

Driving forces for food packaging development in Sweden - a historical perspective

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Abstract

Availability of safe, edible food is essential. Food shortage has caused many wars and encouraged people to try to preserve food for a longer time, allowing storage and transport, often in some kind of package/container. The USA showed the way in developing the food sector and already prior to the 2nd World War they had self-service stores filled with packed goods. Europe, however, had to wait to apply the US ideas until after the war. As Sweden did not take part, the country got a head start, although with restricted imports and exports and rationing of some food. When self-service retail and new food products, particularly frozen food, became available in the 1950s, the role of packaging and distribution became important, providing mass-produced food at reasonable prices. The country took the lead in frozen food in Europe and became the origin of some quite successful packaging companies and distribution/equipment suppliers, starting up as local supporting companies to the food sector but then expanding into Europe in order to grow. The purpose of this study is to identify the key drivers in society, in the food industry and elsewhere that have affected the development of food-retail packaging, with Sweden as an example of a lead country in Europe for some years after WW II. The study is qualitative and based on semi-structured interviews with experts in the field.

The results clearly indicate that *frozen food technology* and the introduction of *self-service stores* at about the same time and mainly later *chilled/fresh food* are the three developments that are considered to have had the most profound influence on the food sector development. Packages were considered as a consequence of the appearance of frozen or chilled food and self-service stores by the interviewees and not as very important in itself, even though neither frozen/chilled food nor self-service stores would exist without packaging and efficient distribution.

Key words: food packaging, frozen food, self-service, chilled food, driving forces

Introduction

Availability of safe, edible food is essential and therefore a highly political issue (Earle, 1997). Rationing and food shortages have encouraged people to try to preserve food for a longer time, bridging over seasons and allowing storage and transport. Wars have often spurred this development. One example is the canning of food, initially by heating the food in sealed glass containers. These products were used in the Napoleonic wars. Later, tin plate cans were used in the expansion of the British Empire around the world, in the US Civil War and, in fact, in both the First and Second World Wars. Naylor states that “Indeed, the canning of food was a decisive

moment in the growth of globalization” (Naylor, 2000). In WW II, other means of preservation were also applied, but the can was still around. Nearly two-thirds of the food supplies for the Allied forces were in cans (Cancentral, 2004).

Drying, heating, salting, baking, fermentation, freezing and chilling etc are other examples of ways and means to extend the shelf life of food. Some of the processes have been around for a long time, but many have been further developed during the last century (Welch, 2000) particularly encouraged by wartime needs (Goldblith, 1989). In most cases some sort of container has been needed, even as part of the process, like cans. Glass bottles containing wine were sold at the end of the 17th century and beer, wine, water and medical tonics in distinctive consumer-unit glass bottles in the 18th century (Twede, 1997).

Even before WW II, the US had shown the way in developing the food sector with self-service stores filled with packed goods like cans, frozen food packages, cartons of milk etc. Then the war came, and Europe had to wait until the war was over to apply the US ideas, although some of them came with the US troops, for instance milk in cartons and pallets to facilitate transports (Rasmusson, 1999). Milk cartons were introduced in the US with a patent in 1915, and in the 1930s gable top containers started to become established on the market, with Pure-Pak taking the lead (Planetark, 2004).

In the period after the war, the shops in Sweden were either of the country store type or small “specialty shops” for milk, meat, fish, bread etc, most of which was sold in loose weight or by volume. Chilled distribution of dairy products, initially in loose volume, was done by the dairies themselves. To this very day the dairies in Sweden has kept their own distribution of large volume dairy products. The food industry consisted mainly of mills and sugar, chocolate and margarine industries (Throne-Holst, 1973). Pre-packed flour for retail was one of the few packed items available, since 1930, and in 2.5 kg Kraft paper bags made by Åkerlund & Rausing, Å&R (Å&R-Pressen, 1980).

When self-service retail was introduced in the 1950s, the role of packaging became important since it got the role of providing mass-produced food at reasonable prices (Alerstam, Bovin& Jönson, 1995). The new food products also placed new demands on packaging.

Another role of the package was to be the bearer of information to consumers, and the package became essential in the product-selling process when self-service stores were introduced (Olsson & Györei, 2002; Olsmats, 2002) .

For Sweden, membership in EFTA in 1960 gradually, and in the EU in 1995, finally opened up a large “home” market full of competition-- and opportunities. Before Sweden joined the EU, it was estimated that about 80 % of the Swedish food production was not exposed to international competition (SOU, 1997). A similar situation was to be found in many European countries -- but the agricultural policy (CAP) within EU is still not allowing for free competition within the block (Södersten, 2004).

The development towards self-service stores, more exports, increased competition and new food processing technologies placed new demands on food packaging, and in today’s society packaging has become pervasive and essential (Robertson, 1993) and a strategic business tool (Olsmats, 2002).

The packaging industry developed very quickly after the war and became quite successful, outside the country as well with names like PLM (cans, glass ,plastic containers), Å&R (cartons, flexible, plastics) and Tetra Pak(coming from Å&R and focusing on carton systems). Equipment companies like Alfa Laval and Frigoscandia, also distribution, thrived.

The purpose of this study is to identify the key drivers in society, in the food industry and elsewhere that have affected the development generally of food-retail packaging since 1945. Sweden is used as an example, a case, as the country did not take part in WW II, and got a head start to become inspired by the USA regarding food products and retailing.

The ambition is to acquire an understanding of how these drivers have had an effect on packaging in order to learn for the future and thereby facilitate future packaging development. The study is limited to primary food packaging (i.e. packaging in direct contact with food).

Methodology

In order to understand the driving forces that have been at work in the food industry and in society after the Second World War, it seemed reasonable to ask people who had been, or were, active in the field in the period from 1945. Hence a qualitative study based on semi-structured interviews with experts in the field was made. By adopting a qualitative perspective, the opinions and feelings of individuals were achieved and could be used as input. Two groups of interviews were made.

In the first group of 11, the main purpose was for the interviewees to give their opinion of what major events have impacted the Swedish food sector, in the widest sense, after the Second World War. The interviewees were then asked to explain why they answered as they did and how, by whom and when this event occurred. 11 people with long experience of the food processing and packaging fields as well as some with retailing experience were selected for interviews. The selection was based on the interviewer's own experience in the field, working with development in the food and packaging industries from 1966 to 1998, as well as on advice from others with long experience of the Swedish food sector. Priority was given to those known to be knowledgeable in a broad field of food science, processing, packaging and trade, with long experience - and available for interviews.

The second group of 7 were suggested during the earlier interviews and in connection with specific issues and expertise and were interviewed to add depth to information or questions arising from the first group.

In the first group 5 persons had experience in food packaging or logistics and in the second 2 persons. More info and background can be found in a separate article (Beckeman, 2004a).

All the people interviewed were around 60 years old or above, and no one approached declined to participate.

Food and packaging innovations

Innovations in the food industry are combined with social and cultural innovations, and the objective is "to produce food that satisfies the nutritional, personal and social needs and wants of all communities" (Earle, 1997). New food processing and packaging technologies have facilitated the distribution of food products over wide geographical areas without unacceptable loss of quality over longer time periods and regardless of economic constraints (Sonneveld, 2000).

The most important function of a food package is that of preservation for food safety. The development of new food preservation technologies together with packaging technology has been going on for several years (Sonneveld, 2000). Furthermore, a package is part of the product throughout the entire supply chain, which means that package design will also influence

the efficiency of the entire chain in terms of functions, features, information and cost aspects (Olsson & Györei, 2002).

However, many people see packages just as a necessary evil and an unnecessary cost. These viewpoints on packaging arise from a limited knowledge or limited consideration of what functions a package has to perform (Robertson, 1990). Even though packages are almost taken for granted, food-packaging development should be viewed as driven by consumer desires, distribution needs and new materials, as well as by the functional, industrial or legislative developments that continuously impose new demands on the development of packaging materials and packaging design (Gerding, Rijk, Jetten, van den Berg, de Kruijf, 1996). Poorly designed packages as an outcome of disregarding the role of the package will result in frustrated users; thus packaging development has to be “consumer driven, distribution driven and technology driven” as claimed by Coles and Beharrell (1990).

With a more holistic view of packaging, it can be viewed as a system that is built up by a product with aligned services. These could, for example, be product safety, but also such services as product information and user practicability, to mention only a few (Alerstam et al, 1995). It has been established by Alerstam et al. (1995) that in terms of product information, the information about content, origin, nutritional value etc. is more important the farther away the consumers are from the food producers. Furthermore, in a marketing-based economy, packaging is not only necessary for safe deliveries of profitable products; it also plays a vital role in the marketing of products (Paine, 2002; Olsmats 2002). It was called “The Silent Salesman” already in the early part of the 20th century (Downes, 1989).

Results

The question about major events that affected the Swedish food sector the most resulted in the following answers from the first group of 11 interviewees:
(The numbers indicate how many mentioned it spontaneously.)

	Number
Frozen food technology	11
Self-service stores	8
Chilled/ fresh food	8
Dual income households	7
Political decisions ^a	6
Distribution	6
Food safety	6
Information gap^b	6
Traceability	5
Globalization	4
Computerization ^c	4
New eating and purchasing habits	4
Retailers' own brands	3
Aseptic process & packaging	3
Microwave oven & technology	3
Nutrition (incl. functional food)	3
Canning	3
Plastics (packaging, films)	2
Car availability	2
Immigration	2
Individualism	2
Quality guarantee	2
Cartons for liquid food	1
Smart packaging systems	1
Low-price shops	1
Ecology	1

- a) Include comments about environmental legislation (1 respondent) and building standards and kitchen
- b) Mainly about chilled food but also about general ignorance regarding food handling
- c) Ordering, labeling, inventory etc

The results presented in the table clearly indicate that frozen *food technology* and the introduction of *self-service stores* are the two developments that are considered to have had the most profound influence on the food sector development after the war. Both developments started in the 1940s in Sweden. They were not directly interdependent, but they were both inspired by US developments from before the war. *Chilled/fresh food* was also rated as very important and started with dairy products, to be followed later by a variety of refrigerated products, i.e. prepared food.

Findus, a small canning company in the south of Sweden, pioneered frozen food and launched their first frozen foods in 1945. In 1962 Nestlé bought the company to expand in Europe with frozen food (Winnerljung, 1991). In 2000 Nestlé sold the Findus brand and the Findus frozen food part in most of Europe to a Swedish risk capital company, EQT, as the expansion in Europe had not been the anticipated one.

Coop, KF, was also active and, in fact, the first to introduce frozen food on a small test market (Bäckström et al, 1992). KF was also first with self-service stores and was the biggest retailer (until 1966, when ICA became the leader in the retail market) with some production of their own at the time. (Giertz & Strömberg, 1999; ICA interviews).

Eight respondents also mentioned *chilled and/or fresh prepared food* (both terms used and mostly referring to refrigerated to be/appear fresh) as a major event influencing the food sector. According to many of the respondents, however, the chilled sector is presently growing and, according to some respondents, starting to compete with frozen prepared food, since the preparation is faster. Chilled/fresh prepared food is a more recent phenomenon and is having greater impact at present than immediately after the war.

One has to conclude that there are relatively few comments indicating that new *packaging* was an important event *per se*. But packaging is a prerequisite for most products sold in self-service stores as well as for frozen and refrigerated food. The respondents mostly see packaging in terms of function and adaptation to its use, which explains the relatively minor influence discernible in the above results. Specific packaging development, e.g. for frozen food, was therefore not seen by most people as a separate event from developing the food.

Comments about packaging and distribution were more frequent in the responses to the question of *why, who and what?*

Comments on packaging and distribution

Frozen food

- The shelf life of frozen food is not a problem with the existing packaging technology, but the price of the product is - and sometimes packages are difficult to open.
- Initially, packaging for frozen food was more elaborate, but it is less so today as the turnover is higher. The package is not less good, only more suitable.
- Distribution centers for frozen food should have been located at the producer's premises to avoid one step in the chain; this was done by Indra (pioneering frozen food for catering and located in Helsingborg) and, to some extent, Findus.
- Relatively early, frozen food was distributed via ordinary channels, but chilled distribution is a weak link.

Self-service

- Self-service drove packaging development, effective logistics, rational packaging with good exposure.
- Packaging is essential for self-service and is a carrier for brands, identification and information.
- Development of transportation and availability of cars for customers is important but followed the development of self-service, supermarkets etc.

Distribution generally

- Between 1945 and 1953, there was a technology change in distribution, based on military experience during W W II.
- The Swedish food distribution system does not have enough competition and is almost an oligopoly; co-distribution by different retailer chains is not done.
- Control of their own distribution is a strategic measure on the part of the retailers, but the dairies still have their own distribution.

Canning

- New technologies or products did not drive the can, but the can drove the development of more products getting into it.
- Every new step in the development of the can opened up a new market, e.g. Danish ham exports.
- Cans have been unfairly exposed to quick political decisions, motivated by environmental reasons.

Packaging generally

- Coca Cola has driven the packaging development of cans, PET etc. and is an unusual example of a product driving packaging development.
- It is always safer to pack first and treat afterwards and thus avoid re-infection, like canning and irradiation, sous vide etc.
- Canned and frozen foods were driven by the same reason: longer shelf life, but special distribution and storage equipment were needed for frozen food.
- The type of distribution drives the packaging, not the other way around, and the distribution has had a linear development over the years.
- The choice of packaging material is also driven by environmental demands, returnable etc.
- If an industry has invested in a functioning packaging system, it is reluctant to invest further in another system.
- The food products have driven the packaging development.
- The retailers have forced the producers to incorporate codes etc. on the packages. What will happen with traceability?

Future packaging

- Future packaging could combine functionality and carrier of identity; will there be systems of integrated packaging and distribution services in the future?
- Packaging goes in the direction of more closed systems, i.e. pre-packed meat and controlled time/temperature.

Initially, both Findus and KF had their own direct distribution of frozen food to the stores (Bäckström et al, 1992), but later it went via intermediate warehouses. Findus came to work very closely with Helsingborg's Fryshus/Frigoscandia, who became world leaders in freezing technology and equipment and prominent in distribution. In 1951 the founder, Tore Lauritzson, had the idea of a "thermo-train" for frozen transports and initiated a partnership with the Swedish railway company, SJ, to construct and use such a train. It eventually became too costly, but it was very visible and created a great deal of publicity for the company and for frozen food in general among the public. Then the refrigerated road vehicles took over (Frigoscandia Distribution, 2002).

Discussion and analysis

A first analysis of the interviews reveals different phases in the Swedish society from the year 1945 and up to the present date that have had an effect on packaging. The phases shown in Figure 1 below correspond well with the literature studied regarding certain issues, such as:

- The introduction of self-service stores that affected the need for packages for distribution and information purposes (Olsson & Györei, 2002) and that facilitated the continued

urbanisation that had started long before the war as a consequence of industrialisation (Magnusson, 1997).

- Women are increasingly joining the outside workforce, although the big increase in Sweden occurred in the 1970s/80s (Magnusson, 1997).
- Families and individuals are changing their life styles and are increasingly buying prepared food (Robertson, 1990), which started with cans and continued with frozen, and more recently, chilled food.
- The development of new preservation technologies (Welch, 2000) resulted in new, more convenient pre-packed products needing controlled storage and distribution and offering a choice (Louis, 1999).
- The shift from small-scale to large-scale processing, required a packaging development driven by the need for distribution to customers and consumers.
- The shift from a regulated economy over to a competitive economy and the appearance of global products required packages that helped to differentiate and market the products (SOU, 1997).
- The development from unpackaged to packaged food accelerated with the introduction of self-service stores followed by a trend towards environmental consciousness, i.e. less or minimally packed products and/or recycling (Gerding et al, 1996).

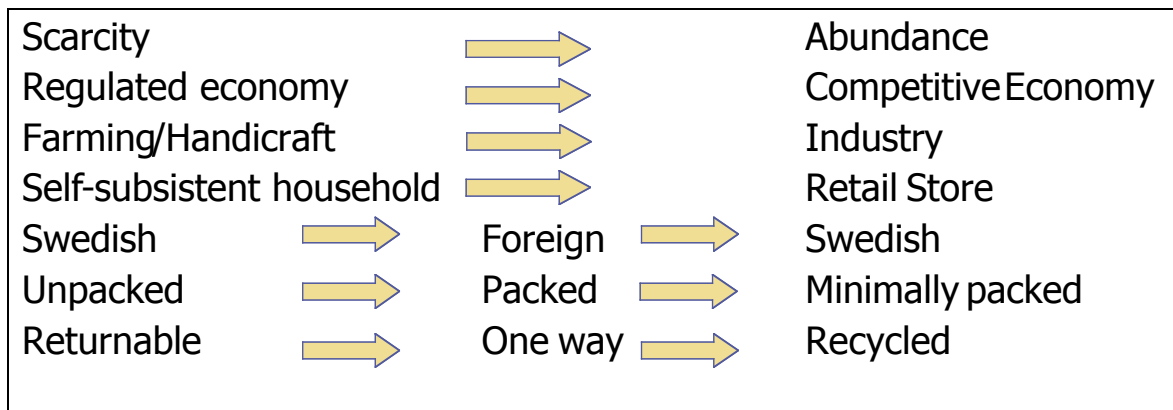


Figure 1: Phases in the Swedish society

Earle writes that “Innovations in the food industry combine technological innovation with social and cultural innovation” (Earle, 1997), which seems to apply to the development of the food sector and the society in Sweden after the war.

Frozen food offered something new, better tasting, available all the year round, with a long shelf life and convenience. By “frozen food” is meant “deep-frozen food” mainly for the consumer market in appropriate packaging, at set and controlled temperatures all the way to the consumer, below minus 18 °C in the stores and lower during distribution (Svenska Kyltekniska föreningen, 2000).

The driving force for introducing frozen food was the same as for canned food, i.e. longer shelf life, but frozen food required special distribution all the way from the producers, including

frozen-food cabinets in stores and homes. Housewives could, when appropriately equipped, apply the technology themselves, but industrial frozen food required special packaging, processing methods and equipment. Furthermore, frozen food required distribution and storage at temperatures well below freezing point all the way into the homes as well as a considerable amount of information about what it was and how to use the products.

The producers were in the driver's seat and supported the founding of the Frozen Food Institute, which was an alliance of visionaries among producers and the trade. The market for industrially frozen food (excluding ice cream) for the retail market grew from less than 1,000 tons in 1950 to 25,000 tons in 1964 and 228,000 tons in 2001. In 2001 the total volume of frozen food was nearly 410,000 tons, including retail, food service and bake-off (Djupfrysningsbyrån, 2003), which per capita makes Sweden number two or three in consumption of frozen food in the world (Djupfrysningsbyrån, 2004).

The importance of *distribution and storage* is seen as a consequence of introducing frozen food requiring a defined temperature all the way to the end user. Consequently, adequate packaging was required. In the initial stages of frozen food, the demands on packaging were set high due to lack of experience. Åkerlund & Rausing and Esselte Pac were the two innovators in frozen food packaging, with the Espresso and Ving-Hermetet systems (machines for erecting, filling and sealing the cartons) introduced at the beginning of the 1950s (Å&R Information Department, 1993; Stark, 1999). Before this development, the products were put into cellophane pouches manually, then into outer cartons and finally outer wraps were applied. Leakage was a major problem for some products, e.g. berries in sugar, and leaking packages were seen as one of the major issues for some frozen-food packaging. The introduction of frozen food confirms that a new technology may drive the development of new packaging due to new requirements being placed on packages from a product and a distribution perspective.

A major breakthrough came with plastics and the polyethylene extrusion coating of cartons in the 1950s. Polyethylene can be heat-sealed, which is another advantage. Å&R was the first company in the world to industrially master the extrusion coating technology, which came in handy for cartons not only for frozen food, but also for liquids and became one of the prerequisites for Tetra Pak's success internationally (Å&R-Pressen, 1980; Stark, 1999; Rydenfelt, 1995). Previously, cartons for liquids had been coated with wax or paraffin. ICI pioneered polyethylene, which was very widely used in coatings and insulation during the war, and consequently availability was limited for non-war uses during that time (American Plastic Council, 2003).

The choice of a coating in contact with food cannot be made at random. This was discovered already when the canning of food started after the war and experience showed that different products require different linings. Off-flavour may develop in the product during storage and, what are worse, undesirable components may leak into the product. The reverse is also true, since the product may interfere with the packaging material by, for instance, making it brittle or causing delamination (may happen in laminated carton material) or by absorbing components that make the product taste less or different.

Self-service stores, the second event that was mentioned as a main driving force for package development, offered the possibility to have a broader range of products and larger sales per square meter at lower costs for the retailer. The point of self-service stores was to mix different product categories and to reduce staff. One interviewee thinks that "the package revolution started when self-service stores were introduced", and it can be argued that the self-service stores definitely became a driving force for packaging development. The fact that the range of products

was extended and that the work was transferred over to the consumers implied that products had to be packed in consumer packages with all the necessary information, so that the consumers could make their decisions and pick the products all by themselves. When the self-service concept arrived, package producers recognized that more technical demands were placed on packages due to distribution requirements (frozen, chilled and ambient distribution), information, traceability and product identity. In the future there is expected to be even more focus on differentiation and product identity, especially with the expansion of retailers' own brands (Olsmats, 2002).

Over the years from 1950 until today, the self-service stores have developed into large supermarkets with assortments of more than 30,000 items that are imported from all over the world, and the trend towards even larger retail stores, "hypermarkets", continues. For the Swedish food industry there are signs of new and more refined products making it on the market, not only in Sweden but internationally. Food exports have increased four-fold during the last ten years, with a 7% increase in 2002, which may be seen as an example of the impact of the EU membership (Wrede, 2003). However, it has to be added that vodka is the largest export article included in the food statistics. Nevertheless, only 20 % of the food production is being exported, as compared with 65% for the rest of Swedish industry (Ottoson, 2003), which leaves ample room for expansion.

On the other hand, the type of shop that existed after the war (the country-store type or small "speciality shops") is being revived to a limited extent. This means that the food industry, the distributors, the package industry and the food retailers must satisfy a more divergent group of consumers by providing safe food and accommodating a variety of different consumption and buying patterns.

Chilled and/or fresh (both terms usually refer to refrigerated to be/appear fresh) *and prepared food* is also found to be driving new package development and mentioned by the majority of the interviewees. "Chilled food" is usually defined as chilled, prepared food, which should be stored at a maximum of plus 8°C (Svenska Kyltekniska föreningen) and did not become popular until the 1980s/90s. It has been established in other studies that food consumption is affected by a number of trends in society such as health concerns, the environment, convenience etc. (Gerding et al, 1996). The trend among consumers to prefer fresh products is also expected to increase, which results in chilled food, particularly prepared chilled food, now competing increasingly with frozen counterparts. In the UK chilled ready meals is now the largest sector in the ready meal category, with 46 % of sales, compared with 38 % for frozen meals (Readymealsinfo, 2004).

One important concern in this trend from frozen to chilled food is the issue of *safety*, which was also mentioned in the interviews. Safety is on everybody's mind and is identified as an increasing trend. A comparison with the UK market shows that they already have a thoroughly temperature-controlled supply chain (Smith & Sparks, 2003), but so far reasons like high costs, distribution structure and the low population density are said to prevent this from happening in Sweden (Djupfrysningsbyrån, 2004). In many ways the supply chain for chilled food is lacking in temperature control in Sweden, which should give cause for concern (Karlberg & Klevås, 2002; Björklund, 2002).

One technical option that is pointed out for increased safety is *superchilled food products*, i.e. keeping the product at a temperature just above its freezing temperature, which gives a higher degree of safety than for ordinary chilled food and at the same time a fresher image than frozen food as well as an increased shelf-life. This requires a differentiated cool chain depending on the freezing temperature of the product, which is being applied in the UK. Three chilled groups have been suggested (Smith & Sparks, 2003): 0-1 degrees Celsius for meat and poultry; + 5 for some

pastry, butter, fats and cheeses and +10-15 for potatoes, eggs, exotic fruits and bananas, in addition to -25 for ice cream and -18 for other frozen foods. Tesco now has two chilled groups, +1 and +12, as well as -25 degrees Celsius for frozen food (Smith & Sparks, 2003). The trends towards chilled food and increased safety will undoubtedly affect the packaging industry, since they demand packages that will provide safe food for end users in a chilled food supply chain and with an acceptable shelf life. What happens from the moment the consumer buys the product and up to consumption is another matter that should not be ignored.

Packaging as the focus of interest in this paper was not mentioned as a major driving force by the interviewees, even though the major drivers of self-service stores, frozen and chilled distribution as well as food safety all place new demands on package development. It might seem surprising that the interviewees paid so little attention to a supporting industry like the packaging manufacturers. When the respondents were asked directly why they did not focus more on packaging and technology, the answer was that at that point in time (after the war) they all worked together. What did not exist, neither here nor in the United States, was developed and tested jointly! This was due to the fact that the competition in the field was still limited and there were few players on the market, but also because the network of knowledgeable people in the industry was small and easy to access.

There are examples of a packaging system driving product development. Once a system is installed, it is often tried for a variety of products, and the packaging system might then have to be adapted and further developed. One example is the can, which has undergone a number of changes to meet the demands of various products. Another is aseptic carton packaging which is tried and used for a wide range of products for which the packaging system has to be modified. In the case of orange juice, which was first introduced as a frozen concentrate in a composite can, then became ready-to-drink in glass bottles at ambient, then ready-to-drink or concentrated aseptic in cartons at ambient and then ready-to-drink at chilled temperature, the large volume market for orange juice in Europe was created by the aseptic carton packaging system, used for 85-90 % of the total orange volume sold (Nermark, 2003).

In the report on “Top 10 Food Science Innovations 1939-1989” made by the staff of Food Technology (1989) they list 4 processing and packaging developments among the 10: Aseptic Processing and Packaging as number 1, Minimum Safe Canning Processes for Vegetables as number 2, Controlled Atmosphere Packaging (CAP) for Fresh Fruits and Vegetables as number 5, and Ultra-High-Temperature (UHT) Processing of Milk and Other Products as number 10 in descending order of importance. This shows that packaging development was important during that period, even if this was not very obvious in the interviews here. This might be due to the fact that packaging tends to be taken for granted and is seen as “one of the most manifold and least noted revolutions in the common experience” (Downes, 1989). Downes argues that packaging has played a key role in the development of the food industry in the 20th century.

There are certain factors and trends identified in the interviews that most likely will have an impact on future packaging development. The *safety* issue, for example, will most likely result in more demands being placed on *tamper proofing*. One problem for the packaging industry will then be to balance the (increasingly aging) consumers’ need for ease-to-open with the tamper proofing that usually makes the package more difficult to open.

Another demand raised from a safety perspective is the issue of *traceability*, which requires a holistic perspective on the supply chains with a collective responsibility on the part of the different actors. In this case the package is the ideal bearer of information, since it adheres to

the product throughout the entire chain. Temperature indicators etc. are being developed, but who in the chain is going to pay for this and assume the responsibility that inevitably follows?

Conclusions

Both frozen food and self-service stores seem to have triggered and accelerated a change in the food sector that had already started as a response to changes in society. The more or less parallel introductions of frozen food and self-service stores supported each other, as the *timing* was right for all parties in the supply chain, including the consumers and society as a whole.

Packages were seen mostly as a consequence of the appearance of frozen food and self-service stores by the interviewees and not as very important per se, even though neither frozen food nor self-service stores would exist without packaging and efficient distribution.

Frozen food required special and controlled distribution and storage capabilities all the way from the producer to the consumer at home. The result was that the packaging companies, in close cooperation with the food producers, developed suitable packaging. They got a lead and developed from national suppliers to international ones and diversified into different packaging materials and systems (Beckeman, 2004 b).

On the basis of the historical perspective adopted in this study in combination with studies made of future trends it can be concluded that package development is driven by different factors, for example:

- New technologies with large potential, e.g. frozen food, aseptic technology, “sous vide”, radiation etc.
- New requirements resulting from the food product and the food concept, e.g. temperature, time
- New consumer requirements and consumer trends
- New retail requirements, e.g. differentiation, size
- Distribution requirements
- Legal aspects
- Societal changes
- Competition and globalisation

It should also be added that new packaging systems might drive new product/concept development, since once a system has been installed, it tends to be tried and used for a variety of new applications, which, in turn, means further development of the packaging system, and so on.

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