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**PREPARE FOR CHANGE: THE IMPACT OF THE GERMAN INK- AND  
MINERAL OIL ORDINANCE STILL TO COME. WHAT'S THE  
CONTRIBUTION OF THE NEW INSTITUTIONAL ECONOMICS TO  
AVOID LIABILITY AND MARKET FAILURE WITHIN THE  
PAPER-BASED PACKAGING SUPPLY CHAIN?****Abstract:**

Igor Ansoff described the important role and function that detecting and analysing weak signals plays in strategic planning. Weak signals are based on the assumption that every event or disaster caused by man is at times to be foreseen and unsurprising. Under the auspices of discrete discontinuities in economic, political, technical and social affair, they prior take notice before they come into existence as a whole. Solid board and corrugated board converters that print and process food packaging operate their businesses within a complex and strict set of regulations and guidelines, set in force by both government agencies and industry associations. These rules ensure that packaging does not negatively impact the products contained within. For ecological and economical purposes, paper-based packaging-material is largely produced using recycled paper. Swiss studies have shown that cardboard boxes made from recycled material can contain significant portions of mineral oil. Animal studies have shown that mineral oil mixtures with low viscosity are stored in the body and can lead to accumulations and damage in the liver, heart valves and lymph nodes. Currently there are no studies on the effects on humans, but it cannot be ruled out that this fraction contains carcinogenic compounds. The increase in the number of food-packaging migration alerts in recent times has been highlighted by consumer protection organisation and the media and the German legislator has decided to act with a national approach towards stringent consumer protection. This paper aims to give an overview of the current status of the German Ink and Mineral Oil Ordinance still to come (law bill) in relation to recent and future risk management within the paper-based packaging supply chain. A possible European spill over will be highlighted. To achieve objectives in strategic networks a cooperative service provision along the supply chain must be formed and agreed upon co-operation between the parties. The design and operation of networks based on trust, transparency, openness and intensive communication but all actors are subjected towards information asymmetries and behavioural uncertainties. The theoretical goal of this paper is to narrow the gap between existing knowledge about the regulation still to come and the consistent use of established economic theories. The paper shows the contribution of Weak Signals and the New Institutional Economics in order to avoid opportunistic behaviour in the paper-based packaging supply chain. The paper aims to give recommendations for action towards adjusted and suitable behaviour.

**Keywords:**

Weak signals, Packaging, German Ink Ordinance, Boiling Frog Syndrome, Information Asymmetries,

Behavioural Uncertainties, Principal-Agent Problems, New Institutional Economics.

**JEL Classification:** A10, A00

## 1. Introduction

In today's world, food retailers and grocers offer consumers a wide open range and choice for their conveniences. Seen from a marketing point of view packaging is the principal means of communication, distinguishing the product from its competitors and provoking the decision to buy and to consume. Packaging is the flagship of a brand; it sets the brand's reputation and polishes the image of the marque. Rappold et. al. (2005, p.4) argue that packaging "... offers brand owners the opportunity to provide product differentiation and a quality image using packaging that has distinct merchandising advantages and display appeal when compared with competing types of packaging". The expectations of the customer for consumables and foods are a high degree of pleasure, long imperishability, a low price, and a low health risk combined with ecological compatibility of the packaging and sustainability aspects during the production process. Food supply and the protective, preserving role of packaging for consumer products is a field where supply and demand is continuously changing. They are subjected to the development of national and international food markets and adaptation to consumer demands, on the availability of relevant resources, supply chain management and legal and technological exigencies. Mass production of packaged food has been enabled by technological innovations in food production, processing and logistics with packaging playing a key role. The economies of scale and speed<sup>1</sup> are involved; efficiency in distribution, production and storage in the intense industrial competitions have made many products more affordable (Chandler (1999, p.235), Carson, 2014, p.1).

With regards to the general principle of ecological and economical purposes, paper-based packaging-material is largely produced using recycled paper (Wenzel, 2012, p.42). In 2009 Swiss studies have shown that cardboard boxes made from recycled paper based raw material can contain significant portions of mineral oil (Biedermann et al., 2010, p.785). The mineral oils stem from the type of printing ink commonly used in newspaper printing. Recent studies on mineral oils found in foodstuffs have raised concerns about consumer safety. According to these studies, traces of mineral oils migrate to food from inks found on the printed surface of packaging and in recycled packaging papers.

Although no toxicological studies on the effects of human exposure to mineral oil traces<sup>2</sup> currently exist, it cannot be ruled out that this fraction contains carcinogenic

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<sup>1</sup> Speed is in general crucial and substantial in a supply chain under the light of following parameters: the products are spoilable, subject to rapid extinction, needed on short notice, valuable in connection to its mass, very expensive to manage (Janvier-James, 2012, p.196).

<sup>2</sup> Mineral oils include a wide range of hydrocarbon substances and are generally divided into mineral oil saturated hydrocarbon (MOSH) and mineral oil aromatic hydrocarbon (MOAH). The term "mineral oil" is unclear and not demarked. The term "mineral oil" (oil and waxes) also covers hydrocarbons, which have been designed and constructed synthetically in the refinery through chemical reactions such as cracking, cyclization, condensation, and hydrogenation. Products are even referred as "mineral oil" when they they might be grouped in analogous,

compounds. Frequent intake of such contaminated foodstuffs can thus lead to excess in the toxicological limit values. Animal studies<sup>3</sup> have shown that mineral oil mixtures with low viscosity are stored in the body and can lead to accumulations and damage in the liver, heart valves and lymph nodes (Hellwig et al., 2010, p.18).

The increase in the number of food-packaging migration alerts in recent times<sup>4</sup> has been highlighted by consumer protection organisations and the media and the driven German legislator has decided to act. After a period of almost 4 years of preparation and discussions, the national provisions planned by the Federal Government of Germany were introduced in public with the twenty first amendment to the Consumer Goods Ordinance, the recent 5<sup>th</sup> law bill from 14<sup>th</sup> July 2014.

This article is divided into eight sections, which are almost independent, in order to make reading easier. Section 2 discussed the subject of paper-based packaging in brief details. Section 3 is devoted to migration, concerned with the transfer of the contaminant taking place in paper-based packaging and describes the recent scientific assessment. Section 4 provides the regulatory framework. In section 5 and 6 the theoretical part is concerned with weak signals and a brief resume on New Institutional Economic Theory. Section 7 is of interest for people thinking of the future, when low migration packaging will be considered and may be wide spread in the market place. Section 8 summarizes and closes the article.

## 2. Paper-based Packaging

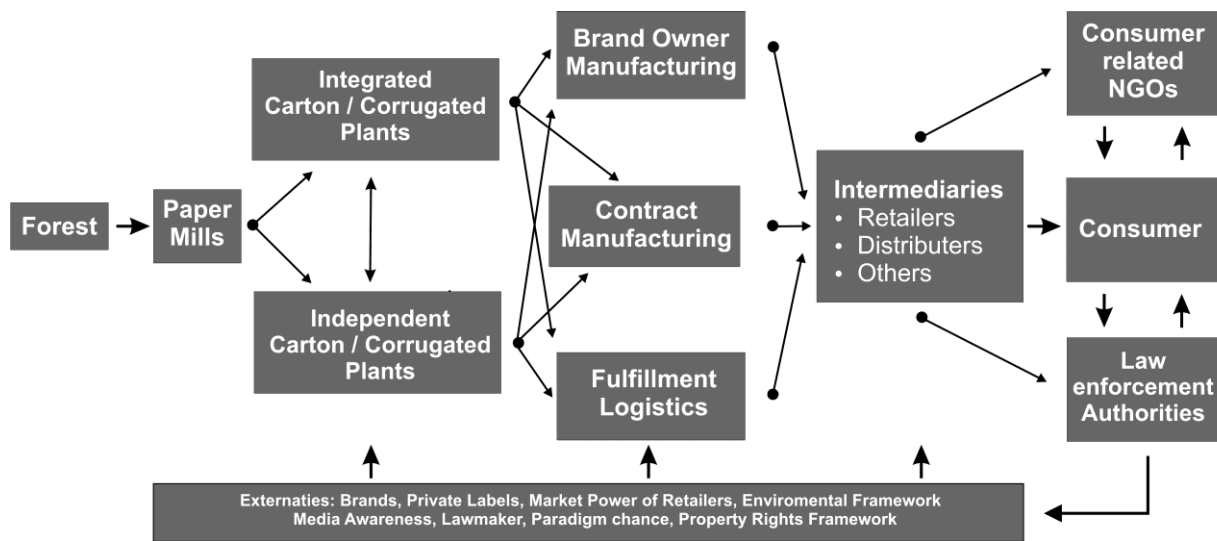
The supply chain for folding carton or corrugated board production starts with papermaking and ends with a packed product in the hands of the consumer. Paper mills produce raw grades of paper in web form or sheets. Integrated folding carton or corrugated board plants focus on high volume production; these actors in the market typically have sheeting capability, full colour printing and converting capabilities. Independent plants purchase raw materials or finished sheets from paper or corrugated mills for end product processing. In addition to folding carton converters, brands or private labels may contract provision of services, the realization of the product, value adding printing to a third party provider that delivers packaging. Companies involved in co-packing, fulfilment and logistics typically provide re-packing, warehousing and distribution services (Landa, 2014, p.11-12).

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similar structures, produced from coal, gas, syntheses to produce fuels, paraffin and lubricating oils (BfR, 2012, p.6).

<sup>3</sup> See BfR 008/2010; Doak et al., (1983); Lavoie et al., (1985); Rice et al. (1987), cited in Hellwig et al., (2010).

<sup>4</sup> See food safety scares: ITX (2006), Benzophenon (2009) and mineral oil traces (2010, 2012)

**Figure 1: Paperbased packaging supply chain**

Source: Author's own graph

Paper, board and corrugated board are reel or sheet materials comprising an interlaced network of cellulose fibres derived from wood. Cellulose fibres are capable of developing physico-chemical bonds (bridges) at their points of contact within the fibre network, thus forming a sheet (Kirwan, 2013, p.243). Paper and board are naturally renewable, sustainable products which do not pollute the environment in the course of manufacture; it is recyclable as material, energy or compost or at least biodegradable (ibid, 2013, p. 281). For ecological and economical purposes, paper-based packaging material is largely produced using recycled fibres for paper and board manufacturing. In 2010, about 45% of the fibre used worldwide was virgin fibre and the rest, 55%, was from recovered paper (ibid, 2013, p.25).

The importance of packaging hardly needs stressing, as only few foods are transported, offered and sold in an unpackaged state, more than 95% of all groceries, and retailer packaging that are put on the market in Western Europe are packaged (Rappold et al., 2005, p.1).

Paper-based packaging is multi-faceted. Soroka (2010, p.3) argues that packaging is best described as a coordinated system of preparing goods for transport, distribution, storage, retailing, and use. Packaging is an entity of components with the obligation to serve predictably and to cover a certain product. Packaging must ensure its ability to transport and store materials as well as transmitting information. As far as packaging is concerned to food and feed it is primarily related to protecting the content by maintaining its properties. Folding carton products may be packed in direct contact with food and feed or following the bag in box principle. The principal roles of packaging are to contain, protect/preserve food and feed during transport and storage and to inform the user. It is a carrier of information for usage, serves as sales promotion and an advertising factor at the place of sale.

The large retailers handle a major share of the packaged grocery market and exert considerable influence on food manufacturers and associated packaging suppliers. It is, therefore, important for packaging suppliers to be fully aware of market demand and respond quickly to changes. In addition, the concentration of buyer power at the retail level means that manufacturers may have to modify their distribution and packaging operations in response to structural changes in retailing. Packaging for fast-moving consumer goods (FMCG) has been referred to as part of the food retail marketing mix and thus closely affects all the other marketing variables i.e. product, price, promotion, and place (Nickels & Jolsen, 1976; p.14).

Today in the paper based packaging business the competition is not between single companies rather between vertically cooperating networks. In order to guarantee the conformity, quality, attributes of the product and increase efficiency and value to end consumers, companies have to cooperate, especially with bidirectional communication. Supply chain networks in the food and feed industry represent strictly coordinated food systems, consisting of a focal company, which is responsible for coordination and other elements, such as suppliers, consumers and logistic services. Packaging is the subject of this coordinated system.

### **3. Migration and scientific assessment**

Recycled paper and board may contain many potential contaminants, which may migrate from packaging materials into foodstuffs. Migrants are substances which are able to be transferred through a material layer due to their chemical, mobile characteristics and molecular size; they diffuse across the packaging material (Muncke, 2009, p.4549). Recent research by Biedermann and Grob (2010) has shown that cardboard boxes made from recycled material can contain unexpected, significant high portions of mineral oil. Mineral oils include a wide range of hydrocarbon substances and are generally divided into mineral oil saturated hydrocarbon (MOSH) and mineral oil aromatic hydrocarbon (MOAH). As a rule, mineral oil enters the recycling process via stem from printing ink (mineral oil-based) generally used to print newspapers. The Scientific Committee on Food (SCF) of the European Food Safety Authority (EFSA) consider the entire range of molecular weight of less than 1000 Daltons (Da) to be toxicologically relevant because it can be absorbed through the human gastrointestinal tract. The statements or scientific opinions from official national or European authorities vary between diametrically opposed positions. The German BfR and the European EFSA identified potential concern due to the MOAH fraction, which may be both mutagenic and carcinogenic (EFSA, 2013, p.6-7). This knowledge is an ecological and economic dilemma, because government institutions and the Environment Agency at European level are very much in favour of promoting the use of renewable waste paper. In contrast the British FSA stated that "...today's opinion does not identify any specific food safety concerns." (FSA, 2012, p.1). In summary, uncertainty remains.

## 4. The Regulatory Framework

In the EU there is still no harmonized regulatory framework on food contact paper, board and corrugated board applications. Especially for applications using recycled paper fibres in contact with food and feed, there is no specific directive about paper and board coming into contact with foods. Due to the lack of regulations in the food packaging sector and as not all packaging materials are yet covered by European legislation, national legislation and national recommendations have to be taken into account. In the framework regulation 1935/2004/EC of the European Parliament and of the council (18) on materials and articles intended to come into contact with food, common and superior guidelines regarding demands on food packaging are laid down with reference to the Regulation on Good Manufacturing Practice (EC) No 2023/2006. The Framework Regulation applies to all materials or articles which, “in their finished state:

- (1) are intended to be brought into contact with food;
- (2) or are already in contact with food and were intended for that purpose;
- (3) or can reasonably be expected to be brought into contact with food or to transfer their constituents to food under normal or foreseeable conditions of use.”

The essential safety requirement of the Framework Regulation is found in Article 3, which requires and demands that materials and articles, including active and intelligent materials and articles, shall be manufactured in compliance with good manufacturing practice (GMP) so that, under normal or foreseeable conditions of use, they do not transfer their constituents to food in quantities which could: (1) endanger human health or (2) bring about an unacceptable change in the composition of the food (3) or bring about a deterioration in the organoleptic characteristics thereof.

The Council Regulation (EEC) No 315/93 of 8<sup>th</sup> February 1993 laid down procedures for contaminants in food. The overall goal of consumer health protection is to minimize contaminants in food as far as possible. The EU Contaminants Regulation requires Member States, for example, to prevent circulation of food containing contaminants in quantities which cannot be tolerated for health or in particular toxicological reasons.

The 5<sup>th</sup> law bill of the German Inks Ordinance from 24. July 2014 is structured along similar lines to the Swiss Ordinance SR 817.023.21, with a list of substances allowed to be used in the manufacture of food packaging inks, and migration limits for substances migrating from the printed packaging. Another focus will be put on so-called NIAS, non-intentionally added substances, that any kind of cross-contamination with other raw materials, consumables and supplies products is avoided under all circumstances. The use of nano-materials will be prohibited. The compliance with legal requirements passes on to an upstream member of the packaging chain to the

packaging company, co-packer and marketer. The notification process for EC legislation (law standards acceptable across the EU), a must when a national regulation has come in force, shall take place 2015-2017, and the 2 years represent the transitional period for largely completed sale of foodstuffs and commodities that do not comply with the imminent German Ink Ordinance. Key issues are:

- (1) No migration of aromatic hydrocarbons with carbon numbers range from C<sub>10</sub> to C<sub>25</sub> into food and feed
- (2) Evidence of migration potential in use of recycling, secondary packaging
- (3) No evidence when migrations can be excluded (barrier principle),
- (4) New safeguards on margin of exposure
- (5) A functional barrier requirement for recycled cardboard, exceptions only if an absolute barrier can be demonstrated
- (6) Declaration of Conformity

## 5. Weak Signals

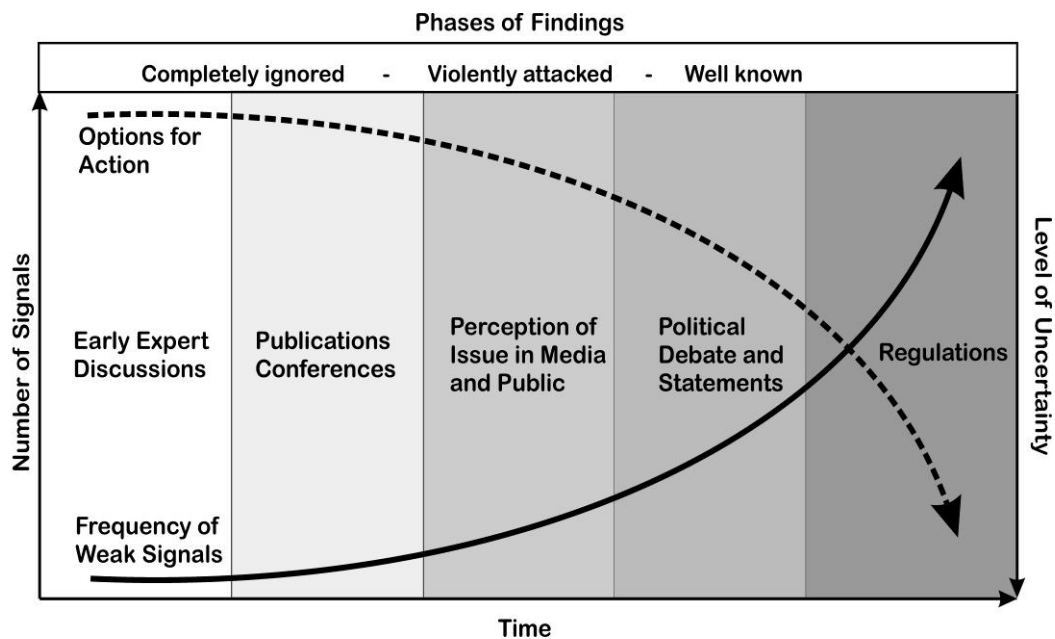
Almost 40 years ago, Igor Ansoff's article "*Managing strategic surprise by response to weak signals*" described the important role that detecting and analysing weak signals plays in strategic planning (Ansoff, 1982). Ansoff postulated that discontinuities could be perceived by "weak signals". "*Political and economic fog of uncertainty*"<sup>5</sup> makes it necessary to prepare and to arm a company and to reduce the response time to weak signals (cf. *ibid*, p.30).

Weak signals are based on the assumption that every event or disaster caused by man can at times be foreseen. Under the auspices of discrete discontinuities in economic, political, technical and social affairs, they can be detected before they come into existence as a whole (Reich et al., 2011, p.5). Aeschmann (2010, p.2) demonstrates that with an increasing number of weak signals the freedom of choice of applicable recommendations of actions decreases.

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<sup>5</sup> Leslie Smith, personal communication (cited in Ansoff 1975, p.24)



**Figure 2: Weak signals and options for action**

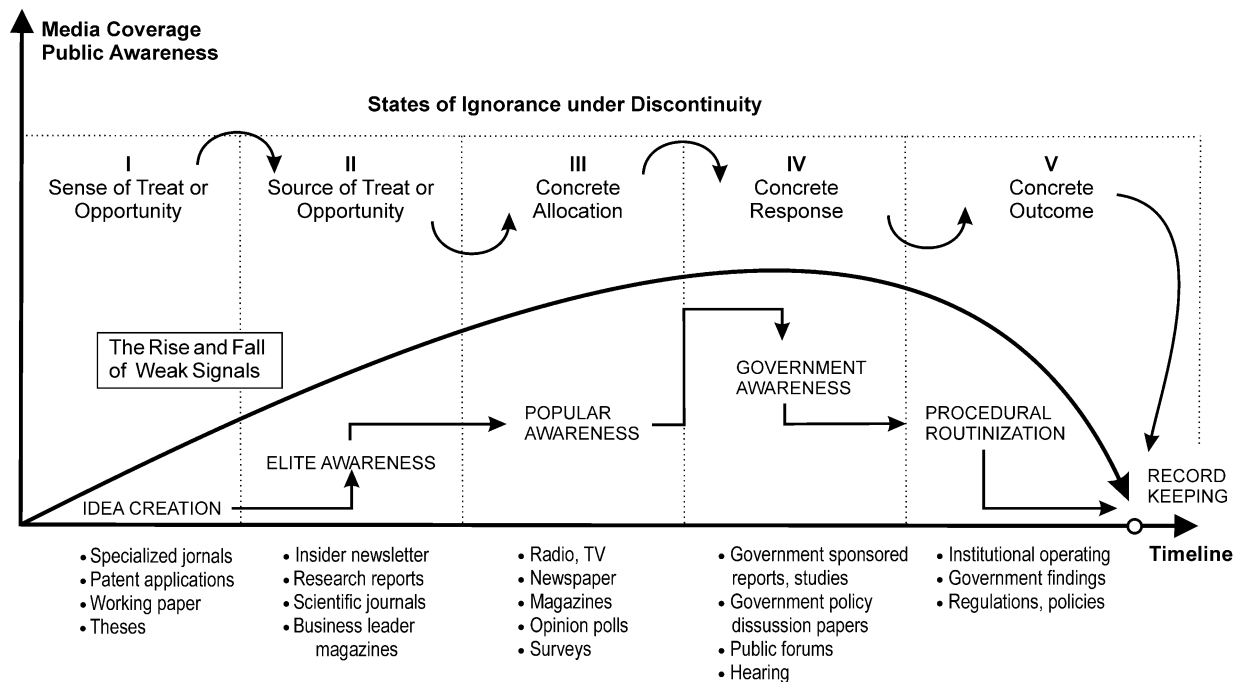
Source: Author's own graph, based on Aeschimann (2010, p.2)

Inside direct professional-to-professional discussions and among industry insiders the so-called "Mount of Olives" was well known (Kersten, 2011, p.14). Animal feeding studies have shown that mineral oil mixtures with low viscosity are stored in the body and can lead to accumulations and damage in the liver, heart valves and lymph nodes (See BfR 008/2010; Doak et al., (1983); Lavoie et al., (1985); Rice et al. (1987), cited in Hellwig et al., (2010).) Sources of weak signals may have been specialized journals, patent applications, doctoral dissertations and early experts' discussions. Elite awareness took place. The scientific community has been informed by Biedermann and Grob<sup>6</sup> in 2010. Risk perception is an issue that has been discussed in the media and in public.<sup>7</sup> Political debate and statements of industrial associations were discussed at this stage.<sup>8</sup> Government sponsored reports, studies, government policy discussion papers, draft legislation and law bills are also to be considered.

<sup>6</sup> K. Grob, Official Food Control Authority Zurich, presented first migration analyses at the BfR in Nov. 2009.

<sup>7</sup> N.N.: Schwarz auf Reis. Öko-Test-Magazin, September 2010, S. 14-21; Friedel, C.: Mogelpackung – Schweizer Wissenschaftler warnen vor Mineralöl-Aromaten aus Recyclingkarton.; ENTSORGA – Das Fachmagazin für Abfall, Abwasser, Luft und Boden. Oktober 2010, S. 20-23; N.N.: Keine runde Sache. Stiftung Warentest, November 2010, 18-24; N.N.: Mineralöl in Lebensmitteln. ARD-Beitrag Plusminus vom 02.11.2010, ZDF heute (02.05.11): Mineralöl in Recycling-Kartons, Stiftung Warentest: Adventskalender mit Schokoladenfüllung from 26.11.2012, Die Welt (22.11.2013): Mineralöl in fast jeder Nusschokolade gefunden.

<sup>8</sup> Stated in the newspaper article: "Giftige Farben auf Verpackungen werden verboten!" German Tagesspiegel, Berlin 01. 11. 2010 and N.N.: Mineralöl in Lebensmitteln: Aigner will Giftfarben verbieten., Spiegel Online, Dec. 09 BfR published internal findings, Feb. 2010, BLL recommended to use only mineral oil-free inks , 24<sup>th</sup> Feb. BMELV hearing of involved industries association, 15<sup>th</sup> April BMELV hearing of ink associations and publisher, 25<sup>th</sup> Aug. BMELV follow-up meeting of involved industries and authorities to present first findings, 18<sup>th</sup> Jan. 2011 German Federal Environmental Agency (UBA) Expert Meeting of involved associations, authorities and industries to share facts and find solutions, stakeholder-feedback in writing until 04<sup>th</sup> Feb., 11th April BMELV follow up meeting.

**Figure 3: The rise and fall of weak signals**

Source: Author's own graph as an extension of Hiltunen (2008, p.24) and Choo (n.d.).

## 6. New Institutions Economics

In order to function successfully an efficient institutional framework is needed for an economy. Institutions represent and develop the rules of the game: the humanly devised constraints that structure human interaction (North, 1993, Section II). The sociologist Scott (1995, p.33) gives shape to them as “regulative, normative, and cognitive structures and activities that provide stability and meaning to social behaviour.” They are made up of formal constraints like rules, laws and constitutions (North, 1996, p.3). In addition they are interwoven with informal constraints such as norms of behaviour, conventions, self-imposed codes of conduct, and granted by their enforcement characteristics (Benham, 2014, p.1).<sup>9</sup> One can observe a certain relevance of the theoretical framework of New Institutional Economics (NIE) for the management discipline Supply Chain Management (SCM). Institutions, it is argued and postulated, govern the purpose of an organization (Lietke, 2005, p.1). For the analysis of behavioural uncertainty in hierarchical relationships the literature proposed to apply the findings of the cornerstones of the NIE theory. The New Institutional Economics seeks to analyse the favourability of institutional arrangements and is thus suitable to give impetus to solutions for the present problems.

<sup>9</sup> Ronald Coase Institute, (2014), New Institutional Economics, online: <http://coase.org/newinstitutionaleconomics.htm>, last access: 08. Sep. 2014.

Aside from all disciplinary roots, there is a remarkable consensus on a core proposition: Institutions matter. Although, institutions serve many functions, their most fundamental role is to reduce uncertainty and provide meaning. Institutions shorten the range of uncertainty for all actors in the market by determining the ruling norms of suited behaviours and defining the boundaries of what is legitimate (Peng et al., 2009, p.66). If one weighs the pros and cons of a supply chain, the real problem appears to be in terms of the institutional cooperation between various members of the supply chain: behavioural uncertainty, information asymmetry, power to control, technical feasibility, costs, affordability and advantages.

In conclusion, one can argue that the collection of theories which constitute NIE adequately covers the matters of institutions in general, and, more specifically, a company and its relations of depth and width (Lietke, 2005, p.5). As Kledal (2003, p.14) remarked a company can be regarded as an institutional arrangement where the governance structure is implemented to minimize transaction costs on its bundle of contracts, and secure the most efficient allocation of property rights. This definition will be used to characterise the focal company within packaging supply chain. A supply chain will be characterised for the purpose of this paper as a “set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances and/ or information from a source to a customer” (Mentzer et al.; 2001,p.4).

## 6.1 Principal and Agent

The agency theory or principal agent theory (PAT) deals with agency problems resulting from conflicts of interest that may emerge in contractual relationships when mutual self-interested actors are subjected towards information asymmetry or uncertainty. Agency relationships are defined as interactions between two or more actors or parties, where one acts for the other in a particular decision making area (Ross 1973, p.134). The individual who undertakes the actions is called the agent and the person whose is affected by agent's actions is called the principal. Both contribute to a production process (King, 2002, p.10). The typical case of agency relationship is one that exists between an employer (the principal) and his employee (the agent). The overall goal of agency theory is to explain how contracting parties design contracts to minimize the costs related to such problems. PAT covers, amongst other topics two key concepts: the existence of asymmetric information and creation of incentives towards adjusted behaviour (Padilla, 2002, p.4). PAT is also concerned with the governance and control mechanism structure of firms to mitigate the chances and opportunities of opportunism, conflict of interests and information asymmetry between the delegating authority (Principal) and the agent. Contracts are used as governance and control mechanisms while incentives are provided to meet expected standards. When there is uncertainty or opportunistic behaviour in industrial production processing, the linkage of payment to performance can shift risk to the agent, to

demonstrate adverse behaviour that may not be in the best interest of the principal (King, 2002, p.10).

## 6.2 Transaction Costs

In 1937 Roland Harry Coase was the first to reason why firms do exist at all. He argued that the use of the market for economic transactions entails costs (Coase, 1937, p.390) and that these cost are present in addition to regular production costs. These later became known as transaction costs. Wigand et al. (1997, p.35) states that transaction costs arise and burden the creation, assignment, transfer and implementation of property rights. They include information and communication costs, as well as time and effort employed on managing business exchanges. Due to this burden of costs, Coase (1937, p.392-393) argued, that it is more efficient to establish a company, to create an organisation instead of using market transactions.

Williamson (1990, p.67) subsequently developed and operationalized later what has gone into existence as Transaction Cost Economics (TCE). TCE's basic idea is to align transactions with governance structures differing in their cost and competencies in a production cost and transaction cost economizing way while mitigating hold-up problems associated with contractual hazards such as asset<sup>10</sup> specificity. In general TCE theory argues that miscellaneous control and governance mechanisms should be performed to mitigate the risk of opportunistic behaviour of (supply chain) firms. King (2002, p.10) points out in this regard that TCE encourages the development of business process relationships and information systems that help to downsize transaction costs and establish explicit consideration of trade-offs between maximizing processing efficiency and minimizing transaction costs across or downstream the supply chain. In view of the bargaining power across a supply chain TCE encourages one to bear in mind the fundamental changes that can occur after asset specific investments have been made.

## 6.3 Property Rights

The basic approach of the Property Rights Theory (PRT) is the acknowledgement of the principle that for ownership, not only the possession is relevant, but also all related rights attached thereto (Alchian et al., 1973, p.16-19). The market is not driven by physical resources and services, but rather defined by the exchange and transfer of bundled rights. The sum of bundled rights can be understood as Property Rights in the meaning of effective goods (Demsetz, 1967, p.347). In the world of economists property rights to an asset consists of three elements that inherently hands over power

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<sup>10</sup> An asset can be physical, such as plants, as well as human or intellectual assets, working power, such as working time, technical availability or management knowledge (Lietke, 2005, p.3).

(Hart, 1995; Barzel, 1997): (1.) The right to consume or dispose a good, (2.) the right to control the making or exchange of a good (Specific and residual rights of control), (3.) the right to appropriate specific, or residual earnings<sup>11</sup>. However, property rights do not only consist of access, they also carry with them a dialectic counterpart: exclusion. Since private property is assumed to be exclusive, the key feature of property rights that concern economists is exactly that of exclusion (Kledal, 2003. p.15). PRT is concerned with the question of who should own assets in settings where two or more technologically separate activities are vertically linked and it is not possible to write and enforce contracts that specify the actions of all parties. This is similar to the stylized setting for agency theory, but property rights theory focuses on system-wide impacts of alternative asset ownership rather than on the design of incentive systems. In this respect, these two frameworks are complementary.

## 6.4 Scenario of Uncertainty, Risk and Ignorance

The complex sequence of uncertainty, risk and ignorance is best demonstrated using an example: A retailer, a focal company within a supply chain, places an order for developing, producing and supplying folding boxes for a bag in a box-system. The inner bag is not a suitable barrier and the box must have supreme low migration characteristics until the end of its shelf life<sup>12</sup>. In particular all required information and materials are specified to satisfy the requirements of the bag in box product to be created in good time and as required and in the appropriate form. To fulfil the contract, the supplier is not only subjected to produce the ordered parts, but also to carry out a comprehensive quality and hygienic control. The additional quality control measures provide for the supplier at first a major operational cost factor, which do not provide any kind of benefit. By restricting the quality assurance measures he could increase his benefit, if the client does not notice this. The contractor may shorten the range of samples at random for testing, or reduce test batches for disruptive material testing. Due to the limited quality assurance measures the staff costs are reduced. The focal company has outsourced its quality assurance; there are no costs for the quality control of incoming goods, the goal is to generate higher benefits. On the other hand the focal company must face the possibility that suitable quality assurance measures are not performed and the product's contractually assured characteristics are beyond specifications.

The following values are relevant in this example, the asymmetry of information of hidden characteristics and adverse selection between the contracting parties. It may

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<sup>11</sup> The net earnings that remain after all payments to which it is contractually committed, such as wages, interest payments.

<sup>12</sup> The period between the manufacture and the retail purchase of a food product, during which time the product is in a state of satisfactory quality in terms of nutritional value, taste, texture and appearance (Kilcast, and Subramaniam, 2000, p.2)

be asserted, however, that the focal company had before closing of the contract not all information about the agent, regarding his professional suitability for the duties involved.

The focal company was able to get a good impression and to visualise the supplier due to through company visits, awareness campaigns, robust indicators of high profile projects and audits. However, a perfect proof of ex ante assessment of the agent skills, know-how, as well as the reliability of the supplier is impossible. In the evaluation of the supplier it may be assumed that the supplier consciously better represents during an audit, as he corresponds to reality.

The unsuitability of the supplier can therefore be evaluated only in the course of the business relationship, if the contractual arrangements and the standard-compliant job execution have not been met. Due to the insufficient monitoring of contractors' performance, hidden action, hidden information and moral hazard result. The costly acquisition of information encourages the agents' opportunistic behaviour. The agent knows that due to increasing complexity and information asymmetry with regard to many goods and services, he has room to manoeuvre and the disadvantages and risks may as a result be borne by the customer. The agent might reduce the quality assurance measures and thus increase his order-related contribution. Furthermore, he could subsequently replace expensive low migration materials with cheaper ones from which an improvement to the contribution margin results. Although the supplier insists, he is meeting the agreed contract, he acts fraudulently. The problem here is that any quality assurance problems are not known until delivery. The focal company can react with sanctions on these quality defects, but damage occurred and may not be averted.

All three cases of information asymmetry have got one characteristic in common: cheating. There is the risk that the supplier (agent) falsified information deliberately to gain personal advantage for his needs.

## **6.5 The Contribution of NIE**

The following section focus on a few selected issues that arise within the paper-based packaging supply chain, highlighted under the framework of the NIE. A focal firm is an initiator of business transaction. Focal firms conceive, design and produce the offered goods or services intended for consumption. In a supply chain network the focal company is an institution of central decision making authority which provides the set of rules on how the business is being done. The focal company coordinates the other upstream members in order to realise its strategic objectives. The focal company is identified by consumers or the end customers as responsible and liable for the product. (Hanf and Dautzenberg, 2006, p.79f).

Large retailers as the focal companies in the packaging supply chain wield significant power over suppliers. It is quite common for the largest retailers to make provisions in

their contracts to charge suppliers significant costs in the event that they are obliged to remove the supplier's product from their shelves as part of a product recall (Zurich Insurance, 2007, p.4). Beside signalling and monitoring, another important instrument to reduce the principal's significant risks and uncertainties concerning quality is self-selection, in terms of self-assessment. The Principal arranges a decision-making situation with multiple criteria, which forces the agent to make a selection decision before closing the contract. The agent's self-selection reveals itself as a hallmark of the agent's future quality, compliant behaviour and contractual fidelity yet to come. Self-selection accentuates certain types of contracts that have a substantial alternative of on demand due to the agent's preferences. Due to the stipulation of the contract, a principal-orientated choice takes place (Neus, 2007, p.220); but what kind of contract, what are the criteria? One way to economize on the questions raised above would be to focus on the costs of contracting (ex-ante or post-ante) or using the price mechanism of the market: the transaction costs. Transaction cost refers to the cost of providing some good or service through the market rather than having it provided from within the firm. Ex ante costs involve searching for and evaluating business partners or key suppliers (searching costs) and the costs of drafting, negotiating, closing and safeguarding an agreement (contract costs). Ex post costs include enforcing agreements, and negotiation to correct misalignments and mechanisms associated with solving disputes between the parties (Kledal, 2003, p.13). Transaction costs are therefore closely related to the concept of property rights: the costs of determining and defining property rights, of exchanging property rights, and the costs of protecting property rights. If transaction costs are positive, allocation of property rights matters (ibid, 2003, p.13). In a nutshell: the conceptual characteristics and selection parameter dictate the agency cost that will influence the governance structure of the firms along the supply chain. According to Padilla (2002, p.40) there is no doubt that agency problems are ineradicable. They are latent in any contractual relationships. The contribution of agency theory shows that when individuals (self-interest with guile) want to contract, they must integrate this variable when they design and close the contract. Individuals (actors in the market) are self-interested maximizers, they have a strong interest to minimize the burden of costs generated by agency problems (Karni, 2008, p.337).

The primary contribution of property rights theory is in providing insights on who should be the chain leader (King, 2002, p.13). The retailer as the focal company provides the rules of the game, but buying from the market implies that the purchaser is confronted with information asymmetry, bounded rationality and opportunism. When using the TCE approach, one wants to minimize transaction costs through a proper form of governance. Hence, the governance mode that reduces transaction costs most is favoured. Quality management and quality certification systems may be used for governance too. In the pre-contractual phase the principal may screen the market for a suitable agent. Screening will reduce the risk of adverse selection; it encompasses all levels of planning and execution of the principal's information

activities for evaluation of the agent's current performance and future behaviour (Göbel, 2002, p.111).

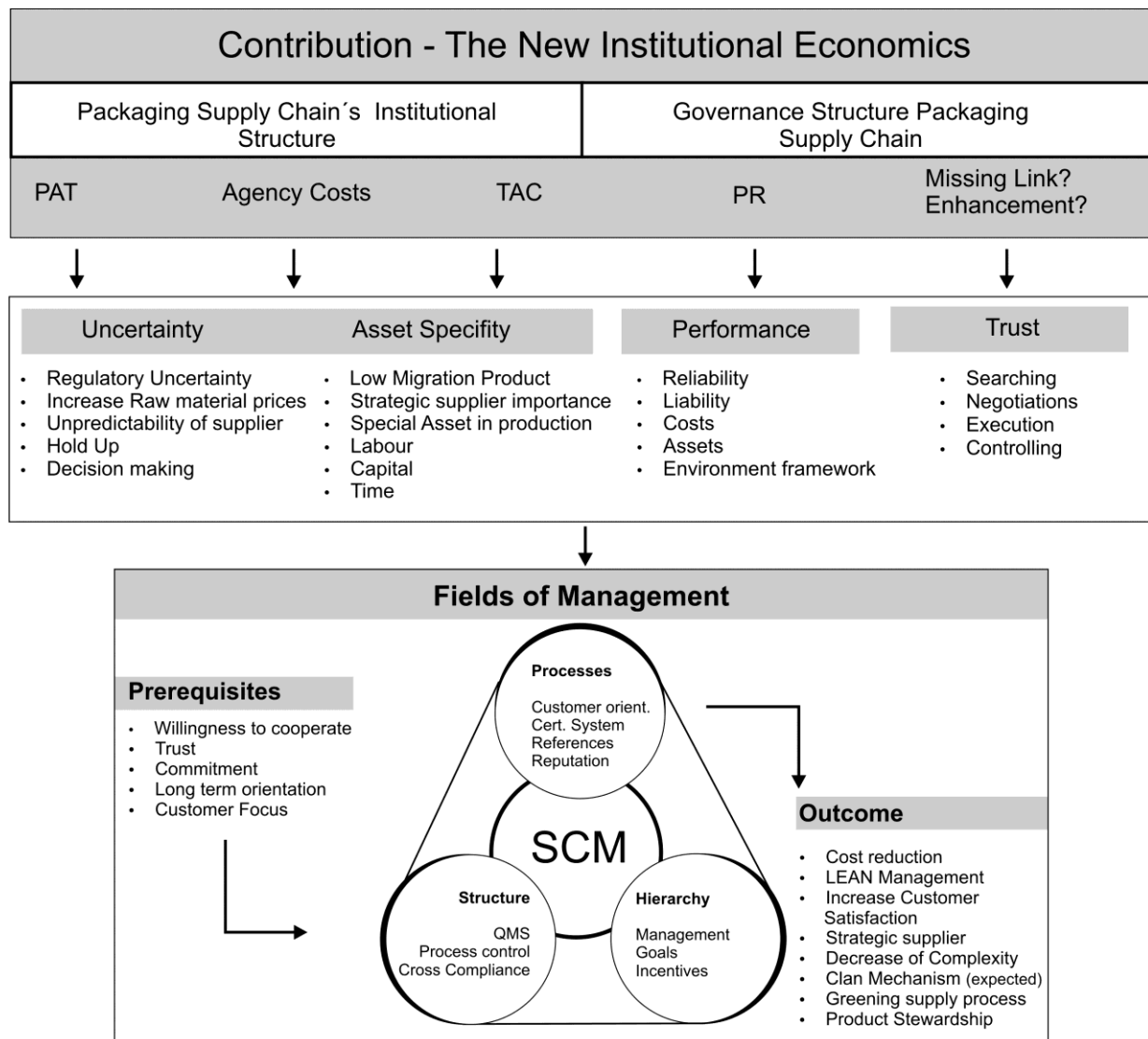
The agent himself may use signalling and warranties to demonstrate compliance and accountability. He build up his reputation. These bonding costs are almost all related to Quality Certifications Systems (QCS) and third party audits. These QCS like Good Practice, ISO9000ff, HACCP, BRC, IFS et. shorten the range and burden of principal's agency cost as a hallmark. Seen from agent's perspective these QCS may serve as bounding and signalling, but the corresponding structures and procedures, the processes and methods implemented for measuring and monitoring risk are also barriers to entry for competitors.

The duty of the PR approach is to find the optimal opportunity to exercise control with subordination agreements setting maximum levels for certain contaminants in food- and feedstuffs for packed product yet to come with its specific packaging. The burden of proof applies to the packaging system as a whole. Scrupulous compliance work and the warranted characteristics must be ensured by any technical interface of the processes, this requires a specification of the requirements in the safety criteria and announced audits and ex-post sanctions. The parameters that shorten the range of partners' freedom to make contractual arrangements are the agency cost. These kinds of contract bound PR should set into existence the sense of trust, a cornerstone in supply chain management.

According to Wilson (1995, p.337-338), trust is one of the fundamental pillars in business relationships and involves the belief that a relationship partner will act mutually in the best interest of the other partners. The concept of trust refers to confidence and credibility, competence in fulfilling obligations and reliability of promises to build up a sound and stable atmosphere.



**Figure 4: Contribution of NIE**



Source: Author's own graph

## 7. Recommendations for action

A crisis can be understood as a critical event or point of decision making, because if the going gets tough and it is not handled in an appropriate and timely manner it may turn into a disaster, something will hit the fan. Seen from an economic point of view it may be unstable conditions, in political, social, or market affairs, involving decisive change. The final crisis of food or feed related packaging is a recall, not in silence, but with media awareness in public. The producer's obligation to exercise diligence does not end with the delivery to the distributors. According to Klindt (cited in Hüttere, 2007, p.2) the average recall costs are two million Euros. The 5<sup>th</sup> law bill of the German Ink and Mineral Oil Ordinance budgets even the costs for implementation and enforcement: Personal and material expenses with 5.44 million Euros and annual

administration expenses with 1.51 million Euros. It may be asserted, however, those regulatory authorities and other supervisory agencies will take samples. That milestone is also the target date for putting low migration paper based packaging at the shelf: End of transmission period minus accumulated best before date.

Aside from the situation stated above the question of liability arises in the context of migration. What's the recent scope and impact of liability? As stated before the Framework Regulation (EC) Nr. 1935/2004 applies to all materials or articles which „in their finished state”, are intended to be brought into contact with food, or are already in contact with food and were intended for that purpose, or can reasonably be expected to be brought into contact with food or to transfer their constituents to food under normal or foreseeable conditions of use: Not endanger human health; or bring about an unacceptable change in the composition of the food; or bring about a deterioration in the organoleptic characteristics thereof. Clear words and intentions of the lawmakers, but on the basis of current scientific knowledge the share of MOSH and MOAH is ubiquitous. This understanding may establish future law enforcement action against the packaging manufacturer and the food manufacturer. Furthermore it may be expected, that official authorities take advantage of the opportunity and support given by law to issue formal "early warnings" directly to the public. Making this information accessible to the public enhances potential risk to marketers. Combined with the quick response from the retail community and supported by NGOs like "Foodwatch" for example, a costly market clearance is granted and the brand owner's image suffers substantial harm. While the loss of the food manufacturer can be judged by sales decline, the possible damage to the image of the brand owner is difficult to rate, since it can often be long term (Voerste, 2008, ff.). Possible recommendations and options are widely discussed (BfR Opinion No. 008/2010, FAQ of BfR from 10<sup>th</sup> of March 2010.). In view of the conditions of uncertainty concerning the proper functioning of the paper-based packaging supply chain, liability and limitation of liability of the marketer and supplier and the behaviour of supervisory authorities, the stakeholders attitude towards the facing of the recent situation may be described as a "wait-and-see" attitude (Kam, 2004, p.190) or a "paralysis by analysis" situation (Harremoës et al., (2001, p.181) or a "Boiling Frog" approach. (Mendonça et al, 2008, p.10). The future Ink- and Mineral Oil Ordinance is almost 4 years under preparation. From the perspective of Fiedler et al. (2013, p.5) and Kersten et al. (2011, p.15) possible recommendations for action are discussed:

- The sole use of low migration inks
- Prohibition of waste paper for food packaging
- Encourage substitution by virgin fibres
- Improvement of the recycling process
- Use of an inner bag as a functional barrier
- Use of a product-side coating as a functional barrier

All approaches cannot be effectively and promptly implemented and they are neither economically nor ecologically meaningful in the present state of affairs. Due to the recent absence of guidelines and safeguards, the overarching principle behind these requirements is the avoidance of liability risks, internally and externally.

- Comprehensive consultation in the packaging supply chain, bidirectional communication
- Overall assessment of raw materials, packaging and finished products
- Own due diligence applied realistically and compliance with laws or regulations
- Necessary diligence (migration test) and realistic self-assessment while facing risk
- The rise of mutual trust in a stable atmosphere
- Review of the contracts governing: limitations of liability of the suppliers, given warranties, rules of evidence and adjusting recall insurance cover, and finally the court will not consider high costs as an argument for raw material or goods defects (Hartwig, 2013, p.24)

## 8. Closing and outlook

This article attempts to reflect some highlights of the contribution of the NIE towards the packaging supply chain. Further research is necessary to prevent food scares by means of preventative action including information, instruction and guidance. Recent literature demonstrates that NIE's bundle of theories is not enough to explain supply chain management due to the division of labour and knowledge which creates uncertainty and risk. Recent literature discusses economic theories in addition: Network Perspective, Network Theory, Resource Based View, Organization Theory, Game Theory, Systems Theory and Strategic Choice Theory (Hofman, 2014, p.15-16; Ketchen and Hult, 2007, p. 455-456, Chen and Paulraj, 2004, p. 121-122)

As stated before uncertainty, risk, ignorance, and contradictory interests pervade contractual relationships. Therefore individuals or actors in the market are confronted with moral hazards and adverse selections all the time (Padilla, 2002, p. 34). Sound knowledge about the perspective of agency cost transformed into efficient and sustainable contract negotiations and closing of contracts may lead to pareto-optimal win-win situations. For strategic items long-term lasting and close relationships with a small number of suppliers should be cultivated, with focus on a high level of trust and commitment. The strategic selection of sourcing options should be based on total costs assessment rather than price per input basis. A future risk management subjected towards the imminent ordinance must cover bottleneck items. To shorten the range of migration, functional coated barriers on paper based packaging or on coated bag in a box will be a demand and a driver in the market. The "bundle of rights" offered by the PR include the right to exclude one from using resources (Klein and Robinson, 2011, p.194). Bottleneck products represent non-strategic supply of high

risk, when one or few suppliers are available on the market. To mitigate the supply risk and transaction costs, contracting relationships with suppliers should be developed, with particular focus on inventory and safety stock strategies.

Facing the truth that the pollution of waste papers with mineral oil is incorporated in our current recycling system and will remain for several years to come, the principal of an absolute barrier could be the last resort. On the other hand there is a great risk that grocer and brand-owner change their existing packaging philosophy: Instead of using paper-based boxes with functional inner pouches for food and animal feed, one can conclude that it may be suitable to print direct on the non-contact surface of an absolute barrier. Such as flow-wrappings of multi-layered plastic materials which are stored in a common tray.

As history tells us, the price of ignoring weak signals can become very unpleasant. This is why weak signal perception should therefore be settled in a solid foresight perspective for all involved stakeholders. Ansoff predicted that a gap of some years is likely between the first pick up of weak signals and the development and implementation of a new strategy. The law bill has been recently published in Germany, if one follows the potential parallel proceedings of former sectorial food crises in the EU, a European spill over is well on target: Prepare for change in the paper based packaging industry!

## 9. References

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## List of Abbreviations

BfR	Federal Institute for Risk Assessment (GER)
BMELV	Federal Ministry of Food and Agriculture (GER)
BRC	British Retail Consortium
C	Carbon Chain
Da	Dalton, unified atomic mass unit (USA)
EC	European Community
EEC	European Economic Community
EFSA	European Food Safety Authority
EU	European Union
FAQ	Frequently asked questions
FMCG	fast-moving consumer goods
FSA	Food Standards Agency (GB)
GMP	Good Manufacturing Practice
HACCP	Hazard Analysis and Critical Control Points
ibid	Latin, meaning "in the same place"
IFS	International Featured Standards
ISO	International Organization for Standardization
MOAH	mineral oil aromatic hydrocarbon
MOSH	mineral oil saturated hydrocarbons
NGO	Non-Governmental Organization



NIAS	Non-intentionally added substances
NIE	New Institutional Economics
PAT	Principal agent theory
PRT	Property Rights Theory
QCS	Quality Certifications Systems
SR	Systematic Order; Swiss Law
TEC	Transaction Cost Economics
UBA	Federal Environmental Agency (GER)