' moving lines and this will lead to rationalization of product ranges by distributors.

(DV) Unlikely this system will become universally adopted - more likely to be confined to major multiple retail groups. SPNS is really just a form of coding, one application of which is with automated front-end equipment in retail stores. Refit cost and hardware investment will be a serious delaying factor. The problems should not be underestimated. In fact will not be cost-effective - too long a pay-back period.

07 Expenditure on grocery products will represent 10% smaller share in real terms (i.e. say 30% down to 27%) of household expenditure than is currently the case

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	39	1	16	17	5	0	104
MEAN	1993	1983	2001	1988	1985	0	1991
LOG MEAN	1989	1983	1994	1988	1984	0	1989
CALC RANGE	1984	1983	1986	1986	1982	0	1984
	1998	1983	2008	1990	1987	0	1996
MEDIAN	1987	0	1989	1989	1984	0	1987
RANGE	1984	0	1984	1985	1983	0	1984
	1989	0	2024	1989	1989	0	1989



(R) Total volume of market likely to remain more or less static throughout. Shorter working hours and increased leisure etc., will ensure a decrease in expenditure on food/grocery items. Health consciousness and diversity of family interests will play down importance of spending on food. Cannot neglect importance of gardens and allotments and growers selling at roadside. Pressures on standards of living.

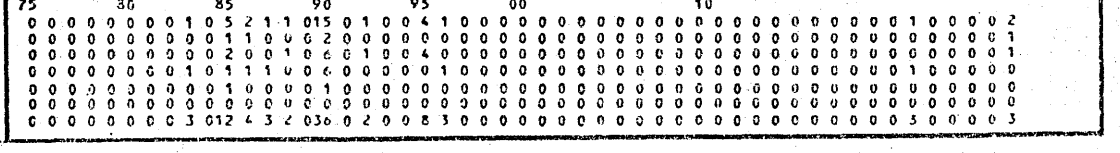
(DD) Size of retail outlets to increase in order to offer some economy of scale. An increasingly service sensitive situation will develop. A static or decreasing market place will necessitate finding cheaper methods of distribution to conserve margins.

(I) Continued decline of High Street as a grocery distribution point; cheaper rental sites sought elsewhere to combat competitive pressures. This will be an advantageous trend for delivering party. Discounting activity will continue to grow; popular in an inflationary climate. Pressure for range rationalization and elimination of non-profitable minor lines. Pressures for profit maintenance will intensify in all sectors and perhaps bring more joint action (suppliers and distributors co-operating together). Product innovation and mix will be critical. Non-food items will become progressively more important to superstore groups. May see increase in own-brand packs designed to sell at a particular price.

(DV) Inflation and consequent lower standard of living more likely to affect non-foods. Don't believe there is 10% slack in the system. Question too broad; embraces many factors of which distribution is only one consideration. Unless institutional or major changes take place, distribution costs will continue to rise. Legislation, environmental factors etc., will add to these costs. U.K. food cheap compared to remainder of EEC, so could easily not occur.

56 *The aggregate sales volume (or value in real terms) of concentrates of all kinds (later diluted in the home) will increase to 50% above current levels by*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	34	5	15	12	2	0	79
	56 MEAN	1992	1995	1993	1991	1988	0	1992
	LOG MEAN	1991	1992	1992	1990	1987	0	1990
	CALC RANGE	1986	1986	1988	1986	1986	0	1986
		1997	2001	1997	1995	1989	0	1996
	MEDIAN	1989	1989	1989	1989	0	0	1989
	RANGE	1986	1985	1989	1986	0	0	1986
		1994	2024	1994	1989	0	0	1989



(R) Sales of concentrates will increase substantially, but current revival of fresh foods as diet may slow progress down. Offers useful space savings at retail outlet and also to consumer. The technology involved is continually improving. Should also offer a more economic alternative to consumer. This is probably only a small segment of the market so a 50% increase may not be either too difficult to achieve or very significant in itself. Definite transport and storage savings will accrue. Concentrates market still apparently very under-developed. However, counter interest in 'freshness' may obstruct development to full potential. Will

largely depend on consumers' preference (or otherwise) for fresh products. Already occurring with products such as squashes, sauces, mixes, instant potato, soups, instant coffee, powdered milk. Next stage is to 'super' concentrates.

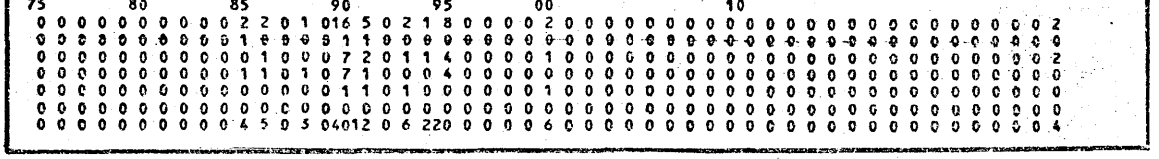
(DD) Reduction in distribution volume will mean cost savings at all points in distribution channel as well as in packaging. Because business in concentrates will still be relatively minor even after large increase, savings will be of limited scale and should not disturb existing patterns too significantly. Manufacturers are currently working on new product concepts to reduce bulk movement.

(I) Some concentrates already carry poor quality connotations and this will have to be overcome by joint supplier/distributor action. Both parties should welcome this type of business as it offers a possible avenue for trimming costs. Less bulk per unit of weight carried.

(DV) Difficult to envisage; there does not appear to be signs either way. Perhaps too much consumer resistance to this.

52 *A 4-day working week (for personnel) will be introduced into manufacturing and retailing sections of the grocery industry by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	3	19	15	4	0	102
52 MEAN	1993	1989	1996	1991	1994	0	1993
LOG MEAN	1992	1988	1994	1990	1993	0	1992
CALC RANGE	1988	1987	1989	1988	1991	0	1989
	1997	1990	2000	1993	1996	0	1996
MEDIAN	1989	0	1990	1989	0	0	1989
RANGE	1989	0	1989	1989	0	0	1989
	1994	0	1994	1994	0	0	1994



(R) Will come, probably caused by pressures from outside the grocery industry. Economy will have to be in good shape to absorb this change. The other view is that a 4-day working week will be necessary to combat unemployment by spreading the workload, i.e. work sharing arrangements. Automation may allow this development in the manufacturing sector first. Would be a reduction in hours rather than days worked. Unions likely to seek lesser number of regular work hours and then ensure any additional hours actually worked are paid on an overtime premium basis. Current unemployment situation has taken the pressure off employers for the present.

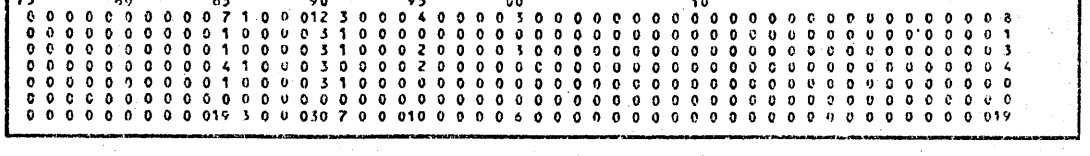
(DD) Minimal, as store opening hours are unlikely to be affected. Changes will be in staffing patterns.

(I) May mean longer opening hours for retailers and double or staggered shift staffing. This would in turn give suppliers greater freedom to achieve deliveries, i.e. out-of-normal hours. May be some communicational difficulties because of possible variance in work times among companies across the industry.

(DV) Consumers could NOT stand the cost in the next decade unless every one is to have two jobs with little leisure time. To be at all feasible, significant progress towards reduced labour content in work tasks must be achieved.

11 *A 25% growth (in volume terms) will be achieved with institutional distribution of pre-prepared food specifically produced for use in restaurants, hospitals, theatres, factories etc., or sold through take-away outlets for consumption elsewhere, possibly in the home.*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	38	6	13	14	5	0	94
11 MEAN	1998	1995	2001	1999	1989	0	1997
LOG MEAN	1994	1992	1998	1994	1989	0	1994
CALC RANGE	1988	1987	1991	1987	1988	0	1988
	2004	2000	2007	2005	1991	0	2005
MEDIAN	1989	1989	1994	1989	1989	0	1989
RANGE	1989	1989	1989	1984	1989	0	1989
	1999	2024	2024	2024	1990	0	1999



(R) Growth in food consumed in restaurants, hospitals, factories, schools etc., will be supplemented by take-away convenience foods purchased outside, but consumed in, the home. In addition, the need to cut back in staffing levels will ensure ready-prepared food will become increasingly in demand for the types of institutions covered by the definition. This trend will be encouraged by cost savings in labour (staffing) secured with pre-prepared foods. May ultimately see development of major catering centres specially equipped to prepare and convey hot food to all institutions within a certain radius. Continuing trend to consumption of convenience foods. Possible reduction in expensive packaging in order to sell at a price. Protection during transit to become the key criterion in packaging design. Local authorities are the likely trend setters, but the squeeze on spending will force the shelving of some ambitious plans.

(DD) Drop size incentives will be important to overcome the tendency by institutional customers to demand small drops and high frequency service. If the trend develops into a major movement, new distribution channels may emerge, specifically designed for this task.

Out-of-hours delivery to these types of outlets seems quite feasible. Further packaging and product developments can be expected. Catering packs to offset product/distribution costs. Increase in temperature controlled small vehicle distribution fleets. Economic recovery and growth in the industrial sector will result in a labour shortage in service industries. Product and packaging development will accelerate such trends.

(I) Pressure on drop sizes and service levels. Closer relations between supplier and distributor re packaging and delivery specifications. More promotional activity by suppliers of convenience foods in restaurants.

(DV) Think 25% too high. The practical distribution radii for pre-prepared food is very limited. Cannot forsee 25% growth in a declining market. Size of institutions has peaked and new designs of hospitals and schools etc., will be smaller and more concerned with personal requirements. Perhaps reference should be more specific and not include commodities such as frozen vegetables, dehydrated vegetables and soup powders where it has already occurred. Estimates confined to dishes prepared and processed, e.g. lasagne, stews, cottage pie, etc.

20 *Electronic funds transfer systems and customer-bank terminals linked to retail outlet electronic point-of-sale systems at the checkout will be in general use by larger retail units in the grocery industry by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	2	18	14	3	3	107
20 MEAN	1997	1993	1999	1997	1987	2003	1997
LOG MEAN	1995	1992	1997	1996	1981	1998	1994
CALC RANGE	1989	1991	1992	1993	1977	1990	1988
	2003	1994	2004	2000	1989	2011	2003
MEDIAN	1994	0	1995	1994	0	0	1994
RANGE	1989	0	1993	1989	0	0	1989
	1999	0	1999	1999	0	0	1999

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The use of more sophisticated electronic funds transfer systems will be increasingly sought in order to overcome security risks associated with cash, cheques, and credit cards. The introduction of a simple (from customers point of view) system may help overcome any initial customer resistance.

(DD) Improved credit control by suppliers, and stock control at retail store level. Automated ordering and stock call-up facility for retailers.

(I) Cash flow improvement for suppliers at the expense of the basis distributors are currently operating on. Tighter controls by suppliers and distributors may harden their relationship. Some haggling over terms/procedures of funds transfer. Generally, banks and manufacturers are more interested in this event than stores. Such a development must surely have implications for the role and number of manufacturers' sales representatives.

(DV) Electronic funds transfer systems, Customer-bank terminals, and retail outlet electronic POS are three distinct and discrete systems which should not be confused; it so happens that this event links them, but they do have other applications.

16 Government prices control measures will be finally phased out by

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	36	2	13	15	4	2	99
16 MEAN	2000	1993	2001	2001	1993	2016	2001
LOG MEAN	1995	1991	1997	1994	1986	2014	1995
CALC RANGE	1987	1987	1989	1986	1981	2009	1987
	2007	1997	2008	2008	1997	2021	2008
MEDIAN	1994	0	1994	1989	0	0	1994
RANGE	1984	0	1989	1984	0	0	1984
	2024	0	2024	2024	0	0	2024

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(R) Some Government control over prices is expected to continue indefinitely, in varying degrees as the political colour of the Governing party changes. Failing national Government controls, there may well be broadly based EEC controls. However, as world and domestic situation improves and prices stabilise, controls may be relaxed progressively. Two polarised points of view:

(1) Price controls are here to say, despite which party in power.

(2) Price controls are a relatively recent phenomena and industry should question the degree of permanence.

One view is that controls will be relaxed to a point where they are political colouring matter but having little practical effect.

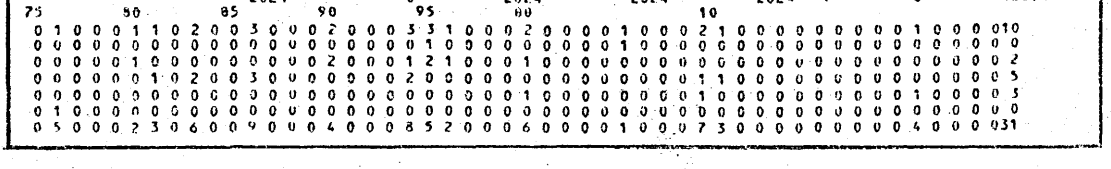
(DD) If world food shortage worsens, price fluctuations will occur and Governments may attempt to cushion these with price controls. Distribution costs as part of total product cost will become even more critical.

(I) Continuous pressure on margins in both supplier and distributor sectors, hence continuing interplay between these two groups to gain a differential advantage. Distributors will continue to press suppliers for additional discounts and other non-price concessions.

(DV) Don't serve any real purpose; commercial pressures are the best restraint on prices. Legislation for political purposes only. Are obvious as nuisance value in many industries. A return to a free market economy is very likely when the restrictive effects of price control is finally understood by Government.

45 *A commodity buying approach towards grocery product purchases will become a significant part of purchasers buying patterns by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	34	2	10	15	6	1	96
45 MEAN	2003	2000	1999	2002	2017	1976	2004
LOG MEAN	1997	2000	1995	1996	2016	1976	1997
CALC RANGE	1989	1996	1989	1988	2010	1976	1988
	2011	2003	2005	2010	2024	1976	2012
MEDIAN	1999	0	1994	1993	2024	0	1999
RANGE	1989	0	1989	1985	2008	0	1985
	2024	0	2024	2024	2024	0	2024



(R) Economic pressures, reduction in brand advertising, increase in own brand, more educated consumers, all tend to point to more commodity-type purchases, but the major unknown variable is however, brand loyalty. Certainly, manufacturers will strongly resist loss of brand loyalty and therefore loss of any control over their own destiny. Quality and brand still important in purchase decision - not just price alone. The issue of own-brand is closely linked with this question. Tesco's move out of Greenshield stamps has brought the issue more to the fore. Already have this trend in evidence, but range of products involved is comparatively limited. Some trend towards contract pricing of branded products in attempt to hold own label development.

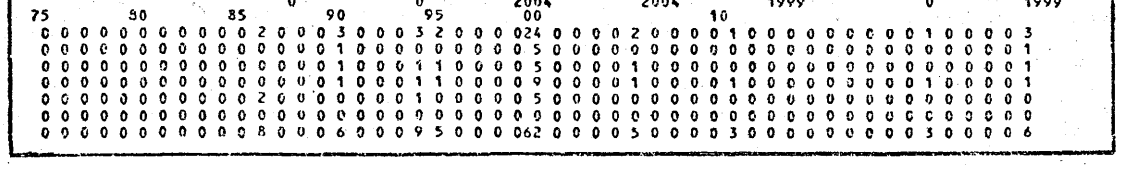
(DD) Could mean production and distribution of larger basic units. Difficult to visualise what other significant developments will follow.

(I) Consumer taste may tend to switch more quickly than is currently the case in response to changing market conditions. If so, would make stock management more difficult for suppliers and distributors alike.

(DV) Housewife will always prefer to be selective - and choose brands which for various reasons are perceived to be best (on items other than staples).

34 *The major mode of transport used in grocery distribution will continue to be road, but an alternative (cheaper and/or more environmentally acceptable) source of motive power will emerge by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	7	10	16	8	0	107
34 MEAN	2001	2002	2001	2002	1996	0	2000
LOG MEAN	1999	2001	2000	2001	1995	0	1999
CALC RANGE	1994	1995	1995	1997	1991	0	1994
	2005	2007	2006	2007	2000	0	2005
MEDIAN	1999	1999	1999	1999	1999	0	1999
RANGE	1999	1999	1994	1999	1993	0	1994
	0	0	2004	2004	1999	0	1999



(R) No practical alternative (to road) for heavy traffic is envisaged and the development of North Sea oil stocks will tend to delay the emergence of innovations in alternative sources of power, at least until the 1990s. Pollution control of vehicle emission will reduce resistance to vehicles driven by oil based products. Road is likely to remain the main mode of transport but envisage greater use of rail for bulk movements to rail head depots. However, no alternative for store deliveries. But source of motive power may alter in next 20 years. Electric powered trucks initially in 15/30 cwt range and later up to 8-10 tons capacity are likely to emerge, not just on pollution grounds but based on economy of operation as well. The main problem with electric-drive technology at present is limited range. May be electric trucks will do the short range work and trunkers will keep oil motors. The main problem in future may not be range but the logistics associated with battery movement and storage.

(DD) Will lead to better transport routing to gain optimum return for each ton-mile of road transport. Some computer packages already available for this purpose. Will facilitate swap or demountable body system. Alternative would be to trunk swap bodies to rail depots and deliver locally, although this unlikely to gain much acceptance.

(I) Continued heavy investment by suppliers and distributors alike on road transport equipment. It would be advantageous to seek some compability between fleets to facilitate easier interchange.

(DV) These developments must occur earlier than panel forecast. Population of small electric vehicles will increase dramatically after 1982, certainly in the 20-30 cwt range. Difficulties with 6-8 ton range. Financial and environmental pressures will encourage battery technology to progress in a much shorter time scale; may even get Government help.

01 The volume of food consumed outside the home (all outlets) compared to that consumed within the home will double by

This event DELETED after Round 1 because majority of panel were agreed they could not ever visualise the doubling of food volume consumed outside the home (relative to that consumed in the home).

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	66	11	26	22	5	2	159
	1 MEAN	2012	2019	2007	2018	1997	2015	2011
	LOG MEAN	2006	2013	2001	2015	1992	2010	2006
	CALC RANGE	1996	2002	1991	2005	1985	2003	1995
		2021	2029	2015	2027	2003	2020	2021
	MEDIAN	2024	2024	2024	2024	1994	0	2024
	RANGE	1994	2024	1985	2024	1934	0	1994
		2024	0	2024	0	2024	0	2024

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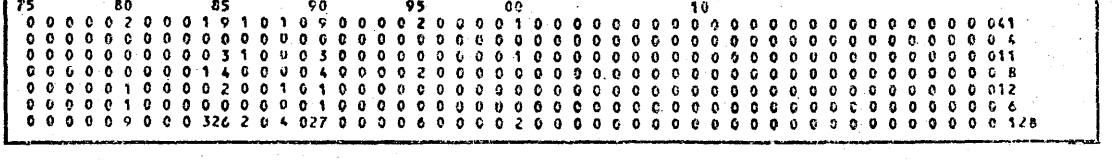
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03 Government sponsored and controlled break-bulk centres will be in operation on the edge of most major towns (to service High Street shops in restricted access areas) by

This event deleted after Round 1 because majority of panel agreed that Government controlled and operated break-bulk centres were not feasible or likely.

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	67	4	19	19	17	8	207
	3 MEAN	2011	2025	2010	2004	2013	2015	2011
	LOG MEAN	2004	2025	2004	1998	2007	2008	2004
	CALC RANGE	1994	2025	1994	1990	1995	1996	1993
		2020	2025	2019	2012	2024	2026	2020
	MEDIAN	2024	0	2024	1994	2024	2024	2024
	RANGE	1989	0	1989	1984	1989	2024	1989
		2024	0	2024	2024	2024	0	2024

75 80 85 90 95 00 10



(R) More Government interference inevitable, but not to level suggested. Not politically interesting enough to a Government with many more major issues to contend with. Government could influence INDIRECTLY through legislation on traffic movement. Major superstores being constructed on edge of towns anyway. Not acceptable to private enterprise. Would be uneconomic and have conflicting PRIORITIES. This type of facility already operated by some professional distribution companies. No need or justification for Government intervention in this area of activity.

(DD) Growth of major distributors own central warehouse systems and those of distribution companies. IF did occur, would lead to higher inventory per unit sold, higher costs, less control over customer service levels. Operational and legal problems also forseen. Increasing consolidation within and by major suppliers, plus use of brokers and specialist distribution companies would be used to by-pass such centres if established.

(I) Government owned and operated break-bulk centres would mean less supplier (or distributor) control over deliveries, and this would cause problems. Perhaps force closer liaison between these parties in an effort to beat the system.

05 Nationalized and/or Government operated retail stores selling grocery products will begin trading operations

This event deleted after Round 1 because over two-thirds of panel answered NEVER.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	66	12	29	19	3	3	154
S MEAN	2015	2019	2016	2010	2025	2010	2014
LOG MEAN	2009	2016	2011	2003	2025	1999	2008
CALC RANGE	1999	2007	2001	1993	2025	1988	1997
	2025	2028	2025	2019	2025	2019	2024
MEDIAN	2024	2024	2024	2024	0	0	2024
RANGE	1999	2024	1999	1989	0	0	1994
	2024	0	2024	2024	0	0	2024

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RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	63	15	17	21	8	2	154
B MEAN	2011	2002	2017	2013	2011	2003	2012
LOG MEAN	2005	1997	2014	2007	2006	1991	2005
CALC RANGE	1995	1989	2005	1996	1995	1983	1995
	2020	2010	2026	2022	2021	2008	2021
MEDIAN	2024	1989	2024	2024	2024	0	2024
RANGE	1989	1985	2024	1999	1989	0	1989
	2024	2024	0	2024	2024	0	2024

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RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	66	17	17	15	11	6	170
19 MEAN	2009	2005	2002	2017	2015	2006	2010
LOG MEAN	2003	1999	1998	2013	2010	1999	2005
CALC RANGE	1993	1990	1990	2003	2000	1989	1995
	2017	2013	2009	2026	2025	2014	2019
MEDIAN	2024	1999	1994	2024	2024	2024	2024
RANGE	1989	1989	1989	1999	1989	1984	1989
	2024	2024	2024	2024	2024	2024	2024

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(R) May increase marginally, but road taxes, fuel costs, decline in U.K. living standards, restrictive legislation, environmental factors etc., will mitigate against suggested large increase in car ownership. Public transport facilities should continue to improve.

(DD) Reduced Government spending on road system will mean relatively poor transport conditions for distribution vehicles. Traffic congestion will not ease or worsen significantly. Convenience stores will see a mild resurgence in their business. Additional bus services may have to be laid on by out-of-town superstore operators. Possibly home delivery services will gain popularity in some areas. As car ownership increases, out-of-town superstores are further advantaged as congestion grows in the High Street.

(I) Even current level of congestion on the roads will again raise the issue of out-of-hours deliveries. Suppliers and distributors will need to co-operate fully on the matter of delivery timing.

23 A Government sponsored national pallet pool will begin operations by

This question DELETED after Round 1 because majority of panel were agreed a Government sponsored pallet pool would NEVER eventuate.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	67	7	18	18	12	12	205
23 MEAN	2013	2012	2008	2015	2007	2022	2014
LOG MEAN	2006	2006	2001	2009	1998	2020	2007
CALC RANGE	1995	1996	1991	1998	1988	2012	1996
	2022	2021	2017	2025	2015	2030	2024
MEDIAN	2024	2024	2024	2024	2024	2024	2024
RANGE	1989	1999	1989	1994	1989	2024	1999
	2024	2024	2024	2024	2024	0	2024

75 80 85 90 95 00 10

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(R) Not politically interesting; perhaps too many other Government priorities. Some major private companies already in this type of business, albeit a smaller scale. Certainly, the industry wants action in this important cost area but not Government involvement.

(DD) A large scale national pallet pool, if professionally operated, would ultimately lower materials handling costs in distribution. Any sustained swing to display pack modules as a distribution vehicle would necessitate free interchange of pallets between suppliers and distributors.

(I) A successfully operated pallet pool would reduce friction between suppliers and distributors on matter of pallet losses. Clerical workload may increase at both ends of distribution channel.

25 *Total number of households in the U.K. will be 25% above the current number by*

The event deleted after Round 1 because over two-thirds of panel answered NEVER.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	62	17	13	15	14	3	159
25 MEAN	2015	2016	2016	2012	2013	2025	2015
LOG MEAN	2011	2014	2010	2009	2008	2025	2010
CALC RANGE	2001	2005	1998	2000	1997	2025	2000
	2024	2025	2026	2021	2023	2025	2024
MEDIAN	2024	2024	2024	2024	2024	0	2024
RANGE	1999	1999	2024	1999	1999	0	1999
	2024	2024	0	2024	2024	0	2024

75 80 85 90 95 00 10

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(R) Closely related to Event 36 on population trends in U.K. Population is expected to be fairly static in the years ahead, so demand for additional housing not likely to increase anywhere near 25% suggested. In fact, it is suggested that new replacements will not even match wastage of older houses.

(DD) Minimal effect on distribution sector of food industry.

30 *When will the U.K. be obtaining 75% of her food requirements from other EEC countries*

The panel almost unanimous in their judgement that U.K. would NEVER be purchasing 75% of her total food requirements from EEC countries. Such an early consensus allowed this question to be DELETED after Round 1.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	62	24	16	11	7	4	137
30 MEAN	2019	2015	2023	2018	2019	2025	2020
LOG MEAN	2015	2011	2020	2014	2015	2025	2017
CALC RANGE	2005	2001	2012	2003	2004	2025	2007
	2028	2025	2031	2028	2030	2025	2029
MEDIAN	2024	2024	2024	2024	2024	0	2024
RANGE	2024	1999	2024	2024	2024	0	2024
	0	2024	0	0	0	0	0

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(R) Increased intensity of domestic food production and continuing links with Commonwealth countries makes such an event highly unlikely. Quite apart from this trend, the EEC could never supply such major items as hard wheat, meat, etc. Home production is thought to be around 55% of total requirements at present, and increasing.

36 *When will the population of the U.K. reach 75 million people*

Panel virtually in complete agreement that U.K. population unlikely to reach 75 millions by 2025. This amounted to a NEVER consensus, hence statement DELETED from further consideration after Round 1.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	65	14	13	21	9	8	179
36 MEAN	2022	2018	2023	2022	2025	2025	2023
LOG MEAN	2021	2015	2022	2021	2025	2025	2022
CALC RANGE	2014	2006	2017	2014	2025	2025	2016
	2029	2027	2028	2029	2025	2025	2029
MEDIAN	2024	2024	2024	2024	2024	2024	2024
RANGE	2024	2019	2024	2024	2024	2024	2024
	0	2024	0	0	0	0	0

·75	80	85	90	95	00	10	
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							012
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							019
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							9
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							8
0 0 0 0 0 0 0 0 0 0 1 0 0 3 0 0 0 0 0 0 0 0 0 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0							167

(R) Indications are that population is stabilising, due to declining birthrate and fewer immigrants.

(DD) A static or falling population will mean increased competition to gain a larger share of existing market. This trend will require streamlining of distribution facilities.

(I) The above situation could result in various suppliers and multiple retailers co-operating more closely for mutual benefit. Only the strongest suppliers and distributors will survive in these conditions. Possibly more vertical integration among companies in food industry.

39 *5% of all inter-city movement of grocery products (between manufacturers and their distributors) will be conveyed through a pipeline network*

Event deleted after Round 1 because of NEVER consensus.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	62	19	13	19	8	3	149
39 MEAN	2016	2017	2015	2015	2021	2010	2016
LOG MEAN	2012	2014	2011	2009	2018	1999	2011
CALC RANGE	2001	2006	2002	1999	2009	1988	2000
	2026	2026	2025	2025	2029	2019	2026
MEDIAN	2024	2024	2024	2024	2024	0	2024
RANGE	1999	1999	1999	1999	2024	0	2009
	2024	2024	2024	2024	0	0	2024

75	80	85	90	95	00	10	
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0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0							012
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0 0 0 0 0 1 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0							013
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0 0 0 0 0 8 0 0 0 0 9 0 0 0 0 6 0 0 0 0 0 0 0 0 0 14 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 2 0 0 0							107

(R) Unlikely to be sufficient motivation and finance available to overcome the technical and financial difficulties posed by such a scheme. Some very limited development may take place in a very localised area.

(I) If such a scheme did proceed, it would obviously involve a high degree of Government intervention.

48 *The drift of population away from large city conurbations will continue until*

Event DELETED after Round 1.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	64	18	28	7	9	2	141
48 MEAN	1998	1993	1996	2000	2010	2000	2000
LOG MEAN	1990	1988	1989	1990	2005	1981	1991
CALC RANGE	1983	1982	1983	1982	1995	1976	1985
	2003	1997	2002	2005	2019	1995	2005
MEDIAN	1989	1989	1994	1999	2024	0	1994
RANGE	1984	1979	1984	1984	1989	0	1984
	2024	1999	1999	2024	2024	0	2024

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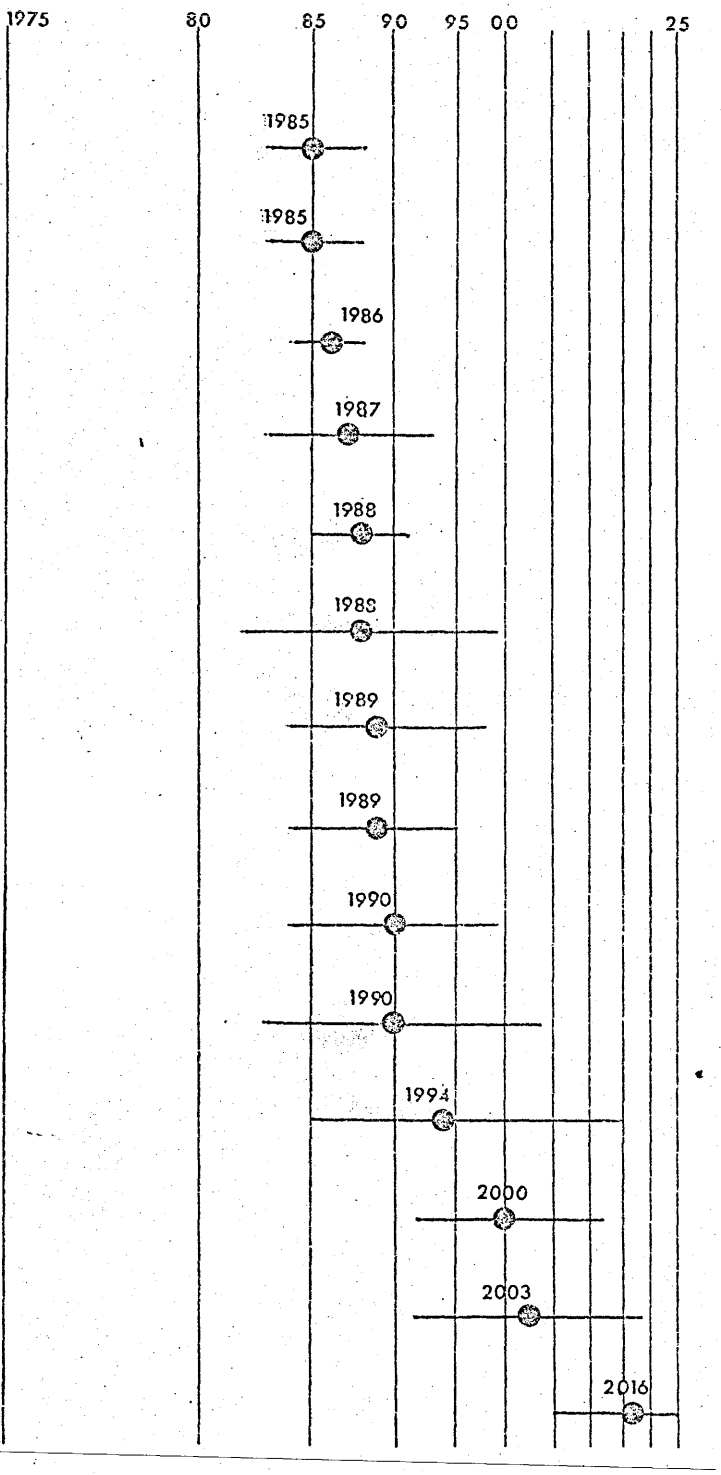
RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	60	18	15	15	10	2	143
62 MEAN	2010	2017	2009	2010	2004	2000	2008
LOG MEAN	2002	2015	2000	2002	1994	1981	1998
CALC RANGE	1991	2005	1990	1992	1985	1976	1987
	2020	2027	2018	2019	2011	1995	2016
MEDIAN	2024	2024	2024	2024	2024	0	2024
RANGE	1989	2024	1989	1988	1979	0	1984
	2024	0	2024	2024	2024	0	2024

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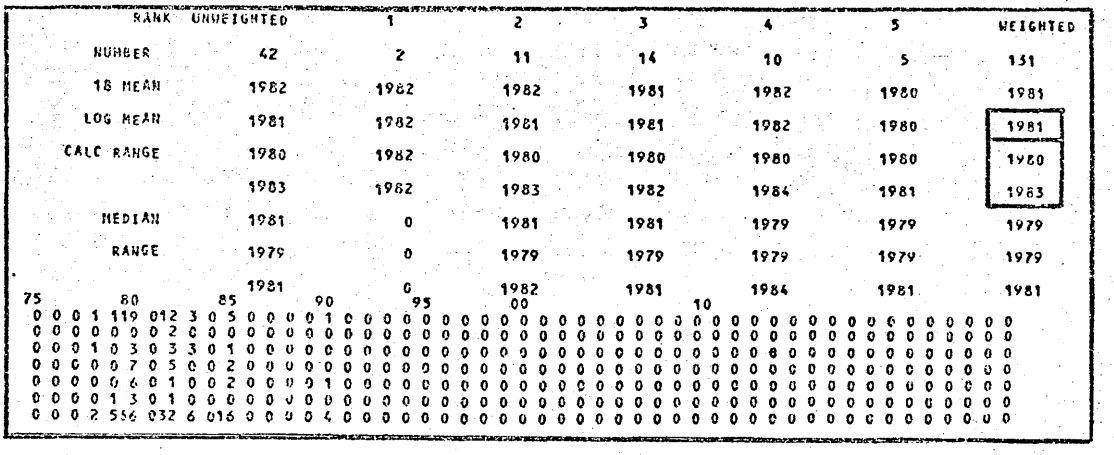
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EVENT NO.	EVENT DESCRIPTION
04	RETAIL GROUP BUYING OFFICES IN EEC
43	RETAIL CONCENTRATION
35	CASH & CARRY WHOLESALERS
37	OWN-LABEL SALES VOLUME
17	FOOD BROKERS AND OTHER AGENCIES
41	MANUFACTURER & RETAILER LOBBIES
27	DELIVERY LEAD TIMES
28	OUT-OF-HOURS DELIVERIES
13	SUNDAY TRADING
31	MANUFACTURERS EXPENDITURE ON ADVERTISING
14	NON-STORE SHOPPING
12	IN-LINE PRICING OF BRANDED PRODUCTS
54	JOINT RETAIL VENTURES BY MANUFACTURERS
50	R & D ACTIVITY

QUANTITATIVE FORECAST



18 *In-line pricing of own label products will become a uniform requirement of most major multiple chains by*



RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	42	2	11	14	10	5	131
18 MEAN	1982	1982	1982	1981	1982	1980	1981
LOG MEAN	1981	1982	1981	1981	1982	1980	1981
CALC RANGE	1980	1982	1980	1980	1980	1980	1980
	1983	1982	1983	1982	1984	1981	1983
MEDIAN	1981	0	1981	1981	1979	1979	1979
RANGE	1979	0	1979	1979	1979	1979	1979
	1981	0	1982	1981	1984	1981	1981

75 80 85 90 95 00 10

(R) Much easier to administer than in-line pricing of branded products. Own brands usually equate to volume lines and economic pricing runs are therefore possible. This trend already evident. Pressure by retail customers less easily resisted by manufacturers. Not a major problem provided there are adequate lead-times given on price changes and clear distributor responsibility established for internal stock levels and write-offs. Already a uniform requirement in frozen food sector of the industry. Could be obsoleted by SPNS.

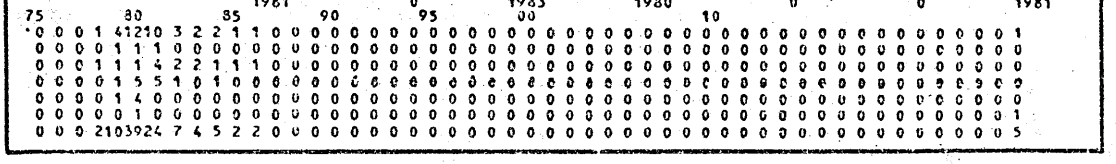
(DD) Changes in packaging will affect distribution. Could be affected by cage pallet development. Larger inventories at production point.

(I) Will still cause some problems of control at suppliers end. Demands close ties between parties in sales forecast area. Suppliers of own label products tend to have a better relationship/understanding with their retail customers. Price communication at point of sale is going to be a most important area of manufacturer/distributor discussion and development.

(DV) Although the labelling for own label makes in-line pricing easier, do not see such a clear distinction between own-label and branded products as the event suggests. Since price look-up at the retail outlet will be a reality for most major retailers by 1980, in-line pricing unnecessary. Price changes are the problem with pricing done in manufacturers sub-system.

59 *A strong recovery in grocery industry research and development (R & D) activity (products and methods) can be expected by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	37	3	14	13	5	2	100
59 MEAN	1982	1980	1982	1981	1980	2003	1983
LOG MEAN	1981	1980	1982	1981	1980	1991	1981
CALC RANGE	1979	1979	1980	1980	1980	1983	1979
	1984	1981	1983	1981	1980	2008	1985
MEDIAN	1980	0	1981	1980	1979	0	1979
RANGE	1979	0	1980	1979	1979	0	1979
	1981	0	1983	1980	0	0	1981



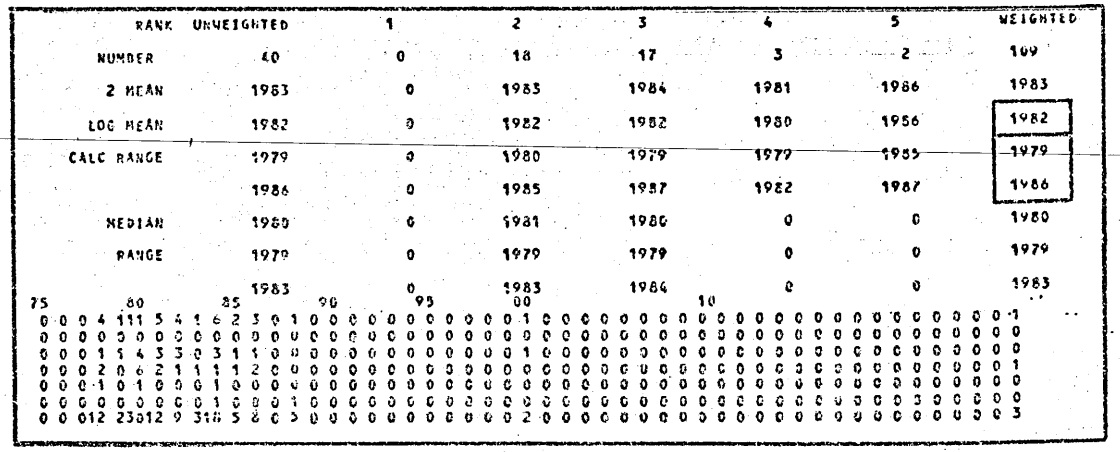
(R) Recovery would follow projected macro-economic recovery. As soon as pressure on margins ease, the process will begin. Research into new products and technologies must continue for the long term good of the industry. Looking for innovations is really a continuous process. The level of activity depends more on the external environment than on the availability of cash. A good idea will nearly always find cash to support its development. Economic life depends on R & D. Merging of EEC companies will stimulate shared R & D at higher overall level. Major new developments from multi-nationals who have never cut back in real terms.

(DD) More money will be spent on researching new distribution methods/ procedures, always aimed at trimming costs to maintain reasonable margins.

(I) May present an ideal opportunity for all parties in the industry to co-operate to their mutual benefit.

02 *Most major manufacturers will be attempting to develop, produce, and sell a new range of ambient-stable food products (with extended shelf-life properties) by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	0	18	17	3	2	100
2 MEAN	1983	0	1985	1984	1981	1986	1983
LOG MEAN	1982	0	1982	1982	1980	1956	1982
CALC RANGE	1979	0	1980	1979	1979	1985	1979
	1986	0	1985	1987	1982	1987	1986
MEDIAN	1980	0	1981	1980	0	0	1980
RANGE	1979	0	1979	1979	0	0	1979
	1983	0	1983	1984	0	0	1983



(R) Distribution cost pressures (as well as consumer requirements) make such a movement desirable (already evident). Open-date coding closely related (will mean stricter stock control). Consumer awareness and Government diligence increasing on 'freshness' leading to development work to improve taste. Energy saving objectives will also hasten this development. Application likely to be limited. Some manufacturers already doing this (e.g. dairy products manufacture) - in development phase. Assumed prepared foods and dairy products life at present 14 days; new development (4 months), but years away. Mainly applies to perishable and semi-perishable foods. Depends on type of product and current shelf life. Do we really know what consumer thinks?

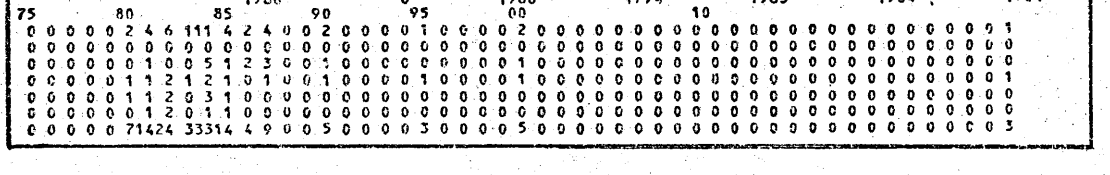
(DD) Reduced dependence on van selling. New types of packaging; increase of multi-pack sales. Increased pressures for correct stock rotation. Regional assembly. Greater flexibility; non-specialist facilities (storage and transport). Radical change on methods of storing and handling, major simplifications, therefore reduced costs. Increased drop size. Delivery frequency dependent on in-store stock holding capacity and rate of sale.

(I) Will assist production of currently short-life products leading to stability in production patterns. Better customer service but less urgency in physical distribution, few problems, reduced costs. Less frequent deliveries by supplier but larger lots. Easier stock control, less waste, fewer returns, and cheaper product. Increased space available for competitor products stocking. Improved scheduling of deliveries. Longer shelf-life reduces speed at which supplier must deliver, but may increase stock holding at retail outlet. Possible pressure by supplier for distributor to stock more. Revised distribution and credit arrangements. Less frequent merchandising. Economies and simplifications in both supplier and distributor sub-systems. May initially cause tension between manufacturers and retailers because of new stocking patterns and control requirements. Little real impact on distribution.

(DV) This type of convenience good is expensive. Why not increase the range of chilled and quick-frozen foods. Approximately 40% food spending already in this category so only a relatively few cold cabinet lines still substituable.

32 *The number of superstores in the U.K. will reach 100 by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	0	14	13	8	5	124
32 MEAN	1986	0	1986	1989	1983	1983	1986
LOG MEAN	1985	0	1986	1986	1983	1983	1984
CALC RANGE	1982	0	1984	1982	1982	1982	1982
	1989	0	1989	1993	1984	1984	1988
MEDIAN	1983	0	1985	1983	1983	1981	1983
RANGE	1981	0	1983	1981	1981	1981	1981
	1986	0	1986	1994	1983	1984	1984



(R) Superstore development seems to be increasingly active despite early reluctance by planning authorities to allow faster progress. The major multiples want larger units, and so do the consumers who consider them as price competitive. If currently established units succeed over next few years, expansion rate may well increase thereafter. Major problems with superstore expansion are availability of suitable sites and availability of developmental capital. Some signs that local authorities are easing their previous hard-line attitude towards such developments. Potential for such developments in the South-East of England.

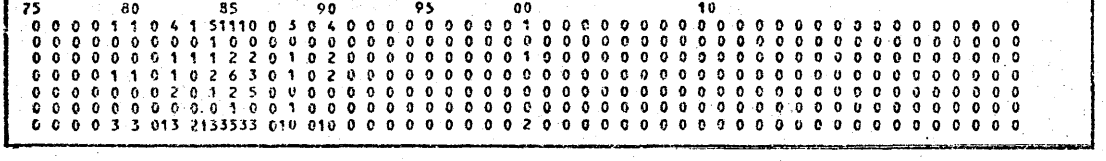
(DD) Increased number of large drop sizes, mostly direct, to fewer delivery points. Reduction in small retail units operated by the major multiples will assist distribution economies. Possible increase in caging of volume products.

(I) Continuing the trend for a few major retail multiple groups to dominate suppliers because of their power position in the industry, hence further pressure on suppliers' margins. Less business for cash and carry wholesalers servicing a diminishing number of small independents. More direct delivery and merchandising by the manufacturer.

(DV) This number may be achieved but not until after outer limit of INTER-QUARTILE range. Cannot forsee 100 of the European size hypermarkets - we could not support them. In any event, number will grow slowly because of high costs etc., and scarcity of sites.

22 *The traditionally food oriented major multiple chains will push sales of non-food merchandise up to around 30% of total aggregate sales by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	1	11	17	10	2	124
22 MEAN	1986	1984	1987	1985	1985	1987	1985
LOG MEAN	1985	1984	1987	1985	1985	1986	1985
CALC RANGE	1983	1984	1984	1983	1984	1985	1983
	1987	1984	1990	1987	1986	1987	1987
MEDIAN	1984	0	1985	1984	1985	0	1984
RANGE	1983	0	1983	1983	1983	0	1983
	1985	0	1989	1985	1985	0	1985



(R) Already the trend, but will take many years to reach say 50/50 level with food. Will involve mainly larger new stores, changes of image etc; certainly, store overheads demand that higher profit non-food lines be traded. Diversification in this way will help attain sales stability and improve competitiveness. Some currently 'grocery only' retailers will not alter their policy but despite these, trend is likely to spread. One-stop shopping concept. Rate of progress in this direction will vary widely between companies in the industry. One major limitation will be the lack of specialist advice available to the consumer in large superstores and indeed the physical constraint of how much a customer can carry out of the store. Can be overcome by franchising and contract carriers respectively. Moves in this direction already obvious and accelerating. One-stop shopping could still become two-stop shopping to avoid take-away size limitations - it will appeal to consumers who today still have multi-stop shopping. Different materials handling systems at superstores will complicate matters. Store within a store concept could give more credibility, e.g. Cater-Debenhams, Sainsbury-BHS, John Lewis-Waitrose.

(DD) Rationalisation of food product ranges should lead to fewer distribution problems. Superstores will deliver goods (direct from warehouse) sold to purchaser from in-store displays. Large break-bulk depots operated by retailers may become essential to avoid confusion and delays at store. Correct store design becomes critical. Linked to out-of-town stores, otherwise a space restriction. There will be some interesting mix problems arise.

(I) Personnel used to the retail food trade will have to adjust to a new type of business. Retail distributors dealing with many more suppliers, and this will cause problems initially. Food suppliers will feel their importance to distributor is being diluted by new non-food business activity.

(DV) Doubt 30% participation will be achieved at retail outlets with both food and non-food ranges on a common site.

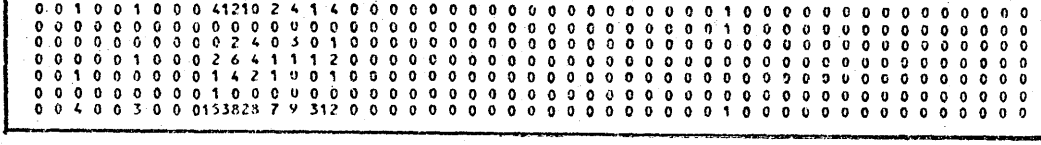
04 Retail buying groups will be operating effectively to purchase EEC produced grocery products through the European buying offices of major home based distributors

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	39	6	17	11	2	3	96
	4 MEAN	1986	1985	1987	1985	1985	1986	1986
	LOG MEAN	1985	1985	1987	1984	1984	1985	1985
	CALC RANGE	1984	1983	1985	1983	1981	1983	1983
		1988	1986	1989	1987	1988	1988	1988
	MEDIAN	1984	1984	1987	1984	0	0	1984
	RANGE	1983	1981	1984	1981	0	0	1983
		1989	1989	1989	1985	0	0	1989

75	80	85	90	95	00	10
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43 *The present trend towards retail concentration will continue (fewer, bigger) until 50% of total grocery sales are being achieved through outlets operated by the major multiple chains*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	1	10	18	10	1	120
43 MEAN	1986	2010	1987	1986	1985	1984	1986
LOG MEAN	1986	2010	1987	1986	1984	1984	1985
CALC RANGE	1983	2010	1986	1984	1982	1984	1983
	1989	2010	1988	1987	1987	1984	1988
MEDIAN	1985	0	1985	1985	1984	0	1985
RANGE	1984	0	1985	1984	1984	0	1984
	1987	0	1987	1987	1986	0	1986



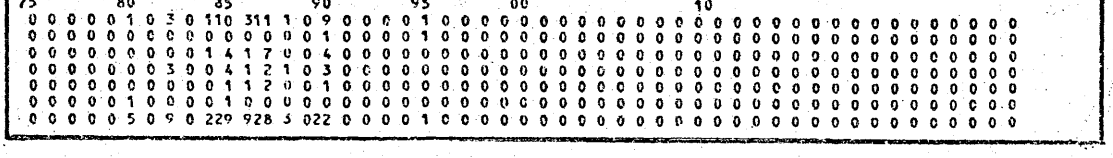
(R) The trend is already clear, with major multiples increasing their share each year at the expense of the small independents sector; an inevitable process. Current share thought to be above 50%. Perhaps the only restraints will be financial and geographical. There is little doubt that present trend in favour of multiples will continue into forseeable future. However, a point may be reached where a backlash towards smaller units giving more personalised service will occur. Some independents may be revitalised as multiples withdraw their competition in the High Street by closing smaller uneconomical units. No obvious reason why the smaller units giving more personalized service should not be operated by the multiples.

(DD) Larger, fewer, drop sizes will improve delivery distribution economies. Change in mix of vehicle sizes on the roads; fewer, bigger, designs. May provide further impetus for use of cage pallets. Specialist distribution companies may find increasing opportunities with small retail customers.

(I) Fewer buying points will mean greater concentration of power for the retail sector (reflected in terms of trade) which will be difficult for suppliers to neutralise.

35 *Cash and carry wholesale outlets will be reduced to 75% of their current numerical strength by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	2	17	14	5	2	108
35 MEAN	1987	1993	1987	1986	1987	1983	1986
LOG MEAN	1986	1992	1987	1986	1987	1982	1986
CALC RANGE	1985	1991	1986	1984	1986	1981	1984
	1988	1994	1988	1988	1988	1984	1988
MEDIAN	1986	0	1986	1985	1986	0	1986
RANGE	1984	0	1984	1984	1985	0	1984
	1989	0	1989	1989	1989	0	1986



(R) Inevitable closure of many small and inefficient operations, but the process will be slower than predicted by some quarters of the food industry. The Cash and Carry trade grew rapidly and is now undergoing considerable rationalisation pressure. Growth in numbers of superstores with deep-cut prices will make many Cash and Carry's unviable. Their main customers, the small independents, will continue to reduce in numbers. Amalgamations and takeovers will also tend to prune the numbers of outlets. Their function could now possibly be filled by large multiples; certainly the prices are competitive at the latter. Cash & Carrys could well counter by seeking to cater for specialised segments of the market which the major multiples are not attempting to cover. Cash & Carrys may even begin to open their doors to the consumer. If so, may put business from independents at risk. New consumer discount stores already selling to public at Cash & Carry prices, and attracting small retail and catering buyers. May try to counter by taking on more non-foods.

(DD) May decrease delivery points to be serviced, resulting in a simplified distribution network.

(I) Bigger orders from remaining Cash & Carry outlets who will be more efficient and expect better trade terms from suppliers. Total volume unlikely to be affected across industry. This kind of situation will cause 'innovation' in retailing.

37 *When will 20% of total industry wide branded product sales (Branded plus own label) be own label products*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	37	1	12	16	6	2	107
MEAN	1990	1987	1989	1992	1986	1984	1989
LOG MEAN	1987	1987	1987	1989	1986	1983	1987
CALC RANGE	1983	1987	1983	1984	1983	1982	1983
	1993	1987	1993	1997	1988	1984	1993
MEDIAN	1986	0	1986	1989	1986	0	1986
RANGE	1984	0	1984	1984	1984	0	1984
	1989	0	1986	1989	1989	0	1989

75 80 85 90 95 00 10

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(R) Brand loyality will continue to dominate because price differentials between branded and own label products have closed considerably in recent years. U.S. experience indicates own label development will amount to around 30-35% in a limited segment of the total market. In some cases, branded prices below own label! Suppliers will not be keen for own label brands to grow to such an extent that their own brand products are seriously threatened. If manufacturers cannot however, maintain brand loyalty, then own label lines likely to increase. In the longer term future, multiple retailers may want to develop strong store loyalty and trade under their name (as Marks & Spencer do with St. Michael). Evidence suggests that own labels will gain some ground and may become a major factor if store advertising continues at present levels. Cost/profit rationalization by both retailers and manufacturers will take a long time to shake out in this area. Trend towards commodity-buying plus strengthening of own brand. Increasing store loyalty at expense of brand loyalty.

(D) Marginal effect, although any substantial swing to own label would stimulate demand by distributors for price-marking.

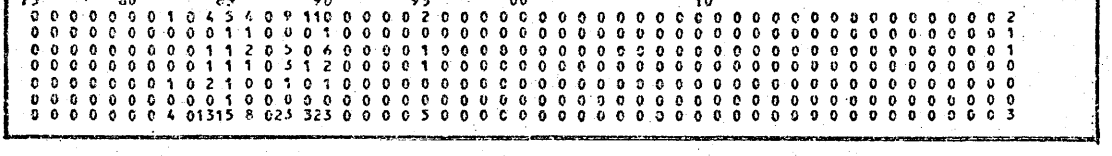
(I) Distribution initiative will continue to rest with suppliers; concentration of effort on large volume branded products. Even with own label, supplier generally has delivery responsibility as well as having to meet more stringent specifications, e.g. quality, packaging, price-marking etc. Manufacturers' reluctance to deliver own label direct could cause an increase in deliveries through consolidation depots.

(DV) 20% by value possible, but 20% of individual brand items, never. Suppliers will resist suggested trend and advertise more heavily to re-establish brand loyalties.

17 *Foodbrokers and other types of marketing/distribution agencies will increase their share of the grocery distribution task to 5% of total industry volume*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	38	4	17	10	6	1	97
17 MEAN	1990	1997	1991	1988	1986	1985	1989
LOG MEAN	1988	1992	1989	1988	1985	1985	1988
CALC RANGE	1985	1986	1986	1986	1984	1985	1985
	1993	2002	1994	1990	1987	1985	1991
MEDIAN	1987	0	1987	1987	1984	0	1987
RANGE	1984	0	1987	1985	1983	0	1984
	1989	0	1989	1989	1989	0	1989

75 80 85 90 95 00 10



(R) The increasing expertness of food distribution agencies will hasten this event, and manufacturers will increasingly seek their services on purely cost-economic grounds. New firms are expected to move into the third party distribution market in addition to the 3 or 4 significant ones already operating. The high cost of maintaining conventional sales forces in the field will see brokers taking more of this activity too, especially in case of medium to small firms. Trend could be slowed if non-competiting suppliers adopt the 'shared facilities' approach. Small 'specialist' manufacturers unable to support a national sales force will tend to use brokers services. The merchandising service offered by brokers will be important in-store competitive factor. Food brokers unlikely to be a major influence on whether physical distribution is contracted out or handled by own account transport. This is consistent with the widening variety of foodstuffs being developed - many of which must attract a smaller segment of the market. While food brokers will prosper they may not actually grow that much but merely turn over accounts. Lack of funds will encourage manufacturers to use food brokers. There is a need for more real entrepreneurial activity to supplement current firms' activities.

(DD) Increased volume of contracted consolidated physical distribution. Fewer, larger, drop sizes. Increased usage of shared distribution facilities among suppliers. Possible development of regional distribution centres. Brokers will be able to select agency products to suit their portfolio.

(I) Fewer apparent sources of supply. Administrative changes because working with a third party. The advantages of using a broker compared to the cost of maintaining an independent marketing operation must continue to make this an ever increasingly popular area. Open date coding will increase relevance of brokers.

(DV) The traditional wholesaling/distribution channels will be favoured by manufacturers rather than brokerage. In any event, their growth

limited by number of small retailers trading, and this is steadily decreasing. Merger of manufacturing interests will also limit scope available to brokers.

41 *Strong manufacturer and retailer pressure groups (other than and in addition to existing trade associations) will be formed to lobby for each party's vested interests in times when divergent attitudes are taken on important issues which affect them*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	34	3	11	13	4	3	95
41 MEAN	1995	1997	1997	1995	1989	1994	1994
LOG MEAN	1989	1969	1990	1990	1987	1984	1988
CALC RANGE	1982	1982	1983	1983	1984	1978	1982
	2000	2002	2002	2000	1992	1996	1999
MEDIAN	1987	0	1989	1987	0	0	1986
RANGE	1982	0	1986	1984	0	0	1980
	2024	0	2024	2024	0	0	1998

75 80 85 90 95 00 10

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0 2 5 0 011 7 0 3 010 012 8 012 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 021
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(R) Stronger action has to be organised to combat increasing Government/union pressure. Such groups are already being formed to deal with a few of the existing controversies in the industry. Certainly room for franker discussions of industry problems without dilutionary effect of institutional thinking which tends to come from respective trade associations. Manufacturers, for instance, have three pressure points - the Government, the retail customer, and the consumer; may be what is required are three specialist organisations to cope with each of these groups. If traditional trade associations are to survive, they must be prepared to sharpen up their performance. National political groups will change and a different type of association or pressure group will be instituted. Actually happening now. May find their role in selective lobbying.

(DD) For optimum total system efficiency, improved costing systems and methods need to be developed by suppliers and distributors alike, and working arrangements agreed regarding the fair allocation of costs/responsibilities when changes are introduced.

(I) A necessary awareness of supplier-distributor problems, and the action of Government, but nevertheless an increasing need to defend own interests. This means conflict on certain issues of mutual importance.

(DV) May develop, but only very slowly because vested interests of all parties, and unwillingness to discuss openly. Consider interests too insular and will prohibit co-operation. Trade Associations will cover needs when particular crucial issues come into contention.

27 *Delivery lead times demanded of manufacturers by the major multiple chains will become 10-15% shorter than their current requirement*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	1	11	14	11	3	124
27 MEAN	1992	1985	1990	1992	1989	2011	1993
LOG MEAN	1989	1985	1987	1989	1987	2002	1989
CALC RANGE	1983	1965	1983	1984	1983	1990	1984
	1997	1985	1994	1997	1993	2020	1998
MEDIAN	1985	0	1984	1987	1984	0	1985
RANGE	1984	0	1983	1984	1984	0	1984
	1989	0	1989	1997	1987	0	1989

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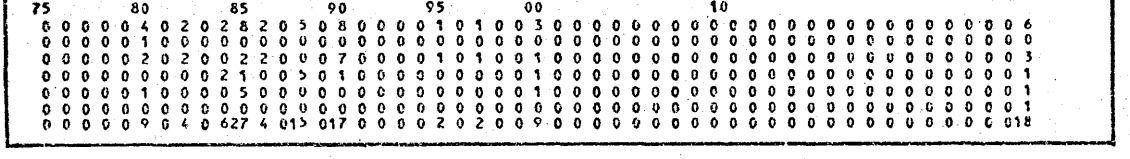
28 *Out-of-hours deliveries will finally become generally accepted by most major manufacturers and multiple chains in the grocery industry*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	41	2	11	18	8	2	120
	28 MEAN	1990	1993	1988	1988	1998	1993	1991
	LOG MEAN	1988	1991	1988	1986	1994	1991	1989
	CALC RANGE	1984	1987	1985	1983	1987	1987	1984
		1994	1997	1990	1991	2004	1997	1995
	MEDIAN	1986	0	1986	1934	1989	0	1986
	RANGE	1984	0	1984	1982	1986	0	1984
		1989	0	1989	1989	2024	0	1989

75	80	85	90	95	00	10
0 0 0 0 0 1 0 1 4	0 1 3	1 5 0	1 8 0	0 0 0 0 0 0 0 0 0	4 0 0 0 0 0 0 0 0 0

13 *At least a few of the major multiple chains will commence Sunday trading*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	42	1	21	11	8	1	113
	13 MEAN	1993	1980	1993	1992	1991	2025	1994
	LOG MEAN	1989	1980	1990	1990	1988	2025	1990
	CALC RANGE	1984	1980	1984	1985	1983	2025	1984
		1998	1980	1998	1996	1996	2025	1999
	MEDIAN	1987	0	1989	1987	1984	0	1987
	RANGE	1984	0	1984	1984	1984	0	1984
		1996	0	1996	1989	1999	0	1996



(R) Consumer movements will force Government to relax existing restrictions on Sunday opening. Working wives would welcome additional shopping opportunity. This trend may follow in line with practice in some EEC countries. Major multiples would have to see a net gain in profits before pressing for additional opening hours because staffing costs would be a problem. Unions likely to resist this movement. Environmental lobby against such a move. If does come, additional staff costs will need to be offset by automation, and union resistance countered by shift work programmes. Would require retailers to carry larger stocks because weekend deliveries unlikely to be acceptable from traffic point of view; possibly some limited deliveries of perishables. More likely to be a local or regional rather than national development, particularly where ethnic groups are concerned. Unlikely that actual volume of goods sold over the week would increase, so majors not likely to be interested. Factors affecting it are:
(a) more working wives; (b) more joint car shopping by families; and (c) general retail overcrowding on Fridays and Saturdays.
Is really a straight commercial matter, e.g. consumer demand and utilization of assets. May occur for large out-of-town hypermarket units.

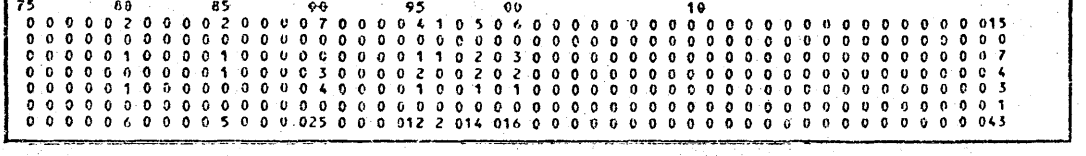
(DD) Would possibly require some Sunday deliveries and this is unlikely to be acceptable to the public or suppliers. Saturday deliveries or fewer restrictions on Friday delivery are possible alternatives. Perishables daily delivery cycle would include Sundays.

(I) Large multiple chains will become larger and buying concentration will continue. Has implications for industrial relations with employees of both suppliers and distributors. Monday closing by distributors may become more general. Additional strain on merchandising function/service provided by suppliers. Increased stock holding required at retail outlet if weekend deliveries not possible. Pricing policies will have to take account of higher wage costs.

(DV) Cannot forsee Sunday deliveries taking place. Environmentalists will resist transport movements on Sundays. No increase in Sales. Costs high. Socially unacceptable. Biggest factor against is that total volume throughput unlikely to increase.

12 *In-line pricing of branded products will become a uniform requirement of most major multiple chains by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	42	0	16	14	11	1	123
12 MEAN	2005	0	2008	2003	2001	2025	2004
LOG MEAN	2000	0	2003	2000	1996	2025	2000
CALC RANGE	1992	0	1994	1992	1989	2025	1992
	2012	0	2016	2010	2008	2025	2012
MEDIAN	1999	0	1999	1997	1994	0	1997
RANGE	1989	0	1997	1989	1989	0	1989
	2024	0	2024	2024	2024	0	2024



(R) Currently being done on a limited scale and selective basis. Although widespread adoption of in-line pricing will be strenuously resisted by suppliers, this is likely to become a uniform requirement by most major multiples but whether manufacturers can be persuaded to respond is another matter. Cage palletising will reinforce this demand but emergence of a standard product code would remove a lot of retail pressure from suppliers. Certainly, the administrative control required to individually price at source for even a few distributors is a significant on-cost burden. Brand leaders will be able to resist this practice more successfully than secondary brands. Impractical for branded goods unless retailer commitment for specified quantities and regulated deliveries. More appropriate to own label products. On positive side would reduce merchandising time in-store and hence produce some cost saving to manufacturers involved in this activity. However, would increase stock levels and control problems at manufacturer's warehouse. At best, expect some form of interim pricing system to be adopted for major multiples which will cease when SPNS fully implemented.

(DD) Much better to adopt a standard product coding system which, combined with computer price look-up facilities at the retail outlet, ensures price flexibility to the last possible moment before sale to consumer. In-line pricing will complicate stock rotation procedures. Direct computer-to-computer links would ease some of the difficulties. May be advantageous for the distribution function rather than manufacturing to undertake this activity (at an intermediate point); otherwise, may work to increase percentage of direct deliveries. Mechanical price-marking techniques. NOT necessarily a requirement of computer systems.

(I) Cost transference from distributor to supplier. Suppliers will want a closer monitor of distribution servicing costs by major customer, and perhaps by location. Expect attempt by suppliers to pass on cost of this additional activity. Inevitable conflict over

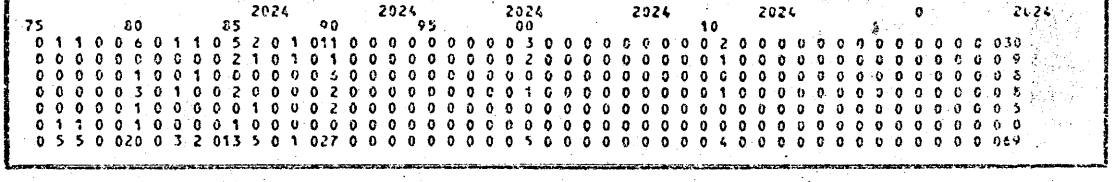
price change notifications unless adequate notice period adhered to by distributors. Increased stock holding levels at supplier locations. May push channel parties towards more formal contractural arrangements. This will remain a contentious issue for some time. Could well influence the ratio of direct versus indirect distribution, i.e. in favour of indirect.

(DV) Commercially impractical; would increase warehousing/inventory costs. The requirement will be there but unless there is a complete standardisation across the country, manufacturers stand no chance of complying. SPNS will undoubtedly come and this is the main reason for no major in-line pricing commitment. Impractical in times of high inflation.

14 Non-store shopping from home will be introduced into the U.K. grocery industry by

This event DELETED after Round 1 because half the panel agreed non-store shopping from home would NEVER be introduced into U.K.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	64	17	16	18	9	4	159
14 MEAN	2005	2010	2006	2005	2008	1980	2003
LOG MEAN	1997	2005	2000	1997	2000	1978	1994
CALC RANGE	1988	1995	1990	1987	1990	1977	1985
	2013	2019	2015	2012	2017	1981	2010
MEDIAN	2009	2024	2024	2009	2024	0	1989
RANGE	1985	1989	1989	1984	1989	0	1984
	2024	2024	2024	2024	2024	0	2024



(R) Could possibly be the next development after hypermarkets in the evolution of retail practices, but still only a vague possibility; scale likely to be insignificant. U.K. housewives generally enjoy the social contact that personal shopping affords. Would require costly investment in communications equipment which is hardly justifiable. A type of non-store shopping experiment tried several years ago in U.K. but did not succeed.

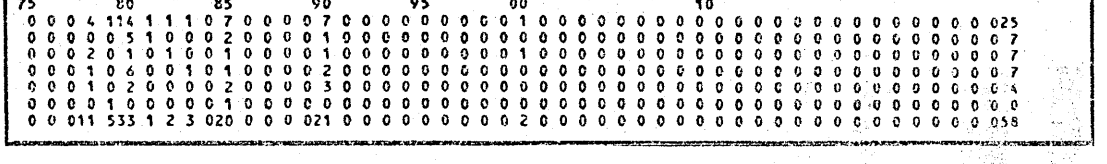
(DD) On any significant scale, this development would add to distribution costs to ultimate consumer. Possible that made-up shopping deliveries left for collection at collection centres could emerge on limited scale.

(I) If this innovation was adopted on significant scale, the additional diversity of activity would complicate retailing. Greater emphasis on media advertising, but who pays? The emergence of wholesalers open to public access, operating from warehouses located out of town.

31 *Most major manufacturers will have increased their total advertising outlay to 25% (in real terms) above the current annual rate in an attempt to strengthen the market position of their branded products*

This question DELETED after Round 1 because of high proportion of panel who said this would NEVER occur. Perhaps 25% increment was too ambitious and pushed the time horizon out too far. (Advertising meant to include expenditure on promotions as well.)

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	62	16	14	18	12	2	156
31 MEAN	2000	2001	2005	1999	1998	1982	1999
LOG MEAN	1991	1992	1995	1990	1991	1981	1990
CALC RANGE	1983	1984	1986	1982	1983	1980	1983
	2006	2007	2012	2004	2004	1984	2004
MEDIAN	1989	1989	2024	1989	1989	0	1989
RANGE	1979	1979	1981	1979	1984	0	1979
	2024	2024	2024	2024	2024	0	2024



(R) Advertising expenditure may increase in response to competitive factors but not to extent suggested, because trade discount structures will make this impossible. Government price controls will also have an indirect effect in preventing steep increases in advertising because such expenditure cannot be automatically recovered from consumers.

(DD) Some rationalisation rather than growth of branded product ranges may simplify distribution function at the company (supplier) level.

(I) Suppliers and distributors alike must reach some understanding as to when the point of diminishing returns is reached with product advertising, and how this expenditure should be allocated. Joint promotions and developments in own-label sphere will affect how advertising expenditure made.

50 *Research and development work on product and method types of innovation will fall to 50% of the 1975 level (measured in real expenditure terms) of activity by*

Panel overwhelmingly agreed that R & D expenditure will not fall as suggested. This event therefore DELETED after Round 1.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	62	13	16	17	8	8	168
50 MEAN	2019	2014	2019	2018	2025	2025	2021
LOG MEAN	2013	2007	2011	2011	2025	2025	2016
CALC RANGE	2002	1996	1999	1999	2025	2025	2005
	2030	2024	2031	2029	2025	2025	2032
MEDIAN	2024	2024	2024	2024	2024	2024	2024
RANGE	2024	1999	2024	2024	2024	2024	2024
	0	2024	0	0	0	0	0

75	80	85	90	95	00	10	
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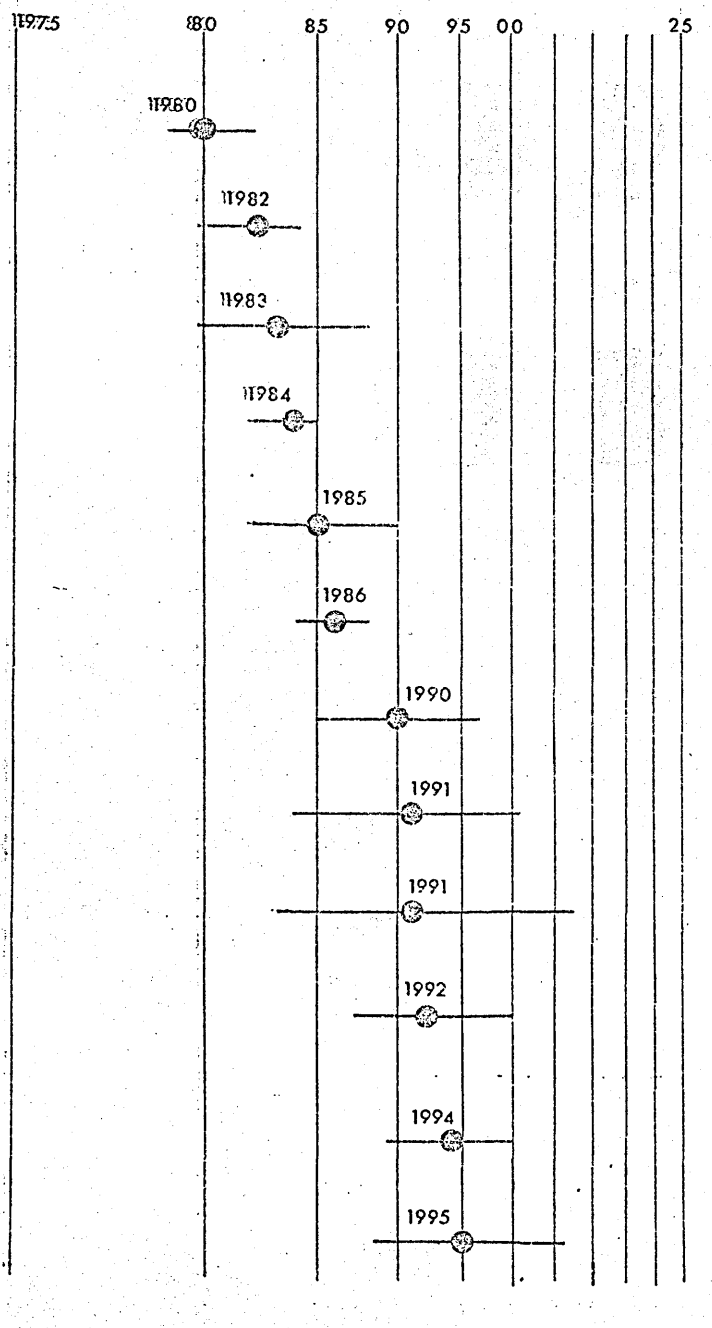
(R) Little justification and very unlikely. There are too many formidable organisational difficulties, and in any event the major retail multiples would fiercely resist introduction of this type of operation on any significant scale. Unlikely, as vertical trading patterns are declining.

(DD) Difficult to forsee what would happen if joint operations did eventuate on any significant scale.

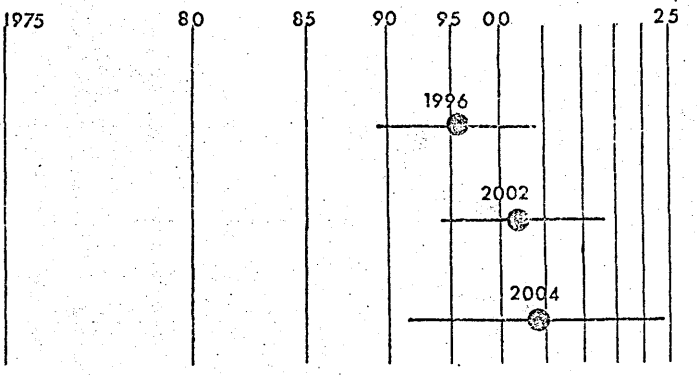
(I) If it did eventuate, supplier-distributor relations would be further complicated. Could even see the emergence of intra-organisational conflict. Difficult to manage.

INTERNAL-CONTROL EVENTS: The list of 15 events comprising this category is tabulated below, arranged in order of the mean year of forecasted occurrence across the full period under consideration.

EVENT NO.	EVENT DESCRIPTION	QUANTITATIVE FORECAST
61	ACCOUNT PROFITABILITY ANALYSES	1980
29	DIVISIONAL INTEGRATION BY MANUFACTURERS	1982
44	MANUFACTURERS TRADE TERMS	1983
47	MANUFACTURERS SALES FORCES	1984
21	MANUFACTURERS STOCK-HOLDING POINTS	1985
60	ELECTRONIC P.O.S. EQUIPMENT AT CHECK-OUT	1986
09	DIRECT VERSUS INDIRECT DELIVERIES	1990
46	CAGE PALLETS	1991
42	IN-HOUSE PACKAGING AT RETAIL OUTLET	1991
55	DEVELOPMENT OF NEW ONE-TRANSFER SYSTEMS	1992
15	PRE-PACKED DISPLAY UNITS	1994
33	DEMOUNTABLE-BODY VEHICLES	1995

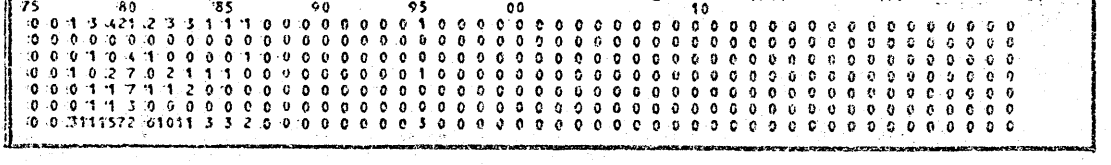


EVENT NO.	EVENT DESCRIPTION	QUANTITATIVE FORECAST
57	ALTERNATIVE TO TRADITIONAL PALLET	
51	MODULAR UNIT LOAD SYSTEM	
38	IN-STORE MANUFACTURE	



67 *Most major manufacturers will have adopted some form of account profitability analysis audit system for monitoring distribution costs*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	61	0	7	16	13	5	139
61 MEAN	1981	0	1981	1982	1980	1979	1981
LOG MEAN	1980	0	1980	1981	1980	1979	1980
CALC RANGE	1979	0	1979	1979	1979	1979	1979
	1982	0	1982	1983	1981	1980	1982
MEDIAN	1979	0	1979	1979	1979	1979	1979
RANGE	1979	0	1979	1979	1979	1978	1979
	1981	0	1980	1982	1981	1979	1980



(R) This trend already evident. Economic pressures will force a more sophisticated approach to monitoring the distribution costs of doing business. Attitudes have, and are changing to the extent that distribution costs are now regarded as a fully integral part of product cost, not simply an on-cost afterthought. In view of increasing demands being placed on manufacturers by retailers, it is essential for the former to assess the cost-effectiveness of the locations it services and the methods employed. Some companies already attempting the type of analysis suggested. Reduction of sales force size will stimulate increasing use of this development. It is <u>total</u> account profitability which matters - not just distribution part.

(DD) As cost analyses techniques improve, changes in distribution methods will be continually in progress. Those companies good at analysing their costs accurately and seeking improvement will do well in the market place. May allow a more flexible approach to specific problems.

(I) Cost analyses, especially from supplier end will be the basis of continual price negotiations between suppliers and distributors. This concept has gained momentum recently. Will lead to greater dialogue between retailers and manufacturers in understanding distribution costs.

(DV) Difficult to implement effectively if service level is to be maintained. Because of complexity and cost, believe 'most' manufacturers will be slow to get started.

29 *Most major manufacturers will adopt some form of intra-company integration (where a company has a number of divisional companies) of their sales and distribution functions in an attempt to achieve improved operating efficiencies*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	40	1	8	15	13	3	129
29 MEAN	1982	1981	1981	1982	1982	1982	1982
LOG MEAN	1981	1981	1981	1982	1981	1982	1982
CALC RANGE	1980	1981	1980	1981	1979	1980	1980
	1983	1981	1982	1984	1984	1984	1984
MEDIAN	1980	0	1979	1981	1980	0	1980
RANGE	1979	0	1979	1979	1979	0	1979
	1982	0	1980	1982	1980	0	1982

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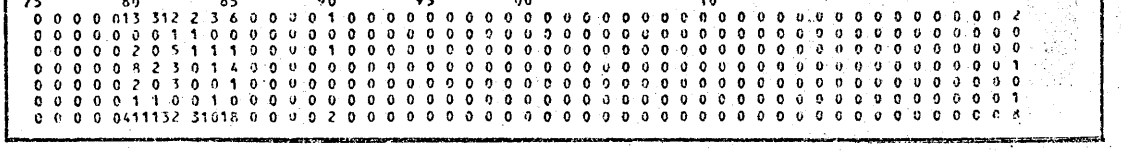
(I) Will require integrated management systems to control sales, marketing, and distribution functions in manufacturing organisations. This approach should benefit supplier-distributor relations as latter will have fewer parties to deal with. Main problems relate to proper control and effectiveness of costing systems in establishing proper base for decision making and allocation of total costs if individual divisions are not to rebel and want to go own way.

(DV) Economies can be obtained without integration. There are many problems which require solution and will take time.

44 *Most major manufacturers trade terms will be based on physical volume sold to a customer rather than £ stg. sales value; this has drop size implications and will be generally accepted practice in the industry by*

Clarification: by 'volume' is meant total annual contracted volume with allowance for the number of deliveries required, i.e. includes drop size consideration.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	42	2	11	19	6	4	125
44 MEAN	1984	1983	1985	1984	1982	1993	1985
LOG MEAN	1983	1982	1983	1982	1982	1986	1983
CALC RANGE	1980	1982	1981	1980	1981	1980	1980
	1987	1983	1984	1987	1983	1997	1988
MEDIAN	1981	0	1981	1980	1981	0	1981
RANGE	1979	0	1981	1979	1979	0	1979
	1983	0	1983	1984	1984	0	1983



(R) Macro-economic conditions make this changeover urgent. Greater objectivity in purely volume based terms but complications acknowledged. Since volume to a large extent dictates cost this is a logical development. Some manufacturers already operating in this way. Further companies will swing over to this procedure when they start monitoring the cost of servicing individual retailers by individual outlet. In turn, distribution service companies may win extra business if more cost competition than own account operation.

(DD) Physical distribution costing is the key here. Volume movement is not the only consideration. Suppliers would do well to relate selling prices to the identifiable costs of servicing customers (down to individual outlets in some cases). Drop size considerations essential.

(I) Distributors would tend to resist widespread adoption of this because not in their interests. Would also lead to greater

pressure on all smaller (multiple owned) retail outlets unless a national agreement had been negotiated. Buying negotiations affected. Degree of discounting will become more closely correlated to individual outlet size/type. Trade terms will increasingly reflect drop size - not just volume expressed in tonnage or £ stg.

(DV) The suggested system breaks down when large powerful multiples demand a national contract price, even though drop size will vary between its locations. See a continuation of present arrangements. Fair trading regulations may restrict this. Other considerations cannot be overlooked, e.g. distance.

47 *The size of field sales forces retained by most major manufacturers in the grocery industry will fall to 75% of current numerical strength*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	37	2	6	15	11	3	118
	47 MEAN	1984	1984	1985	1984	1984	1982	1984
	LOG MEAN	1984	1983	1985	1984	1984	1982	1984
	CALC RANGE	1982	1982	1983	1983	1982	1980	1982
		1985	1984	1987	1985	1985	1984	1985
	MEDIAN	1983	0	1984	1983	1985	0	1983
	RANGE	1981	0	1983	1981	1981	0	1981
		1984	0	1989	1985	1984	0	1984

75	80	85	90	95	00	10
0 0 0 1 0 2 0 7	1 1 0 9 5 0 1 0	1 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0	1 0 0 1 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1	0 1 3 0 0 0 0 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 3	1 4 2 5 0 1 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
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0 0 0 5 0 7 0 2	0 3 3 5 2 6 1 7	0 5 0 2 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0

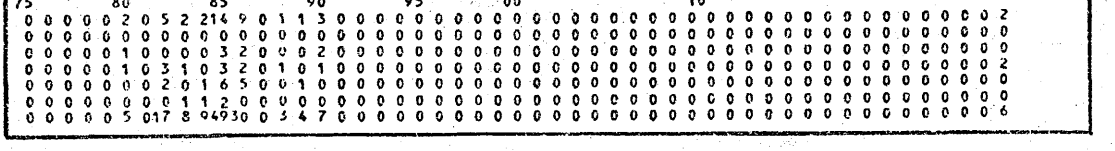
(R) Reduction in number of buying points, and the increasing costs of maintaining a salesman in the field will influence this trend to fewer salesmen despite the problem of maintaining effective brand selling. Centralised buying approaches being adopted by some major retail groups will also reinforce this development. Reduction in number of retail outlets reduces need for salesmen but increases need for specialist merchandising staff. There will be a greater use of telephone selling and telephone order-entry but manufacturers will not want to withdraw physical presence too far because of the risk of losing display space to a competitor. Reordering (as opposed to initial sell-in function) and distribution function will move closer together. Increased costs of representation will lead to this. Already, field salesmen have less influence on volume. Increased emphasis on H.O. contacts with telesales ordering. Concentration of retail customers will assist changeover to more centralized buying.

(DD) A change in buying and order processing procedures. Improved information transmission techniques.

(I) Closer liaison between suppliers and distributors on non-salesmen ordering. Reduced personal contact between the parties. Distributors to do more of the order assessment work than is currently the case.

21 *The aggregate number of stock-holding points maintained by the major manufacturers (as a group) will fall to a level 25% below the current number*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	0	8	14	15	4	136
Z1 MEAN	1987	0	1986	1990	1985	1984	1987
LOG MEAN	1986	0	1985	1987	1985	1984	1985
CALC RANGE	1982	0	1984	1982	1984	1984	1982
	1990	0	1988	1995	1986	1985	1990
MEDIAN	1984	0	1985	1984	1984	0	1984
RANGE	1983	0	1984	1981	1984	0	1983
	1985	0	1989	1989	1985	0	1985



(R) Increased sophistication of stock control and handling techniques will allow a slow reduction in stock-holding points, down to a level below which geographical constraints become a significant factor. Trend is to keep capital facilities and stock investment to minimal levels. During last 5 years a substantial reduction has already occurred and this should continue for a time until geographical and other constraints arrest decline. Must always keep in mind the objective of maintaining profitable stock, not just less stock throughout the country. The major victims during next few years will be smaller depots. Improved motorway system over last few years is bringing more locations into reach of larger depots some distance away. Trend inevitable but may be held back by capital problems. Rationalization will continue. Joint ventures a possibility. Store location patterns will influence the rate of change.

(DD) Reduction in stocking points can be covered by distribution service companies. Possible shift of major distribution centres to geographic centre of England. More use of stockless transit depots, and swap bodies. Bulk-break redistribution points. Fewer stock-holding points generally means lower costs and certainly lower investment in stocks. Will happen due to a combination of circumstances:

(a) Cost of maintaining stock and servicing smaller outlets.
(b) Open date coding will generate need to improve rotation efficiency.

Increase of demountable systems will eliminate smaller locations.

(I) Possibly some reduction in service levels achievable by suppliers; larger less frequent deliveries to retail outlets will not please retail multiples. Possibly further discount opportunities for superstores.

(DV) Consider reduction possible, but <u>not</u> 25% below current already depleted level.

60 *Electronic point-of-sale systems at the checkout will be installed and operational in most U.K. superstores by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	3	9	19	9	1	119
GO MEAN	1986	1984	1987	1986	1986	1982	1986
LOG MEAN	1986	1984	1986	1986	1986	1982	1986
CALC RANGE	1984	1984	1984	1984	1985	1982	1984
	1988	1985	1989	1988	1987	1982	1988
MEDIAN	1984	0	1984	1984	1984	0	1984
RANGE	1984	0	1984	1984	1984	0	1984
	1987	0	1989	1987	1986	0	1987

75 80 85 90 95 00 10

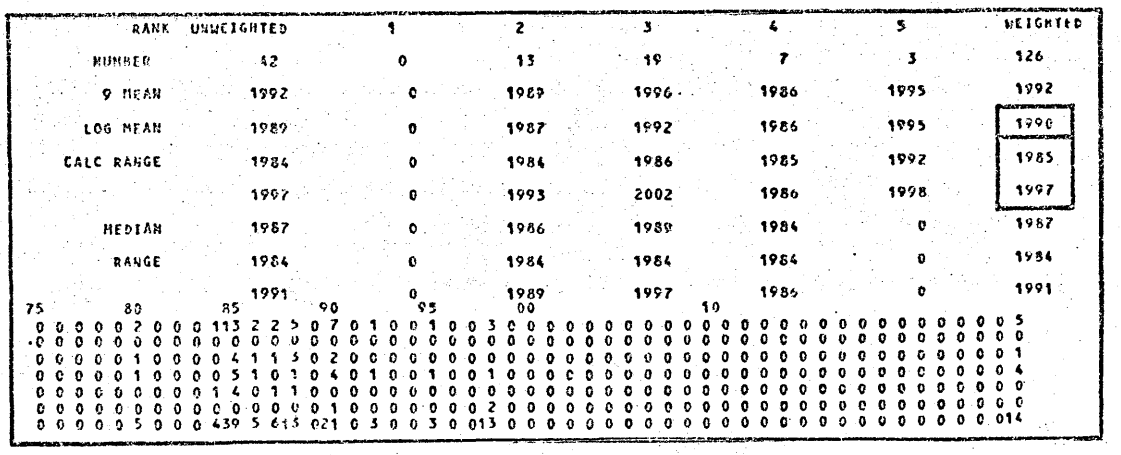
(R) This development will come, but full implementation will be slowed by capital funds requirement and some consumer resistance. There may even be an interim step between manual and fully automatic symbol scanning stages. The technology is already available. Due to vast range of goods sold and the velocity of turnover, more detailed and accurate information needed to control stores. The EPOS can be of varying degrees of sophistication to suit individual company's needs. If successful, could lead to lower stock levels at branch store locations and fewer stock-outs. Technically, nothing to hold back this event although cash availability will be a problem. Electronic POS is not necessarily synomynous with front end automation.

(DD) Will have significant effects in the stock control, order processing, price marking, and stock leakage areas of product distribution, i.e. mainly retail end advantages. The need to achieve a high level of speed and quality of POS data, without involving a high labour cost will require such systems. These can only be completely effective however, when appropriate product coding systems are available.

(I) This innovation should be one where suppliers and retailers cooperate fully with minimal conflict. There will initially be a period of problems before the system settles down.

(DV) 'Most' NEVER; possibly 'some'.

09 *20% (by total volume) of current indirect deliveries received from most major manufacturers will be moving direct to the larger retail outlets by*



RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	42	0	13	19	7	3	126
9 MEAN	1992	0	1989	1996	1986	1995	1992
LOG MEAN	1989	0	1987	1992	1986	1995	1990
CALC RANGE	1984	0	1984	1986	1985	1992	1985
	1997	0	1993	2002	1986	1998	1997
MEDIAN	1987	0	1986	1989	1984	0	1987
RANGE	1984	0	1984	1984	1984	0	1984
	1991	0	1989	1997	1986	0	1991

75 80 85 90 95 00 10

(R) Direct branch versus intermediate warehouse deliveries are still subject to wide fluctuation of opinion in the trade, some companies moving away from such direct delivery operations, others are actively building up their deliveries. Success or otherwise of cage pallet concept may have important effect on which way this issue finally resolved. The continued or otherwise development of large superstore retail outlets (to which direct deliveries are viable) will also be key factor. Certainly, this event will follow if transit unit is used for displaying goods in-store. Tendency to larger stores also reinforces the suggested trend. Manufacturers may attempt to exert greater influence on individual stores in promotions. Increased deliveries direct to store will necessitate improved handling procedures at back door. Changing proportions of direct versus indirect could well influence trading terms. Date coding will reinforce the pressure for deliveries direct to larger retail units. Implication is that large retail multiples will reduce the level of deliveries via their own warehouse systems. Move will help improve stock-turn, reduce working capital, improve cash flow.

(DD) Either way, there could be a growth in scope for distribution service company activity. If occurs to any extent, a reduction in traditional wholesaler middlemen in distribution chain. Possible development of container delivery and pick-up service at off-peak times. More larger trunking vehicles necessary. More pressure for cages or similar transfer vehicle in conjunction with in-line pricing. Possible emergence of joint delivery services by groups of suppliers. Already happening with superstores, hypermarkets, and other large outlets. Manufacturers to welcome more control of store input. Development pace, however, will depend largely on hypermarket development and distribution drop sizes relative to costs. This trend could well be coupled with out-of-hours deliveries, and fewer outlets of larger average size.

(I) Continual escalation in costs will make it difficult for small/medium size suppliers to maintain independent distribution operations. Direct deliveries in less than superstore size units will inevitably increase costs. Price/margin pressure on supplier, but

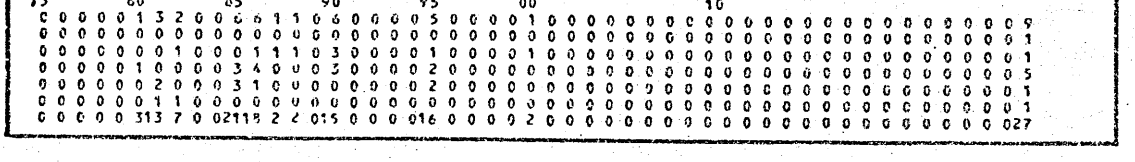
generally cheaper for retail stores. Hard bargaining on terms of trade likely. Possible fall off in service levels to distributors if proportion of direct deliveries increases appreciably. Lower in-store staffing levels on the Continental pattern must follow. There will be confrontation between manufacturers and retail customers over revised trade terms as changeover from indirect to direct occurs. Possibly lead to smaller delivery vehicles.

(DV) As manufacturers become more aware of their actual distribution costs, more use will be made of consolidation depots, professionally operated by either manufacturer or another party. Environmental considerations will severely limit extent of direct deliveries. Retail stores may regard as unacceptable because of space, labour and security. Will become areas of increased expenditure.

46 *Industry acceptance of cage pallets will reach a point where 25% of all grocery volume sold in superstores will be handled in cages by manufacturers at the point of production or some other intermediate location*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	1	10	18	9	3	126
46 MEAN	1996	2025	1993	1998	1991	1996	1995
LOG MEAN	1991	2025	1991	1993	1988	1988	1991
CALC RANGE	1985	2025	1986	1986	1985	1982	1984
	2001	2025	1998	2004	1995	2001	2001
MEDIAN	1989	0	1989	1989	1984	0	1986
RANGE	1984	0	1986	1985	1984	0	1984
	1999	0	1999	2024	1994	0	1994

75 80 85 90 95 00 10



(R) Continuance and extent of this trend will depend on whether cages will mostly be filled at production point or some later stage in the distribution chain. Some evidence at the moment to suggest slight loss in momentum of this concept.

(DD) Use of automatic cage filling machines will be essential where relatively large volumes are involved. Pace of development will be forced by retail exponents of cages. In-line pricing is a key factor in growth of cage acceptance. Although the concept is sound the actual cage vehicle still has to prove itself as the correct conveyance and indeed that it is compatible to current or projected systems. This may be difficult. Actual speed of development may depend largely on pace of superstore construction. Caging likely to be carried out at an intermediate point because of the distances to be travelled from factory to retail outlet.

(I) A most contentious issue because of cost reallocations which occur in the supplier-distributor channel, and source of considerable conflict. Must be resolved equably for good of industry. Causes loss of cube and therefore lower utilization in transport and

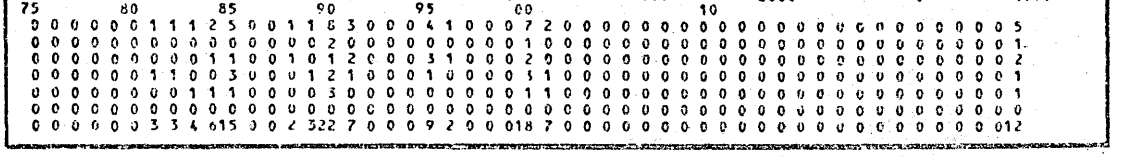
storage. In addition, a sided unit places considerable constraint on use of auto-palletisers. Concept embodied not in question; only the vehicle being applied to it, i.e. the cage pallet.

(DV) Cages have yet to prove beneficial overall - from production to consumption. Whatever happens, not likely to reach 25% penetration. Alternative unit expected because of capital cost of cages.

55 *Partial replacement /substitution of cage pallets by a rival one-operation transfer procedure (from production to shop floor) will become evident by*

	RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
	NUMBER	42	4	14	15	9	0	113
	55 MEAN	1996	2001	1997	1993	1994	0	1995
	LOG MEAN	1993	1998	1995	1991	1991	0	1992
	CALC RANGE	1987	1991	1989	1986	1986	0	1987
		2001	2008	2003	1998	1999	0	2000
	MEDIAN	1990	0	1994	1989	1989	0	1989
	RANGE	1987	0	1989	1984	1984	0	1984
		1999	0	1999	1999	2000	0	1999

75 80 85 90 95 00 10



(R) Difficult to visualise a better approach at present but overall cost of the cage system may lead to such a change. Supplier objections and distributor inefficiencies with present system may ultimately lead to an alternative, possibly promoted from manufacturing sector, and in early 1980s. The cage pallet is currently resisted by those manufacturers who are not geared up to handle them economically. The same problem may present for any new unit which is introduced to industry. Perhaps the answer will be a disposable one-trip unit but hard to see it justify itself on economic grounds. Already some packs available in Europe and designs are being developed in the U.K.

(DD) A continuing search for simpler more cost-effective distribution of grocery products. The transit/display module concept may be further refined. Factory to shop floor is only suitable for high volume lines but cannot see one-trip unit is feasible.

(I) Only an innovation(s) introduced through a process of joint consultation is likely to gain overall acceptance and reduce conflicts between suppliers and distributors. Possible emergence of jointly represented Design Committees.

(DV) Economies in this area are preceded by significant investment expenditure. Can't see it happening in forseeable future.

15 *Pre-packed (either by manufacturer or retailer) display units will account for an average 25% of grocery products volume throughput (number of units) across stores operated by the major multiple chains*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	2	10	23	4	2	117
15 MEAN	1995	1993	1994	1997	1991	1994	1995
LOG MEAN	1994	1992	1994	1994	1990	1994	1994
CALC RANGE	1989	1988	1990	1989	1988	1991	1989
	2000	1997	1998	2002	1994	1996	2000
MEDIAN	1994	0	1997	1997	0	0	1994
RANGE	1989	0	1989	1989	0	0	1989
	1999	0	1999	1999	0	0	1999

75 80 85 90 95 00 10

0 0 0 0 1 1 0 0 0 4 1 0 0 0 9 1 0 0 0 4 0 0 6 011 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 3 0 0 0 0 1 0 0 3 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 1 0 0 0 2 0 0 0 0 4 0 0 0 0 3 0 0 1 0 8 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 3 3 0 0 012 1 0 0 027 4 0 0 011 0 018 029 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6

(R) One qualification may be the lack of standardisation across retail outlets. In addition, it is expected that only a small percentage of total grocery lines will have volume sales enough to warrant merchandising in such display units. Recent experience suggests full utilisation of prepacked display units may take longer to reach than originally supposed. The disposable one-trip container may again be looked at. Overall problem is one of agreeing module size and standardising on this. There is still a large volume of food requiring temperature control which will be excluded from this development. All depends on growth of large (super) stores. Quite probable at the 25% level, particularly if selective packaging standards are introduced because of effect of date coding, whereby very fast moving 'channels' can be serviced with a lower packaging standard, as product will never get 'old' and require the increased protection from more comprehensive packaging.

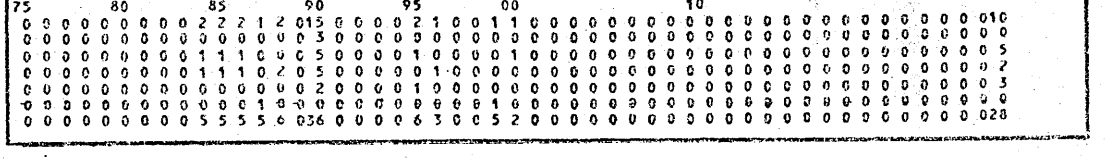
(DD) Increased concentration of delivery to fewer points. Display units could well become the basic module of distribution but will require some degree of standardisation between suppliers packing similar product groups. Will also require further development in vehicle designs and off-loading equipment. May give further impetus to direct deliveries movement.

(I) Any special delivery arrangements will lead to more interdependence between suppliers and distributors and closer operational discussion throughout chain of distribution. Closer technical ties. Suppliers unwilling to play major part in packing these units at production source. Considerable variance between major retail distributors on how they would handle units, and what they would expect of supplier(s). Equipment implications for both sides and a need to negotiate where costs should fall.

(DV) Improbable because it will be difficult to achieve:
(a) truck haulage utilization with standard equipment, and
(b) shop utilization with variable modules. Certainly, shops will begin to run into layout and access problems. Problems of type and size of display unit and associated cost may be prohibitive. Will definitely NOT include fresh produce.

33 *The proportion of demountable-body type vehicles (swap bodies rather than articulated trailers) in use with most manufacturers, multiple chains, and distribution service companies will reach 25% of their combined transport fleets by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	39	3	15	13	6	2	106
33 MEAN	1999	1990	2002	1994	2008	1993	1999
LOG MEAN	1995	1990	1997	1992	2004	1992	1995
CALC RANGE	1988	1990	1989	1986	1995	1988	1988
	2005	1990	2009	1999	2017	1996	2006
MEDIAN	1989	0	1989	1989	2024	0	1989
RANGE	1989	0	1989	1987	1989	0	1989
	2024	0	2024	1995	2024	0	2024



(R) Cost of drivers time will preclude waiting during loading/unloading operations, but changeover will not be quick because of the capital funds required for vehicles and docking facilities. Some companies already using similar procedures. Could be used to provide extra stocking space at peak times. This type of equipment is expensive to purchase. Their use could increase driver utilisation. Swap bodies have been available for years but acceptance slow in coming. If does come, will mean re-appraisal of warehouse and retail store goods reception facilities.

(DD) More attention to transport movement/scheduling. Optimises use of equipment and driver time, so is cost-effective. Closely related to out-of-hours delivery issue, but not complicated by staffing at delivery point. Provides additional flexibility in distribution. May be forerunner of shared distribution by some suppliers. Would require labour saving ancillary equipment to create savings in handling into and out of containers.

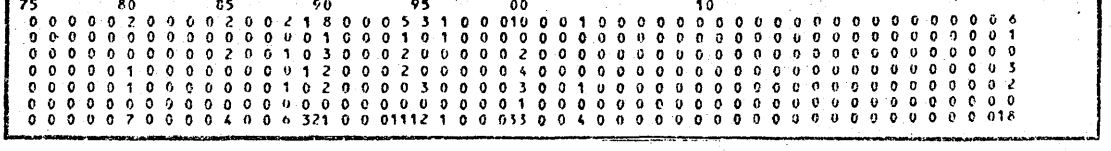
(I) Suppliers may see this as one avenue of productivity gain, but final test will be the return on capital invested in new and specialised equipment. Distributors would have to set aside sufficient parking space at rear of their stores. Quick turnaround at store would be responsibility of retail distributor and this may be a source of conflict.

(DV) Not a panacea for inefficient distribution operations. Swap bodies may find some application but never to 25% extent

suggested. These vehicles are not cost-effective except in very limited circumstances. Curtain sided vehicles will predominate - save time in sheeting and protect goods during transit. Could well see alternative solutions.

57 *An alternative unit load to the traditional pallet will be introduced into service by manufacturers and retailers throughout the grocery industry by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	41	4	10	13	13	1	120
57 MEAN	1998	2001	1992	2001	1999	2000	1998
LOG MEAN	1995	1998	1991	1997	1996	2000	1996
CALC RANGE	1989	1992	1988	1990	1989	2000	1989
	2004	2008	1995	2008	2005	2000	2004
MEDIAN	1994	0	1989	1999	1994	0	1994
RANGE	1989	0	1987	1989	1989	0	1989
	1999	0	1999	2024	2002	0	1999



(R) Could very well occur but may be delayed due to problems of finding a suitable alternative and achieving the necessary industry acceptance. Perhaps a disposable system will be tried, or a skid/squeeze clamping arrangement. Any new system would have drastic implications for existing investment and hence would need to demonstrate considerable advantages to gain acceptance. Perhaps a type of disposable unit made of recycled material is faint possibility. Wooden pallets are clearly not an ideal solution but they are firmly established. With the changes in store design, the way is open to a number of alternative unit load systems and these will have to be designed to fit in with current handling equipment rather than be 'specials'.

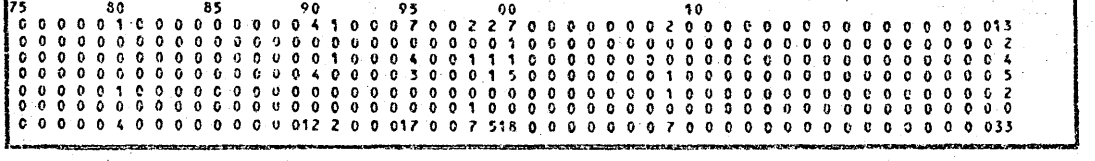
(DD) Any new module/unit load vehicle would have significant effect on all stages of the distribution channel. Even small changes of this type are costly taken on an industry wide basis. Ease of handling is one of the main criterion. Slip sheets will be introduced for a wide range of products, particularly cartons of light weight products, i.e. tissues, cereals, soap, powders etc., initially in warehouses of large multiple chains.

(I) Depending on which party (if any) within the industry develops and/or introduces such an alternative, conflict between suppliers and distributors very likely to occur.

(DV) Alternatives may appear from time to time, but the wooden pallet will continue in general use across the industry. Nothing else in sight at moment.

51 *A modular unit load system (involving compatible unit sizes from the small product pack through to large containers) will be operative in the grocery industry by*

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	39	3	12	19	4	1	105
51 MEAN	2006	2017	2006	2004	2010	1998	2005
LOG MEAN	2003	2015	2003	2001	2001	1998	2002
CALC RANGE	1995	2007	1996	1995	1990	1998	1994
	2013	2024	2013	2011	2019	1998	2013
MEDIAN	1999	0	1998	1999	0	0	1999
RANGE	1994	0	1994	1994	0	0	1994
	2024	0	2024	2024	0	0	2024



(R) The fragmented nature of the industry, makes co-operation on such a project difficult, although there are potentially modular systems being tried in various sectors following experience in Sweden. Certainly, the economies of operation would seem attractive but investment to achieve it may be too great. Important to agree a universal system. EEC legislation on standard pack sizes may assist. There are however so many problems in simply getting the interested groups together and achieving agreement. A full modular unit load system may just not be possible or probable. The investment in current wooden pallet based systems is too big to simply abandon. Theoretically ideal, but in practical terms virtually impossible to introduce without legislation. Present wide variety of pack sizes and shapes makes this virtually impossible. Metrication considerations may promote idea.

(DD) Complete rethink of materials handling systems. Greater ease of handling, less damage, lower costs. Better utilisation of storage and transport facilities. Competition among packaging companies to offer the required system(s).

(I) Product and packaging rationalization possible, and cost savings available to be shared by suppliers and distributors. Closer co-operation. Constraints on design freedom in regard to packaging. There is also the problem of compatibility of many products, e.g. with contamination, and packaging (glass versus paper). Increasing standardization will result in pack size/shape changes but not for all products.

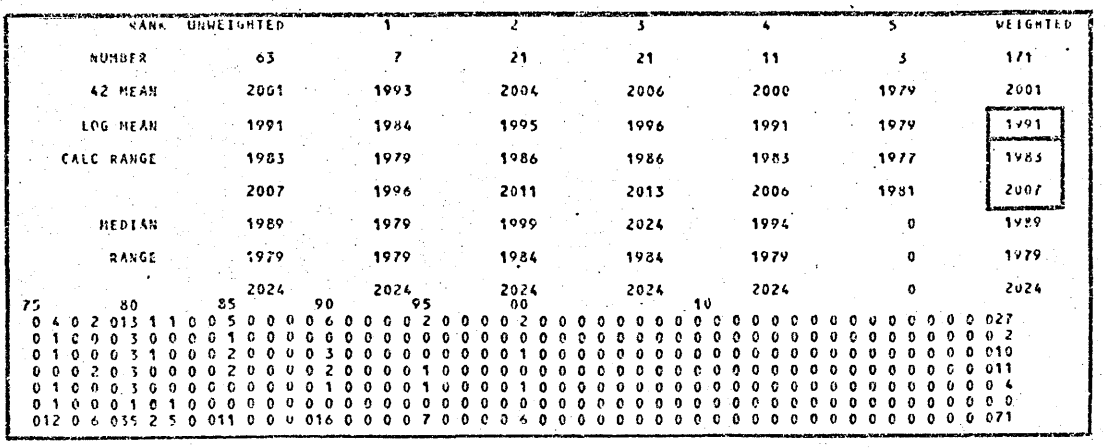
(DV) Work already started on modular systems. Logical, desirable, and less prone to conflict of interest than say cages.

38 *The major multiple chains will begin in-store on-the-spot manufacture of products other than the baked items currently produced*

Over two-thirds of panel considered that in-store on-the-spot manufacture would NEVER reach more than token levels in even major multiple stores. Event DELETED after Round 1.

RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	65	13	18	26	5	3	162
38 MEAN	2014	2023	2006	2012	2025	2009	2013
LOG MEAN	2005	2022	1995	2003	2025	1996	2004
CALC RANGE	1993	2017	1985	1992	2025	1985	1992
	2024	2028	2014	2022	2025	2016	2025
MEDIAN	2024	2024	2024	2024	2024	0	2024
RANGE	1999	2024	1984	1984	2024	0	1989
	2024	0	2024	2024	0	0	2024

75	80	85	90	95	00	10	
0 1 1 1 0 7 0 0 0 0 4 0 0 0 0 2 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0



RANK	UNWEIGHTED	1	2	3	4	5	WEIGHTED
NUMBER	63	7	21	21	11	3	171
42 MEAN	2001	1993	2004	2006	2000	1979	2001
LOG MEAN	1991	1984	1995	1996	1991	1979	1991
CALC RANGE	1983	1979	1986	1986	1983	1977	1983
	2007	1996	2011	2013	2006	1981	2007
MEDIAN	1989	1979	1999	2024	1994	0	1989
RANGE	1979	1979	1984	1984	1979	0	1979
	2024	2024	2024	2024	2024	0	2024

75 80 85 90 95 00 10

0 4 0 2 013 1 1 0 0 5 0 0 0 0 6 0 0 0 0 2 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 027
0 1 0 0 0 3 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2
0 1 0 0 0 3 1 0 0 0 2 0 0 0 0 3 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 010
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012 0 6 035 2 5 0 011 0 0 0 016 0 0 0 0 7 0 0 0 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 071

(R) Problem is really one of a division of technologies. Certainly does not fit current trend to minimise in-store labour at retail outlet. May happen on a very limited scale with a few bulk commodities, in some superstores. Costs expected to be prohibitive and quality control aspects would need close examination.

(DD) From a purely transport logistics point of view, such a development might lower costs because more product being moved in bulk, but costs would be pushed through to retail distribution end where much of the packing would be carried out. Very unlikely to occur.

(I) Suppliers likely to welcome such a trend, but distributors would not want to promote this trend too far (against their best interests). Would really be the opposite of cage palletisation in terms of the direction of cost movement. Distributors might try to have suppliers do this work in-store as an extension of current merchandising activity.

Supplementary Questions

1 *How will the implementation of the 'Dykes Act'*[12] *affect physical distribution strategies in the consumer goods field?*

The panel were almost unanimous in agreeing that the short term effect would be minimal but in the longer term it posed some

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12 The Heavy Commercial Vehicles (Controls and Regulations) Act 1972 (the so called 'Dykes Act') requires local authorities, by 1 January 1977, to make a survey, prepare proposals, and draft a traffic regulation order to preserve or improve the amenities of their respective areas.

uncertainties. The two main retarding factors were seen as:

- the reduction in public sector expenditure will simply not permit the development of alternative facilities such as by-pass routes/roads, public break-bulk centres etc., and

- it would be extremely difficult to introduce restrictions of the type mooted with any real degree of uniformity across the large number of local authorities involved.

Broadly interpreted, the implications of the Act for distribution are extremely significant, even if it only partially implemented. Restricted access in terms of time periods and gross weight of delivery vehicles would require a complete revision of existing patterns of delivery to High Street retail outlets, and will almost certainly involve new warehouse/depot location strategies. Four areas would come under close scrutiny:

- the issue of out-of-hours deliveries would again become prominent,

- the development of out-of-town retail developments would receive considerable impetus,

- the matter of specifications for centre of town delivery vehicles would become important, and

- the use of edge of town break-bulk centres would become mandatory for certain size loads.

Clearly, the key unknown factor in this legislation, for all affected companies, is how far the restrictions will go if and when they do come. Most agree some restrictions on heavy goods vehicle movements are inevitable because of growing traffic congestion, but taken to extremes, the result of severe legislation could be more costly distribution and expensive alternative arrangements which local authorities would have to finance themselves, e.g. lorry parks. From the local authority's point of view, the cost of administering and controlling highly restrictive procedures could well prove prohibitive.

2 *Will increased traffic restrictions accentuate movement from 'own account' operations to the use of professional distribution service companies?*

The panel had a mixed reaction to this question although on balance the consensus was that other alternative strategies would predominate, e.g. manufacturers would seek 'grouping' or 'consolidation' agreements between themselves rather than discard 'own account' operations and make a major move to professional distribution service agencies. Clearly, the total volume of goods involved will not alter radically, only the (allowable) frequency of delivery caused by restrictions in access, unloading, routing, zoning etc. The feeling was that distribution service companies were unlikely to prove a viable alternative if massive volume was redirected through their facilities even without the sensitive question of

supplier 'loss of control' necessarily entering into the equation. The implications are therefore evident; more co-operation between (non-competing) suppliers at least.

3 *How will the Government's policy on transport (recent consultative document) affect distribution of consumer products?*

The document referred to is consultative, rather than policy in nature, and far too general in its present form to allow firm inferences to be drawn. It does however, display a certain realism of the future problems facing transportation in the U.K., but is unlikely to have anything more than marginal impact. It is unlikely that rail freight will win much freight away from road, even if extra road taxes are applied.

4 *What do you see as the major changes in distribution patterns as a result of the increasing number of discount stores (i.e. large superstore and/or Kwiksave types)?*

Discount type retail operations will continue to penetrate the market, gaining share at the expense of general purpose supermarkets. The larger units will predominantly be new large developments in out-of-town or edge-of-town locations. This will encourage direct deliveries by manufacturers, with average drop sizes increasing. Through unit-loads such as the cage pallet, roll pallet etc., will be used in transit/merchandising activities, and will require more sophistication in handling equipment at the retail outlet. The accent on volume throughput in this type of retail outlet will lead to product rationalization, i.e. a lesser range of products offered.

5 *How do you think the changing proportions of direct branch delivery versus a more indirect form of delivery will influence future supplier-distributor negotiations of trading terms and conditions?*

It is evident that major retail groups are demanding a greater discount on direct delivered full loads to large outlets. But manufacturers/suppliers are also becoming more aware of the real costs of direct branch deliveries on any substantial scale. Deliveries through a consolidation point may gain in favour.

This issue has recently led many manufacturers to begin work on developing a formalised Customs Account Profitability Analysis, the aim being to monitor the cost-effectiveness of distribution service, by customer, by location. Armed with better quality performance information, manufacturers will fight hard in any trade terms negotiations to protect their margins. Ultimately however, it is the continuing trend towards concentration of buying power among relatively few distributors which may prevail.

Executive Summary: A Scenario for the Future

The following scenario, outlined under several headings, attempts to draw together the various strands of emergent thought evident in the foregoing Delphi forecast results. In effect it represents a sketch of the operational environment which the subject industry will be confronted with over the next twenty plus years. The pertinent Delphi event numbers shown throughout the text in brackets will facilitate easy reference back to the detailed comments on each particular issue.

Government Intervention: Government prices control measures are likely to persist in some form or other (16), and likewise for fair trading legislation (58), but it is reasonable to assume Government owned and a operated pallet pool (23) and/or retail stores (05) will not become a reality. The influence of traffic restriction legislation (Dykes Act) is a little more uncertain although it is difficult to forsee either central or local government wishing to advance the funding for edge-of-town break-bulk redistribution centres (03) and the other facilities which would be a necessary part of its implementation. Stricter food standards (10), especially for chilled and frozen products in transit and storage are a realistic expectation and this will involve both temperature monitoring devices and open date coding on packs (24). Planning permission applications for superstore developments are however expected to receive more favourable consideration than has been the experience to date (49). EEC truck specifications (53) will come despite the complexities of inter-nation negotiations, and more Government attention will be focussed on waste disposal and recycling issues (40).

Food/Grocery Sources: Because of the increased intensity of domestic food production and continuing links with Commonwealth countries, dependency on EEC sources is not expected to increase markedly (30). Although homegrown (garden and allotment) fresh foods production will continue to increase, space restrictions will place a very definite ceiling on the output achievable from this source (62).

Social/Demographic Factors: Present indications are that domestic population will remain relatively static or grow slowly (36). Population drift will at first be away from the major conurbations and then

possibly reverse as the influences of increased commuting costs and fewer employment opportunities take effect (48). Total number of households could see an actual decrease from current levels as wastage of older houses outpaces new construction (25). Car ownership will only see a marginal increase (19) but pressure for the 4-day working week within the industry will continue to mount (52).

Consumer Behaviour: The volume of (pre-prepared) food consumed outside the home will increase (01), reflected in increased emphasis on institutional-type distribution (11). Sales of concentrates (56) are likely to increase substantially but the overall effect on total volume will be comparatively insignificant. Consumers will become 'fresh food' oriented (08) and may tend to develop a 'commodity' rather than 'brand' approach in their purchasing behaviour (45). This will of course be resisted by manufacturers who will fight to maintain their respective brand loyalties. Expenditure on food/grocery products as a percentage of total household spend will tend to decline (07).

Distribution Patterns: The aggregate number of stockholding points maintained by manufacturers across the country will progressively decrease (21), and deliveries direct to retail outlets (09) will increase, at least initially, as large store developments are opened. Foodbrokers and other professional distribution agencies should increase their share of the total distribution task (17) although this is not likely to go above 5%. Non-store shopping from home (14) remains a vague possibility but nothing more than that. The major mode of transport will continue to be road (34), with breakthroughs in electric drive technology expected to confirm this supremacy. Certainly, the notion of inter-city movement of goods via pneumatic pipeline (39), although technologically feasible, remains highly improbable.

Retail Evolution: The currently evident trend towards concentration (43) into a relatively few major retail organizations will continue. There is likely to be 100 superstores (of 50,000 sq. ft. net sales area) in the country by 1984 (32) and a corresponding decrease in the numbers of cash and carry wholesale outlets (35). Previously food oriented multiples will progressively increase their participation in non-foods (22) although they are likely to resist the temptation of opening up a new competitive front by beginning to trade on Sundays (13). Front-end

automation will be progressively introduced into larger retail outlets in the form of electronic point-of-sale equipment (60) and ultimately electronic funds transfer systems, and customer bank terminal systems (20) may begin to appear, but the latter are a long way off. On the trading side, retail buying groups are expected to establish European offices for the purpose of buying EEC produced food (04). However, the practices of in-store 'manufacture' (38) or accepting bulk shipments for later in-house packing will not gain any significant level of acceptance.

Manufacturing Sector: Because of the implications of date coding regulations, manufacturers will step up their efforts to develop ambient-stable products with extended shelf-life properties (02) although there are obvious limits to the extent of this trend. Manufacturers will become increasingly sensitive to the total costs of servicing retail clients and very soon develop sophisticated customer account profitability analysis procedures to monitor these (61). Striving to become more cost effective, manufacturers will move towards greater integration of divisional sales and distribution functions (29) and as a result field sales forces are expected to decline in numerical strength (47). Manufacturers' own account transport will continue to fulfill the major part of the physical distribution task (Supplementary 2) although professional distribution service companies will make some gains in specific areas. More demountable-body type vehicles will be included in transport fleets (33) but will nevertheless be a minor element in numerical terms. Advertising outlay will be increased enough to hold current brand loyalties (31), and research and development activities will continue at a reasonable level (50, 59). However, it is unlikely that manufacturers will go to the extent of integrating forward into retailing through joint ventures (54).

Supplier-Distributor Relations: There are expected to be many interface areas, some contentious, between suppliers and distributors over the next 10-15 years. Quite apart from the trade and professional associations which already exist, specialized pressure groups will emerge to lobby for their respective interests on a highly selective basis (41). Areas of concern to come under focus will be manufacturers' trade terms (44), standard documentation leading ultimately to

computer-to-computer data transfer systems (06), an article numbering system (26) to replace current pricing requirements (12, 18, 37), out-of-hours deliveries (28), delivery lead times (21) and the whole vexed area of unit load systems (15, 46, 51, 55, 57).

The scenario outlined above has many implications for current distribution channel systems in the food/grocery industry. In the following chapter, some attention will be given to several of the more significant changes/innovations which have been forecast. These will be applied to our channel model in an attempt to analyze and anticipate what systemic changes will occur as a consequence, and predict the possible implications of these consequences in terms of supplier-distributor channel relationships.

CHAPTER VII

ANALYSIS & FINDINGS

Background to Research

The research orientation of this thesis developed out of an interest in events surrounding the introduction of cage palletization in the U.K. grocery industry by major retail groups; the divisions which this particular innovation caused were readily apparent. Preliminary work revealed that this was not just an isolated incident; on the contrary, it was yet another manifestation of change and the problems associated with it.

Distribution channels in the grocery industry have been experiencing such pressures for over twenty-five years in the U.K., and longer in the U.S. Initial introduction of the traditional wooden pallet into distribution channel systems by manufacturers some twenty-five years ago caused severe problems in the distributive sector[1]; now it seems the tables have been reversed. The ability to succeed in imposing such large-scale changes obviously implies the presence of power. There appears to be no basis for thinking that similar events will not or have not already occurred in other industries.

The vehicles of change, the innovations which have left their mark on supplier-distributor relationships in the industry, have had varying effects. The exact form of innovation has been a mix of technological,

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[1] The flat wooden pallet was a carry-over from World War II; the U.S. Army were using the pallet for materials handling tasks towards the end of the war. Food and grocery manufacturers realized the potential of this piece of equipment and initially used it for moving product within the confines of the manufacturing facility. Its use gradually spread to outside delivery, and initially caused wholesale and retail customers many major problems; for example, the volume of goods was much higher than distributors were hitherto used to handling and selling. Certainly, they lacked the equipment to handle such large heavy loads. Many smaller independent stores were squeezed out of business about this time and counter strategies from the retail sector included formation of Symbol Voluntary Group organizations and the introduction of Cash and Carry type wholesaling.

institutional, and procedural types.[2]

The effects and consequences of these innovations on the industry have all been significant although to varying degrees; in most cases however, supplier and distributor sectors have held different perceptions about the associated effects. Above all, there seems to be scant evidence of any concerted effort to fully understand the processes involved and 'manage' them through. So, what started out to be an interest in one isolated albeit signficant innovation (the cage pallet), widened in scope to a desire to find some conceptual basis for observed events on a wider front. The conceptual basis provides the necessary element to ensure a reasonable breadth of application, but there is a pragmatic thread woven into the research. It is research of a conceptual nature but with very real practical relevance which makes it the converse of the action research category as defined in Clark's (1972) taxonomy.

Model Validation

Each of the two distribution innovations described in Chapter V will now be used to partially test the capacity of our model to explain observed events and perhaps give an indication of its predictive ability as well. This validation procedure is undertaken on a conceptual plane rather than any detailed analysis of statistical data, simply because it is the best way in this particular case, and in any event there are no feasible alternatives that we are aware of.

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[2] Current and historical examples of these three categories, in no particular order, are given below:

technological	:	unit loads, cage pallets, standard product numbering systems, temperature control equipment for chilled and frozen foods in-transit, increased shelf-life products, packaging developments, ...
institutional	:	self-service, co-operative societies, supermarkets, cash & carry wholesalers, 'shoppers paradise' deep discount stores, hypermarkets, food brokers, distribution service organizations, shared facilities ... .
procedural	:	out-of-hours deliveries, standard invoicing systems, open-date marking, fair trading regulations, ...

Cage Palletization

Simply expressed, the cage pallet is a device for the through handling of product from manufacturer to retailer. Because it has the dual role of transporter (in the actual physical transport leg), and merchandise display vehicle (at the point-of-sale), the module size is obviously a compromise between the larger more transport-efficient flat wooden pallet, and the small fibreboard case unit which has traditionally been used to replenish retail store shelves. In essence, its role was originally perceived to be (by its innovators) that of reducing the number of times a particular product is handled, particularly in the retail distributor's subsystem, because handling at this stage in the distribution channel is labour intensive, and potentially uneconomical.

The model interpreted: What does our model predict about the introduction of such a device? The primary effect from using cage pallets in a distribution system is to decrease the 'variety' present, i.e. goods are being received at the retail distributor's end of the channel (by the ingestor subsystem) in such a condition as to obviate the requirement for any further break-bulk (sorting) activity prior to merchandising onto the point-of-sale display area.

Assuming that the fundamental equation of low variety transformation into high variety is maintained as goods are moved through the channel, the cage pallets' perceived effect of actually reducing the general level of variety at the retail end of the channel has important implications for handling costs.

Through the use of cage pallets, the retail distributor effectively has to manage less variety at the point-of-sale, and herein lies the key to its attraction for this particular channel party. Not surprisingly then it is a device sponsored by retail interests. However, it is also true, by definition, that the cage pallet influences the variety that the retailer can offer consumers.[3] If for example, there is a significant

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[3] Recall that large scale introduction of cage pallets forces product range rationalization unless store size is increased significantly. However, for a fixed store size, product range rationalization of the type practiced by such companies as Asda, effectively means less choice and less variety for the consumer to choose from. There are of course other reasons why such a policy might be pursued.

discrepancy between the variety sought by the consumer, and the variety offered by the store, the store will soon go out of business.

It then becomes apparent that the suggested reduction in variety at the retail level is achieved, at least with the cage pallet innovation, by successfully moving the (variety) difference back up the channel towards the manufacturer.

This shift is manifested in the forms of a lower degree of unitization the manufacturer is forced to engage in, and in the additional activities which have to be undertaken, e.g. control of cage movement and supply of empties, price-marking, and a general fragmentation of traditional packing procedures; these additional activities, as well as the problems of lesser unitization, all carry cost penalties for manufacturers caught up in the usage of cage pallets. However, there is another not so obvious aspect to the cage pallet innovation. Reallocation of the activities referred to above could in fact pose a threat to the retailer. The fact that the manufacturer takes on additional activities hitherto performed by the retailer implies that the former is quite capable of integrating forward in the channel and perhaps taking over all the functions of the retailer. In the extreme case, all the retailer is doing is transmitting unit variety, i.e. variety of a similar level to that which the manufacturer could also offer; he no longer serves as a variety amplifier, and therefore, given certain conditions could in theory become redundant. In such circumstances perhaps the only service that the retailer is performing for a manufacturer is providing outlets for his products.

In the cage pallet example, the additional variety forced upon manufacturers through the reallocation of activities referred to above can only be successfully 'managed' (or absorbed) by adding variety. This may mean developing more complex control systems to cope with the new requirements imposed on the manufacturing subsystem. This action obviously implies additional cost to design, develop, implement and operate such control procedures. It is possible that the forecast introduction of new product numbering systems, and electronic point-of-sale equipment at the check-out[4] will compensate by tending to shift some of

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[4] Recall discussion of Events 26 and 60 in previous chapter.

this functional variety back to the retailer, and in many ways re-instating retailing to its former viability as the major recognized institution for sales to consumers (end users).

In terms of system stability, since by definition the cage pallet is a 'through unit-load' designed to reduce handling by moving goods direct from manufacturers' packaging lines to retail store shelves, any intermediate operations, whether in the manufacturer or retailer subsystems, will be materially reduced. This has the effect of reducing the number of nodes (n) in a given system network. Also, because direct deliveries are involved, the connectance (C) could be expected to increase as more linkages become necessary to sustain the procedure.

Likewise, since the cage pallet mode of operation requires a much higher degree of communication between the parties involved, particularly in the areas of pricing information, order quantities, and delivery instructions, the degree of interaction (S) between the parties also rises, i.e. the degree of interdependency is increased over and above the norm experienced with more traditional procedures. Actually, the manufacturer may be more dependent on the retailer for survival than vice versa because consumers can always choose another brand. Such behaviour leads to conditions which are ripe for the exercise of power, i.e. high S, and relatively lower values of n and c. This aspect will be explored a little further under a separate heading later in the chapter.

Although a number of nodes would be eliminated, the system size (n) would not alter dramatically (presumably remaining comparatively large), and combined with some increase in C and a substantial increase in S, the result would be to push the system towards the instability condition defined by the May-Ashby-Gardner-McMurtrie equation.

Likewise, because the quantities of stock using such a mode of operation requires closer control it is logical to expect that the buffer safety stock factor present in the total system would reduce by some finite but unquantifiable margin. What we are therefore witnessing is a lowering of the system's inherent redundancy and hence its resilience to cope with the onslaught of unexpected external effects which might

accompany industrial relations problems or a break-down in communications.[5]

All the above considerations add up to a system of operation which is more brittle than previously, and one in which the shifts in cost responsibilities are a primary source of conflict and the presence of power to ensure the will of the stronger party (in this case the retailer), prevails. In systems theoretic terms, this means high S, medium to high n, and a relatively higher value of C.

Actual Observed Experience: This aspect has received comprehensive coverage using the case study format in Chapter V but the essential points are worth reinterating in order to facilitate direct comparison with the model's interpretation already outlined.

Leaving aside the motives implicit in developing cage pallets for use in distribution channels, the external effects appear to match up with what our model would predict. Certainly, following recent research (Christopher et al, 1977) there can be no denial that use of this particular vehicle has been successful in effecting an unequitable reallocation of cost responsibilities within the total channel system without a compensatory reallocation of benefits between the respective parties involved. Clearly then, the handling of variety in a commercial context entails costs as well as benefits. Channel parties are unlikely to (willingly) engage in such handling if on-costs are attracted to their particular operation, and even if cost savings (benefits) are initially evident, long term strategic benefits may not be assured.

The Cranfield study (Ibid) clearly identifies a substantial shift of costs into the manufacturing sector and substantial cost savings in the retail sector, the exact extent of which is dependent upon the actual

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[5] A space capsule provides a good demonstration of this redundancy requirement. The systems in such a capsule have a high degree of interdependency or interaction (S). Hence considerable back-up facilities (redundancy) are necessary because if one system fails the consequences would otherwise be catastrophic. This is an extreme example, but it demonstrates the point that nodes in a system with a high S require a comparable degree of built-in redundancy.

mode of physical operation in use.[6] More importantly, the same study (Ibid) quantified these costs and benefits and found that on an industry-wide basis, the costs outweighed the benefits, i.e. there is a net on-cost associated with the use of cage pallets. This finding ran entirely contrary to perceptions prevalent in the industry at the time of introduction, and obviously its implications are of profound importance, e.g. if there is no overall net (productivity) gain, the channel system must either attempt to manage (or absorb) the net on-cost,[7] or pass it along to the consuming public in the form of price rises. Given the current macro-economic climate, consumers could not be expected to tolerate more than marginal price rises before beginning to exhibit brand switching behaviour - consumers as a group have become much more price/value conscious in recent years.

If we accept that historically the core requirement for development of new distribution channel systems and procedures (recall review in Chapter II) has been one of economic efficiency, it is hard to see the cage pallet innovation lasting, at least in its present form. In effect, we are here agreeing with the model's interpretation of a potential increase in system instability to a point where ultimately the distribution system as a whole will no longer tolerate the accumulation of cost premiums, and it will be discarded in preference for a more viable alternative. Apart from this purely economic-based argument, it is also possible to surmise that longer term strategic implications will mitigate against its survival, e.g. the future design of retail stores to meet consumer requirements may not be compatible with a cage type unit load.

On this point it is significant that already, just four years after the introduction of cages, and the massive early forecast projections of cage population, there is clear evidence that the movement has lost

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[6] Tesco's hypermarket at Irlam provides an interesting comparison. For cage pallets delivered direct from manufacturers to this store an acceptable benefit accrued to Tesco. However, where cages were actually filled at Tesco's nearby Winsford depot for onforwarding to Irlam, their use actually carried an on-cost. One implication of this finding would appear to be that nodes may be most cost efficient when they are predominantly unifunctional, i.e. specialize predominantly in one type of activity instead of a mixture of activities and/or functions.

[7] Reflected in a lower profit contribution (or possibly a loss) with cage palletized lines.

momentum and is visibly faltering. Some of its early retail proponents have had second thoughts and are actively seeking alternatives, e.g. Tesco Stores Ltd., J. Sainsbury Ltd.

The alternative to operating the cage pallet as a direct transfer system (from manufacturer to retailer) is to involve a third party.[8] The original expectation was that such companies, acting for several manufacturer clients, might be able to build up enough volume in caged lines in order to justify machine automated pricing and filling procedures and hence reduce or even eliminate any cost penalties evident at the firm level. So far there is no indication this has or is likely to be achieved; on the contrary, the Cranfield report (Christopher et al, 1977) found few examples of cost saving. However, some manufacturers have resorted to this strategy more as a short term measure to help neutralize pressing organizational (and space) problems, and to protect their market share with individual retail customers, at least until the situation is clarified; they have been prepared to pay a premium for this convenience and protection. Obviously, use of a third party interposes yet another node into the system, which for this particular innovation must by definition, add costs to the total system's operation. Again, we confirm our earlier expressed view that the innovation cannot survive in the longer term.

Assessment: Introduction of the cage pallet innovation represented an earnest attempt by a number of major retailers in the U.K. grocery industry to reduce the materials handling costs in their own particular segments of the overall channel system. Because manufacturers perceived from the outset, that their subsystems would carry additional costs as a result of the retailers' actions, they resisted but were nevertheless forced to comply through the application of power by the retailers concerned. Once it had been established that a net on-cost was introduced into the total system and problems of module size incompatibility with existing materials handling equipment became fully obvious, manufacturer resistance stiffened. More importantly, a few retail groups began to entertain second thoughts as to the merits of cage pallet operations in

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[8] Here we have in mind professional distribution service companies in particular.

their own stores. The rate of penetration slowed and is now unlikely to reach anywhere near original (retailer) expectations.

Our model, as demonstrated in the foregoing analysis was able to quite accurately portray events, and even more importantly, explain (and predict) the observed behaviour using the more fundamental and generally applicable language of systems theory. From a strategic viewpoint it is also significant that despite its advantages, the demise of cage pallet usage on any large scale is predicted simply on the basis that system stability would be threatened in the longer term. Ultimately, we would expect that actions will be taken in the industry, possibly in the form of another innovation, which will render the cage as we now know it, obsolete.

The Hypermarket Form of Retailing Institution

As already described, the hypermarket (or superstore) is the latest development in a long history of retail outlet evolution; essentially, it is a large-scale discount operation which is designed to operationalize the concept of 'one-stop shopping'. It offers a large carefully selected range of food and non-food items and operates on reduced margins, relying on large volume throughput and economies of scale to make it a most attractive shopping venue (in price terms) from the consumer's viewpoint.

Described crudely, the hypermarket is a quasi-warehouse institution and in purely physical distribution terms takes inputs equivalent in lot size to an intermediate field warehouse. For this reason retail operators mostly require manufacturers to deliver direct, bypassing any warehouse system the former may maintain. Obviously, as the number of large stores of this size increases, there will be an increasing requirement for deliveries direct from manufacturers' warehouses to retail branches. Despite the apparent drop size economies this tendency towards an increasing number of trips is likely to cause manufacturers concern which they may attempt to reflect in their trade terms.

The model interpreted: Again, using the variety concept in our systems model it is possible to explain what is happening with the introduction of large-scale retail outlets into the distribution channel. If for example, such a store is capable of ingesting a level of variety (particularly in terms of lot sizes) as well as overall volume of inputs

similar to a field warehouse operated by either a wholesale intermediary or the same retailer, there is little point in retaining such a warehouse in the system - it simply serves no purpose. In such a situation, delivery direct from a manufacturer's factory warehouse would seem to be a more effective method although in practice delivery from field warehouses are still retained in many cases for other non-cost related reasons.

The capability to cope with variety of different degrees is really a function of the node size and also the 'bits' of information being processed, i.e. in terms of product range, physical characteristics etc., of the goods being handled. So what is regarded as low variety or high variety is very much relative to the capacity of the particular node under review.

Given that the size of the domestic grocery industry is finite and currently exhibiting little real growth, then as the number of large hypermarkets increases, the effect will be to push small to medium size retail units out of the channel, i.e. each hypermarket will replace several smaller units. In such a situation the total number of nodes (n) in the network will reduce significantly.

If additional links are introduced through the requirement of direct rather than depot-based (indirect) deliveries to retail branches, the system's connectance (C) will quite possibly increase. The strength of interaction or interdependency (S) between nodes involved in a system which has more direct linkages than previously is likely to become more intense. If for example a full load of product does not arrive according to schedule, the retail outlet will most probably suffer a stock-out of the lines involved until the matter is rectified.

Again, as in the cage pallet example, the system's float or redundancy factor is reduced to a point where it becomes brittle and open to severe repercussions unless every part performs up to expectations. To be realistic, this is unlikely to be sustained over any substantial period of time. Taken to extremes, if n, C, and S all increase, at some point a condition of instability is reached - this would be at the point where no more large size outlets could be supported by the consuming population; growth would be suddenly checked if not eliminated altogether. Perhaps even another form of retail outlet would begin to emerge, e.g. non-store shopping (shopping from home using telecommunications), which even now is beginning to appear in some areas in the U.S.

To shift the discussion beyond the confines of the channel for a moment, and into the domain of the consumer, one effect of hypermarkets will be to reduce the variety available for consumer choice. In this situation the hypermarket may be tempted to try and cater for the relatively high variety consumers are demanding and have been used to getting (in the form of product ranges which are both wide and have depth[9]). If this approach is followed the hypermarket can by definition no longer hope to realize the economies potentially available to it as a mass merchandising unit.

Alternatively, there may well be a market opportunity for smaller outlets to open, specifically designed to accommodate that part of the variety requirement of consumers which the hypermarket cannot handle cost effectively. In the final analysis then, it is those retailers who handle variety at significantly higher cost than competitors, who suffer. But there is now room for retailers handling different levels of variety (at a 'higher' cost).

Actual observed experience: In terms of numbers, hypermarkets have not made an auspicious start in the U.K. and the evidence to date is that their full effect has not yet been felt by the smaller store sector. Up to a point manufacturers welcome the larger drop size opportunities, and there is not the same degree of redistribution of activity and costs that we saw with the cage pallet example.

However, as numbers grow, and the demands for direct deliveries continue to mount, a point will be reached at which existing field warehouse facilities operated by manufacturers will be undermined in terms of utilization. The additional trips to retail branches, rather than buffered by an intermediate consolidation point, will add costs, particularly if all these are single trips. More importantly, any perturbations bearing on a system with a high proportion of direct linkages could be expected to pose problems because the system is unlikely to be capable

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[9] The implications of this are clear; many different brands of a particular product, and in addition, a wide range of pack sizes to choose from within each product line.

of recovering its equilibrium before subsequent changes confuse the situation still further. In other words, loss of intermediate buffer nodes makes the system susceptible to break-down because its 'relaxation time' following a perturbation may well be longer than the interval between perturbations.[10]

Even at this early stage in the development of hypermarkets, manufacturers are beginning to question the economies of direct versus indirect deliveries, particularly as existing facilities utilization is seen to suffer in many instances.

Assessment: The model adequately explains the de-emphasis surrounding intermediate stocking locations and the corresponding requirement for additional direct deliveries to large retail stores. It also predicts a finite limit of the growth of such large stores if the industry's total distribution network is to remain somewhere near a stable state; too many such outlets would unbalance the whole pattern of retail distribution and ultimately financial failures might be expected as the market is saturated in various geographical areas of the country even though it may be poorly serviced in others.

The Predictive Dimension

We are now at a stage in the development of this thesis where it is possible to apply our conceptual model to the task of predicting systemic change in the wake of the changes which are yet to occur. Note the primary interest is not one of trying to predict which changes/innovations will occur, but rather, having established what changes are possible and in fact probable, to predict the effects of such change agents on the distribution system as we know it.

Before we can proceed with this task it is first necessary to forecast what changes, and in some cases specific innovations, that might provide the necessary perturbations. For this purpose we employed the Delphi forecast technique; the results of that part of the research are

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[10] This follows the idea proposed by Beer (1974) that "the currently explosive rate of change produces perturbations at intervals that are shorter than the relaxation time of our institutional system", (Ibid, p.59).

fully documented in the previous chapter. A selected number of the 'events' investigated in the forecast will now be examined in more detail, using the model to predict the particular effect of each on the existing distribution channel network.

Event 24: Open-date marking on product packs

This innovation is already in evidence and its diffusion will be rapid once mandatory legislation is passed; the time dimension is implicit and of fundamental importance here. Because of the time strictures imposed on use of the products affected by such a change, the distribution system is clearly placed under pressure to perform in a more time-efficient manner, i.e. as a more responsive dynamic system.

In terms of our model, the parameter which appears to be affected by such a change is the strength of interaction (S) between system nodes, i.e. supplier and distributor nodes. Interdependency is necessarily increased between the existing parties because smoother procedures are mandatory if stock losses and stock-outs are to be avoided. The other parameters of our model appear to be generally unaffected, so the overall systemic effects will be constrained to the behavioural or communicational level as outlined above.

If suitable operational procedures were not introduced by all channel parties we could forsee the level of intra-channel conflict rising as a result of this specific issue. The change itself is not one which, like so many others, tends to disadvantage one party *vis-a-vis* another. In fact, it is an external event, imposed on the channel from an outside source (the Government) and could disadvantage all parties (except the consumer) if cooperative action is not undertaken. The possibility of cooperative action is important because it may override the tendency to use power that has been implied in our discussion to this point.

Event 06: Direct computer-to-computer data transfer systems

If and when such an innovation does come, it is likely to be retailer sponsored although in this particular instance the initial capital investment is extremely high and the magnitude of the financial returns still uncertain.

In terms of our model it is clear that should direct communication facilities be introduced linking every supplier with every major retailer

in a more formalized manner, the level of variety (in terms of 'bits' of information) flowing in both directions may well increase. However, computers by definition have the additional in-built capacity to cope with such an increase.

The idea of a variety increase has important implications which have not been fully developed to this point. In particular, there is implicit in the 'event' being discussed here, a more intensive use of instruments (computers) to attenuate variety.[11]

The number of system nodes (n) may not be affected but this type of arrangement will tend to increase the connectance of the overall network. The strength of interaction (S) of parties may well decrease as the personal contact level diminishes, and flexibility will also be reduced because of the discipline seemingly required to operate such a formal method of communication.

Again, the time factor is implicit in the motive for introducing such a change, the belief being that the faster, more accurate relay of information in both directions up and down the channel will benefit all parties concerned. The difficulties in implementing such a change, quite apart from the high capital investment requirements, are seen to be very great because at the core of the concept is the requirement for standardized procedures, documentation, and internal systems. In an industry of this size, and judging from past experience, the chance of acceptance would seem to be slim, at least on any large scale.

Perhaps the most important implication of a procedure which accelerates the transfer of information to the extent suggested here centers about the effect on the distribution system's relaxation time. For example, it might lead to service demands on the manufacturing sector (by the retail sector) which are simply too great, and even if attainable, certainly very costly. One spin-off effect to compensate for such a situation could well be the stimulation and growth of third party distribution service companies who might function to provide buffer stocks (in addition to the functions currently performed such as breaking-bulk, price-marking, and transportation).[12]

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[11] On the other hand we should also recognize that a situation in which low variety is present might in the same way stimulate the introduction of variety increasing mechanisms.

[12] This is actually happening now in Australia with certain over the counter pharmarcy lines (and a number of ethical drugs as well). The number of nodes in this particular network is known to be very high.

Event 26: Article numbering, machine readable symbols, and electronic point-of-sale systems

Again, the initiative for such an innovation is likely to come from the retail sector, for despite initial set-up costs (mostly expenditure on computerized check-out equipment), there is the potential for productivity gains due to faster through-put of customers, the elimination of 'under-ringing' of prices at the till, and a smaller percentage of losses through pilferage. The system will also facilitate other useful byproducts such as continuous inventory control, automatic reordering procedures, and a wealth of information on sales patterns by product groups and even individual products if required. Presumably too, it will enable fine tuning of marketing strategy, e.g. less national, more regional advertising, more selective point-of-sale promotional campaigns, price cutting etc.

From the manufacturers point of view, this innovation is extremely welcome because it largely removes (depending on extent of application across the industry) the current requirement to price-mark individual products, a most costly activity.

The innovation being discussed here is, as the previous one was, a variety attenuator - in terms of handling variety. The distribution function *per se* is primarily concerned with handling variety whereas the retailer is concerned with 'matching' variety, i.e. his variety *vis-a-vis* the consumer. Therefore the way in which the distribution system handles variety may attenuate the variety the consumer wants, and may, in the long term, be counterproductive for a particular manufacturer or intermediary.

In terms of our model, few of the major system parameters we have pinpointed are affected by what is essentially the retail sector removing from the manufacturing sector, the requirement to price-mark. It will be recalled that this price-marking requirement which has existed in the industry for some time, is a manifestation of the power brought to bear by one channel party over another, i.e. the presence of a high degree of interdependence (or interaction) S. Removing, or at least reducing , that area of contention can only improve supplier-distributor relationships, and made for a better climate (lower S) in which co-operation of a more voluntary nature may flourish.

From the retail subsystem point of view, the introduction of this innovation will increase the flexibility of operation. Over the total distribution channel system, greater stability of operation could be expected on the basis that the strength of interaction (S) between parties would tend to reduce and possibly connectance (C) also because of the relatively fewer instructions reaching manufacturers from retailers.

Event 11: Growth in institutional distribution

If the pattern of food consumption alters in favour of pre-prepared take-away convenience foods at the expense of the volume of food currently prepared and eaten in the home, then some alteration in distribution networks might be expected. This change, if it developed into a perceptible shift, would almost certainly be brought about through the action of consumers themselves who are a key influential in the environment.

It is quite apparent that new distribution channels and therefore additional nodes would have to be established to cater for any substantial growth in this segment of the market. Specialised intermediaries would almost certainly be required to absorb a given level of variety from suppliers, and to not only sort this and increase variety, but possibly process the food to a condition where it is ready to be served hot. This would bring a new dimension to the functions and activities already performed by channel parties. Time would be important in this situation as well as a high degree of interdependence and co-ordination between retail outlet and intermediate processors.

Expanding further on some of the points being made above. On the one hand we have rigidly connected high capacity links to serve hypermarkets, and on the other, a growing take-away sector which needs to be serviced, e.g. MacDonalds, Kentucky Chicken etc. This implies an increase in system size (n) as nodes are added, but a fairly low capacity through each node. So either the new system is run in tandem with the 'traditional' system (which is basically set up to handle a lot of low variety or big capacity throughputs), or else intermediaries again emerge (but this time with different 'functions' to the old style wholesaler).

Event 03: Government sponsored break-bulk centres

This innovation, apparently thought to be highly improbable by the Delphi panel, is well suited for testing by our model because it is itself a system node. The function of such a break-bulk or redistribution centre located at the edge of a large commercial centre would be to

eliminate the movement of large trunking vehicles into town centres. Even on this basis it is a precarious concept because the actual number of (smaller) vehicle movements involved would probably be greater than before such a centre was established, hence congestion may in fact rise.

Using the variety concept again, it would seem that such a centre could only add to the cost of distribution. Manufacturers capable of delivering a given level of variety to retail stores or their own warehouses would be faced with delivering a similar level of variety to the redistribution centre. In other words, such a centre would serve no apparent cost effective purpose - rather, establishment of such facilities would have to be on political grounds supported by environmental considerations, and would almost certainly be of dubious economic value.

Because such facilities are fundamentally indefensible in strictly distribution channel terms, we concur with the panel's judgement that the concept is unworkable. If a series of these centres were introduced across the country our model would predict unacceptable levels of stock, (high redundancy) and a loss in time-responsiveness of the total system. This is the other extreme to having a distribution system operating on a fully direct delivered basis with few if any intermediaries. Neither extreme is thought to be acceptable or feasible for viable continuity of the industry's distribution network.

Event 02: Ambient stable foods

The development of food products with greater shelf-life properties than are currently available has important implications for system flexibility. Provided consumers do not undermine the movement on the grounds of lack of apparent 'freshness', specialist facilities used in the storage and transport phases of distribution should be reduced, releasing capital for use elsewhere. Simplicity would be enhanced and delivery frequencies could be reduced, with drop-sizes increased correspondingly.

Overall stability of the system could be expected to increase as specialist nodes (n) were reduced, connectance (C) reduced as a result, and interdependence (S) becomesof less concern. In addition, time and therefore cost pressures on the system would diminish as a direct result of the lesser urgency associated with longer life products and the lower probability of stock wastage.

Benefits from this development would largely be retained in the manufacturing subsystem. There would be additional costs entailed in the retail subsystem, and it may be difficult to persuade retailers to accept what is effectively a lower frequency of service and the possibility of having to carry additional stocks as a result. Herein lies the potential for a conflictful situation even though we have outlined above system properties which by their direction of tendency are actually setting or moulding the conditions for more co-operation, i.e. lower values of n, C, and S.

Event 22: Growing emphasis on non-foods in food retail outlets

Entry into new non-food areas is an emerging feature of retailing in the U.K. food/grocery industry. Profit margins have steadily been eroded in the food sector by a high level of Government prices constraint, and opportunities for achieving compensationary gains appear to exist in the non-foods sector. The ability to stock and sell non-foods is closely related to the development of large hypermarket style stores and much of the reasoning applied to that particular case study is equally valid here.

There are however some additional factors which involve parameters in our model. In particular, this trend poses a danger for food/grocery manufacturers who in effect would witness some considerable erosion of their own importance to retail customers. At the same time, with a whole new set of manufacturing and/or wholesaling nodes to deal with, the total distribution system is growing considerably in scope, i.e. n is increasing. The trend towards non-food operations by previously food oriented retailers suggests a tendency towards department store style operations. In turn this would probably lead to specialization in either food or non-food, with new retail opportunities emerging.

There is obviously a balance between foods and non-foods to be sought. One consequence of going too far with the current trend would be to adversely affect the manufacturing subsystem of the industry as we currently know it. If this became a real possibility there would obviously be counter actions from the manufacturing sector and a corresponding deterioration in supplier-distributor relationships.

Event 17: Growth of food brokers and other third party professional distribution agencies

The justification for this type of distribution institution hinges solely on the economies of scale principle, i.e. the idea of accepting a certain level of variety as inputs from a number of clients, and sorting and consolidating this in order to effect an economic coverage of retail outlets. In the U.K., as elsewhere, foodbrokers also have the important additional roles of sales and merchandising, especially where they represent small and medium size manufacturers in geographically isolated markets such as Scotland.

Using our model, it would appear that the potential for large scale growth of third party operators is limited because the injection of another party and extra nodes into the network, and increasing connectance, is unlikely to be sustainable on several grounds, e.g. the variety equation is not necessarily maintained, time-responsiveness of the system is adversely affected, and total stocks in the overall system would probably rise to unacceptably high levels, i.e. high redundancy.

We would predict that if these types of agencies were to have a chance of significant penetration, there would by definition have to be a corresponding reduction in intermediate field warehouse facilities operated by manufacturers and (to some extent) retailers. In this way they may be able to fulfil the variety criterion and avoid pushing the system towards instability. In effect, major manufacturers (rather than the usual case of smaller manufacturers) would need to use these agencies for a major part of their output, almost as if they were part of their own distribution sub-system. This is unlikely to occur so their role will remain a secondary one.

Event 28: Out-of-hours deliveries

This innovation, tried once and failed, is now a real possibility, given conditions[13] have changed considerably in its favour over the last five years. Deliveries would either follow a single drop or multi-drop configuration depending on size of stores being serviced, most probably

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[13] Cost pressures are now much greater. Manufacturers have seen their profit margins squeezed by inflation and Government prices controls, and are therefore prepared to look more closely at areas of potential saving, even if previously tried and failed.

a mixture of both, e.g. single full load deliveries direct to large out-of-town stores, and multiple drops of a lesser size to smaller supermarkets located in the High Streets.

This innovation appears to do nothing which will react adversely on the key system parameters of stability, redundancy, variety etc., and that is worth knowing. Even though no intrinsic disadvantages are immediately evident, the possible implementation of this innovation is complicated by political and environmental (mainly noise) considerations, especially where retail stores are located adjacent to residential areas.

The economies mainly accrue to the manufacturing subsystem and some additional costs are likely in the retail subsystem in the form of maintaining a receiving labour force at each store. Hence, we are again faced with potential conflict between suppliers and distributors over the allocation of costs and benefits across the whole system. Manufacturers would be expected to encourage retailer participation in the scheme by offering concessions reflected in revised terms of trade.

Event 29: Intra-company integration

This change, which mutually includes Event 21 (i.e. a reduction in manufacturers' stockholding points), will mainly be initiated within the manufacturing sector as economies in operation at the national level are sought; it is potentially a very promising area of productivity gain. The principal consideration will be how far can this rationalization be taken before dysfunctional effects begin to surface, possibly in the form of lost sales and therefore lost revenue. Most manufacturers have considerable slack (or redundancy) in their current systems, and some of this can be taken up, but in order to retain a reasonable degree of flexibility some portion of this slack should be retained. Just exactly what level this should be will vary between individual companies based on their current mode of operation, general operational philosophy, and corporate objectives.

We would expect the number of nodes in the manufacturing subsystem to decrease and the degree of connectance with retail outlets to do likewise - both of which are acceptable because the trend is towards simplification of the total network. On the other hand, retail customers will be on guard to resist any suggestion of lesser service levels than are currently enjoyed.

All the improvement will therefore have to emanate from within the manufacturing subsystem without changing the *status quo* perceptibly, at least not suddenly. A gradual change may have a better chance of succeeding if the wish is to retain market share with lower service levels.

Event 09: Direct versus indirect deliveries

The question of direct versus indirect deliveries from manufacturers to suppliers is a vexed one and as pointed out in the cage pallet and hypermarket case studies (Chapter V), is closely related to variety levels. We would expect that competitive, time, and even economic considerations, will always support some level of direct delivery system, but the optimum balance between direct and indirect must be found otherwise manufacturers will begin to attract cost premiums; most manufacturers are aware of this although unsure where the proper balance lies.

To date, the state of the art in distribution costing has not been advanced enough to allow a full analysis of the costs/benefits involved, or the trade-offs possible, given certain interacting variables. Our model would predict that if the trend to direct delivery is taken too far, flexibility of the total system will suffer, and unnecessary time pressures will push the systems towards an unstable condition with possible dysfunctional consequences for all parties.

Event 33: Demountable - body type transport vehicles

If retailers and manufacturers begin using more of this type of vehicle, some benefit in terms of fewer fixed warehouses can be expected, i.e. these vehicles will actually be mobile warehouses. This event is related to the idea of out-of-hours deliveries because it may be a way of obviating the need to retain receiving staff at the retail outlet. Given that such an innovation would increase facilities utilization, and being mobile, the increase in system flexibility it allows is potentially very promising.

Summary

The general thrust of changes forecast to impinge on the U.K. grocery industry, and the distribution system within it, have already been outlined in the scenario at the end of Chapter VI. However, it is perhaps pertinent to comment on a few of the events singled out for scrutiny in the above section.

There are already visible signs that the continued search for faster information transfer and processing, coupled with a general desire to reduce stockholding levels across the industry is going to bring problems. Seemingly, it is not possible to have both because the system's time-responsiveness will very likely not be able to cope. The continued trend towards concentration in the retail sector, and rationalization of field warehouse facilities by manufacturers, points towards a lesser number of nodes in the future.

However, with fewer, larger ordering/delivery points, the interaction between dominant members of the retail and manufacturing sectors is likely to remain high and therefore conflict on important issues may still be expected. The actual level of conflict will very likely be accentuated in times when one industry sector is attempting to introduce an innovation which does not, or is perceived not, to result in a equal sharing of costs and benefits throughout the length of the affected channel.

Factor Analytic Evaluation of the Environment

Helmer and Gordon (cited in Mandanis, 1969, pp. 163-164) in their work on the Delphi forecast technique, pinpointed several areas of potential improvement, and recommended "development of techniques for the formulation of sequential questions that would probe more systematically into the underlying reasons for the respondents' opinions, in a deliberate effort to construct a theoretical foundation for the phenomena under enquiry".

We are here not concerned with the development of new forecast techniques, but it would be most useful to gain some understanding of the underlying reasoning brought to bear by the industry panel and used to develop the scenario outlined in Chapter VI. We regard this part of our research as a very worthwhile contribution towards assessing the future environment the industry faces, not in terms of the visible scenario already offered, but in terms of a few key underlying parameters not so immediately evident.

In our view this is a much more useful interpretation of the possible future environment, acknowledging of course that extensive planning is still necessary in order to permit managements to

'influence' their future rather than just merely follow and react to it as it unfolds.

In order to arrive at a reduced number of abstract variables we factor analyzed[14] the probabilities supplied by the panel in Round 2 of the Delphi forecast. We used this particular stage of the forecast because whereas the estimates offered in Round 1 may well have been fragmented, and those in the final round somewhat biased and constrained by feedback, Round 2 was expected to exhibit some pattern and yet still display a relatively wide spread of opinion.

Our expectation was that a factor analytic approach would not only identify a reduced number of abstract variables, but also offer "... a weighting of observed variables according to structural indications in the data itself", (Cattell 1971, p.174). Results of our factor analysis (in the form of a factor matrix) are set out in Appendix M.

Factor Analysis

The factor analysis program used to obtain a multiple factor solution of the data was from the SPSS library,(see Kim, 1975). The factors were 'rotated' according to the VARIMAX criterion which attempts to maximize the variance of the squared loadings in each column of the factor matrix. The computational formula is as follows:

$$V = {}^{n}\sum_{p=1}^{m}\sum_{j=1}^{n}\left(\frac{a_{jp}}{h_j}\right)^4 - \sum_{p=1}^{m}\left(\sum_{j=1}^{n}\frac{a_{jp}^2}{h_j^2}\right)^2$$

where V = contribution of the common factors to the total variance of n

m = number of common factors

n = number of variables in the set

a = factor loading or 'uniqueness' of the variable, i.e. the extent to which the factors fail to account for the unit variance of the variable

h = the 'communality' of the variable, i.e. the sum of squares of the common factor coefficients

j = variable 1, 2, ... n

p, q = common factors 1, 2, ... n

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[14] Broadly, the factor analysis technique "... is meant to help one see the grouping or structure in data containing a large number of variables," (Ehrenberg & Goodhardt, 1976, p.1.)

This process is designed to resolve an n × n correlation matrix into an n × k factor matrix where k, the number of factors, is usually much smaller than the number of variables. The factor matrix (F) is such that when it is multiplied by its transpose (F'), the correlation matrix (R) is reproduced,

$$\text{i.e. } R = F\,F'$$

The Solution: In the rotated varimax orthogoral solution (see Appendix M), 14 factors accounted for 100.0% of the total variance; the first 3 factors accounted for 48.1%. The 14-factor solution result was entirely due to the program itself which is designed to cease computing once the eigen value (λ) falls below 1.000.

Solution Interpretation: The factor solution can be interpreted in two ways:

1. By noting the variables that have substantial loadings (positive and negative) in common on a particular factor and contrasting these variables with the remaining variables that have low or zero factor loadings on that factor. In order to explain or describe the factor, it is necessary to conceptualize what those variables with high factor loadings have in common in a distribution system sense. This interpretation will be necessarily speculative even though based on theoretical and/or empirical grounds.
2. By inspection, finding variables that have a high factor loading or one factor only, and a low or zero loading on other factors.

Under this second condition the variables that are high on one specific factor and low on the other factors, cluster together in 'n' dimensional space. This clustering would indicate that those particular variables are closely related and thus 'simple structure' is exhibited. Once again, the 'clustering' is explained in terms of what the variables have in common in a distribution system sense. Often, in this form of cluster analysis, there will be more clusters than factors or alternatively, fewer clusters than factors; in our case it is the latter.

The two methods outlined above are not mutually exclusive. According to Cattell (1965, p.423), "... factor analysis and cluster type analysis ... are mutually necessary for effective description and measurement".

Findings

If we follow the first approach outlined above, the 14 factors (or dimensions) could well be labelled as follows:

Factor	Description
1	Planning - system size
2	Flexibility
3	Vested interests - interdependency
4	Technology
5	Own-label emphasis
6	Unitization degree
7	Stock redundancy level
8	Regulation - ground rules
9	Commodity (versus brand) emphasis
10	Time
11	Productivity
12	System time-responsiveness
13	Research and development
14	Diversification

Similarly, by following the second approach outlined above, it is possible to determine the existence of at least 5 clusters; again these have been selected by inspection and are listed below in component form, i.e. in the form of the events (specified by their discrete number)[15] which constitute each cluster.

Cluster 1: 24 Open-date coding
29 Divisional integration by manufacturers
32 Number of superstores
35 Cash & carry wholesaling
43 Retail sector concentration
47 Manufacturers' sales forces
49 Superstore planning permissions

Cluster 2: 17 Foodbrokers and other agencies
28 Out-of-hours deliveries

Cluster 3: 11 Institutional-type distribution
41 Manufacturer and retailer lobbies

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[15] Refer back to Chapter VI for full descriptions of each event included in the clusters.

Cluster 4: 18 In-line pricing of own-label products
33 Demountable - body vehicles
Cluster 5: 46 Cage pallets
57 Alternative to traditional pallet

Taking into account each of the above cluster's component elements, we have labelled them as follows:

Cluster 1 Planning
Cluster 2 Flexibility
Cluster 3 Vested interests
Cluster 4 Mechanization
Cluster 5 Productivity

As already indicated, Appendix M is a tabulation of the various factor 'loadings' to emerge from this analysis. In effect these loadings are the coefficients in the equations expressing the observed variables in terms of the new factors. With uncorrelated factors such as these the 'loadings' are also the correlations between the factor variables. We have however also included the full correlation coefficient matrix for the 43 variables used in this analysis to demonstrate that the correlation between components within each cluster is satisfactory, (see Appendix N), i.e. virtually all the relationships identified appear to be feasible in practice.

It is encouraging that most of the key systems parameters that have been introduced and developed throughout this thesis (e.g. system size, planning, time, interaction - interdependency etc.) appear at some stage in the foregoing factor-cluster analysis. This would indicate that the expert panel, in making their various forecasts as part of the Delphi exercise, appear to understand more about the nature of their future operating environment than we had hitherto given credit for. The panel are apparently seeing adaption to future system changes in terms of:

- greater concentration, i.e. fewer system nodes, more richly connected, (higher C)
- the requirement to be flexible
- a continued emphasis on efficiency, productivity, and accountability
- less relative uncertainty because ground rules are being spelt out by Government, therefore making planning more feasible.

Since our discussion has shifted emphasis towards environmental considerations, it is significant that the results of the factor analysis tend to indicate a form of organization strongly indicative of a Type III environment. In effect, the panel appears to be forecasting a return to Type III environment conditions in the years ahead.[16] This is an encouraging sign because planning will become much more meaningful than has been the case during the last few years of (turbulent) Type IV environment in the U.K.

Certainly, in a Type III environment, life is much more predictable because the ground rules within which we operate remain fairly constant. These ground rules can be in the form of government legislation, health and quality regulations, etc. It is therefore more feasible to plan under such conditions. Nevertheless, the environment is still very competitive and dynamic, and competitors in the market place still have to be concerned with what each other are doing. Consequently, market share is of great importance.

In a Type IV environment such as we appear to have been experiencing, the primary characteristic is a high degree of relative uncertainty - so it becomes exceedingly difficult to plan because events occur which the system has simply not anticipated. This happens because the 'ground rules' have changed due to the very agitated state of the environment; the system is buffeted on all sides.

Clearly, some items and some clusters in the analysis indicate that the panel forsee changes outside the distribution system affecting its future, e.g. E.E.C. regulations, food standards, environmental issues etc. One of the inferences we can draw from this work is that in looking at any specialist area of operation we should always view it in a wider environmental context. Previous workers have tended to concentrate on either the system or its environment, but the link has largely been ignored except for the work of a few, among them Glaser (1976), Emery and Trist (1965) and Emery (1967).

This particular part of the research programme has given some useful insights into the bases used by Delphi panelists for their various projections; it has given us some understanding of the 'dimensions'

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[16] This conclusion tends to be in line with what is happening in Australia although the rate of return to Type III in the U.K. appears to be slower.

participants have subconsciously applied to their various opinion based assessments. The results turned out meaningful and well because a considerable overlap between this subconscious model and our own heuristic model is evident. For example, structure in terms of numbers of nodes is clearly included, but of particular interest is the time element, (the dynamic dimension) which is very much present in both models. This may on the surface appear to be a trivial finding but in fact it is significant, seen in the perspective of many previous social science models which largely ignore time and are therefore static or at best 'comparative static'.

It would be fair to add however, that the social sciences suffer from the problem that dimensions or potential dimensions are cognitive rather than basic or fundamental in character. So if, as is the case here, the Delphi technique is simply used as a measuring device we still have to try and delineate what the key dimensions are which best describe the underlying reasoning supporting the judgements being made. We can only do this subjectively.

Relationship of Catastrophe Theory and Linear Forecasting

Whereas the Delphi forecast predictions yielded results which appear to be based on a subconscious model of the world using 'continuous' behaviour as a principal assumption (e.g. simply extrapolating existing conditions into the future), unexpected 'discontinuities' are generally not allowed for; this is the weakness of all linear forecasting techniques.

Examples of this condition are the 1973 world oil crisis and the more recent electrical black-out in New York. In both cases, the actual events were unpredicted, but examined in retrospect it is evident they were caused by a combination of seemingly low probability factors coming together at one time.

The lesson for management is clear; forecasting techniques must now be sought which will make at least some allowance for low probability events and the 'search technique' introduced by Emery (1976) goes some of the way towards achieving this. We can no longer automatically expect continuous type forces to result in continuous type output behaviour - the subtle less visible events have to be sought out and evaluated.

In this respect, 'catastrophe' theory outlined in Chapter III is a good general model to begin this new orientation with, because it will be possible to study a number of key parameters in three-dimensional

space and assess if the directional tendency of each is likely to result in a catastrophic and sudden loss of system stability. Measurement of such parameters is not as important as the direction and magnitude of movement, i.e. the vector.

Behavioural Explanations

One of the major criticisms levelled at channel theorists in Chapter II concerned the way in which the behavioural factors of power, conflict, co-operation, and control have hitherto been developed, i.e. in such a way that they appear more as manifestations of certain as yet ill-defined pressures rather than derived quantities in their own right. In addition these important behavioural parameters have largely been developed in isolation without drawing attention to the inter-relatedness that is so necessary if we accept the proposition that distribution channels are a form of 'open' system.

Our model however, with its various heuristics, is an attempt to delineate certain structural or organizational conditions which must be present before for example, power becomes a viable strategy. For the purposes of this discussion we will restrict our attention to the behavioural dimensions of power and control to demonstrate our particular approach.

Power

"Marketing activity (including channel transactions) within a channel system involves a power relationship because the interaction which defines a system implies that the behaviour of one or more members depends to some extent upon the behaviour of others", (Dixon & Layton, 1971, p.315).

There is little doubt that power exists but we consider it more fundamental to establish the appropriate conditions in which it does or does not exist, or should or should not exist. Where therefore we find perceptions of power and the conditions do not appear to be appropriate, we might conclude that there is only perceived rather than real power present. In terms of our model, a high S (interaction) value is necessary to ensure the presence of power; it is not necessary for connectance (C) to be high, and the number of nodes in the system may well be relatively low.

Our whole approach then depends on the proposition that some particular structural arrangement (or pattern) within a channel context will be more or less amenable than other configurations to the actual presence of, and management of, behavioural parameters. Therefore, if it is conflict which we are concerned with, there should be a particular structural arrangement which will more readily facilitate its emergence and/or resolution than other alternatives.

If a particular channel is short (in spatial and temporal terms) as is the case with direct deliveries from manufacturer to retailer, then power considerations are extremely important. There is no intermediary buffer zone and the two end parties do not have the easy options of simply leaving the channel if either is dissatisfied with the way things are going.[17]

In such a situation, manufacturers become more dependent on their retail customers, and the latter's relative power increases, i.e. S is high. As volume of sales to a particular retailer increases as a proportion of a particular manufacturer's total output, dependency increases and correspondingly, flexibility to pursue alternative courses of action is reduced. At the same time, the potential for the system to suddenly become unstable, increases.

Control

Control is difficult to achieve in a system. If for example, the number of nodes is large, the connectance (C) is low, and strength of interaction (S) is high for small groupings, and the system is open so that parties may leave or enter, it is difficult to control events to any degree whatsoever. In essence this is how urban guerilla units work, and this is exactly why they are so difficult to contain let alone eradicate.

But, if n is low, C is high, and S is also high, as in a typical village community, control is easier to achieve because of the uniformity

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[17] The point being made is worth expanding on. If a particular manufacturer has a high S value in one channel linkage with a retailer, but is also connected to a large number of other retail customers in a large system (high C, high n), there exists the opportunity to EXIT the channel despite the exercise of power by the (first) retailer concerned. However, in a situation where there is high S, low C, and low n, the only way out as already suggested in the text above is to leave the system or else begin to build up C and n with a view to achieving a position which will give the option to shift channels in the longer term.

and homogenity present. When this type of social structure is departed from, problems of control begin to surface. Most distribution systems for example have a relatively large number of nodes, although C and S may be either high or low depending on the particular circumstance under review.

Conclusions

In this chapter we have attempted to pull together the various mainstreams of logic which have been separately developed up to this point in the thesis, and demonstrate how, in a conceptual sense, the series of heuristics developed in Chapter III can and do offer plausible 'explanations' as well as 'predictions' about the effects of innovative change in distribution channel systems. It is important to realize that it is not necessary for all heuristics to apply in all cases - different combinations will suffice depending on the type of change being investigated.

Our findings tend to confirm the importance of stability considerations in systems subject to the action of change agents. This is so because the type and extent of structural 'rearrangement' which occurs will largely dictate the effects and consequences to follow.

In particular, a situation where the strength of interaction (S) between channel parties is high, can, given the existence of certain other structural conditions such as medium to low connectance (C), and medium system size (n), lead to the exercise of power by one party over another to force acceptance of a particular innovation.

Resistance on the part of the receiver paves the way for a relationship which contains a fair degree of conflict, and may if sustained, be to neither party's benefit in the longer term. Armed with a knowledge of how various combinations of n, C, S, and other system parameters may influence system behaviour and performance, we are now in a better position to understand and anticipate the systemic implications of future distribution innovations.

In terms of the viability of nodes within a given network, 'variety' is the guiding concept, e.g. it is now possible to predict whether or not a new intermediary node is likely to be viable or not, simply on the basis of what change in variety is achieved through the node in question. If there is no change, the intermediary may well disappear in time because no apparent purpose is served by its existence. We regard variety as a very powerful concept and one which is likely to be of great use in developing channel theory in the future. Currently it is only present in the literature by implication, i.e. in the notions of breaking-bulk and to a lesser extent, customer service levels.

Finally, our coverage of environmental considerations in this chapter has purposefully been more detailed than originally intended because it became clear in the course of the research that it is essential to postulate some sort of structure of the wider environment if there is to be any chance at all of understanding and predicting the sequence of events subsequent to innovation introduction. The environment is a vital source of system influentials.

We will now proceed to summarize and draw conclusions for this entire undertaking.

CHAPTER VIII

CONCLUSIONS

Initial interest in innovation and particularly its effects in a distribution channels context, developed out of recent events observed in the U.K. grocery industry. A number of innovative type changes were sponsored and promoted by retail interests and met with widespread opposition in the manufacturing sector. Preliminary indications were that this situation was not atypical and that further investigation was warranted because of the wider implications for theory and practice.

However, any study of the effects of innovation has necessarily to be preceded by a careful re-examination of existing channels theory. In this regard, although several mainstream conceptualizations of channel mechanisms could be identified, each with its own particular contribution to the cumulative body of knowledge on the subject, a number of deficiencies were also evident.

Most existing 'theory' relating to channels is of a descriptive nature and consequently lacks explanatory power and therefore predictive value. Despite the strong economic bias running through the literature, many concepts tend to lack an overall sense of integration (e.g. the mechanistic with the behavioural elements) and there still are very real problems of measurement, particularly where cost functions are involved. Strategic type considerations are generally overlooked, and very little attention is given to the implications of different structural patterns within a distribution network. There appears to be a pre-occupation with solving problems in isolation without due reference to any overall framework to relate these to. These early findings have tended to alter the nature of the research task to one of seeking a new conceptualization of distribution channels which will, among other things, facilitate an improved understanding of the sequence of events in a channel subject to innovative pressures.

Systems theory was chosen as the vehicle of the proposed new conceptualization because of a conviction that because distribution channels are in fact networks, they should therefore be capable of description in system theoretic terms, albeit in the more fundamental language drawn from a range of disciplines already at an advanced stage in the use of systems concepts. The sub-task becomes one of identifying and extracting

the pertinent concepts, and at least beginning the process of building the necessary bridges between theory and practice to bring a new orientation to channels thinking.

Channels are conceptualized as a network of nodes, linked together in various structural configurations, and exhibiting varying strengths of interaction (the behavioural factor). Although nodal points are generally seen as institutional facilities, each is expected to perform a range of functions (and activities within those functions) and handle different degrees of 'variety' according to their locational circumstance within the network. Note that the systems approach emphasizes organization, and treats institutions, functions etc., as subsidiary considerations.

The real significance of model parameters such as system size, connectance, strength of interaction, variety, redundancy, capacity, flexibility (resilience) etc., aside from their actual identification as usable concepts, are their respective orders of magnitude and directional tendency (either increasing or decreasing). Because we are working at the conceptual level, these vectorial properties are more relevant than a detailed knowledge of the absolute values involved. Measurement requirements are therefore of lesser concern, at least in the early stages of theory formulation.

In addition to a conceptual basis for explaining and predicting the build-up of conditions tending towards an unstable state, application of the guiding principle of 'variety', originally developed by Ashby, is regarded as one of the central contributions of the thesis. It has been possible to identify physical and functional forms of variety, but there may well be others. Certainly, the variety principle is worthy of further exploratory work.

Managing the variety present in a distribution system, whether in physical or informational terms, is what company executives are constantly attempting to do although seldom recognized as such. Of particular relevance in this context is the apparent capability of technological developments (i.e. innovation) to alter variety levels previously operative at specific points in a particular channel, e.g. at the retail end of the channel, the cage pallet may tend to reduce

assortment choice available to the consumer.[1]

However, it is also possible that even in a situation where variety is apparently being 'managed' satisfactorily, the subject system may in fact still have a tendency towards instability. In the extreme case of possible sudden system collapse, 'catastrophe' theory provides a useful indicator of when the system is entering a potentially dangerous behaviour zone.

The relevance to innovation of the various concepts embodied in the model presented here now becomes clear - any innovation introduced into a channel system, irrespective of its source or method of entry, will have an overall effect on channel behaviour consistent with its effect on the constituents of the model, considered individually and in combination. The type of evaluative logic which may be used in assessing the impact of a particular innovation has already been demonstrated in the previous chapter. Unlike the largely intra-organizational orientation so characteristic of much of the existing innovation literature, the model developed here is operative in an interorganizational perspective.

Although the theory incumbent in our model appears to be generally consistent with observed behaviour, there are nevertheless several caveats which should be aired. The model is purposefully general in scope and as such will not necessarily 'explain' every instance of varying channel behaviour. The concepts incorporated in the model remain largely untested in any operational sense and therefore await further validatory work. Finally, measurement of some parameters, although measurable in theory may well prove difficult to achieve in practice. In general, it is conceded that much work still remains in order to refine the raw concepts introduced here, and to achieve a greater degree of integration between these concepts. Future research efforts could profitably focus on these areas.

However, despite the acknowledged deficiencies of our model, it is now possible to offer plausible explanations (anchored in a viable conceptual framework) for observed behaviour in distribution channels which are subject to the pressures of change in the particular form of innovation. In turn, this new capability has important strategic implications for on-going intra-channel relationships.

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[1] If this does in fact happen, it is possible to predict that certain events may follow on as a direct consequence. In effect we are saying that in order to meet and match the level of variety that consumers demand, it could be that certain new forms of retailing first have to emerge.

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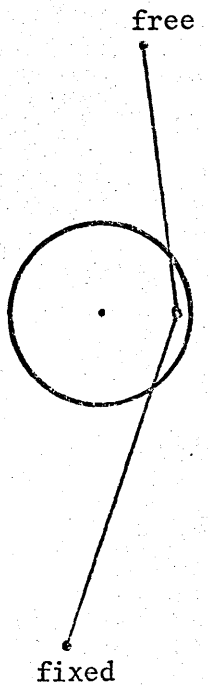
APPENDICES

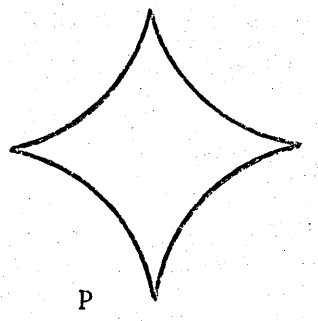
APPENDIX A

A BRIEF BACKGROUND TO THE THEORY OF CATASTROPHES

(Abstracted from "The Magnificient Seven: An Introduction to Thom's 'elementary castrophes'", in Manifold, 14 Spring, 1973, pp.6-13.)

The Zeeman Catastrophe Machine illustrates the principles on which the theory is based. Consider a pivoted disc as sketched below, to the edge of which are attached two elastic strings. The end of one string is fixed, the other is free to move in the plane of the disc. Coordinates (relative to some coordinatisation of the plane) of the free end provide the control variables of the system. The angle at which the disc can rest in equilibrium is the state variable. Experiment reveals that there is a 'diamond-shaped' region in the plane (roughly as shown below)





with the following property: outside the region, only one (stable) equilibrium state exists; inside there are two.

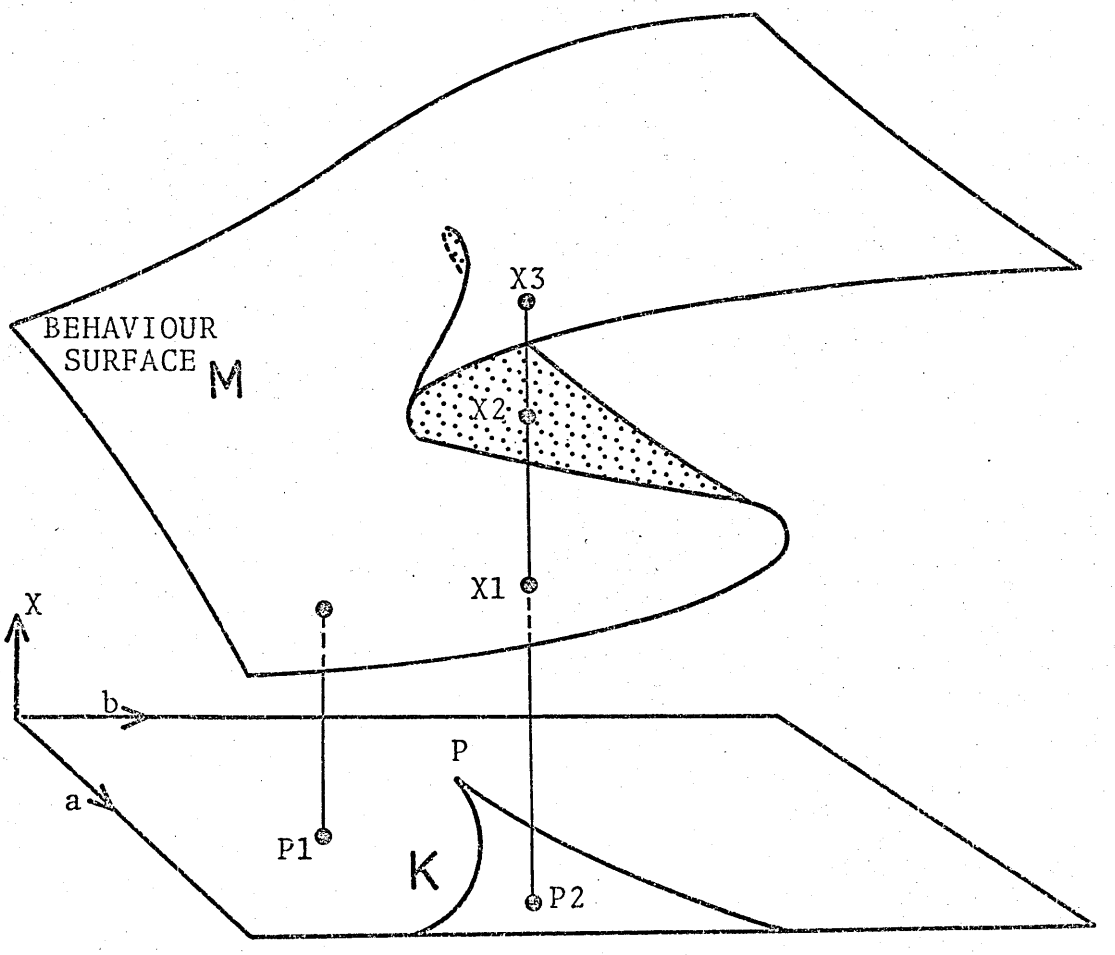
Near the point P, the energy in the system (i.e. in the elastic) takes the form

$$V = \frac{1}{4}x^4 + \frac{1}{2}ax^2 + bx$$

where (a,b) are the coordinates of the free end in a certain coordinate system with P = (0,0), and x is related to the angle at which the disc rests. The equilibria are given by stationary values of the energy:

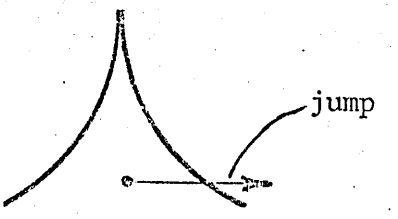
$$\frac{dV}{dx} = x^3 + ax + b = 0$$

Minima of V give stable equilibria, maxima give unstable (such as a pin balancing on a point). Other stationary points can be stable in some directions and unstable in others. The graph of the solutions of this equation in (x,a,b)-space is as depicted in the sketch on the following page.



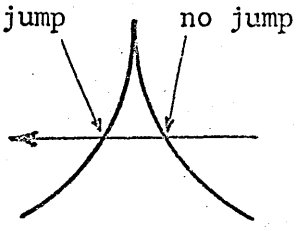
Over a point such as p_1 outside the cusp K, there is only one point of the surface, so there is only one equilibrium state. Over a point p_2 inside K there are three states: of these x_1 and x_3 are stable and x_2 is unstable. Because the surface M is folded, several phenomena arise.

(1) Catastrophic jumps: With the system in equilibrium state x_3 (top sheet of M) at p_2 move the free end across the curve K. The equilibrium state jumps, very suddenly from the top sheet to the bottom, as K is crossed; the point representing the state of the machine 'falls over the edge' of the fold. Here we have a continuous change in control leading to a discontinuous change in state.

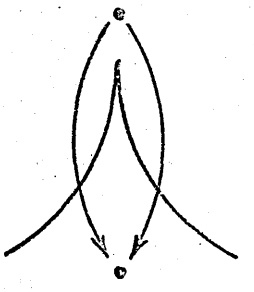


These sudden changes are called catastrophic jumps. On a machine they are very noticeable.

(2) Delay phenomena: A reversal of the path just taken does not produce a jump back at the same point: the system stays on the lower sheet. Only when the path crosses the other side of K does a return jump take place. The system only jumps when forced to. If the free end is moved to and fro across K a phenomenon akin to 'hysteresis loops' in magnetism occurs.



(3) Divergence phenomena: Two paths starting and ending at the same place do not lead to the same state: one may lead to the top sheet, the other to the bottom sheet. The final state of the system can depend on past history. The difference between the two paths may be very small: everything depends on which side they pass the cusp point.



These phenomena all arise because the folds in the surface, when squashed down on to the control (a,b)-space, give rise to singularities where the squashing is not differentiable. The surface itself is smooth: the singularities are inherent in the projection map. (More strictly, its restriction to the surface.)

A general mathematical set-up for such a system will have three parts:

(i) A control space $C = \mathbb{R}^k$

(ii) A state space $X = \mathbb{R}^m$

(iii) A potential function $V : X \times C \to \mathbb{R}$

Thus in our example C is $\mathbb{R}^2$ with coordinates (a,b), X is $\mathbb{R}$ with coordinate (x), and

$$V(x,a,b) = \frac{1}{4}x^4 + \frac{1}{2}ax^2 + bx$$

The equilibria are given by solutions of

$$\text{grad } V = 0$$

so that if X is coordinatised by $(x_1,\ldots,x_n)$ the equilibria are determined by the simultaneous system of equations

$$\frac{\partial V}{\partial x_1} = \frac{\partial V}{\partial x_2} = \ldots = \frac{\partial V}{\partial x_n} = 0$$

It is a fact (and is part of Thom's theorem) that 'in general' the solutions form a smooth submanifold ('hypersurface') M of $X \times C$. The projection map $(x,c) \to c$ restricts to give a map

$$\chi : M \to C$$

Thom's theorem lists the possible singularities for X. In other words, it describes the possible kinds of 'fold pattern' which can occur for the solutions of such a system of equations. In consequence the possible catastrophic jumps are known.

For control spaces of dimension $k \leq 6$, there are only finitely many basically different types: the numbers of types being given by

k	1	2	3	4	5	6
number of types	1	2	5	7	11	14

By 'basically different' we mean that we are only interested in the behaviour of X

(a) Locally: i.e. for values near the singularity point,

(b) Up to diffeomorphism: we allow smooth reversible changes of coordinates and do not consider these as changing the type.

The possible types for $k \leq 4$ are listed below. (Note that the 'cusp' type of catastrophe situation is the one developed in Chapter III and used for the purposes of the thesis proper.)

Name		Dim C	Dim X	Potential
CUSPOIDS	Fold	1	1	$\frac{1}{3}x^3 + ax$
	Cusp	2	1	$\frac{1}{4}x^4 + \frac{1}{2}ax^2 + bx$
	Swallowtail	3	1	$\frac{1}{5}x^5 + \frac{1}{3}ax^3 + \frac{1}{2}bx^2 + cx$
	Butterfly	4	1	$\frac{1}{6}x^6 + \frac{1}{4}ax^4 + \frac{1}{3}bx^3 + \frac{1}{2}cx^2 + dx$
UMBILICS	Hyperbolic Umbilic	3	2	$x^3 + y^3 + ax + by = cxy$
	Elliptic Umbilic	3	2	$x^3 - 3xy^2 + ax + by + c\,(x^2+y^2)$
	Parabolic Umbilic	4	2	$x^2y + y^4 + ax + by + cx^2 + dy^2$

The C-coordinates are a,b,c,d: the X-coordinates are x,y.

Each type is listed only in the dimension where it first occurs: thereafter it occurs in all higher dimensions with a suitable number of trivial control variables added which do not occur in V.

The restriction to 4 dimensions arises if one takes C to be space-time. In a sense, all phenomena are controlled by space-time, so only dim $C \leq 4$ is needed. However, this is an oversimplication, and higher dimensional catastrophes are of considerable interest.

To the non-topologist the theorem may sound very vague, because of the phrases 'locally' and 'up to diffeomorphism'. Using topological ideas the theorem is completely precise. What it implies is this: in any physical situation where continuous changes in control cause discontinuous changes in state (and there are many such) it is possible to choose coordinates in such a way that the kinds of discontinuity which occur are one of a standard list of 7 types. These same 7 catastrophes govern all physical phenomena.

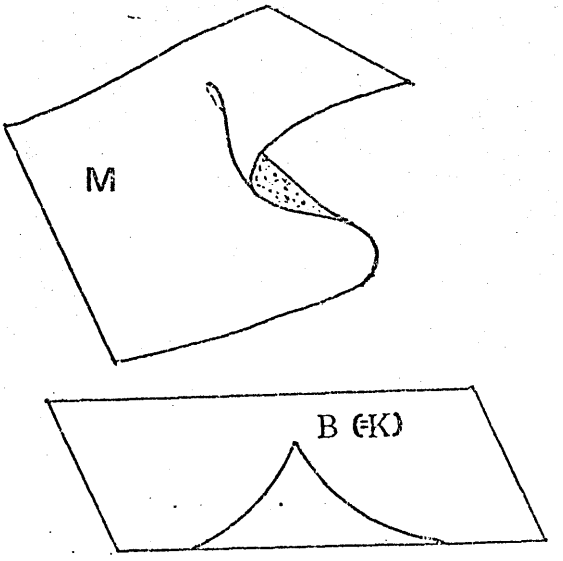
Potentially, therefore, the theorem is a very powerful tool. It is not easy to prove: in fact, it needs a large portion of very high-powered mathematics, taken from several different branches. The study of singularities is a very respectable field, with a history of over a century: none of the main problems have been solved in that time.

The nontrivial nature of the theorem is well illustrated by the presence of 7 elementary catastrophes in the list, although only the cusp type is illustrated pictorially below. They rapidly become very complex, and no simple pattern is apparent. Unfortunately the dimensions get too big to draw the whole catastrophe, and we will have to restrict ourselves to the bifurcation set B, the image under χ of the folds. For the cusp catastrophe this is the cusped curve which we called K.

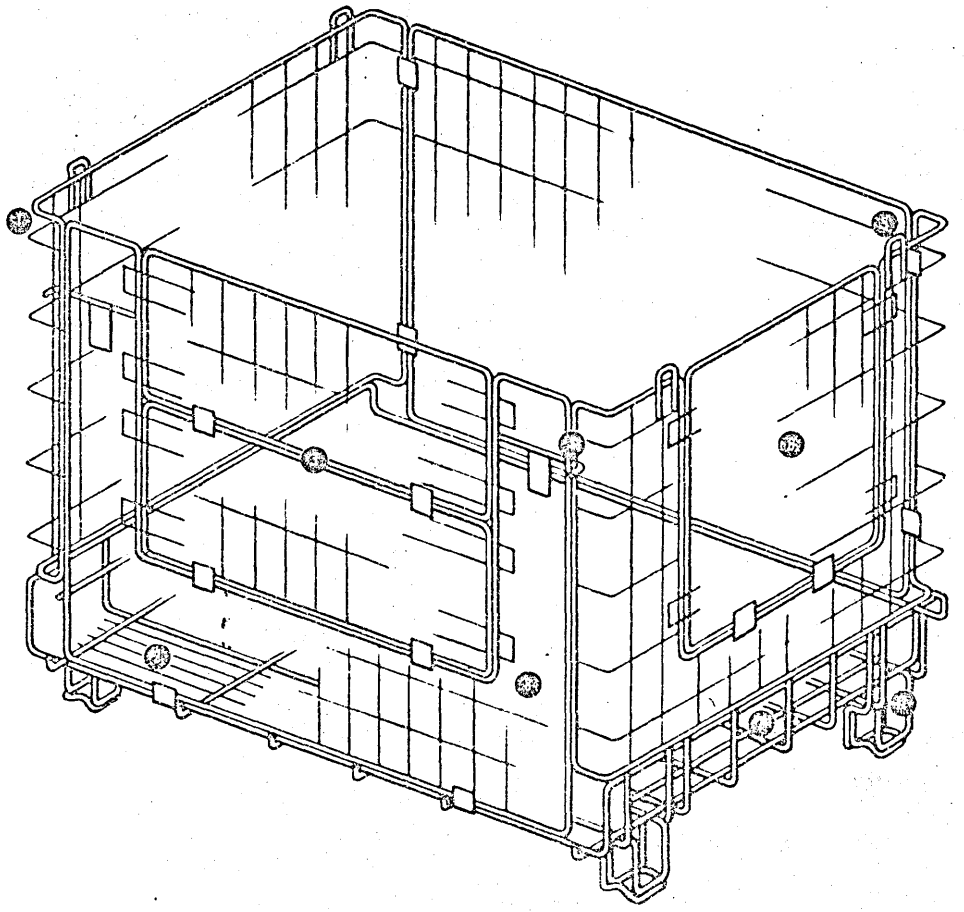
The Cusp

$C = \mathbb{R}^2$

$X = \mathbb{R}$



What goes into a cage?



A typical cage projected especially for *Materials Handling News* by a leading manufacturer WCB Clares

1 *A well-rounded and pleasing design without projections and sharp edges to meet modern merchandising/ display requirements*

2 *A strongly constructed base to support maximum capacity load of 300kg under adverse conditions within the distribution sequence without deflection*

3 *Double front drop gate construction to provide for maximum customer access*

4 *Positive back for front gate assembly to give support and rigidity to the whole structure for stacking*

5 *Positive location for stacking one cage on top of another*

6 *Single end drop gate to provide for end-on display facilities*

7 *Strong box construction for feet to eliminate strain on welds and to give easy, safe and positive support for stacking. In this typical cage design the distance between the feet on the front of the cage is 27½in allowing the use of normal forklift and pallet trucks. Distance between the feet at the ends of the cage, in this example, is 15¾in, the maximur one can achieve using strong-foot assembly and proven to be satisfactory for use with special pallet trucks or forklifts when the cage is being used end-on*

8 *General construction and design to allow for quick and easy collapsing for storage and transport*

APPENDIX C

Draft Specification for U.K. Standard ½-Euro Cage Pallet (prepared by IGD Working Party 4th March 1976)

All dimensions and loads in metric standard units (mm).

1. The maximum dimensions inclusive of feet protrusions are to be as follows:-

Width	850
Depth	600
Height	670

2. Stacking and Handling Features

The cage pallet to meet the following requirements:

(a) 4-way entry for truck forks.

(b) Front access between feet not less than 700.

(c) End access between feet not less than 382.

(d) Stack up to 5 loaded pallets high in storage; up to 2 high on a fork lift truck, and up to 3 high in transit on a vehicle.

(e) Provide adequate stacking requirements in both erected and collapsed condition (see (g)).

(f) Have minimum floor clearance of 95 for fork entry.

(g) All locating devices to be positioned within a band not less than 204 nor more than 240 (236) from the longitudinal centre line.

(h) The construction of the feet must be such that they cause no obstruction within the band reserved to locating devices.

(j) The fork bearing surfaces of the pallet must be level and so constructed that the load can be carried safely on forks inserted through only 75% of the width or length of the cage.

3. General Features

(a) Construction must be free of internal obstruction and sharp or protruding parts in order to facilitate automatic packing and to prevent damage to merchandise.

(b) Consumer access must be a maximum commensurate with structural rigidity to satisfy 2(d), but in any case comply with the following:-

Front:	Minimum width	625	Minimum depth	275	(300)
Side:	Minimum width	320	Minimum depth	300	
	Maximum width	368			

(c) Pallet must be easily erected and 'knocked down' by unskilled personnel.

(d) Pallet must safely carry load of 300 kgs.

(e) The usable inside dimensions must be to a maximum compatible with pallet construction, but in any case not less than -

Width	780
Depth	555
Height	535

(f) Height of unit when collapsed not more than 300.

(g) Minimum capacity 232 litres.

(h) Any hole in basket or other construction must have a maximum 'short' dimension of:-

Base	30
Side Panels	50

(i) An identification plate to be fitted showing details of manufacturer, owner, and the tare weight of the cage.

(j) All gates must be latched so that accidental opening will not occur due to vibration during transport or handling.

(k) All gates when open must hang vertically and no lower than the base at the pallet's feet.

(l) When the cage is folded flat, any vertical pegs protruding above the top of the side frame of the base, other than foot location devices (which must fall within the band stated in para. 2(g)) must fall within 134 of the longitudinal centre line.

APPENDIX D

Name .....

Please return by
2 February 1976

SOME INITIAL INPUTS TO THE DELPHI FORECAST OF POSSIBLE FUTURE* INNOVATIONS IN THE DISTRIBUTIVE SECTOR OF THE U.K. GROCERY INDUSTRY.

Note: Please interpret the term innovation in the broadest possible context, i.e. any method, technique, process, procedure, re-organisation, technical development, or in fact anything which produces change(s) of economic or behavioural significance in the distribution channel between end of manufacturer's production line and point of sale in retail outlet(s).

The following headings may assist in organizing your thoughts:

FACTORS AFFECTING FUTURE DEVELOPMENTS IN GROCERY DISTRIBUTION

TECHNOLOGY BASED INNOVATIONS

INSTITUTIONAL (OR ORGANIZATIONAL) BASED INNOVATIONS

OTHER CATEGORIES OF INNOVATION

OTHER TRENDS OR INFLUENCES NOT ALREADY MENTIONED ABOVE e.g. developments in other fields

* Future can mean up to 15 or 20 years hence.

If more space required please use reverse side of this page.

RETURN TO: John L Gattorna, Research Fellow, School of Management, Cranfield Institute of Technology, Cranfield, Beds. MK43 OAL

APPENDIX E

GROUP IDEA GENERATION session on the topic of future innovative developments in the distributive sector of the UK grocery industry, preliminary to a full-scale DELPHI FUTURES STUDY ON DISTRIBUTION INNOVATION, Cranfield School of Management, 29 January 1976.

Convenor: John Gattorna

Participants:	Mr A S Baker	Director of Distribution & Production, Fine Fare Limited
	Mr R J Banister	Logistics Manager The Nestlé Company Limited
	Mr E R Biggs	Physical Distribution Manager Kraft Foods Limited
	Mr E J Cresswell	Client Executive G.T. SPD Limited
	Mr J R Davis	General Distribution Manager Brooke Bond Oxo Limited
	Mr R B Dunn	National Distribution Manager James Robertson and Sons
	Mr R D O Fassam	Manager - Distribution Quaker Oats Limited
	Mr A S Fortune	Chairman Independent Marketing Services Ltd
	Mr M Hillard	Divisional Distribution Manager South, CPC (United Kingdom) Ltd
	Mr E Jameson	Chairman Eric Jameson Associates Limited
	Mr S M D Oliver	Sales and Distribution Director Unigate Foods Limited
	Mr T E Roberts	R & D Controller Asda Stores Limited
	Mr D C Shann	Development Manager National Freight Corporation
	Mr P D Virgo	Associate Director - Management Services, Bowater-Scott Corp. Ltd.
	Mr D W Stevens	Associate Director - Distribution Nabisco Limited
	Mr I E L Davis	Marketing Services Manager Bowater-Scott Corporation Limited
	Mr P Stubbs	Managing Director Wheatsheaf Distribution & Trading Limited

APPENDIX F

EDITED PROCEEDINGS OF pre-DELPHI GROUP IDEA GENERATION SESSION, CRANFIELD, 29 JANUARY 1976

Key Macro-Economic Issues

growth. (at national aggregate and industry levels):

- cannot just extrapolate past experience (particularly with sales figures)
- be prepared to adjust to lower growth prospects (a slowdown in expansion and a change from adventuresome growth to modest growth conditions and even zero or negative rates)

Availability of investment funds (and corresponding willingness to invest):

- innovative developments are very much conditioned by capital availability
- companies are more likely to resist development projects in times of uncertainty, inadequate profits, and poor cash-flows

Social Factors

population:

- changes in numbers and structure
- positive or negative growth?
- proportionately more younger or older people

Changes in spending power:

- geographically
- within social strata

Real incomes:

- increase or decrease?
- consequent effect on standard of living

Smaller family unit
Increase in number of women employed
Changes in use of leisure time

Introduction of 4-day working week for all

Increase in regional feeling:

- this will influence product sales
- favour locally based manufacturers

Changes in eating habits:

- more food consumed outside the home
- more prepacked food, catering packs etc.
- use of micro-wave ovens to continue trend to less formal meal times

Total tonnage of food consumed:

- little if any increase in aggregate consumption
- mix will probably alter

The Consumer

Wants/needs (will not necessarily be satisfied):

- increasing health/diet consciousness
- to shop in a busy successful store with a pleasant environment
- do not want to shop at all
- the ability to purchase perceived needs at cheapest price (value for money)
- reliable, regular, and easily accessible supply
- revival of RPM?
- more or less fancy packaging
- to shop on credit
- wide range of choice
- longer trading hours

Consumer purchasing habits:

- demise of the traditional High Street supermarket with increasing emphasis on consumer bulk buying (the squirrel syndrome) via bulk discount outlets
- catalogue shopping
- continued expansion of frozen foods (and correspondingly, home freezers)
- trend towards greater expenditure on non-food items (thereby indirectly affecting food purchases)
- the consumer shopping as a caterer
- consumers will shop at hypermarkets for staple items and local convenience/specialty stores for residual requirements
- consumer may rebel against trend towards diminishing choice of outlets
- greater mobility

Two discernible categories of consumer:

- a. shopping is regarded as a social pleasure (this feeling may eventually be replaced by other social satisfactions)
- b. get shopping over with as quickly as possible in order to enjoy leisure time

More male shoppers
Convenience of location (accessibility) of paramount importance
Consumer buying groups established as a power block
More direct communication between manufacturer and consumer via advertising
Advertising to become increasingly subject to Government controls
Growth of 'consumerism' and consumer 'unions' (consumers will be better organized to run boycotts etc.)
Consumer will be better educated, better informed, and have higher expectations
A back to nature movement may develop aimed at more self-sufficiency
A proportionately older population may demand higher standards of service, i.e. doorstep selling, home deliveries, store location convenience
Decline in brand loyalty and trend towards commodity markets
Commodity crises will occur in which case consumer will show greater willingness to substitue

Regulatory Influence of Government (all levels)

Local:

- attitude towards planning permission applications for hypermarket developments on edge of towns
- regulations surrounding access to High Street shops by suppliers' vehicles
- degree to which National Government legislation is implemented at local level
- conducting own investigations into aspects of distribution

National:

- trading hours
- road transport vehicle designs/specifications
- lack of a coherent policy on location development
- legislation on food standards especially where temperature controls required
- controls on profit via price and taxation mechanisms
- the relatively low return on food will force retailers to diversify into non-food merchandise
- uncertainty about future legislation is causing a reluctance to plan investment in the foreseeable future; current trend is to purchase outside services
- all distribution channel parties will welcome less Government interference

EEC:

- EEC legislature implications important, especially in regard to road transport

Environmental

Restrictions on cars and commercial vehicles in town centres
Development of vehicle-interchange points (VIPs) outside urban centres for break-bulk operations
Location of large stores at edge of towns should help to relieve traffic problems
Major mode of distribution will remain road, but means of propulsion may alter considerably
Large or small road units? Probably largest unit which is environmentally acceptable and suitable for the job (certain classes of road traffic/transport may disappear)
Polarization towards use of large vehicles for delivery to edge of town hypermarkets, and smaller units for delivery to remaining High Street outlets

Cost-Economics (aim: minimal handling between processor and consumer)

Move towards concentration (fewer, bigger, more centrally controlled companies)
Different concepts of consolidation

Retailer:

- increase in bulk buying
- increased drop size
- direct/indirect delivery ratio to increase tendency to sell bigger consumer packs
- store design aimed at energy conservation
- delivery appointments system
- reduction in stock-holding; maximise selling area
- computer stock control
- later opening hours
- intensitivity more important than absolute size

Manufacturer:

- regard product-coding/price marking as an on-cost
- fewer stockholding points leading gradually to lower operating costs
- decrease in delivery frequency offered
- out-of-hours deliveries reconsidered
- rationalization of product ranges

- decrease in size and scope of traditional sales forces
- increased telephone selling
- greater use of existing facilities
- tendency to greater use of outside specialists in lieu of own fleet/central warehouses
- driver hours restrictions will lead to increased costs
- most product development oriented towards 'replacements' or 'substitutes'

Development of unit loads, e.g. cage pallets, standard pallets, containers etc., for certain products but not all
Further rationalization of pack sizes, cartons, and modular containers to improve transfer efficiencies
Third party agencies to increase share of distribution workload
Indirectly controlled (non-labour) expenditure to grow at fast rate e.g. land rates, leases, services
Building land increasing in cost
Transport mode: switch of long distance road movements to rail; return to canal/river movements
Account profitability analysis by manufacturers to increase, especially the correlation between drop size and profit

Financial:

- Growth of new product innovations will be curtailed; in effect money means nill innovation

Technology Based Developments

Energy:

- conservation grows in importance (matching availability to needs)

Food technology:

- food nutrition developments will heavily influence diet
- vegetable protein developments will reduce fresh meat consumption e.g. soya bean milk, vegetable textured protein etc.

Transportation:

- use of demountable bodies
- underground movement of goods by sealed containers in pneumatic pipelines
- use of stackable roll-pallets to increase warehouse and transport utilization

Packaging developments:

- bulk packs
- expendable pallets
- packaging at store level after break-bulk operation
- new types of convenience packs for institutional markets
- self-destructible packaging (bio-degradable)

Materials handling:

- more mechanical handling techniques in shops
- more automation in warehouse designs to reduce labour costs and increase throughput
- increasing recognition of high-density storage potential for fast-moving lines

Computer applications:

- computer-to-computer data transfer for inter-firm transactions e.g. order placement and processing, delivery acknowledgement, invoices, payments

Communications: (telecommunications, facsimile, television, home terminals)

- telephone/TV shopping from home using VDUs linked by cable to stores (consumer uses visual catalogue to make purchase, and home delivery follows at nominal fee). Shopping from home will tend to concentrate on standard (or staple) purchases

A break through in food production, creating regional or even home production; smaller production units

Influence of developments in U.S. and Europe

Institutional Factors

Retailing:

- trend towards increasing polarity in retail food outlets with extremes of large mass merchandising operations and small boutique type specialty shops
- increasing number of hypermarkets
- declining importance of traditional High Street outlet because of traffic restrictions; independent retailers forced out of business
- fewer (or more) voluntary groups
- fewer multiple chains (as a result of mergers, joint ventures etc.)
- greater use of rack jobbers to consolidate low volume items
- retailers may opt for more in-store on-the-spot manufacture where possible
- diversification into non-foods such as clothes, furniture etc., will have adverse effect on small specialist shops
- growth of group trading (retailers combining to increase their purchasing power)
- possible joint-retailing ventures by non-competiting manufacturers
- retail consortia formed to purchase EEC food
- performance of traditional retail functions at an earlier point in distribution process

Direct selling from manufacturer to consumer

Marketing/selling organizations (agencies) represent and act for several manufacturers in out-lying areas such as Scotland, responsible for both sales and distribution

A national pallet pool will emerge; exchange system more likely than hire
The emergence of non-store retailing; at-home selling, catalogue selling, mail-order, vending, etc.
District shopping centres will not be a great success because they are planned by local authorities instead of retailers

Cash and carry wholesaling:

- developments in cash and carry business; volume, customer type, product range
- change in character towards bulk-buying agency role
- cash and carry will remain to service small independent

Specialist distribution service:

- a shift away from own account fleet operations to third party contractors
- new impetus for growth of distribution service industry
- uncertain economic/political climate brings a greater demand for contractor services
- polarization of the types of distribution services offered:
  a. a strong demand from large users for national coverage and a wide range of services
  b. a demand for regional distribution services doing the local business of a larger number of medium sized manufacturers

Competitive Element

Extension of range into allied fields; wider product base
More (or less) own-label
Northern based chains leading the way in retail innovative developments

Manufacturers:

- want width of distribution for their products and long-term profitability
- prefer to diversity and widen existing ranges as a relatively lower risk approach to increased sales volume

Retailers to form European buying offices; could be problems with regional taste preference
Vertical integration (reduces degree of conflict):

- forward integration by manufacturers
- backward integration by some retailers in manufacturing

Trade Structure

Inter-organizational relationships:

- closer co-operation between channel parties
- ebb and flow of power base
- agreement on profitability targets

Manufacturers trade terms:

- shorter credit for retailers
- national pricing policies to continue in lieu of ex works plus freight arrangement

Manufacturers want more distribution activity by retailer

Organizational Development

Increased influence of PD functional management within the organization and greater recognition accorded professionalism

Higher calibre store management and supervisory personnel will be required; source?

APPENDIX G

COMPANIES REPRESENTED IN DELPHI FUTURES FORECAST

Since anonymity was guaranteed to individual participants on the panel, their names cannot be revealed. However, the initial panel of 94 were drawn from the following 85 companies. Essentially, the views expressed by panel members generally reflected their own cumulative experience in the industry rather than the policies of their current employer.

Allied Suppliers (Distribution) Ltd
ASDA Stores Ltd
Associated Biscuits Ltd
Baylis Transport Ltd
J Bibby & Sons Ltd
Birds Eye Foods Ltd
Booker Belmont Wholesale Ltd
Bowater Containers Ltd
Bowater-Scott Corporation Ltd
British Road Services Ltd
Brooke Bond Oxo Ltd
Burton'sGM Biscuits Ltd
Cadbury Ltd
Cadbury Schweppes Ltd
Cadbury Typhoo Ltd
Cambridge & District Co-operative Society Ltd
Carnation Foods Co. Ltd
Carreras-Rothmans Ltd
Co-operative Wholesale Society Ltd
Cory Distribution Ltd
CPC (United Kingdom) Ltd
Findus Ltd
Fine Fare Ltd
General Foods Ltd
G K N Chep Ltd
Glaxo-Farley Foods Ltd
H J Green & Co. Ltd
H J Heinz Co. Ltd
Amos Hinton & Sons Ltd
Hypermarket Holdings Ltd
IBM (United Kingdom) Ltd
ICL Ltd
Independent Marketing Services Ltd
Eric Jameson Associates Ltd
Jenks Bros Foods Ltd
Gill Jones and Associates Ltd
Johnson Wax Ltd
Kellogg Co. of Gt Britain Ltd
Keymarkets Ltd
King Goodwin Ltd
Kimberley-Clark Ltd
Kraft Foods Ltd
Lowfield (Storage & Distribution) Ltd
J Lyons & Co. Ltd
Lyons Tetley Ltd
McCormick Foods (U.K.) Ltd
Makro Self Service Wholesalers Ltd
Mars Ltd
Marks & Spencer Ltd
Bernard Matthews Ltd
Nabisco Foods Ltd
The National Computing Centre Ltd
National Freight Corporation Ltd
The National Materials Handling Centre

NCR Ltd

The Nestle Co. Ltd

North Eastern Co-operative Society Ltd

Pallet Enterprises Ltd

Pasta Foods Ltd

Pedigree Petfoods Ltd

Laurence Prust & Co. Ltd

Quaker Oats Ltd

Reckitt & Colman Ltd

R H M Foods Ltd

James Robertson & Sons P.M. Ltd

Ross Foods Ltd

J Sainsbury Ltd

Smedley-HP Foods Ltd

Smiths Food Group Ltd

SPD Ltd

Spillers Foods Ltd

Tate & Lyle Refineries Ltd

Tetra Pak Ltd

Tesco Stores Ltd

TLT Distribution Ltd

Unigate Foods Ltd

United Biscuits (U.K.) Ltd

The University of Aston Management Centre

Value Centres (Cash & Carry) Ltd

V G Management Ltd

Waitrose Ltd

Walkers Crisps Ltd

The Wall's Meat Co. Ltd

Weetabix Ltd

Whitworth Holdings Ltd

APPENDIX H
DELPHI FORECAST RESULTS PROCESSING PROGRAM

```
JOB MN911SDELPH3.,GATTORNA      RUN BY GEORGE 2/MK9F ON 28/02/77 AT 23.27
CC FORTRUN V61B,T,LIST
****

FORTRAN COMPILATION BY #XFAT MK 5A DATE 28/02/77 TIME 23/27/48

0001              LIST
0002
0003              SEND TO (ED,SEMICOMPJOBB.STORE)
0004              DUMP ON (ED,PROGRAM JOBB)
0005              PROGRAM(V61B)
0006              INPUT5=CRO
0007              OUTPUT6=LPO
0008              COMPRESSINTEGER AND LOGICAL
0009              END

0010              MASTER LEA
0011      C***    DELPHI FORECAST PROGRAM NO. UL/3-29/1/76
0012      C RUN   ONE DELPHI DISTRIBUTION THREE 23 2 77
0013      C       PROGRAM TO CALCULATE MEANS AND INTERQUARTILE RANGES
                    FROM RANKED
0014      C       PROGRAM DEVELOPED UNILEVER RESEARCH 1975 J W K 1968
                    W C BEDFORD
0015      C       PROGRAM THIRD RUN WITH ACTUAL RESULTS
0016      C       DELPHI DATA - MAX QUESTIONS 62, 6 RANKINGS 0-5
0017              DIMENSION MATRIX (62, 60, 7), MEAN (62, 7), LRY (62, 7),
                    NRY (62, 7), NOANS (62)
0018              DIMENSION MPRINT (62, 7, 8), TLE(40), TIT(40, 62),
                    IN(21)
0019              REAL LGSUM, LLGSUM
0020              NRJSUM=0
0021              MATSUM=0
0022              LGSUM=0
0023              DO 5 I=1, 62
0024              NOANS (I)=0
0025              DO 5 K=1,7
0026              MEAN(I,K)=0
0027              LRY(I,K)=0
0028              NRY(I,K)=0
0029              DO 5 J=1,60
0030              MATRIX(I,J,K)=0
0031            5 CONTINUE
0032      C***    THIS REQUIRES 64 CARDS IN ALL IF LESS THAN 62 QUESTIONS
                    USE BLANKS
0033              READ(5,10)TLE,NOQ,NOLY,NOBY, NRUN,TIT
0034      10      FORMAT(40A2,/, 4I5, 62(/.40A2))
0035              NOLY=NOLY+1
0036              NLY=NOLY-NOBY+1
0037              NNQ=0
0038              NNP=0
0039              WRITE(6,11) NRUN,TLE
0040           11 FORMAT('1',5X,'DELPHI FORCAST - ANALYSIS OF RESULTS -
                    RUN ',I2,
0041             1 2(' '/),20X,40A2,//)
```

```
0042      C***    THIS NEEDS 7 OR 8 CARDS FOR EACH RESPONDENT WITH AN
                    EXTRA YEAR OF
0043      C***    9998 TO END AN INDIVIDUALS ESTIMATES AND 9999 FOR THE
                    GROUPS
0044      121     READ(5,15) NP,IN
0045      15      FORMAT ( 3,7X,7(I3,I5,I2))
0046              DO 12 IY =3,21,3
0047              NQ = IN(IY-2)
0048              NY=IN(IY-1)
0049              NR=IN(IY)
0050        20    FORMAT(' ', 'INPUT ERROR',I10,I3,I4,I6)
0051              IF(NY-2027) 40,40,203
0052       203    IF(NY-9998)204,35,100
0053       204    NY = 2025
0054              GO TO 40
0055        35    NNP=NNP+1
0056              GO TO 121
0057              40 IF(NY-0)42,41,50
0058        41    WRITE(6,20)NP,NR,NQ,NY
0059              NY=NY+NOLY+1
0060              I=NQ
0061              IF(NQ)12,12,45
0062        45    CONTINUE
0063              NOANS(I)=NOANS(I)+1
0064              GO TO 12
0065        42    WRITE(6,20)NP,NR,NQ,NY
0066              GO TO 12
0067        50    IF(NY-1973)55,55,60
0068        55    WRITE(6,20)NP,NR,NQ,NY
0069              GO TO 12
0070        60    IF(NY-NOLY)70,70,65
0071        65    WRITE(6,20)NP,NR,NQ,NY
0072        70    IF(NR-5)72,72,71
0073        71    WRITE(6,20)NP,NR,NQ,NY
0074              NR = 5
0075        72    IF(NR)75,75,80
0076        75    WRITE(6,20)NP,NR,NQ,NY
0077              NR = 1
0078        80    IF(NQ-NOQ)90,90,85
0079        85    WRITE(6,20)NP,NR,NQ,NY
0080              GO TO 12
0081        90    IF(NQ)85,85,91
0082        91    NNQ=NNQ+1
0083              J=NY-NOBY
0084              I=NQ
0085              K=NR+1
0086              MATRIX(I,J,K)=MATRIX(I,J,K)+1
0087        12    CONTINUE
0088              GO TO 121
0089       100    CONTINUE
0090              NNP=NNP+1
0091              DO 120 K =2,6
0092              KK =K- 1
0093              DO 120 I=1,NOQ
0094              DO 120 J=1,NLY
0095              MATRIX(I,J,1)=MATRIX(I,J,1)+MATRIX(I,J,K)
```

```
0096        120  MATRIX(I,J,7)=MATRIX(I,J,7)+KK*MATRIX(I,J,K)
0097             M=NLY-1
0098             WRITE(6,5000)
0099       5000  FORMAT('1',5X,'QUESTION',20X,'MEAN YEAR OF ESTIMATES')
0100       5001  FORMAT(' ',11X,'RANK',' UNWEIGHTED',10X,'1',12X,'2',
                   12X,'3',
0101          1  12X,'4',12X,'5',10x,'WEIGHTED', //,8X,'NUMBER',7I13,/)
0102       5002  FORMAT(' ',6X,I3,' MEAN',7(7X,I6))
0103       5003  FORMAT('0',9X,'RANGE ',6(7X,I6),7X,I6)
0104       5004  FORMAT('0',14X,6)7X,I6),7X,I6)
0105       5005  FORMAT('0',3X,'NO ANSWERS',5X,I4)
0106       5006  FORMAT( ' ',4(' '/),5X, 'TOTAL NUMBER OF PARTICIPANTS
                   = ',I4,3X,
0107          1  'PER CENT RESPONSE = ',F4.0)
0108       5010  FORMAT('0',8X,'MEDIAN',7(7X,I6))
0109       5011  FORMAT('0',6X,'LOG MEAN',7(7X,I6))
0110       5012  FORMAT(1X,55I2)
0111       5014  FORMAT('0',4X,'CALC RANGE',6(7X,I6),7X,I6)
0112       5015  FORMAT('0',14X,6(7x,I6),7X,I6)
0113       5016  FORMAT(20x,40A2)
0114             DO 3500 k=1,7
0115             DO 2500 I=1,NOQ
0116             DO 1500 J=1,M
0117             JY=J+NOBY
0118             NRJSUM=NRJSUM+MATRIX(I,J,K)
0119             MATSUM=MATSUM+(MATRIX(I,J,K)*J)
0120             A = J
0121             LGSUM = LGSUM+MATRIX(I,J,K)*ALOG10(A)
0122             MPRINT(I,K,8) = MRJSUM
0123       1500  CONTINUE
0124             IF(NRJSUM)103,102,101
0125        101  NK=NRJSUM/4+ 0.4
0126             NKL=NRJSUM*0.75  +0.6
0127             NKM=NRJSUM/2
0128             BOBY = NOBY + 0.5
0129             LLGSUM = LGSUM/NRJSUM
0130             CAR = 10.0**LLGSUM
0131             CARR=MATSUM
0132             CARR=CARR/NRJSUM
0133             CARRY=ALOG(CARR/CAR)
0134             IF(CARRY.LT.0.0) CARRY=0
0135             CARRY = 0.96*SQRT(CARRY)
0136             CARRY = 2.718**CARRY
0137             MPRINT(I,K,5) =BOBY +CAR
0138             MPRINT(I,K,1)=BOBY +CARR
0139             MPRINT(I,K,6) = BOBY + CAR/CARRY
0140             MPRINT(I,K,7) = BOBY + CAR*CARRY
0141             IF(NRJSUM-4)106,106,301
0142         103 WRITE(6,5007)K,I,NRJSUM
0143        5007 FORMAT(' ','ERROR CREPT IN K= ',I3,'  I= ',I3,'NRJSUM
                   =',I9)
0144         102 MPRINT(I,K,1)=0
0145             MPRINT(I,K,5) = 0
0146         106 MPRINT(I,K,2)=0
0147             MPRINT(I,K,3)=0
0148             MPRINT(I,K,4)=0
```

```
0149        259   MATSUM=0
0150              NRJSUM=0
0151              LGSUM = 0
0152              GO TO 2500
0153         301  IRSUM=0
0154         104  MATSUM=0
0155              NRJSUM=0
0156              LGSUM  =0
0157              DO 2000 J=1,M
0158              IRSUM=IRSUM+MATRIX(I,J,K)
0159              IF(IRSUM-NK)1100,1100,1150
0160       1100   MPRINT(I,K,2)=J+NOBY
0161              MPRINT(I,K,4)=J+NOBY
0162              GO TO 2000
0163       1150   IF(IRSUM-NKM )1160,1160,1200
0164       1160   MPRINT(I,K,4)=J+NOBY
0165              MPRINT(I,K,3)=J+NOBY
0166              GO TO 2000
0167       1200   IF(IRSUM-NKL)1300,1300,2500
0168       1300   MPRINT(I,K,3)=J+NOBY
0169       2000   CONTINUE
0170       2500   CONTINUE
0171       3000   CONTINUE
0172       3500   CONTINUE
0173              DO 3510 I=1,NOQ
0174              WRITE(6,5016)(TIT(L,I),L=1,40)
0175              WRITE(6,5001)(MPRINT(I,JV,8), JV=1,7)
0176              WRITE(6,5002)I,(MPRINT(I,JV,1),JV=1,7)
0177              WRITE(6,5011)(MPRINT(I,JV,5),JV=1,7)
0178              WRITE(6,5014)(MPRINT(I,JV,6),JV=1,7)
0179              WRITE(6,5015)(MPRINT(I,JV,7),JV=1,7)
0180              WRITE(6,5010)(MPRINT(I,JV,4),JV=1,7)
0181              WRITE(6,5003)(MPRINT(I,JV,2),JV=1,7)
0182              WRITE(6,5004)(MPRINT(I,JV,3),JV=1,7)
0183              WRITE(6,5013)
0184       5013   FORMAT(1X,'75',8X,'80',8X,'85',8X,'90',8X,'95',8X,
                    '00',17X,'10')
0185              DO 400 IM = 1,7
0186              WRITE(6,5012)(MATRIX(I,J,IM),J = 1,55)
0187         400  CONTINUE
0188       3510   WRITE(6,5005)NOANS(I)
0189              ANAQ=NNQ
0190              ANAQ=(NNQ/NNP)*100.0/NOQ
0191              WRITE(6,5006)NNP,ANAQ
0192         105  STOP
0193              END

END OF SEGMENT, LENGTH 932, NAME LEA

0194              FINISH
```

APPENDIX J

APPENDIX J1: ROUND 1 INSTRUCTIONS

Event statements 01-62 are market-place changes which are expected to result in various DISTRIBUTION DEVELOPMENTS with consequent IMPLICATIONS for supplier-distributor relationships. You are requested to provide answers as follows:

SECTION 1

- a year-date estimate for the anticipated occurrence of each event ("NEVER" is an acceptable response if that is what you conclude, in which case insert 2025)
- on a 0-5 scale, rate your own COMPETENCE to answer each question as it is being considered
- offer a few key words/phrases to briefly explain the REASONING you used as a basis for your year-date assessment

SECTION 2

- comment on any possible DISTRIBUTION DEVELOPMENTS you consider may follow as a result of the various events occurring as anticipated
- comment on any on-going IMPLICATIONS you foresee as consequential upon the DISTRIBUTION DEVELOPMENTS you have already outlined in the preceding part, with particular reference to supplier-distributor relationships within the grocery industry

APPENDIX J2: SPECIAL NOTES

1. You may find it easier to offer qualitative comment for the last two parts above on just those areas you know most about and insert "don't know" for the residual.
2. In every case where you are assessing how to answer the year-date question in Section 1, think in terms of industry expectations (or segments thereof) rather than what you think the expectations might be at the company level.
3. You will find some of the event statements are of % increase (or decrease) type format; if you disagree with the % quoted, or its direction, "NEVER" may be the most appropriate answer in such cases, so insert 2025.
4. Definitions are provided for key words/phrases in the main text.

APPENDIX J3: SAMPLE (UNRELATED TO ACTUAL FORECAST AREA)

PLEASE STATE IN WHICH YEAR YOU EXPECT THE FOLLOWING EVENT TO OCCUR (IF AT ALL)

EVENT No.	EVENT DESCRIPTION(3)	YEAR ESTIMATE(1)	C-R(2)
9 9	A "*noise-free*" *aircraft should be available by*	1 9 9 0	2

REASONING behind year-date estimate

Considerable research programme currently underway on aircraft engine noise problem due to Concorde's difficulties and political pressures brought by residents in the environs of airports at home and overseas

~~DISTRIBUTION~~ DEVELOPMENTS which may follow as a result of event occurrence

Any advanced technology developed could be applied to other noise problem areas e.g. heavy industry, road/rail transport vehicles etc.

IMPLICATIONS of event and subsequent developments, ~~for supplier distributor relationships~~

Improved quality of living for many of community currently affected by noise; considerable reduction in number of ear damage cases; fewer work days lost through ear illnesses

(1) In cases where you cannot ever visualise event occurring, insert 2025

(2) COMPETENCE-RATING; on a 0-5 scale, rate your self-perceived ability to answer each statement

(3) DEFINITIONS provided for key words/phrases

IMPORTANT IN THINKING THROUGH HOW YOU WILL RESPOND TO THE VARIOUS EVENT QUESTIONS POSED IN THE FOLLOWING PAGES, MAKE YOUR OWN ASSESSMENT OF THE LIKELY MACRO ECONOMIC GROWTH RATE(S) WHICH THE U.K. WILL EXPERIENCE DURING THE FORECAST PERIOD.

APPENDIX J4: ROUND 1 QUESTIONNAIRE FORMAT

PLEASE STATE IN WHICH YEAR YOU EXPECT THE FOLLOWING EVENTS TO OCCUR (IF AT ALL)

EVENT No.	EVENT DESCRIPTION(3)	YEAR ESTIMATE(1)	C-R(2)
☐☐		☐☐☐☐	☐

REASONING behind year-date estimate

DISTRIBUTION DEVELOPMENTS which may follow as result of event occurrence

IMPLICATIONS of event and subsequent developments for supplier-distributor relationships

☐☐		☐☐☐☐	☐

REASONING etc.

DISTRIBUTION DEVELOPMENTS etc.

IMPLICATIONS etc.

(1) In cases where you cannot ever visualise event occurring, insert 2025

(2) COMPETENCE-RATING; on a 0-5 scale, rate your self-perceived ability to answer each statement

(3) DEFINITIONS provided for key words/phrases.

APPENDIX J5: DEFINITIONS

It is appreciated that several definitions may exist for some of the following terms. However, for the sake of consistency, the particular definitions set out below will be adhered to throughout the life of this research programme.

account profitability analysis : an analysis which aims to trace the true source(s) of distribution costs down to the individual store level within a particular account, and correlate such costs with the service level being provided

ambient-stable foods : foods which will retain their edible quality and stay bacteriologically safe for extended periods at room temperature

article/standard product numbering system : a code system which allows the industry-wide identification of retail product units by means of a unique reference number, the major application being with electronic point-of-sale systems at the retail check-out

branded product : a product sold carrying the manufacturer's label and generally used by purchasers as a guide in assessing quality

break-bulk centre : a consolidation point (generally located outside the urban area) at which goods destined for the High Street are broken down from bulk loads and made up into smaller mixed-loads for subsequent final delivery to retail outlets

cage pallet : a unit designed to transport goods easily in bulk from manufacturer to retailer at which point it converts to a point-of-sale display unit

cash and carry wholesaler : a wholesaler whose goods are displayed in warehouses where retail and catering customers come to select their requirements, pay cash, and provide their own transport

commodity : a product which is constantly required and used by virtually every household without much regard for brand differentiation e.g. bread, milk, baked beans, tea, frozen peas, fresh vegetables (in season) etc.

customer-bank terminal : direct computer link facility between a trader and his bank for purposes of funds transfer in/out of his account

demountable-body vehicle : a vehicle which has the facility to detach the container portion from the prime mover, generally by means of jacks; the detached container may be left at a delivery drop-point until unloaded by the customer at which time it becomes available for collection

direct delivery : a procedure whereby goods are delivered directly to the retail store by the manufacturer or his transport agent

distribution service company : an organization which offers a comprehensive distribution service to several clients (usually manufacturers) at any one time, using a regional or national network of warehouses/depots linked by a fleet of trunking and local delivery vehicles

electronic funds transfer system : computer-to-computer facility for the book transfer of funds, automatically crediting seller's bank account and simultaneously debiting the purchaser's account; designed to have wider application than customer-bank terminals

electronic point-of-sale system : includes electronic cash registers and scanning devices at the retail checkout, usually linked to small in-store computers for stock control monitoring purposes; a standard product numbering system is necessary for point-of-sale equipment to be fully effective

fair trading regulations : these can take various forms but are generally designed to ensure manufacturers do not discriminate unfairly against some customers in matters of trade discounts offered etc., the usual requirement being that any price differentials between customers or customer groups must be justifiable on order size grounds which in turn relate closely to the production economies of various batch sizes

foodbroker : an organization which offers a complete service to manufacturers i.e. a client may place merchandising, selling, and distribution activities almost entirely under the broker's control although title of the goods is not generally taken by broker

indirect delivery : delivery to a retail store via retailer's own central warehouse or manufacturer's depot

in-line pricing : price labelling of each individual product pack by the manufacturer at the end of the production line, generally using specific price information supplied by the particular retailer the goods are destined for

institutional distribution : distribution by manufacturers to food service operators who specialise in prepared foods for consumption in institutions such as hospitals, factories, theatres etc.

major manufacturers : the 50 largest manufacturers who together are estimated to account for more than 50% of total industry sales to wholesale and retail distributors

major multiple chains	: retail organizations (other than co-operative societies and voluntary groups) with 10 or more branches
major town	: arbitarily defined as a town with a population of over 60,000 people
marketing/distribution agency	: an organization which offers a range of sales and distribution services, particularly in a geographical area where it is uneconomic for all manufacturers wishing to be represented to retain separate sales and distribution forces
motive power	: the means by which a vehicle is driven e.g. petrol, solar, nuclear etc.
non-store shopping	: shopping which does not require physically visiting the retail store e.g. shopping from home using various communicational aids
open-date marking	: the message carried on each individual label recommending the date by which the contents should be used or eaten and has important quality and health implications
out-of-hours delivery	: delivery by a manufacturer (or his agent) to retailers premises outside of normal trading hours
own label product	: a product sold under distributor's own registered brand name; goods sold in this way are generally produced by the manufacturer to the specification of a particular retailer (or wholesaler)
pre-packed display unit	: a unit which is loaded with merchandise before being positioned on the selling floor e.g. wheel-on shelving, counters, and gondolas, and also cage pallets and rear-fill cabinet modules
purchaser	: the ultimate consumer, in this case of grocery products
retailer	: a merchant whose business is selling directly to the ultimate consumer
retail concentration	: the trend to retail concentration is evident in the U.K. grocery industry where the number of buying points responsible for an increasing proportion of the grocery sales volume has steadily decreased so that currently some 20 or so buying points control over 60% of sales volume at the retail level
retail buying group	: a group of independent retailers who agree to purchase some of their requirements jointly in order to obtain the benefits of bulk buying
*superstore/hypermarket**	: a large retailing unit with at least 50,000 sq. ft. of selling area, selling food and non-food products on a self-service basis, and having a large car parking facility; such stores are generally, but not always, located out of town
symbol system	: this is the particular machine-readable coded format used as the basis of a standard product numbering system; various schemes are currently available including the more commonly known IBM bar symbol system
temperature controls	: regulations introduced by Government to ensure the quality maintenance of frozen foods and also to lessen the possibility of chilled foods becoming a health hazard, especially during the period such goods are in-transit
trade terms	: the terms on which manufacturers offer to supply distributors with goods, detailing such matters as discount structure, credit terms etc.

**terms used interchangeably*

APPENDIX K

APPENDIX K1 : ROUND 2 INSTRUCTIONS

In this Round, a reduced list of event statements is returned for further consideration; nineteen have been deleted and need no further attention and several others restructured for clarification purposes. In all cases, the aggregated results of the panel's opinion as expressed in Round 1 is provided in the form of a composite feedback statement which attempts to reflect the majority point of view.

You are therefore requested to:

- Place a PROBABILITY (0-100%) on the subject event occurring, and AGAIN offer an estimate of the YEAR-DATE you think it will occur by. Although you do not have a record of your Round 1 estimates, you will probably soon recognise if your opinion has shifted on a particular issue, thus affecting your original estimate; this procedure helps to ensure panel members think afresh about each event in light of the Group feedback.
- If you do change your previous estimate significantly, please offer a brief explanation of your reasons for changing, under the REASONING section. Similarly, if you wish to alter or amplify your previously expressed opinions regarding possible future DISTRIBUTION DEVELOPMENTS and/or their corresponding IMPLICATIONS for supplier-distributor relations, please do so in the appropriate space. You may also want to agree, disagree, or otherwise comment on the feedback statement provided with each event.

APPENDIX K2: SPECIAL NOTES

1. In cases where you cannot ever visualise a particular event occurring indicate 'NEVER' by inserting 2025 as your estimate.
2. Where you have absolutely no idea on a particular subject, your response should be to leave blank or write 'DON'T KNOW'; it is not necessary to attempt all questions.
3. It is quite possible in the light of the group feedback supplied, that you will want to alter your previously expressed COMPETENCE-RATING (on a scale 0-5); please make sure to again fill-in the space allowed for competence ratings FOR ALL QUESTIONS ATTEMPTED.
4. DEFINITIONS are provided for key words/phrases.
5. In reassessing your year-date estimates, in all cases continue to think in terms of grocery industry expectations rather than company level expectations. Where there is some doubt in your mind, from the way a particular event statement is phrased, as to whether your estimate should be based on a total domestic economy or just grocery industry scale, please use the latter interpretation.
6. You will find some of the event statements have been drafted in percentage increase (or decrease) format; if you disagree with either the size of percentage quoted or its direction, 'NEVER' may be the most appropriate answer (in which case insert 2025 and indicate how you think the question should be modified).
7. Quantitative Feedback Terminology.
   MEDIAN YEAR: is the central forecast if all responses are placed in rank order.
   INTER-QUARTILE RANGE: is the interval or period containing the middle 50% of all responses for a particular event statement.
8, Event statements are given in a random order although the number designations remain the same as in Round 1.
9. Where an event statement is preceded by a ◈ mark, this signifies a modification to the original question format, generally WITHOUT changing its sense.
10. Please do not bother to type out your various responses; rough hand written notes will suffice.
11. In answer to various queries, the reason current or base data information does not accompany event statements is to avoid biasing participants estimates.

12. In the context of this exercise, the word "distribution" as used in the phrase DISTRIBUTION DEVELOPMENTS is meant to carry the widest possible connotation, i.e. not just restricted to physical distribution activities, but information flows and any other methods/techniques which are broadly associated with the total distribution function.
13. In the feedback statement, "supplier" generally means the manufacturer, and "distributor" generally means the retailer.

APPENDIX K3: ROUND 2 QUESTIONNAIRE FORMAT

EVENT ☐☐				PROBABILITY[1] ☐☐☐ Corresponding YEAR ESTIMATE ☐☐☐☐ C-R[2] ☐
CO-ORDINATOR COMMENT				
F[3] E E D B A C K	REASONING	DISTRIBUTION DEVELOPMENTS	IMPLICATIONS	YEAR CALCULATIONS
				MEDIAN ☐☐☐☐ I/Q RANGE[4] ☐☐☐☐ to ☐☐☐☐
PANEL ROUND 2 INPUT				********** ********** **********
EVENT ☐☐				☐☐☐ ☐☐☐☐ ☐
CO-ORDINATOR COMMENT				
F[3] E E D B A C K				MEDIAN ☐☐☐☐ I/Q RANGE ☐☐☐☐ to ☐☐☐☐
PANEL ROUND 3 INPUT				********** ********** **********

NOTES:
1. Probability of event occurrence on a scale 0-100 (%);
2. Competence Rating on scale 0-5;
3. Qualitative and Quantitative feedback from Round 1 INPUT by panel;
4. Inter-Quartile Range.

APPENDIX L

APPENDIX L1 : ROUND 3 INSTRUCTIONS

This is the FINAL ROUND of the current DISTRIBUTION INNOVATION FUTURES FORECAST; 44 event statements remain for final consideration. The aggregated results of the panel's opinion as expressed in the previous Round is provided as feedback in the form of a composite statement which attempts to reflect a spectrum of views consistent with the average probability and MEDIAN year date estimate which resulted from analysing all the individual estimates offered for each event.

You are therefore requested to:

- Place a PROBABILITY (0 - 100%) on the subject event actually occurring, and AGAIN offer an estimate of the YEAR-DATE you think it will occur by. Remember, if you give 'NEVER' as your answer, by definition, the probability of the event occurring is in your estimation, zero. Although you may not have a record of your Round 2 estimates, you will probably soon recognise if your opinion has shifted on a particular issue, thus affecting your original estimate; this procedure helps to ensure panel members think afresh about each event in light of the Group feedback. Make sure to again fill-in your self-perceived COMPETENCE RATING for each question attempted.
- For the QUALITATIVE INPUT, please offer a final statement on your thinking in the case of each event considered, making sure to include the REASONING used, the possible/probable DISTRIBUTION DEVELOPMENTS you foresee as a result of the event occurring, and the corresponding IMPLICATIONS these are likely to have for supplier-distributor relationships in the subject industry.
- Where you are requested to offer a brief explanation in DEFENCE of your position as stated in Round 2, it simply means that your previous estimate falls outside the middle 50% of the responses received, and hence places you in an extreme position. You may either decide to hold to your previously expressed view and explain, or modify this view and move closer to the calculated MEDIAN year as given in the feedback section.

APPENDIX L2: SPECIAL NOTES

1. For this final round, concentrate particularly on providing qualitative explanations for those events you personally have more knowledge about. Try to visualise which DISTRIBUTION DEVELOPMENTS may follow, and the IMPLICATIONS of those for future supplier-distributor relationships in the subject industry.
2. In cases where you cannot ever visualise a particular event occurring indicate 'NEVER' by inserting 2025 as your estimate.
3. Where you have absolutely no idea on a particular subject, your response should be to leave blank or write 'DON'T KNOW'; it is not necessary to attempt all questions.
4. It is quite possible in the light of the group feedback supplied, that you will want to alter your previously expressed COMPETENCE-RATING (on a scale 0-5); please make sure to again fill-in the space allowed for competence ratings FOR ALL QUESTIONS ATTEMPTED.
5. DEFINITIONS are provided for words/phrases shown with the superscript.
6. In re-assessing your year-date estimates, in all cases continue to think in terms of grocery industry expectations rather than company level expectations, using of course, your own cumulative experience in the industry when making the final judgement. Where there is some doubt in your mind due to the way a particular event statement is phrased (i.e. whether your estimate should be based on a total domestic economy or just grocery industry scale), please use the industry level interpretation.
7. You will find some of the event statements have been drafted in percentage (increase or decrease) format; if you disagree with either the size of percentage quoted or its direction, 'NEVER' may be the most appropriate answer (in which case insert 2025 and indicate how you think the question should be modified).
8. Quantitative Feedback Terminology.
   MEDIAN YEAR: is the central forecast if all responses are placed in rank order.
   INTER-QUARTILE RANGE: is the interval or period containing the middle 50% of all responses for a particular event statement.
9. Where an event statement is preceded by a ◈ mark, this indicates a modification to the event description in the previous round.

10. Please do not bother to type your various responses; rough hand-written (but legible) notes will suffice.
11. In answer to various queries, the reason current or base data information does not accompany event statements is to avoid biasing participants estimates.
12. In the context of this exercise, the word 'distribution' as used in the phrase 'DISTRIBUTION DEVELOPMENTS' is meant to carry the widest possible connotation, i.e. not just restricted to physical distribution activities, but information flows and any other methods/techniques which are broadly associated with the total distribution function.
13. In the feedback statement, 'Supplier' generally means the manufacturer, and 'Distributor' generally means the retailer.
14. In general, where the word 'Significant' is used in an event statement, it is meant to connote 20-25% of the particular group or development being referred to.

APPENDIX L3: ROUND 3 QUESTIONNAIRE FORMAT

EVENT ☐☐

CO-ORDINATOR COMMENT		********** **********
F[1] E E D B A C K		MEDIAN ☐☐☐☐ I/Q Range[2] ☐☐☐☐ ☐☐☐☐ AVE PROB ☐☐☐
DEFENCE STATEMENT REQUIRED YES/NO		********** ********** ********** **********
FINAL INPUT		YEAR ESTIMATE ☐☐☐☐ C-R[3] ☐ PROBABILITY[4] ☐☐☐

EVENT ☐☐

CO-ORDINATOR COMMENT		********** **********
F[1] E E D B A C K		MEDIAN ☐☐☐☐ I/Q RANGE[2] ☐☐☐☐ ☐☐☐☐ AVE PROB. ☐☐☐
DEFENCE STATEMENT REQUIRED YES/NO		********** ********** ********** **********
FINAL INPUT		YEAR ESTIMATE ☐☐☐☐ C-R[3] ☐ PROBABILITY[4] ☐☐☐

NOTES 1. Qualitative and Quantitative Feedback. 2. Interquartile Range. 3. Competence Rating on Scale 0-5. 4. Probability on Scale 0-100 (%).

Factor Analysis of Delphi - Varimax Rotated Factor Matrix

(File Noname : Creation Date = 04/27/77)

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
VAR002	0.37743	-0.03012	0.03413	0.08001	-0.07244	-0.18402	-0.15366	0.76301	0.04019	0.00444
VAR004	0.07137	0.29259	0.53261	-0.00896	-0.15225	-0.11111	0.46802	0.11377	-0.12337	0.24484
VAR006	0.24195	0.10892	0.14603	0.33987	-0.03932	0.06008	0.05839	0.06983	-0.00322	0.52493
VAR007	-0.04835	0.30914	-0.02390	0.23123	0.05218	-0.04996	-0.18469	-0.00389	0.39950	0.25769
VAR009	0.09361	0.18788	0.08267	-0.09080	-0.03836	0.20168	-0.10067	-0.00229	-0.09951	0.02298
VAR010	0.29453	-0.00410	0.35303	0.36831	0.41542	-0.18573	0.02199	0.37996	-0.07770	0.05839
VAR011	0.04633	0.25716	0.51403	0.34934	0.35326	0.05238	0.32888	0.00638	0.38374	-0.08052
VAR012	-0.27726	0.19989	-0.11192	-0.00289	0.25420	0.30495	0.14837	0.46585	-0.10759	0.14402
VAR013	-0.04857	-0.10189	0.09851	-0.10346	-0.34320	0.05018	0.08197	0.36145	0.01692	0.15503
VAR015	-0.16249	-0.07008	0.55778	-0.18910	0.23906	0.18192	-0.21364	0.48677	0.10615	0.10826
VAR017	0.23747	0.88815	0.02766	0.10819	0.13847	0.07131	0.01754	0.10759	0.06360	0.09500
VAR018	0.36006	-0.08962	0.04532	0.23252	0.52114	-0.03294	-0.13564	-0.00628	0.08695	0.30061
VAR020	0.09279	0.33667	-0.06152	0.21383	-0.00820	0.07839	-0.16288	0.57478	0.08498	0.20170
VAR021	0.20963	0.03474	-0.17759	0.04274	0.07725	0.10601	0.85294	-0.17402	0.02776	0.03956
VAR022	0.13595	0.06043	-0.03196	-0.11972	0.10594	0.04591	0.20227	0.08528	0.03762	0.04138
VAR024	0.74365	0.12376	0.12819	-0.02080	0.08806	-0.15020	0.09062	0.02090	0.06013	0.16391
VAR026	0.37206	0.02611	0.02094	0.51360	0.12394	-0.16461	0.01975	0.01301	0.05376	0.21530
VAR027	-0.00097	0.37371	0.10889	-0.03626	-0.01450	0.19013	-0.11610	-0.13620	0.22802	0.28359
VAR028	0.11056	0.69272	-0.10886	-0.10381	0.20888	0.17524	0.11005	-0.03281	0.04215	0.04829
VAR029	0.58369	0.29600	0.11342	-0.01681	0.18082	-0.25433	0.17619	0.20810	0.00036	0.11793
VAR032	0.61085	0.14431	0.10755	0.19618	-0.09737	-0.06954	0.12046	0.02690	0.29949	-0.01130
VAR033	0.22067	0.06450	0.14670	0.11725	0.37223	0.36458	0.29943	0.05185	0.05952	0.16161
VAR034	0.11790	0.01208	0.08192	0.02004	-0.05764	0.14406	0.03539	-0.07132	0.10816	0.11433
VAR035	0.62062	0.24267	-0.02179	-0.10618	-0.22526	0.41971	0.00992	-0.02909	-0.07191	0.02969
VAR037	0.04369	0.26990	0.03630	0.01934	0.75327	0.12611	0.07136	0.02529	0.00289	0.06663
VAR040	0.51267	0.13544	0.26097	0.28913	-0.23060	0.31320	0.12067	0.06672	-0.08236	0.03263
VAR041	0.07985	-0.13817	0.85759	0.05430	0.01662	-0.11182	-0.15141	-0.02596	0.01848	-0.02968
VAR043	0.79522	0.10018	0.07707	-0.07473	0.11299	0.09365	0.09480	0.01568	-0.12879	0.22607
VAR044	0.41828	0.49363	0.00865	-0.03346	0.02082	-0.11560	0.22527	0.04876	-0.36519	-0.17002
VAR045	0.15228	-0.04897	-0.00505	-0.13029	-0.00648	-0.03794	0.04429	0.02550	0.87135	-0.07840
VAR046	-0.04364	0.28006	-0.12166	0.11658	0.03592	0.62252	0.02819	0.10581	0.09337	-0.15875
VAR047	0.69801	0.10025	0.02550	0.37504	0.11465	0.07212	-0.01299	0.03812	0.02667	0.11104
VAR049	0.70788	-0.14556	-0.13736	-0.13602	0.05750	-0.08301	-0.10078	0.04044	0.08013	-0.01322
VAR051	-0.02452	0.20582	0.21576	0.20037	0.06633	0.24816	0.04757	0.45310	0.47265	-0.05750
VAR052	0.47664	0.01066	-0.09063	0.06617	0.13457	-0.07227	-0.09025	-0.06157	-0.04534	0.72027
VAR053	0.64402	0.12124	0.09632	0.23675	0.05180	0.12392	0.31065	0.03982	0.10229	0.21858
VAR055	-0.08574	-0.04265	0.08586	0.77049	0.07571	0.34246	0.04547	0.10121	-0.05548	0.09589
VAR056	0.27431	0.10965	0.20103	0.09688	0.10439	0.03545	0.27777	0.25489	-0.04652	0.68997
VAR057	-0.02351	-0.05018	-0.01519	0.06674	0.08411	0.81796	0.03822	-0.07252	-0.04876	0.06324
VAR058	0.30771	0.21394	0.43030	0.31923	0.09267	-0.10573	-0.04804	-0.00327	-0.03762	0.24599
VAR059	0.17910	0.13228	0.08864	-0.14898	0.17796	0.01118	0.00421	0.07859	0.10550	0.10255
VAR060	0.38174	0.29190	0.02722	0.35075	0.10483	0.18950	0.19125	0.07381	0.12268	0.26876
VAR061	0.41862	-0.13014	0.45069	0.08368	-0.08594	0.28494	0.07612	0.10265	0.08100	0.17166

	FACTOR 11	FACTOR 12	FACTOR 13	FACTOR 14
VAR002	-0.08949	0.11510	0.09782	0.17858
VAR004	0.22283	-0.11111	-0.09722	0.09170
VAR006	-0.06291	0.49635	0.20684	-0.10066
VAR007	0.16658	0.09462	-0.08033	0.11331
VAR009	0.11273	0.90258	-0.00438	0.09958
VAR010	-0.08663	0.03288	0.12007	-0.02658
VAR011	0.10429	0.07001	0.04229	0.01318
VAR012	-0.32207	-0.14997	-0.11423	-0.04412
VAR013	0.38987	-0.17142	0.16594	-0.33270
VAR015	0.08814	-0.11587	-0.17360	0.12616
VAR017	-0.08318	-0.00332	0.10207	0.07745
VAR018	-0.15937	0.10246	0.20359	0.39661
VAR020	0.45593	0.17102	0.33936	-0.03128
VAR021	0.03379	-0.07009	0.03407	0.19006
VAR022	-0.01364	0.04272	-0.04025	0.65846
VAR024	-0.18134	0.08268	0.07520	-0.14752
VAR026	-0.11761	0.47826	0.00242	0.07006
VAR027	-0.57851	-0.17292	0.11593	0.17489
VAR028	-0.02219	0.38330	0.10829	-0.11788
VAR029	0.15128	0.18155	-0.04653	0.11321
VAR032	0.15229	0.12408	0.09634	0.12371
VAR033	-0.16583	0.13284	-0.19444	0.18365
VAR034	0.81270	-0.01515	-0.04502	0.02335
VAR035	0.13559	0.04616	0.19153	0.27844
VAR037	0.00029	-0.06669	0.11902	0.05145
VAR040	0.09527	0.06225	0.38446	0.09949
VAR041	-0.02967	0.07987	0.14107	-0.09715
VAR043	-0.00260	0.00285	-0.01563	0.05521
VAR044	-0.09277	0.15009	-0.02138	0.28938
VAR045	-0.04522	-0.05633	0.10787	0.02971
VAR046	-0.02434	0.14494	-0.03759	0.18185
VAR047	0.30453	0.04941	0.09431	0.05101
VAR049	-0.06349	-0.02743	0.01763	0.17835
VAR051	0.15249	-0.15088	-0.05519	-0.10160
VAR052	0.19162	0.09546	0.11394	-0.07806
VAR053	0.15676	0.13284	0.05326	-0.16332
VAR055	0.03829	-0.12573	-0.21732	-0.16572
VAR056	-0.03393	0.00970	-0.00199	0.17992
VAR057	0.10389	0.06133	0.06167	-0.11077
VAR058	0.23287	0.17506	-0.00059	-0.12307
VAR059	-0.06092	0.03068	0.92318	-0.05347
VAR060	0.16163	0.00002	0.04014	-0.30305
VAR061	-0.22093	0.32559	0.07105	0.11675

VARIABLE	COMMUNALITY
VAR002	0.86023
VAR004	0.79704
VAR006	0.79951
VAR007	0.47331
VAR009	0.95920
VAR010	0.73216
VAR011	0.86182
VAR012	0.69958
VAR013	0.63477
VAR015	0.84131
VAR017	0.93026
VAR018	0.81770
VAR020	0.93567
VAR021	0.89958
VAR022	0.53935
VAR024	0.72181
VAR026	0.74310
VAR027	0.76260
VAR028	0.77942
VAR029	0.69795
VAR032	0.62660
VAR033	0.59832
VAR034	0.73966
VAR035	0.92446
VAR037	0.69123
VAR040	0.78171
VAR041	0.83794
VAR043	0.75588
VAR044	0.76438
VAR045	0.82983
VAR046	0.59957
VAR047	0.77829
VAR049	0.62517
VAR051	0.68934
VAR052	0.86094
VAR053	0.74093
VAR055	0.84978
VAR056	0.80323
VAR057	0.72763
VAR058	0.61160
VAR059	0.99907
VAR060	0.65052
VAR061	0.71677

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	9.46226	29.0	29.0
2	3.26900	10.0	39.1
3	2.94594	9.0	48.1
4	2.49097	7.6	55.7
5	2.05840	6.3	62.1
6	1.95199	6.0	68.1
7	1.73398	5.3	73.4
8	1.71772	5.3	78.6
9	1.61059	4.9	83.6
10	1.42564	4.4	88.0
11	1.17813	3.6	91.6
12	1.08804	3.3	94.9
13	0.90622	2.8	97.7
14	0.75087	2.3	100.0

Factor Analysis of Delphi - Correlation Coefficient Matrix

(File Noname : Creation Date = 04/27/77)

	VAR002	VAR004	VAR006	VAR007	VAR009	VAR010	VAR011	VAR012	VAR013	VAR015
VAR002	1.00000	0.00823	0.22559	-0.01172	0.13523	0.53118	-0.01520	0.12795	0.22365	0.26653
VAR004	0.00823	1.00000	0.21311	0.05875	-0.03342	0.21811	0.39856	0.04765	0.33901	0.22424
VAR006	0.22559	0.21311	1.00000	0.26299	0.45929	0.27110	0.27394	0.02615	0.05023	-0.06688
VAR007	-0.01172	0.05875	0.26299	1.00000	0.12466	0.03032	0.30657	0.01847	0.09081	0.04901
VAR009	0.13523	-0.03342	0.45929	0.12466	1.00000	0.00282	0.08423	-0.12589	-0.12700	-0.03374
VAR010	0.53118	0.21811	0.27110	0.03032	0.00282	1.00000	0.45920	0.18399	0.00319	0.25016
VAR011	-0.01520	0.39856	0.27394	0.30657	0.08423	0.45920	1.00000	0.05441	-0.05331	0.25548
VAR012	0.12795	0.04765	0.02615	0.01847	-0.12589	0.18399	0.05441	1.00000	0.04414	0.23632
VAR013	0.22365	0.33901	0.05023	0.09081	-0.12700	0.00319	-0.05331	0.04414	1.00000	0.18337
VAR015	0.26653	0.22424	-0.06688	0.04901	-0.03374	0.25016	0.25548	0.23632	0.18337	1.00000
VAR017	0.21245	0.28039	0.22532	0.29596	0.24196	0.18357	0.34501	0.25034	-0.13670	-0.08963
VAR018	0.23707	-0.10288	0.37257	0.23148	0.09280	0.49916	0.24410	0.05097	-0.34343	0.05456
VAR020	0.45904	0.10745	0.42411	0.28470	0.28593	0.24196	0.17998	0.09886	0.31396	0.23390
VAR021	-0.18692	0.26729	0.07774	-0.15760	-0.09650	-0.05098	0.28894	0.04369	-0.07060	-0.37076
VAR022	0.21939	0.19645	-0.07418	0.08722	0.14566	0.06248	0.07407	0.00849	-0.28030	0.16722
VAR024	0.26218	0.22160	0.35353	-0.04252	0.10831	0.37402	0.10026	-0.22239	-0.05060	-0.07327
VAR026	0.31944	0.03677	0.63393	0.22764	0.35092	0.44222	0.24431	-0.20750	-0.23457	-0.14749
VAR027	-0.00397	0.01760	0.12259	0.20236	-0.12181	0.07915	0.10375	0.19710	-0.26022	0.07984
VAR028	-0.04121	0.04888	0.30778	0.22789	0.48063	0.04294	0.23323	0.14990	-0.15069	-0.09228
VAR029	0.40569	0.41178	0.24404	0.14385	0.25214	0.46584	0.21612	-0.11220	-0.00475	0.02194
VAR032	0.31547	0.19487	0.32613	0.20613	0.15619	0.25388	0.36310	-0.26554	-0.01367	-0.06379
VAR033	0.00521	0.25323	0.31115	0.10195	0.15686	0.24967	0.36062	0.27379	-0.23357	0.19089
VAR034	-0.06541	0.25882	-0.00016	0.16231	0.11423	-0.00982	0.11951	-0.31714	0.32154	0.08253
VAR035	0.19382	0.09715	0.28001	-0.02581	0.29965	-0.12252	0.02402	-0.16910	0.02838	-0.11101
VAR037	-0.04062	-0.02000	0.06173	0.11055	-0.00079	0.29656	0.45073	0.28114	-0.26748	0.24287
VAR040	0.21377	0.27079	0.40308	0.02331	0.21157	0.27870	0.24630	-0.13518	0.16170	-0.05959
VAR041	0.12940	0.30261	0.22856	-0.06253	0.13210	0.38812	0.40325	-0.21845	0.04045	0.41684
VAR043	0.26277	0.17372	0.31996	-0.00247	0.14517	0.23416	0.13371	-0.03688	-0.05827	-0.01866
VAR044	0.24629	0.30765	0.12585	-0.01725	0.22180	0.17152	0.12163	0.09611	-0.25324	-0.17487
VAR045	0.15943	-0.10326	-0.11515	0.23336	-0.12814	-0.07076	0.29742	-0.10590	0.01542	0.01182
VAR046	-0.02898	0.02510	0.05046	0.09930	0.30578	-0.05437	0.13703	0.37409	-0.16817	0.07914
VAR047	0.31272	0.16664	0.39607	0.24491	0.11583	0.40110	0.31549	-0.29242	0.08655	-0.08824
VAR049	0.34996	-0.07824	0.06365	-0.02717	-0.00746	0.18665	-0.12623	-0.15784	-0.09315	-0.08839
VAR051	0.25178	0.12139	0.09507	0.30704	-0.16555	0.17035	0.47929	0.26170	0.19448	0.45383
VAR052	0.15750	0.10996	0.60030	0.26635	0.14911	0.20769	-0.00870	-0.05635	0.07769	-0.09827
VAR053	0.22217	0.30845	0.48440	0.10078	0.19706	0.37895	0.40707	-0.07992	0.10116	-0.16612
VAR055	-0.01165	0.05311	0.19628	0.13486	-0.12255	0.24527	0.29350	0.23301	0.01370	0.08312
VAR056	0.31288	0.47220	0.47174	0.07087	0.09023	0.35068	0.18553	0.21782	0.03335	0.26068
VAR057	-0.20194	-0.07766	0.08042	-0.07490	0.20351	-0.04094	0.03504	0.20753	0.17756	0.05386
VAR058	0.13520	0.42138	0.46017	0.18161	0.22191	0.46759	0.38240	-0.14655	0.01468	0.11467
VAR059	0.17894	0.02289	0.28595	-0.02867	0.03188	0.25585	0.13421	-0.04457	0.15327	-0.02657
VAR060	0.05983	0.18212	0.42092	0.17510	0.05709	0.31710	0.38222	0.04148	0.10856	-0.00169
VAR061	0.27631	0.14774	0.46821	0.00659	0.39730	0.25263	0.31147	-0.03982	-0.03567	0.23505

	VAR017	VAR018	VAR020	VAR021	VAR022	VAR024	VAR026	VAR027	VAR028	VAR029
VAR002	0.21245	0.23707	0.45904	-0.18692	0.21939	0.26218	0.31844	-0.00397	-0.04121	0.40569
VAR004	0.28039	-0.10288	0.10745	0.26729	0.19645	0.22160	0.03677	0.01760	0.04888	0.41178
VAR006	0.22532	0.37257	0.42411	0.07774	-0.07418	0.35353	0.63393	0.12259	0.30778	0.24404
VAR007	0.29596	0.23148	0.28470	-0.15760	0.08722	-0.04252	0.22764	0.20236	0.22789	0.14385
VAR009	0.24196	0.09280	0.28593	-0.09650	0.14566	0.10831	0.35092	-0.12181	0.48063	0.25214
VAR010	0.18357	0.49916	0.24196	-0.05098	0.06248	0.37402	0.44222	0.07915	0.04294	0.46584
VAR011	0.34501	0.24410	0.17998	0.28894	0.07407	0.10026	0.24431	0.10375	0.23323	0.21612
VAR012	0.25034	0.05097	0.09886	0.04369	0.00849	-0.22239	-0.20750	0.19710	0.14990	-0.11220
VAR013	-0.13670	-0.34343	0.31396	-0.07060	-0.28030	-0.05060	-0.23457	-0.26022	-0.15069	-0.00475
VAR015	-0.08963	0.05456	0.23390	-0.37076	0.16722	-0.07327	-0.14749	0.07984	-0.09228	0.02194
VAR017	1.00000	0.21976	0.46629	0.13630	0.16848	0.35613	0.18672	0.47533	0.68487	0.43922
VAR018	0.21976	1.00000	0.14721	0.10771	0.27088	0.33609	0.41766	0.22613	0.03738	0.41032
VAR020	0.46629	0.14721	1.00000	-0.15200	-0.00926	0.14565	0.19291	-0.20226	0.27748	0.30586
VAR021	0.13630	0.10771	-0.15200	1.00000	0.34738	0.19502	0.03800	-0.02679	0.19056	0.23699
VAR022	0.16848	0.27088	-0.00926	0.34738	1.00000	0.00487	0.11123	0.14159	0.07726	0.26188
VAR024	0.35613	0.33609	0.14565	0.19502	0.00487	1.00000	0.43716	0.16541	0.23994	0.60152
VAR026	0.18672	0.41766	0.19291	0.03800	0.11123	0.43716	1.00000	0.05882	0.20806	0.41724
VAR027	0.47533	0.22613	-0.20226	-0.02679	0.14159	0.16541	0.05882	1.00000	0.24115	-0.02312
VAR028	0.68487	0.03738	0.27748	0.19056	0.07726	0.23994	0.20806	0.24115	1.00000	0.30869
VAR029	0.43922	0.41032	0.30586	0.23699	0.26188	0.60152	0.41724	-0.02312	0.30869	1.00000
VAR032	0.25638	0.28310	0.22187	0.22491	0.12682	0.45498	0.40431	-0.00674	0.16184	0.49453
VAR033	0.24385	0.40421	-0.00023	0.39760	0.23673	0.32494	0.32640	0.14725	0.19452	0.22730
VAR034	0.00277	-0.08858	0.35362	0.13293	0.00508	-0.09505	-0.02695	-0.33618	0.01679	0.17303
VAR035	0.42780	0.14971	0.30088	0.25460	0.28019	0.33753	0.08175	0.13640	0.26204	0.30848
VAR037	0.45547	0.39241	0.11490	0.12638	0.17999	0.11673	0.11734	0.08085	0.35566	0.16847
VAR040	0.32322	0.20525	0.39142	0.19869	0.17603	0.39380	0.28164	0.03529	0.14536	0.22637
VAR041	-0.03753	0.16155	-0.05258	-0.25822	-0.16589	0.19431	0.05327	0.03188	-0.17871	0.09647
VAR043	0.32206	0.37119	0.08943	0.24480	0.19489	0.60066	0.27145	0.04535	0.14547	0.56195
VAR044	0.47036	0.14312	0.05747	0.30151	0.26117	0.27366	0.23165	0.05447	0.44418	0.48437
VAR045	0.07950	0.11828	0.02152	0.06912	0.08074	0.17225	0.01533	0.18376	-0.00211	0.04846
VAR046	0.24177	0.05267	0.21340	0.06448	0.13958	-0.09450	0.00917	0.25262	0.30603	0.00669
VAR047	0.27617	0.47620	0.39525	0.21709	0.04760	0.52334	0.51607	-0.05684	0.18032	0.54416
VAR049	0.04801	0.36711	0.01011	0.08622	0.22882	0.56259	0.19107	-0.04194	-0.00358	0.28814
VAR051	0.28456	-0.03818	0.46950	0.02797	-0.03387	0.00059	-0.04713	0.03248	0.12816	0.11371
VAR052	0.15406	0.46617	0.31294	0.07857	0.05602	0.42717	0.34132	0.04183	0.15760	0.37683
VAR053	0.36232	0.22513	0.24191	0.34148	0.13117	0.52558	0.45765	-0.04087	0.24540	0.53268
VAR055	0.12515	0.05317	0.15832	0.06421	-0.14158	-0.09470	0.28634	-0.09865	-0.11082	-0.17134
VAR056	0.31588	0.41557	0.34850	0.32319	0.23305	0.38583	0.37792	0.27640	0.15950	0.39259
VAR057	-0.00683	0.03172	0.02270	0.09492	-0.03037	-0.14592	-0.04002	0.16000	0.21294	-0.16613
VAR058	0.35759	0.25217	0.33803	-0.09244	-0.12036	0.34388	0.43772	-0.07166	0.21239	0.37744
VAR059	0.26063	0.32647	0.41589	0.02458	0.01798	0.30101	0.11157	0.25286	0.29850	0.17384
VAR060	0.36328	0.10606	0.44509	0.24285	-0.07548	0.38200	0.32939	0.13172	0.36380	0.39742
VAR061	0.05335	0.34053	0.07148	0.08422	0.14954	0.34969	0.36819	0.17946	0.10073	0.26043

	VAR032	VARC33	VAR034	VARC35	VAR037	VAR040	VAR041	VAR043	VAR044	VARC45
VARCC2	0.31547	0.00521	-0.06541	0.19882	-0.04062	0.21377	0.12840	0.26277	0.24629	0.15943
VARCC4	0.19487	0.25323	0.25882	0.09715	-0.02000	0.27079	0.30261	0.17372	0.30765	-0.10326
VAR006	0.32613	0.31115	-0.00016	0.28001	0.06173	0.40308	0.22856	0.31996	0.12585	-0.11515
VARCC7	0.20613	0.10195	0.16231	-0.02581	0.11055	0.02331	-0.06253	-0.00247	-0.01725	0.23336
VARCC9	0.15619	0.15686	0.11423	0.29965	-0.00079	0.21157	0.13210	0.14517	0.22180	-0.12814
VAR010	0.25388	0.24967	-0.00982	-0.12252	0.29656	0.27870	0.38812	0.23416	0.17152	-0.07076
VAR011	0.36310	0.36062	0.11951	0.02402	0.45073	0.24630	0.40325	0.13371	0.12163	0.29742
VAR012	-0.26554	0.27379	-0.31714	-0.16910	0.28114	-0.13518	-0.21845	-0.03688	0.09611	-0.10590
VAR013	-0.01367	-0.23357	0.32154	0.02838	-0.26748	0.16170	0.04045	-0.05827	-0.25324	0.01542
VAR015	-0.06379	0.19089	0.08253	-0.11101	0.24287	-0.05959	0.41684	-0.01866	-0.17487	0.01182
VAR017	0.25638	0.24385	0.00277	0.42780	0.45547	0.32322	-0.03753	0.32206	0.47036	0.07990
VAR018	0.28310	0.40421	-0.08858	0.14971	0.39241	0.20525	0.16155	0.37119	0.14312	0.11828
VAR020	0.22187	-0.00023	0.35362	0.30088	0.11490	0.39142	-0.05258	0.08943	0.05747	0.02192
VAR021	0.22491	0.39760	0.13293	0.25460	0.12638	0.19869	-0.25822	0.24480	0.30151	0.06912
VAR022	0.12682	0.23673	0.00508	0.28019	0.17999	0.17603	-0.16589	0.19489	0.26117	0.08074
VAR024	0.45498	0.32494	-0.09505	0.33753	0.11673	0.39380	0.19431	0.60066	0.27366	0.17225
VAR026	0.40431	0.32640	-0.02695	0.08175	0.11734	0.28164	0.05327	0.27145	0.23165	0.01533
VAR027	-0.00674	0.14725	-0.33618	0.13640	0.08085	0.03529	0.03188	0.04535	0.05447	0.18376
VAR028	0.16184	0.19452	0.01679	0.26204	0.35566	0.14536	-0.17871	0.14547	0.44418	-0.00211
VAR029	0.49453	0.22730	0.17303	0.30848	0.16847	0.22637	0.09647	0.56195	0.48437	0.04846
VAR032	1.00000	0.10130	0.25681	0.43548	0.00598	0.53471	0.12584	0.45154	0.33885	0.35453
VAR033	0.10130	1.00000	-0.03646	0.25171	0.37406	0.16335	0.02019	0.26984	0.23631	0.05194
VAR034	0.25681	-0.03646	1.00000	0.25702	-0.02744	0.14895	0.05443	0.07499	-0.09519	0.10279
VAR035	0.43548	0.25171	0.25702	1.00000	0.04529	0.58235	-0.03558	0.61250	0.42207	0.00314
VAR037	0.00598	0.37406	-0.02744	0.04529	1.00000	0.02222	-0.03931	0.23728	0.13310	-0.00610
VAR040	0.53471	0.16335	0.14895	0.58235	0.02222	1.00000	0.24031	0.45739	0.33668	-0.00396
VAR041	0.12584	0.02019	0.05443	-0.03558	-0.03931	0.24031	1.00000	0.06337	-0.05838	0.03562
VAR043	0.45154	0.26984	0.07499	0.61250	0.23728	0.45739	0.06337	1.00000	0.44007	-0.01397
VAR044	0.33885	0.23631	-0.09519	0.42207	0.13310	0.33668	-0.05838	0.44007	1.00000	-0.27626
VAR045	0.35453	0.05194	0.10279	0.00314	-0.00610	-0.00396	0.03562	-0.01397	-0.27626	1.00000
VAR046	0.14200	0.33549	0.09218	0.26121	0.09743	0.23203	-0.27041	-0.00223	0.13027	0.06125
VAR047	0.49784	0.21816	0.37152	0.50007	0.16650	0.51097	0.05258	0.60657	0.34747	-0.00164
VAR049	0.43307	0.21986	-0.00499	0.46119	0.00866	0.25536	-0.05904	0.47297	0.24780	0.25747
VAR051	0.17223	0.22927	0.14443	0.06451	0.14694	0.16402	0.16562	-0.02861	-0.14912	0.34591
VAR052	0.31306	0.11587	0.23625	0.27214	0.13836	0.26708	0.04328	0.55824	0.07419	-0.05014
VAR053	0.56603	0.26296	0.28132	0.41180	0.16810	0.52972	0.09297	0.69112	0.20259	0.12328
VAR055	-0.00244	0.24325	0.05982	-0.05058	0.11682	0.18868	0.07889	-0.06904	-0.26145	-0.20495
VAR056	0.28959	0.39093	0.16773	0.24993	0.27216	0.33886	0.05334	0.46653	0.16778	-0.01804
VAR057	-0.09796	0.35573	0.28080	0.24180	0.11813	0.27864	-0.08553	0.01575	-0.15971	-0.08054
VAR058	0.36104	0.22952	0.33822	0.11555	0.10581	0.42477	0.38859	0.30862	0.17766	-0.01069
VAR059	0.20817	-0.02175	-0.07000	0.27933	0.32454	0.38999	0.20007	0.18169	0.06424	0.24372
VAR060	0.42660	0.24676	0.24957	0.24669	0.24941	0.44809	-0.02445	0.36553	0.16146	0.08430
VAR061	0.30071	0.24787	-0.07347	0.40484	-0.02325	0.53638	0.41865	0.46504	0.15776	0.11565

	VAR046	VAR047	VAR048	VAR051	VAR052	VAR053	VAR055	VAR056	VAR057	VAR058
VAR002	-0.02858	0.31272	0.34996	0.25178	0.15750	0.22217	-0.01165	0.31288	-0.20194	0.13520
VAR004	0.02510	0.16664	-0.07824	0.12139	0.10996	0.30845	0.05311	0.47220	-0.07766	0.43138
VAR006	0.05046	0.39607	0.06365	0.09507	0.60030	0.48440	0.19628	0.47174	0.08042	0.46017
VAR007	0.09930	0.24491	-0.02717	0.30704	0.26635	0.10078	0.13486	0.07087	-0.07490	0.18161
VAR009	0.30578	0.11583	-0.00746	-0.16555	0.14911	0.19706	-0.12255	0.09023	0.20351	0.22191
VAR010	-0.05437	0.40110	0.18665	0.17035	0.20769	0.37895	0.24527	0.35068	-0.04094	0.46759
VAR011	0.13703	0.31549	-0.12623	0.47929	-0.00870	0.40707	0.29350	0.18553	0.03504	0.38240
VAR012	0.37409	-0.29242	-0.15784	0.26170	-0.05635	-0.07992	0.23301	0.21782	0.20753	-0.14655
VAR013	-0.16817	0.08655	-0.09315	0.19448	0.07769	0.10116	0.01370	0.03335	0.17756	0.01468
VAR015	0.07914	-0.08824	-0.08839	0.45383	-0.09827	-0.16612	0.08312	0.26068	0.05386	0.11467
VAR017	0.24177	0.27617	0.04801	0.28456	0.15406	0.36232	0.12515	0.31588	-0.00653	0.35759
VAR018	0.05267	0.47620	0.36711	-0.03818	0.46617	0.22513	0.05317	0.41557	0.03172	0.25217
VAR020	0.21340	0.39525	0.01011	0.49950	0.31294	0.24191	0.15832	0.34850	0.02270	0.33803
VAR021	0.06448	0.21709	0.08622	0.02797	0.07857	0.34148	0.06421	0.32319	0.09492	-0.09244
VAR022	0.13058	0.04760	0.22882	-0.03387	0.05602	0.13117	-0.14158	0.23305	-0.03037	-0.12036
VAR024	-0.09450	0.52334	0.56259	0.00059	0.42717	0.52558	-0.09470	0.38583	-0.14592	0.34388
VAR026	0.00917	0.51607	0.19107	-0.04713	0.34132	0.45765	0.28634	0.37792	-0.04002	0.43772
VAR027	0.25262	-0.05684	-0.04194	0.03248	0.04183	-0.04087	-0.09865	0.27640	0.16000	-0.07166
VAR028	0.30603	0.18032	-0.00358	0.12816	0.15760	0.24540	-0.11082	0.15950	0.21294	0.21239
VAR029	0.00669	0.54416	0.28814	0.11371	0.37683	0.53268	-0.17134	0.39259	-0.16613	0.37744
VAR032	0.14200	0.49784	0.43307	0.17223	0.31306	0.56603	-0.00244	0.28559	-0.09796	0.36104
VAR033	0.33549	0.21816	0.21986	0.22927	0.11587	0.26296	0.24325	0.39093	0.35573	0.22952
VAR034	0.09218	0.37152	-0.00499	0.14443	0.23625	0.28132	0.05982	0.16773	0.28080	0.33822
VAR035	0.26121	0.50007	0.46119	0.06451	0.27214	0.41180	-0.05058	0.24993	0.24180	0.11555
VAR037	0.09743	0.16650	0.00866	0.14694	0.13836	0.16810	0.11682	0.27216	0.11813	0.10581
VAR040	0.23203	0.51097	0.25536	0.16402	0.26708	0.52972	0.18868	0.33886	0.27864	0.42477
VAR041	-0.27041	0.05258	-0.05904	0.16562	0.04328	0.09297	0.07889	0.05334	-0.08553	0.38859
VAR043	-0.00223	0.60657	0.47297	-0.02861	0.55824	0.69112	-0.06904	0.46653	0.01575	0.30862
VAR044	0.13027	0.24747	0.24780	-0.14912	0.07419	0.20259	-0.26145	0.16778	-0.15971	0.17766
VAR045	0.06125	-0.00164	0.25747	0.34591	-0.05014	0.12328	-0.20495	-0.01804	-0.08054	-0.01069
VAR046	1.00000	0.10483	-0.11827	0.22427	-0.18029	0.09142	0.22888	-0.09364	0.54872	-0.09526
VAR047	0.10483	1.00000	0.41085	0.22957	0.51811	0.60553	0.23865	0.29367	0.13492	0.39104
VAR049	-0.11827	0.41085	1.00000	-0.14390	0.35099	0.28394	-0.22908	0.07942	-0.12658	0.12112
VAR051	0.22427	0.22957	-0.14390	1.00000	-0.10718	0.20003	0.30075	0.11655	0.12723	0.13081
VAR052	-0.18029	0.51811	0.35099	-0.10718	1.00000	0.53694	0.00842	0.54478	0.04419	0.42375
VAR053	0.09142	0.60553	0.28394	0.20003	0.53694	1.00000	0.21928	0.43300	0.18179	0.40366
VAR055	0.22888	0.23865	-0.22908	0.30075	0.00842	0.21928	1.00000	0.20054	0.32116	0.27265
VAR056	-0.09364	0.29367	0.07942	0.11655	0.54478	0.43300	0.20054	1.00000	0.00582	0.37516
VAR057	0.54872	0.13492	-0.12658	0.12723	0.04419	0.18179	0.32116	0.00582	1.00000	0.00921
VAR058	-0.09526	0.39104	0.12112	0.13081	0.42375	0.40366	0.27265	0.37516	0.00921	1.00000
VAR059	0.01067	0.19471	0.13129	0.01981	0.24663	0.21504	-0.30071	0.13990	0.06001	0.11426
VAR060	0.10406	0.50859	0.05195	0.29772	0.46443	0.62739	0.42753	0.40259	0.22788	0.38528
VAR061	0.05037	0.37188	0.20760	0.16771	0.18332	0.43253	0.11108	0.45496	0.18186	0.30149

	VAR059	VAR060	VAR061
VAR002	0.17854	0.05983	0.27631
VAR004	0.02289	0.18212	0.14774
VAR006	0.28595	0.42092	0.46821
VAR007	-0.02867	0.17510	0.30659
VAR009	0.03188	0.05709	0.39730
VAR010	0.25585	0.31710	0.25263
VAR011	0.13421	0.38222	0.31147
VAR012	-0.04457	0.04148	-0.03982
VAR013	0.15327	0.10856	-0.03567
VAR015	-0.02657	-0.00169	0.23505
VAR017	0.26063	0.36328	0.05335
VAR018	0.32647	0.10606	0.34053
VAR020	0.41589	0.44509	0.37148
VAR021	0.03458	0.24285	0.08422
VAR022	0.01798	-0.07548	0.14954
VAR024	0.30101	0.38200	0.34969
VAR026	0.11157	0.32939	0.36819
VAR027	0.25286	0.13172	0.17946
VAR028	0.29850	0.36380	0.10073
VAR029	0.17384	0.39742	0.26043
VAR032	0.20317	0.42660	0.30071
VAR033	-0.02175	0.24676	0.34787
VAR034	-0.07000	0.24957	-0.07347
VAR035	0.27923	0.24669	0.40484
VAR037	0.32454	0.24941	-0.02325
VAR040	0.38999	0.44809	0.53638
VAR041	0.20007	-0.02445	0.41865
VAR043	0.18169	0.36553	0.46504
VAR044	0.06424	0.16146	0.15776
VAR045	0.24372	0.08430	0.11565
VAR046	0.01767	0.10406	0.05037
VAR047	0.19471	0.50859	0.37188
VAR049	0.13129	0.05195	0.20760
VAR051	0.01781	0.29772	0.16771
VAR052	0.24663	0.46443	0.18332
VAR053	0.21504	0.62739	0.43253
VAR055	-0.30071	0.42753	0.11108
VAR056	0.13990	0.40259	0.45496
VAR057	0.06001	0.22788	0.18186
VAR058	0.11426	0.38528	0.30149
VAR059	1.00000	0.15263	0.18336
VAR060	0.15263	1.00000	0.22991
VAR061	0.18336	0.22991	1.00000

DETERMINANT OF CORRELATION MATRIX = 0.0000000(0.44523715E-18)

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
VAR002	0.53118	1	9.70082	22.6	22.6
VAR004	0.47220	2	3.52571	8.2	30.8
VAR006	0.62393	3	3.20297	7.4	38.2
VAR007	0.30704	4	2.72581	6.3	44.5
VAR009	0.48063	5	2.23770	5.2	49.8
VAR010	0.52118	6	2.14171	5.0	54.7
VAR011	0.47929	7	1.98250	4.6	59.3
VAR012	0.37409	8	1.94169	4.5	63.9
VAR013	0.34343	9	1.81081	4.2	68.1
VAR015	0.45383	10	1.63453	3.8	71.9
VAR017	0.68487	11	1.42170	3.3	75.2
VAR018	0.49916	12	1.33409	3.1	78.3
VAR020	0.49950	13	1.08743	2.5	80.8
VAR021	0.39760	14	1.00455	2.3	83.1
VAR022	0.34738	15	0.91497	2.1	85.3
VAR024	0.60152	16	0.81183	1.9	87.2
VAR026	0.63393	17	0.76415	1.8	88.9
VAR027	0.47533	18	0.69057	1.6	90.5
VAR028	0.68487	19	0.59793	1.4	91.9
VAR029	0.60152	20	0.55921	1.3	93.2
VAR032	0.56603	21	0.52340	1.2	94.5
VAR033	0.40421	22	0.45702	1.1	95.5
VAR034	0.37152	23	0.41373	1.0	96.5
VAR035	0.61250	24	0.36584	0.9	97.3
VAR037	0.45547	25	0.29297	0.7	98.0
VAR040	0.58235	26	0.28423	0.7	98.7
VAR041	0.41865	27	0.23337	0.5	99.2
VAR043	0.69112	28	0.21021	0.5	99.7
VAR044	0.48437	29	0.19024	0.4	100.1
VAR045	0.35453	30	0.15131	0.4	100.5
VAR046	0.54872	31	0.10315	0.2	100.7
VAR047	0.60657	32	0.08894	0.2	100.9
VAR049	0.56259	33	0.06751	0.2	101.1
VAR051	0.49950	34	0.04193	0.1	101.2
VAR052	0.60030	35	0.02213	0.1	101.3
VAR053	0.69112	36	0.01714	0.0	101.3
VAR055	0.42753	37	0.00999	0.0	101.3
VAR056	0.54478	38	-0.02411	-0.1	101.3
VAR057	0.54872	39	-0.06062	-0.1	101.1
VAR058	0.46759	40	-0.07764	-0.2	100.9
VAR059	0.41589	41	-0.09905	-0.2	100.7
VAR060	0.62739	42	-0.11040	-0.3	100.4
VAR061	0.53638	43	-0.19320	-0.4	100.0

AFTER 12 ITERATIONS COMMUNALITY OF ONE OR MORE VARIABLES EXCEEDED 1.0, PA2 FACTORING TERMINATED AT ITERATION # 11

CURRICULUM VITAE

JOHN GATTORNA, B.E., M.Admin., is a degree qualified engineer with work experience in the civil, mechanical (hydraulics), and petroleum branches of his profession.

He has worked for several organizations during his career, including two U.S. based multi-national corporations, and travelled extensively in the U.S., Australia, the Far East, and South Africa.

Over the last five years he has become progressively more involved in the specialist field of marketing logistics, and for the last two years has acted as a consultant to several U.K. and Spanish companies.

John Gattorna is currently Senior Research Fellow in the Marketing and Logistics Systems Research Centre, and Deputy Director of the Retailing Development Centre, Cranfield School of Management. For his doctoral programme he has been engaged in researching the effects of innovation on supplier-distributor channel relationships in the U.K. food/grocery industry. He was a principal member of the Cranfield research team which recently completed a total system cost/benefit evaluation of the use of cage pallets on a national scale in the U.K. He is also Assistant Editor of the International Journal of Physical Distribution and Materials Management and author of several books and articles in the field of distribution.