Department of Real Estate, Planning and Geoinformatics

Industry Transformation Initiated by a Technological Innovation

Case of UK Grocery Retailing

Arhi Kivilahti

Aalto University

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Industry Transformation Initiated by a Technological Innovation

Case of UK Grocery Retailing

Arhi Kivilahti

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Abstract

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Abstract

Companies respond differently to challenges posed by innovations. It has been argued that the established companies are slow to react to radical technological innovations whereas companies entering the industry are capable of framing novel technologies differently and thus challenge the established companies. However, this argument about incumbent challenger dynamics has been questioned by more recent studies.

This thesis studies how different cognitive frames towards innovations influence the ways in which companies respond to the innovations, which subsequently initiate an industry transformation. Furthermore, the thesis analyses the framing and incumbent challenger dynamics among UK grocery retailing after the introduction of online technologies. The transformation extends from the mid 1990´s to recent developments in 2011. The empirical part of the research is based on an analysis of media archives and on interviews with industry experts.

In UK grocery retailing the online channel received little attention during the early years, but the dotcom boom in the turn of the millennium initiated a hype in the market. During the hype majority of companies adopted the online channel framing it as a disruptive innovation. These companies did not adopt the innovation during the early years, because the innovation was not seen as a threat and did not require any action. This was contrary to the early adopters who framed the innovation as an opportunity. During the hype of the dotcom boom external pressure led the later adopters to defensively act with a rapid response making them vulnerable for the excessively positive expectations of the hype. Eventually the utilization of the existing capabilities and competencies by incumbent companies along with the long maturation period proved to be the reason for the success of the incremental frame to the innovation, used by an incumbent.

Contrastingly to seom other parts of retailing, the impact of online business has remained low for the grocery retailing, representing less than 10% of the market.

However, the online channel is expected to be an important part of the future of the grocery retail industry. This can be seen in the fact that online is a significant part of the overall growth of the sales. Additionally, online channel has started to influence the business models of the existing businesses, which strive to incorporate online as an integral part of the channels offered. It remains to be seen how the growth of the online channel will shape the network of physical stores.

Keywords real estate; retailing; innovation management; industry emergence; technological innovations

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Tekijä
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Väitöskirjan nimi
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Tiivistelmä

Teknologiset innovaatiot voivat saada aikaan merkittäviä muutoksia olemassa olevilla toimialoilla. Useat tutkimukset ovat todenneet, että perinteiset yritykset eivät kykene vastaamaan muutosprosessiin. Uudet, usein pienet, yritykset sen sijaan kykenevät kehystämään innovaatioita eri tavalla, saaden näin kilpailuetua. Viimeaikainen tutkimus on kyseenalaistanut tätä näkemystä. Näin ollen on tärkeää luoda uutta ymmärrystä siitä miten teknologiset innovaatiot vaikuttavat yhtäältä toimialoihin sekä toisaalta yritysten liiketoimintamalleihin.

Tämän tutkimuksen päätavoite on tutkia toimialan muutoksen ajureita sekä eri vaiheita. Muutosprosessiin liittyy usein takaiskuja, virheitä sekä hypen ja pettymyksen sykli. Perinteinen innovaatiotutkimus on puolestaan korostanut kuinka uudet yritykset ovat pystyneet innovaatioiden johdosta syrjäyttämään perinteisiä yrityksiä. Siksi tutkimuksen toinen tavoite on kriittisesti analysoida perinteisten ja uusien yritysten välistä dynamiikkaa.

Ruoan verkkokaupan kehitys Englannissa on toimialan muutoksen näkökulmasta hyvin mielenkiintoinen tapaus tutkittavaksi. Ruokakaupan muutos internetin kehityksen myötä, jota tässä tutkimuksessa tutkitaan, alkaa 1990-luvun puolivälistä ja jatkuu aina viime aikaisiin tapahtumiin vuonna 2011. Tutkimus pohjautuu kattavaan analyysiin alan lehtiarkistoista sekä lukuisiin haastatteluihin alan asiantuntijoiden kanssa. Monilla toimialoilla, mukaan lukien tietyt kaupan alat, internetin kehitys on aikaansaanut voimakkaan muutoksen. Ruokakaupan osalta internetin vaikutus on toistaiseksi jäänyt vähäiseksi, edustaen noin 10 % liikevaihdosta. Hidas kasvu on ollut omiaan heikentämään uusien toimijoiden mahdollisuuksia haastaa perinteisiä yrityksiä. Lisäksi vuosituhannen vaihteen IT-kupla vaikutti myös ruokakauppaan aikaansaaden kiivaan keskustelun oikeasta liiketoimintamallista ruoan verkkokaupan toteutuksen osalta. Olemassa olevien kyvykkyyksien ja toimintojen hyödyntäminen yhdessä markkinan hitaan kasvun kanssa ovat mahdollistaneet vähittäisen kehittämisen lähestymistavan menetyksen, jota perinteinen toimija on käyttänyt.

Ruoan verkkokauppa kasvaa voimakkaasti ja se nähdään merkittävänä kanavana tulevaisuuden ruokakaupassa. Nähtäväksi jää kuinka voimakkaasti verkkokaupan kehitys tulee vaikuttamaan fyysisen kaupan sijoittumiseen sekä konseptien kehittymiseen.

Avainsanat Kaupan ala; kiinteistöt; innovaatiot; toimialan synty

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put in countless hours of his time reading and commenting on my work. Mika's help was the single most important work related help I could have got during the process.

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"*Life's greatest happiness is to be convinced we are loved*." Victor Hugo

Espoo, 19.6.2013

Arhi Kivilahti

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1 Introduction

1.1 Background

The literature on technological innovations and subsequent industry transformation has been widely examined and builds on several research streams, ranging from institutional theory to technology innovation and strategic management (Utterback & Abernathy, 1975; Christensen, 1993; Tripsas & Gavetti, 2000; Hill & Rothaermel, 2003; Hargrave & Van de Ven, 2006). Transformation is instigated by a technological innovation to which companies, new and existing, respond (Chandy & Tellis, 2000). The varying responses collectively transform an existing industry or initiate the formation of a new one (Kaplan & Tripsas, 2008). This research studies the process of industry transformation initiated by a technological innovation with a special emphasis on how different actors frame (search, understand and interpret) the innovations and how that influences the transformation process.

This research approaches industry transformation from three perspectives. The first perspective explores the process of industry transformation itself, whereas the second perspective narrows the focus to the company level. The purpose is to explore the different ways in which companies frame the innovation and subsequently respond to it thus collectively creating a transformation on an industry level. This contributes a cognitive element for the research on industry transformation, something that has been requested by numerous scholars recently (e.g. Kaplan & Tripsas, 2008; Suddaby, 2010; Benner & Tripsas, 2012). The research also examines the different definitions and outcomes of technological innovations. This provides the basis for analysing the responses of companies and the progress of the change within an industry. The main contribution of this research is to explore the role of cognitive framing to how companies respond to technological innovations and how this influences the industry transformation.

Amongst the many approaches to industry transformation, the ecological and evolutionary approaches (e.g. Dosi, 1982; Nelson & Winter, 1982; Hannan & Freeman, 1993) have been criticised for not being able to explain the processes and actions underlying it (Astley, 1985; Rao, 1998). Van De Ven & Garud (1993) argue that an understanding of the processes through which technological innovations initiate industry transformation produces important insights for both management research and practitioners. They go on to suggest that industry transformation research also provides a significant contribution to entrepreneurship research because the development and the commercialisation of new technologies have been said

to be a source of renewal for companies and industries (Tushman & Anderson, 1986; Munir & Phillips, 2002; Tripsas, 2008; Tellis et al., 2009).

The processes and phases of industry transformation initiated by innovations have been identified in prior research (Anderson & Tushman, 1990; Hargrave & Van de Ven, 2006; Sood & Tellis, 2005; Utterback & Abernathy, 1975; Van de Ven & Garud, 1993). The process models have several common characteristics. Usually the transformation process is initiated by an external force that leads innovation development into a phase of high-paced experimentation and low legitimacy. This is coupled with high uncertainty about the characteristics that will eventually become part of the winning design (Murmann & Frenken, 2006) as the innovation competes with existing products or services as well as with rival designs for the same innovation.

During their early years, companies operating in a new environment (whether a new industry or the transformation of an existing industry) face significant uncertainty and need to build legitimacy for their innovation and its new environment (Aldrich & Fiol, 1994). The companies involved in the new environment often collaborate through collective action to provide institutional support for the legitimacy of the innovation (Van de Ven & Garud, 1993). This includes joint ventures between competitors or industry associations to promote legitimacy. In addition to industry associations, governmental actors and the scientific community are seen as important contributors to the institutional rules of industries (Van de Ven & Garud, 1989). Forbes et al (2011) have argued that more research needs to be conducted to develop and test theories during the early years of an industry's transformation as well as the time periods preceding and after the transformation.

Gustafsson et al. (2012) state that the establishment of commercial viability is an important part of the process of industry transformation. They go on to argue that the identity and the network of actors in an industry can be formed as a result of hype surrounding a new technology or industry, but also note that the emergence of an industry requires the ability of companies to generate profitable business. Business models have also been identified as important tools for the successful commercialisation of technological innovations (Chesbrough, 2010; Teece, 2010).

The first era of industry transformation culminates in a dominant design emerging and subsequent stabilising development activities in the industry (Anderson & Tushman, 1990). The emerging network that is involved in developing an innovation then starts to form an industry when the dominant design for the industry emerges (Munir & Phillips, 2002). The nature of development activities also moves from the development of a new

product or service to incremental process improvements in the performance of the products or services of the innovation (Abernathy & Utterback, 1978). These incremental processes aim to differentiate the innovation from competing designs as well as from competing products or services (Benner & Ranganathan, 2012). The emergence of the dominant design reduces uncertainty and increases the legitimacy of the innovation, both of which are features that are characteristic of the first phase of development. The last phase of industry transformation sees progress slowing down and companies turning to more conservative strategies as the innovation loses its competitive edge (Low & Abrahamson, 1997). Eventually, a new innovation challenges the existing status quo and replaces the old innovation (Afuah & Utterback, 1997).

Moving from the industry level to individual company level, previous research on companies' responses to technological innovations has explored how internal and external drivers have influenced responses. Regarding the internal drivers, managerial cognition, more precisely the technological framing of companies, has been found to have an important effect on how companies perceive technological opportunities (Kaplan, 2008a). The technological framing of individual companies is a significant and an under theorised area for research into industry transformation, because the transformation process is shaped by the framing and subsequent responses of individual companies (Kaplan & Tripsas, 2008). The historical background of a company also influences its framing and subsequent response (Benner & Ranganathan, 2012; Tripsas & Gavetti, 2000). Kaplan (2008b) argues that company response to technological change is shaped by the interaction of managerial cognition with organisational incentives and capabilities.

Existing organisational capabilities and value networks (Hill & Rothaermel, 2003), which have become dominant with historical success, can prove to be difficult to displace, making the dominant companies in an industry less adaptive and responsive to radical innovations. However, some capabilities and competences accruing from the history of the company, such as complementary assets (Tripsas, 1997a), can also be beneficial for the companies when responding to technological innovations. The successful response of such companies is seen to be more probable when consumer adoption or technological developments are slow (Ansari & Krop, 2012; Rothaermel & Boeker, 2007).

The research also explores the nature and outcomes of technological innovations. Technological innovations can provide industries with varied outcomes depending on the nature of the innovation. Additionally, different companies frame innovations differently depending on the technological

frames used. The frames can also change over time. Radical and disruptive innovations can change the way an industry is organised and cause dominant companies problems or even put them out of the industry (Srinivasan et al., 2002; Danneels, 2004). In contrast, the development of incremental innovations is built on the competences of dominant companies and therefore the new entrants have significant problems in trying to challenge incumbent companies (Henderson & Clark, 1990). New companies outside the existing networks of actors in the industries are often seen as the source of radical and disruptive innovations (Tushman & Anderson, 1986; Christensen, 1993; Christensen, 1997). Christensen (1997) claims that the fall of incumbent companies is often a result of focusing too much on the needs of the existing customers. The success or failure of incumbent companies when faced with radical innovations has been much studied (i.e. Dewar & Dutton, 1986; Henderson, 1993; Christensen, 1997; Tripsas, 1997b; Benner, 2010). However, recent research has started to question the dominant view of entrant firms developing and succeeding with radical innovations (Chandy & Tellis, 2000; Rothaermel, 2000; Rothaermel, 2001).

Research on industry transformation has traditionally been conducted alongside research on the nature of an innovation. However, these studies have previously ignored three important perspectives. Firstly, the previous research has focused on the technological attributes of innovations and ignored the forces of heterogeneity in the responses of companies to the innovations and how the managerial cognition influences this (Tripsas & Gavetti, 2000). Focusing on the variation in responses to innovations provides better understanding of the diffusion processes (Fiss et al, 2012). The perspective requires further research to understand how and why companies respond differently to innovations (Benner & Tripsas, 2012). Additionally the traditional models have ignored the possibility of a successful response by incumbent companies to a radical innovation. Thirdly, the industry transformation research has not taken into account the possible hype and disappointment often associated with technological innovations. Thus, this research will integrate the cognitive element and the hype-disappointment literature into the industry transformation framework. These elements enable the research to produce unique contribution to the innovation life cycle and industry transformation literatures. Furthermore, online retailing and the hype it received have not been studied from the industry transformation perspective, which provides an additional research contribution.

1.2 Research objective and gaps

This research explores the cognitive elements of innovation research by investigating how companies frame and respond to innovations and how those responses influence the industry transformation. The cognitive approach to technological innovations highlights the framing of the innovations and how that affects the companies' responses. The research further explores whether the dominant and incumbent companies in an industry are able to respond properly to the challenges posed by industry transformation. Moreover, it is studied how this affects the phases and nature of the subsequent industry transformation and how the innovation has been commercialised through business models. The next section illustrates how the research perspectives explored above will be used for the purposes of this research.

The research will be conducted in the context of the industry transformation initiated by the development and adoption of online technologies in grocery retailing in UK. Over the last 15 years online grocery retailing has grown to become an important channel of grocery retailing. According to IGD, an industry data provider, the market represents sales of approximately £6bn in the UK. Thus the UK has been credited with being the world leader in online grocery retailing. The emergence of mobile services as an alternative alongside online and physical stores has given multichannel retailing the possibility to renew retailing with completely new kinds of services. The renewal of grocery retailing through multichannel services has and will force all retailers to rethink their approach to technology as well as user experience. The UK grocery retailing is a fascinating context for studying the framing of innovations and subsequent industry transformation, because over the process several companies have developed various versions of the innovation. This has led the market to various phases and indicated differing frames by new as well as established companies.

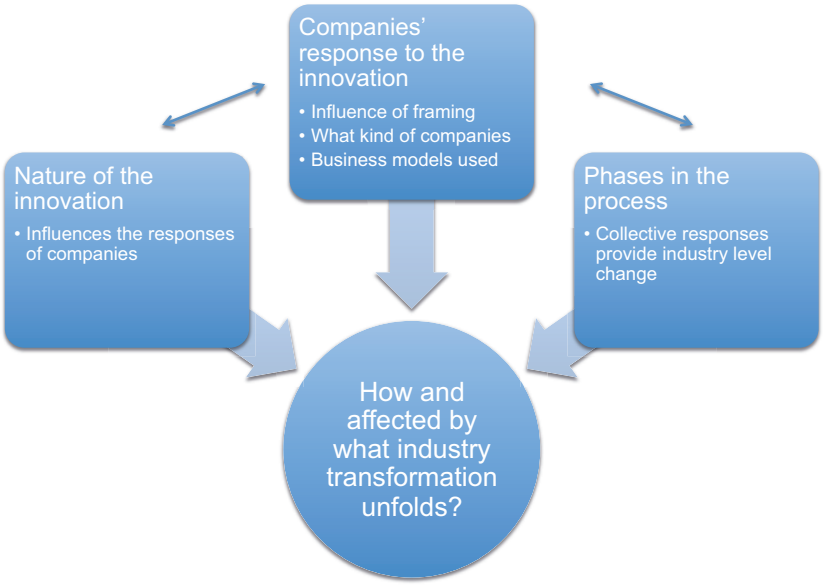

Figure 1. How does the industry transformation unfold and how and why does that transformation occur?

This chapter has explored different theoretical perspectives to the research on industry transformation. The contributions of each theoretical perspective to the research are summarised in Table 1.

The research on industry transformation explores industry level drivers, such as the technological development or public sector actions behind a transformation process. Additionally the perspective also deals with the phases of a transformation.

The early years of industry transformation provide an important research setting, because the challenges the companies face are different to those of established industries (Van de Ven & Garud, 1989; Aldrich & Fiol, 1994). The early years of industry transformation are characterised with uncertainty about the future direction of the transformation, because companies have different approaches for the innovation (Aldrich & Fiol, 1994; Santos & Eisenhardt, 2009). The importance of the actions of individual companies is emphasised as they provide direction for the creation and transformation of an industry (Van de Ven & Garud, 1993; Mezias & Kuperman, 2000). The previous research has extensively identified the variation in responses towards the innovation, but the underlying origins of the variation in the responses remains an under theorized area (Kaplan & Tripsas, 2008). Several models of technological change have also been developed to identify phases in the process. In this research the models will be integrated into a unified model, which forms

the basis for answering the research questions.

The processes of industry transformation after a technological innovation are characterised by setbacks, costly mistakes and cycles of hype and disappointment (Van de Ven & Garud, 1993; Verbong et al., 2008) and they require further research if we are to fully understand how and why companies respond to the hype that can often follow the early years of an innovation. It has been argued that previous research has not given sufficient attention to the birth of new businesses and industries (Forbes & Kirsch, 2011; Low & Abrahamson, 1997).

The second theoretical perspective of the research deals with companies' responses to innovative opportunities and explores the drivers influencing the responses of companies to an innovation. The literature on cognitive framing in relation to technological change is utilised to understand the variety of responses. In order to better understand the unfolding of the industry transformation, we need to explore the reasons behind different choices made by individual companies (Kaplan & Tripsas, 2008). There also exists a lack of empirical research on how the cognition shapes the innovation processes and subsequent industry transformation (Thrane et al, 2010).

The existing research on innovation processes and industry transformation has traditionally perceived new entrants and other outsiders as the sources of discontinuous innovations, to which the incumbents are unable to respond (Anderson & Tushman, 1990). Jiang et al. (2010) emphasise that radical technological innovations often take decades to evolve and that the role of the incumbents in the process has received limited attention. The incumbent-challenger dynamics perspective (Ansari & Krop, 2012) focuses on the responses made by incumbent companies when faced with significant technological change. This is essential to note for this research as large incumbent companies dominate the grocery retail market in UK.

The nature or characteristics of an innovation provides the third perspective of the research. Literature on the nature of innovations offers this research with understanding of the nature of online technologies as an innovation in grocery retailing and how the companies have perceived the nature of the innovation differently. This is closely connected to the impact the innovation has on industry transformation.

The main contribution of the research is to shed light on how the cognitive framing of innovations influences the processes and actions underlying the phases through which the transformation of an industry progresses. The research gap addressed by this research deals with the problem of integrating the traditional innovation life-cycle and industry

transformation research with cognitive elements to produce better understanding on how and why companies respond to innovations and thus promote collective change on the industry. This advances our knowledge on how new technologies emerge, get adopted and adapted, which is important for identifying the ways in which innovations spread and get diffused (Ansari et al, 2010). According to Danneels (2004), there is a need to understand how the emergence of new technologies influences the future of companies and industries.

This section summarises the main streams of literature that form the core of the literature review on the perspectives that jointly comprise this research on industry transformation. The three perspectives enable the research to answer the research questions, which will be presented in the next section.

Table 1. The contribution of different theoretical perspectives to the research

Theoretical perspective	Contribution of the theoretical perspectives for the research
Drivers and phases of industry transformation	The drivers affecting the industry's transformation The phases through which the industry transformation unfolds. How is each phase characterised?
The framing and responses of companies to innovative opportunities	The drivers influencing the varying frames and responses of companies How the cognitive framing shapes the transformation process?
The nature of the technological innovation	The different nature of the innovations and their impact on the incumbent companies How the companies perceive the nature differently and how that changes over time?

1.3 Research questions

The main research questions are illustrated in this section. They also provide the structure and the main theoretical content for the literature review as shown in Figure 2.

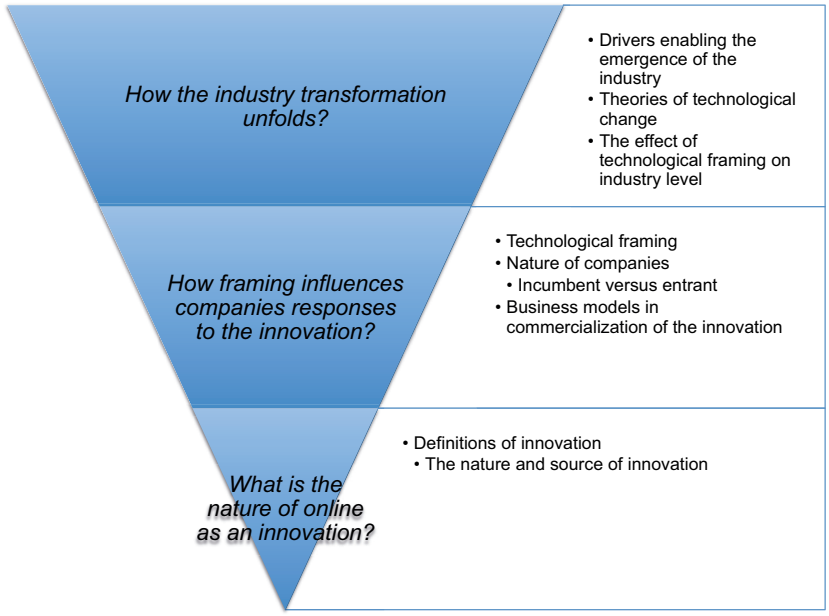

Figure 2. The structure of the literature review

The first part of the research explores how the *industry transformation process* initiated by a technological innovation has unfolded over time and what kinds of drivers have influenced the industry level process. This will integrate the traditional models of industry transformation with the hype-disappointment cycles. The industry transformation process is built as individual companies respond to the technological innovation.

The nature of the innovation along with the technological frames of companies influence the way different *companies respond* to the innovation. Arising from the technological change and lifecycle literature is the argument that radical or disruptive innovations would lead to the fall of the established or incumbent companies. This argument has been questioned in recent research. This study examines how companies (incumbents and entrants) have responded to the emergence of the technological innovation and how that has affected competitive dynamics in the industry. This research will explore how different kinds of companies approached the innovation very differently and what kinds of drivers influenced the technological frames of the companies. The literature

suggests that the nature of an innovation along with more company specific elements affects the way the different actors frame and respond to innovations and therefore how the innovation unfolds.

An essential part of the response to technological change – by both incumbents and new entrants – is how companies create value out of the innovation and how the innovation is taken to the market. Business models are critically important if an innovation is to become a financial success (Chesbrough & Rosenbloom, 2002). Therefore, it is important to study how companies organise their business models in order to respond to the changes created by the emergence of technological innovations.

The issues highlighted in this part of the chapter are summarised in the following research question and the sub-questions:

How cognitive framing influences companies' responses to technological innovations and subsequently shapes the industry transformation?

- How has the industry transformation progressed?
    - Through what kinds of phases has the industry transformation progressed?
    - How and what kinds of drivers have influenced the industry level transformation?
- How have companies (incumbent and entrant) responded to the innovation?
    - How the companies framed the innovation?
    - What kind of internal and external drivers influenced the frames and responses of companies?
    - How the nature of the innovation has influenced the framing by companies?
    - How have the technological frames held by companies influenced their response to the innovation?
    - How and why have business models for commercialising the technological innovation developed during the industry transformation process?

The main research question and its sub-questions provide the basis for the research. They will be explored in the context of the processes and outcomes of the emergence of online retailing within UK grocery retailing, which will be illustrated in the next section.

1.4 Online grocery retailing in UK

Online grocery retailing has been an important part of retailing for more than a decade already. During the mid- and late 1990s it was seen as a fascinating opportunity and its effect was expected to be dramatic for the grocery retail business of the new millennium. The growth estimates for the online grocery market, like those for most online businesses, were high at the turn of the millennium. After the collapse of the dotcom boom in 2000, the development of the market, growth estimates and interest in online channels decreased significantly and some commentators started to question the sustainability of the innovation.

Since 2004 the market has gained a more collective vision about a long-term business model for the online channel. This has also increased interest in online grocery retailing and eventually the legitimacy of the channel has increased. Today online grocery retailing in UK represents 5 % of the grocery retail market and it has been stated that the UK is one of the world's leading markets for online grocery retailing. However, the online channel has required substantial investment and some retailers have experienced losses due to their business model choices and the slow growth of the overall market. Recently, the market for online grocery retailing has started to grow and its growth represents a significant share of the overall growth in the grocery retail market. The online channel has been adopted by the majority of grocery retailers in UK and only two major retailers (Morrisons and Marks & Spencer) do not have an online channel. However, Morrisons plans to launch an online store.

This research explores how the grocery retail industry in the United Kingdom responded to the opportunities presented by the technological innovations accruing from the emergence of the Internet. The growth of online grocery retailing and retailer actions during the process have not been studied much from the perspective of industry transformation, technological innovations or business models. Thus, online grocery retailing provides a good research setting for studying the phenomenon of industry transformation and its phases of technological change as well as the actions of companies and business model innovations. This is because the market for online grocery retailing has changed radically during the process, including a hype-disappointment cycle and varying responses from the big established companies as well as from the smaller entrant companies.

As a technological innovation the Internet was significant for grocery retailing as it enabled the development of a new channel for grocery retailers to contact and sell their products to customers. The online channel

also has different business logic to that of traditional stores. It has been argued that online businesses do not need to rely on the physical location or the restrictions of individual stores, such as a limited range of products (Anderson & Tushman, 1990; Christensen & Tedlow, 2000). This has been notable in some retailing areas, such as book or music retailing, but has not been studied within grocery retailing.

Online grocery retailing did not emerge as a new independent industry, but as an important channel within an established industry (grocery retailing). Therefore it is important to understand how the retailers – new and incumbent – have responded and adapted to the technological innovation and how that has affected the transformation of the established industry. This means that the main theoretical focus of the research lies in studying how and what kinds of companies adopted, responded to and adapted to a new technological innovation (in this case the development of online technologies) and how this affected the transformation of the industry concerned.

Methodologically the research takes a qualitative approach to industry transformation by collecting chronological data about the events that unfolded during the emergence of online grocery retailing.

The research process is characterised by the deductive-inductive approach developed by Pettigrew (1990). The first part includes the review of the essential literature related to the three above described perspectives on industry transformation. The review generated the early research questions and formed the basis for the data collection. The initial data collection consisted of the gathering of chronological data from secondary sources. The analysis of the chronological data further framed the review of the literature and provided the basis for the interviews. The data analysis forms the third part of the research process. After the identification of the overall chronology of events from the secondary data, interviews were conducted to obtain an in-depth perspective on the process. The writing up of the analysis and the finalising of the thesis completed the research process.

The data has been gathered from three main sources of industry information related to grocery retailing. These include two industry magazines (The Grocer and Retail Week) and one national newspaper (The Guardian). The archives of the sources date back to the mid- (The Grocer) and late 1990s (Retail Week and The Guardian). The database for the secondary data consists of more than 400 events about the development of the market. The categorisation of the events into temporal phases resulted in three phases of emergence: (1) an emerging activity network, (2) the creation of warehouses and (3) the emergence of a dominant design. After

generating a chronology of events and analysing them, interviews with people involved in and those who had followed the emergence of online grocery retailing in the UK were conducted. The interviews provided an in-depth, qualitative overview of the events highlighted in the chronology.

1.5 Structure of the thesis

The research is structured so that the next chapter reviews the most important literature on the subject. The below illustrates the structure of the thesis. The literature review chapter is divided into three subchapters: (1) drivers influencing the industry transformation process and their phases, (2) responses to the opportunities provided by the innovation, and (3) the nature or characteristics of the innovation. The following chapter explores the data collection and methodological issues of the research. Chapter 4 examines the development of the online grocery retail market by studying it in chronological order. The chronology is divided into three phases that characterise the development of the online grocery market in UK. The chronology also includes four themes that have been important during that time. Chapter 5 provides an analysis of the themes arising from the chronology of the industry transformation. The themes presented in Chapter 5 are similar to the drivers enabling the industry transformation presented in the literature review (Chapter 2.1.1). The analysis includes a comparison and characterisation of the phases in the development and the identification and analysis of the significant turning points in the transformation of online grocery retailing in UK. This is followed by the discussion chapter, reflecting the findings made in Chapters 4 & 5 in relation to the findings in the literature review chapter. Chapter 7 provides summaries and a conclusion of the research.

2 The role of innovation in industry transformations

The research objectives proposed in the previous chapter touch upon several theoretical perspectives related to technological innovations and subsequent industrial transformations. Technological innovation research illustrates the nature of technological innovations and how they influence transformations within industries. The nature of an innovation also influences the actions of individual companies, shaping the way an innovation eventually transforms an industry (Abernathy & Utterback, 1978; Van de Ven & Garud, 1993; Kaplan & Tripsas, 2008). Much technological innovation literature emphasises the role of new companies in developing radical, disruptive or competence-destroying innovations (Anderson & Tushman, 1990; Christensen, 1993; Christensen & Bower, 1996). This argument has been questioned by some recent research, which emphasises the role of incumbent companies in developing and responding to radical innovations (Low & Abrahamson, 1997; Hill & Rothaermel, 2003; Ansari & Krop, 2012).

The role of the pioneer companies developing innovations during their early years is important (Afuah & Utterback, 1997; Low & Abrahamson, 1997). Pioneers need to face the challenges of emerging industries or innovations because they are vulnerable to the risks of newness. This makes increasing of the legitimacy of an innovation important during its early years (Aldrich & Fiol, 1994).

Alongside the pursuit of legitimacy, the early years of technological change are characterised by uncertainty related to the direction of the technological development (Abernathy & Utterback, 1978; Kaplan & Tripsas, 2008). The legitimacy and the uncertainty eventually fade as the process of technological change becomes stable with the emergence of agreement between the majority of companies over the important issues in the development of the innovation (Anderson & Tushman, 1990). This marks a significant change in the change process.

The literature approaches technological innovations and subsequent industry transformation from three perspectives: 1) industry transformation processes, 2) the response of individual companies, and 3) the definition of the innovation.

The first perspective explores the transformation process on an industry level. It investigates previous research into industry level transformation that has been initiated by innovations as well as the responses of companies to innovations. The perspective addresses questions related to what influences and drives industry transformation, the kind of change

innovation initiates and how the process of industry transformation unfolds. The perspective explores previous research on drivers influencing transformation or emergence processes, such as technological development and institutional arrangements (Van de Ven & Garud, 1989; Gustafsson et al., 2012). The phases of transformation link to research on technological change and lifecycles (i.e. Utterback & Abernathy, 1975; Anderson & Tushman, 1990; Van de Ven & Garud, 1993; Sood & Tellis, 2005).

Research on industry emergence provides a firm grounding for research on industry transformation because both processes are initiated by technological discontinuity. The difference is that industry emergence occurs outside traditional industries compared to the transformation of existing industries. The Forbes & Kirsch (2011) classification of different temporal intervals in industry emergence research is depicted in Figure 3. This research sets in intervals C and D include elements for studying how the processes in new industries become "taken for granted" (Rao, 2004) or legitimised (Aldrich & Fiol, 1994) from interval B onwards. For intervals C and D, Forbes & Kirsch (2011) use Christensen's study on the hard disk-drive industry (Christensen, 1993) and the study by Garud et al. (2002) on Sun's efforts to make Java a standard.

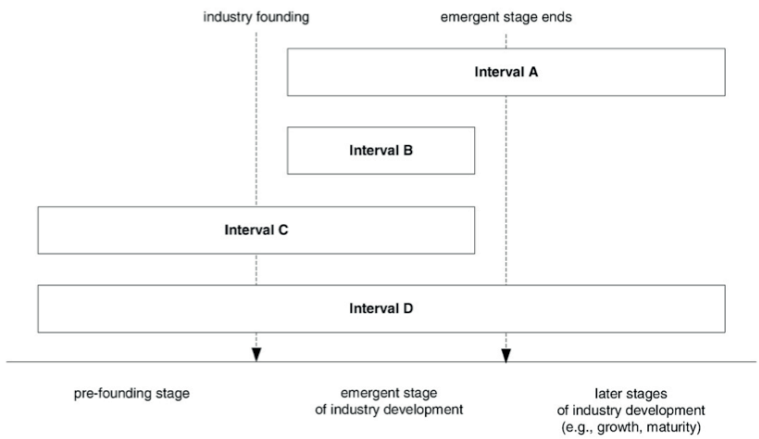

Figure 3. The framework of temporal intervals in the research on industry emergence (Forbes & Kirsch, 2011)

The responses of companies are at the heart of the second perspective, which explores prior research on the responses of individual companies to innovations. The response perspective focuses on how the companies frame innovative opportunities and use business models to commercialise innovations. Business models represent one of the most important tools for successfully responding to and commercialising innovations (Chesbrough,

2010) because the business models enable innovations to create revenue for the companies (Chesbrough & Rosenbloom, 2002; Teece, 2010). The responses of companies are shaped by technological frames, which shape what the companies notice about the new technology and how they interpret it relative to other technologies (Kaplan & Tripsas, 2008). The background of the company influences the framing (Tripsas & Gavetti, 2000) and thus it can become an inertial force inhibiting adaptation to radical changes (Kaplan, 2008b). A reliance on existing capabilities and customers has been identified as one reason for incumbent companies sometimes poor responses to an innovation (Henderson & Clark, 1990; Christensen, 1993). The inability of incumbent companies to respond to innovative opportunities has been questioned recently (Rosenbloom, 2000; Rothaermel, 2001; Hill & Rothaermel, 2003) and frameworks explaining incumbent-challenger dynamics have been developed (Ansari & Krop, 2012).

The responses of individual companies connect the second perspective to the third as the frames and actions of individual companies are influenced by the nature of an innovation. The different definitions of innovations – ranging from incremental to competence-destroying and disruptive innovations (Tushman & Anderson, 1986; Henderson & Clark, 1990; Christensen, 1993) – are investigated in the third perspective. The definitions of what constitutes a technological innovation provide a frame for evaluating the nature of online technologies as an innovation for the grocery retail industry. The nature of an innovation also influences how different kinds of companies respond to different kinds of innovations.

This chapter explores the literature related to the three perspectives of the research and provides an overall view on the most important frameworks of industry transformation, company responses to technological innovations and the nature of technological innovations. This provides a basis for the following chapters detailing the chronological development of the online grocery retail market in UK and the following discussion linking the chronology to academic frameworks.

This chapter is divided into three parts. The first part (chapter 2.3) focuses on the progress of the industry transformation following the innovation and responses by companies. It summarises essential frameworks for studying technological change and lifecycles as well as the drivers enabling the industry transformation or emergence. The industry level transformation is narrowed down in the second part (chapter 2.2) to the responses of companies that then influence the transformation of the industry. The chapter investigates how companies frame and respond to innovative opportunities and commercialise innovations. The review of

company responses then concentrates on the nature of an innovation in the third part (chapter 2.3). The chapter reviews important research on the nature and sources of innovations and the kinds of responses they initiate. The last part of the chapter summarises the research reviewed in order to provide an integrative framework for assessing technological change and subsequent industry change or emergence.

2.1 Drivers and processes of industry transformation initiated by innovations and responses to the innovations

An innovation and the subsequent responses of companies to that innovation initiate transformation in an industry. This chapter investigates a) the drivers underlying and enabling the transformation process and b) the phases through which the transformation unfolds.

The first part of the chapter reviews literature related to the drivers that enable the transformation process. The literature is partly derived from research on industry emergence because the emergence of new industries initiated by an innovation resembles that of industry transformation in existing industries after a discontinuous innovation. The drivers influencing the development of new industries can also be seen to shape the transformation of existing industries. Therefore, the main frameworks of industry emergence (Van de Ven & Garud, 1989; Gustafsson et al., 2012) will be used to reflect on the transformation of the grocery retailing industry after the emergence of online technologies. The elements derived from research on industry emergence should provide it with a good understanding of what elements influence a transformation process during its early years. This research principally deals with the early years of the transformation process of grocery retailing in the UK because the online channel is still growing and not yet a mature market.

The early years of a transformation process represent an interesting setting for the study of organisational actions in the context of uncertainty about an industry's future development (Santos & Eisenhardt, 2009). To understand industry transformation it is necessary to understand *how* and *when* the elements of the process are organised, *what actors* are included in the elements and what outcomes the arrangements of the elements have on the innovation initiating the industry transformation (Van de Ven & Garud 1989).

After presenting the elements influencing industry transformation, this chapter explores the process by examining the phases of the industry transformation. This part reviews essential research on the technological change processes initiated by an innovation, contributing to the research questions by exploring how the process of industry transformation unfolds.

2.1.1 Drivers enabling industry transformation

The first part of the chapter explores drivers that underlie a transformation process after a technological discontinuity. The chapter starts by exploring the definition of an industry and moves from that to cover the essential frameworks of industry emergence. The definitions are utilised to depict the influential drivers underlying and stimulating transformation after a discontinuous innovation. This provides the basis for the next section of the chapter exploring the phases through which a transformation occurs.

Industry is defined by Scott (2001) as "*a population of organizations operating in the same domain as indicated by the similarity of their services or products*". He goes on to state that the concept of an industry forms the basis for other definitions, such as organisational fields (DiMaggio & Powell, 1983). Van De Ven and Garud (1993) define industry as including "not only the traditional definition of an industry, consisting of the set of firms developing similar or substitute products, but also all the other actors in the public and private sectors who play key roles in the development of an industrial system for innovation".

The traditional definition of an industry consisting of companies producing similar products has been altered by Low & Abrahamsson (1997), who define an industry as consisting of companies with the same organisational form. This, they argue, leads research on industry evolution to the study of the diffusion of an organisational form. Munir & Phillips (2002) also emphasise the need to abandon the static notion of industries. They argue that after a discontinuous change, instead of maximising market shares in present markets and technologies, companies compete over the future form of the industry. However, they also state that the traditional definition of industries focusing on products or services that are close substitutes is useful in stable industries. Both Low & Abrahamsson (1997) and Munir & Phillips (2002) agree that the traditional definition of an industry is difficult during radical change because the traditional definition is not able to detect shifting industry boundaries and entrepreneurial activities that shake up industrial structures and enable the emergence of new organisational forms.

According to Munir & Phillips (2002) radical technological change can lead an industry to lose the central product or service around which it is organised and thus the traditional boundaries of the industry. They state that a competitive environment can be characterised as forming an industry again when the dominant design emerges. Due to this, Munir & Phillips (2002) propose the concept of an activity network, which includes a wide group of companies aiming to shape the aspects of a particular activity that

is about to replace the previous industry.

The actions of the individual actors and the development of the activity network on a collective level are important aspects to study in the context of industry transformation. This is because the decisions of individual actors to enter or exit a changing market collectively make up the activity network in the nascent part of the market that emerges from the industry transformation. The nascent markets or industries forming around new technologies start to emerge as individual entrepreneurs manage to gather resources for it (Aldrich & Fiol, 1994). The individual companies also work collectively to overcome the limitations of the existing fields by developing new ways to interact (Lawrence & Phillips, 2004). This leads the actors to shape the boundaries and the structure of the new market (Santos & Eisenhardt, 2009). However, the development of the nascent market faces significant challenges before it can be seen as an established industry.

The actors in the nascent market act – individually and collectively – to define and shape the new market. Van De Ven & Garud (1989) and Gustafsson et al. (2012) emphasise the importance of the actors involved in the transformation of the industry. They also extend the drivers enabling the industry transformation to include other drivers important to the process. The instrumental activities (Van de Ven & Garud, 1989) of the individual actors or activity networks are supported by different kinds of resource endowments (Van de Ven & Garud, 1993). They include the following aspects: (1) the technological basis (Gustafsson et al. 2012) and scientific development, (2) the development of the human resource pool, and (3) financing (Van de Ven & Garud, 1989). The development of these activities often occurs outside the individual companies on a collective industry level.

Of the three classes, technological basis and scientific knowledge provides the basic understanding for the creation of the innovation that eventually transforms the industry. Traditionally, the creation of basic research takes a long time and it is often conducted outside the companies in the public sector and in collaboration between private companies and the public sector. The basic research and subsequent technological innovations are rarely developed and commercialised in a vacuum by individual firms, instead they are the product of a long process of accumulation (Van de Ven & Garud, 1989; Garud & Karnoe, 2003). The accumulation of knowledge over time is essential in the emergent social systems framework developed by Van De Ven & Garud (1989). Also Rosenberg (1983, cited in Van De Ven & Garud, 1993) highlights the importance of the accumulation of knowledge as he states that technological development is “a process of cumulative accretion of useful knowledge, to which many people make essential

contributions". The momentum for a technological innovation is accumulated from the inputs of distributed actors (Garud & Karnoe, 2003). The network of distributed actors does not just include the actors who create and develop new ideas, but also includes the developers of complementary assets (Teece, 1986), basic research institutions and other institutional actors (Van de Ven & Garud, 1993; Garud & Rappa, 1994) as well as customers who also provide inputs (Von Hippel, 1986). Through the processes of learning by doing and experimentation, the actors create the capabilities needed for designing, producing and distributing goods and services (Garud & Karnoe, 2003). In spite of this, one or few individuals are usually given recognition for the results of this accumulative process, especially when the role of "individual genius" as the driving force in the development of product breakthroughs is emphasised (Tushman & Anderson, 1986).

On the other hand, the technological development of an innovation often coevolves with the development of complementary technologies (Van de Ven & Garud, 1993) and industry capabilities (Lampel & Shamsie, 2003). In his study on the emergence of the semiconductor industry, Rappa (1989) emphasised the importance of communication between researchers and how it affected the evolution of the technology and the emergence of the industry. The technological innovation development models suggest that the industry structure changes as technologies change and the companies utilising the technologies interact with their environment (Afuah & Utterback, 1997).

Transforming industries and technologies often requires new kinds of skills and, according to Van De Ven & Garud (1989), a pool of competent people (the second aspect in the resource endowments), which develops in three ways. Firstly, through recruitment companies finding the right people and training them with the skills needed; this way expertise is also eventually diffused to the market when those people move to other companies. Secondly, via industry events, such as conferences, at which industry participants share their experiences and learn from each other. Thirdly, human competence can be increased by collaboration between industry participants in research and development activities. Hence, it can be summarised that numerous participants from different parts of the public and private sector collaborate and contribute to the development and commercialisation of an innovation (Van de Ven & Garud, 1993).

The third aspect in the resource endowments identified by Van De Ven & Garud (1993) deals with the financing of innovations, enabling the commercialisation of innovations that can transform industries. An activity network and the identity of an industry in transformation can sometimes

form alongside the commercialisation of an innovation due to the high potential seen in the business. However, Gustafsson et al. (2012) argue that long-term success and the successful transformation of an industry can happen only if the business can generate revenue and become commercially viable. They used Internet-based businesses as examples of industries where venture capitalists invested in hyped sectors with a clear identity but no economically viable business models for revenue creation. The emergence of bubbles or a hype-disappointment cycle from technology revolutions is not restricted to Internet related technologies; it has been identified of being a common phenomenon (Pérez, 2002; Konrad et al., 2012).

The utilisation of business potential by the actors in an industry can be enabled or restricted by its institutional drivers, which include the public sector governance of the industry as well as the collective actions of the actors involved in the legitimation of the industry undergoing transformation (Van de Ven & Garud, 1993).

The public sector governance of an industry can happen through regulatory and other institutional mechanisms, which can be either favourable or restrictive (Suárez, 2004). Companies do not merely adapt to the institutional requirements they are faced with, but they often play an active role in shaping those requirements by trying to integrate their own goals into the requirements and make them institutional rules (Meyer & Rowan, 1977).

During the early years of industry transformation brought about by a technological discontinuity, the variety of technological solutions creates uncertainty (Utterback, 1996; Anderson & Tushman, 1990). Legitimacy is important in reducing uncertainty as the creation of trust enables the more efficient operation of market mechanisms (Van de Ven & Garud, 1989).

Legitimacy has been defined as a crucial element in the creation and survival of new organisational forms (Suddaby & Greenwood, 2005). It is socially constructed and perceived by a collective audience which has conflicting expectations as to whether (Ashforth & Gibbs, 1990) "*the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions*" (Suchman, 1995). Aldrich & Fiol (1994) divide legitimacy into two classes: cognitive and socio-political legitimacy. According to them, socio-political legitimacy refers to how well the new industry conforms to existing rules and standards. Cognitive legitimacy, on the other hand, refers to how well knowledge about the industry is spread and ultimately how taken for granted the emerging industry is.

The establishment of legitimacy is important for reducing uncertainty in a

transforming industry (Aldrich & Fiol, 1994). In fact, transformed industries in their nascent phase have high uncertainty (Benner & Tripsas, 2012) or ambiguity (Santos & Eisenhardt, 2009) about the characteristics, meanings and implications of the transforming industry as well as the aspects that will eventually become part of the dominant design (Kaplan & Tripsas, 2008) because the collective understanding or frame of the industry has not yet arisen.

In the nascent stages of industry transformation, legitimacy is based on how the attributes of the new industry conform to the prevailing institutional logic (Suddaby & Greenwood, 2005). In order to change the prevailing institutional logic, entrepreneurs in nascent markets aim to shape organisational boundaries in order to attain a defendable (preferably a dominant) position in the market (Santos & Eisenhardt, 2009). Institutional entrepreneurs also increase the legitimacy of the nascent industry by creating norms, models and patterns of behaviour (Déjean et al., 2004). Another aspect emphasised in the literature on institutional change is the use of rhetoric (Suddaby & Greenwood, 2005) or discourse (Lawrence & Phillips, 2004; Phillips et al., 2004; Munir & Phillips, 2005) to initiate change in institutional fields by institutional entrepreneurs. The popular press can be a significant channel for discourse as extensive coverage in the popular press can also provide legitimation for the innovation transforming the industry (Mazza & Alvarez, 2000).

Legitimacy in a new industry is also built up as the number of successful incumbent companies adopting the innovation rises, making the market more attractive for new companies (Haveman, 1993; Hargrave & Van de Ven, 2006; Dobrev & Gotsopoulos, 2010). Other important groups that legitimate a new industry are the corporate children of the established firms, who, through their multi-business parents' reputation and credibility, promote important legitimacy and also endorse an industry's transformation (Lange et al., 2009).

As the collective understanding of the important technological aspects of a new industry is unclear, the standardisation of technological development around a dominant design reduces uncertainty around the innovation and the transformation process (Gustafsson et al., 2012). Along with standardisation several tools, such as guarantees and licences, other tools are developed to promote trust in an innovation and therefore reduce uncertainty about it (Van de Ven & Garud, 1989). The reduction of uncertainty also leads to higher legitimacy. Nevertheless, standardisation as well as the creation of trust often requires collective action from the different actors in the industry.

Collective action by private companies is organised through industry

institutions and associations, which represent the collective interests of the companies involved in the industry (Tomlinson, 2012). The effectiveness and strength of an institution depends on the active support and participation of its companies, which affects the strength and efficacy of the delivered collective goals of the industry and the industry's legitimacy (Tomlinson 2012). Institutions and associations can also legitimate change through discourses within and outside the profession (Greenwood et al., 2002).

Collaboration between actors is emphasised in the bricolage approach set out by Garud & Karnoe (2003). They state that technological initiatives should build on a low-risk and progressive approach that uses the contribution of relevant actors in order to mobilise necessary skills and resources, while ensuring the acceptance of the technology in the wider community.

Even though collaboration is crucial for collective action, the contradictory objectives of competition and collaboration can create problems for generating collective action between private firms (Garud et al., 2002). Collective action in an industry is related to the level of imitability. For an innovation with easy imitability, an imitator may reap the profits from the innovation instead of the innovator (Teece, 1986). Aldrich & Fiol (1994) stated that when competitors are able to copy the core competences of an innovation, the actors involved in developing the innovations have a higher incentive to collectively stabilise the industry. The competitive individual strategies of companies with imitable innovations can impede collective action as competitors may try to develop standards that favour their own innovation, trying to make their innovation the one that is adopted by the market (Van de Ven & Garud, 1989). On the other hand, the inimitability of an innovation produced by legal instruments (Teece,1986) reduces the need for collective action and induces firm-centred actions (Aldrich & Fiol, 1994).

Gustafsson et al. (2012) state that the last constitutive element of industry transformation, industry identity, is not only defined by the actors internal to the emerging industry, but also by external audiences, something which is also proposed by Hsu & Kenney (2005) and by Van De Ven & Garud (1989). These internal and external actors also participate in a political institutional field (Van de Ven & Garud, 1993) as they shape the boundaries in the early stages of emergence and thus provide the basis for an industry's identity (Gustafsson et al., 2012).

2.1.2 The process and phase models of technological change

The previous section explored the essential elements affecting the emergence of industries or organisational forms. The elements studied in the context of industry emergence can also be used to study the transformation of industries through technological change, which initiates the emergence of new kinds of actors within an existing industry. The research reviewed in the section will provide an understanding and exploration of the temporal perspective on industry transformation that is initiated by technological change. The process and phase models of technological change will also be reviewed in this section.

Several frameworks have been developed to explain the temporal order of different phases during a technological change process initiated by a technological discontinuity. The models have many similarities, but they approach the phenomenon differently. However, whether the framework is about the evolution of organisational forms or technological innovation, they all share the same characteristics of industry change going through two or three separate phases. The models illustrate how the innovations have been developed within each phase and how and when that has changed to enable the transition from one phase to another.

This chapter explores six models illustrating the industrial change initiated by a technological innovation or discontinuity. One of the models is more focused on the early years of the industry emergence (Van de Ven & Garud, 1989), whereas one is built to explain the emergence of new organisational forms (Low & Abrahamson, 1997). Hargrave & Van De Ven (2006) approach the change phenomenon from an institutional theory perspective. Table 2 summarises the frameworks explained in this section and in chapter 1.6 the models are integrated to provide a more comprehensive picture of the drivers affecting the development of an industry over time.

Table 2. Summarisation of the technological change frameworks

Phases	Utterback & Abernathy (1978-1994)	Van De Ven & Garud (1989)	Tushman & Anderson (1990)	Low & Abrahamsson (1997)	Sood & Tellis (2005)	Hargrave & Van De Ven (2006)
1	Fluid	Initiation	Ferment	Emergence	Introduction	Emergence
	Lot of uncertainty;	Externally stimulated; interactions; emerging activity network	Discontinuity; intense development; uncertainty; experimentation; new activity networks	Movements in the emergence of new organisational forms; nature and role of pioneers; innovation and experimentation	Slow progress in performance; technology not well known; bottlenecks;	Technologically driven; little conflict; unorganised actors
2	Transitional	Start-up	Incremental change	Growth	Growth	Developmental
	Standardisation takes place; dominant design emerges reducing uncertainty; competition to differentiation	Individual change from external to internal; collective level moves away from traditional industries	Dominant design emerges; from intense to incremental development	Bandwagons exploiting the new form; growing emphasis on following others	Dominant standard; researchers to study the new platform; rapid increase in performance and further revenues	Activity network emerging; diverse approaches; contest for legitimacy (-> synthesis -> next phase)
3	Specific	Take-off		Maturity	Maturity	Implementation/ convergence
	Emphasis on process innovation; product innovation incremental	New business can exist on its own; activity network accumulating		Clones replicating existing forms; difficult to find competitive advantage; formalisation & hierarchy; conservative strategies	Progress occurs slowly; innate feature for each platform	Diffusion of the synthesis; losing approaches fading; seed of the new antithesis

2.1.2.1 Patterns of industrial innovation (Utterback & Abernathy)

The dynamic model of innovation development by Utterback and Abernathy (Utterback & Abernathy, 1975; Abernathy & Utterback, 1978; Utterback, 1996) illustrates the dynamic processes that unfold during the evolution of a technology. The Utterback and Abernathy model identifies three phases in the evolutionary development of technological change: fluid phase, transitional phase and specific phase. In the *fluid phase* the performance criteria for the innovation are typically not well understood (Abernathy & Utterback, 1978). The phase is characterised by high uncertainty and products that are normally still crude, unreliable and expensive (Utterback, 1996). The uncertainty is divided between target and technical uncertainty, leading to intense development and great variety in the solutions developed. Competition within an industry occurs between old and new technologies as well as between the different designs developed by the new technology (Afuah & Utterback, 1997).

The development then enters a *transitional phase* as the industry and its products mature (Utterback & Abernathy, 1975). This phase is characterised by the emergence of a dominant design, leading the emphasis of development to shift from radical product innovation to incremental product innovation along with heightened price competition and process innovation (Abernathy & Utterback, 1978). The emergence of a dominant design significantly reduces uncertainties related to the technology and the customer needs become more clearly understood (Utterback, 1996), allowing development to focus more on the dimensions of the dominant design. This phase also sees the rise of more formal control as well as more efficient systems of production (Utterback & Abernathy, 1975), and thus higher sales of the products as greater efficiency arises, although competition between products that have been differentiated around the dominant design starts to increase (Afuah & Utterback, 1997).

The last phase, *specific phase*, includes innovation activities that are focused on reducing costs and improving the quality of the products (Abernathy & Utterback, 1978). The products become very similar and the linkage between the product and the production process becomes intertwined, making it difficult and costly to change either of them (Utterback & Abernathy, 1975). The cyclical evolution of technology has often been seen to repeat itself as industry outsiders introduce a new technological discontinuity with the capability to challenge the old one (Afuah & Utterback, 1997).

2.1.2.2 The social systems framework

In their social systems framework Van De Ven & Garud (1989) identify three stages in the emergence process (initiation, start-up and take-off). During the first stage, the *initiation period*, the entrepreneurs on the individual firm level form a business venture. External forces stimulate the process. Interaction is then enabled on the collective level as the paths of the entrepreneurs intersect. The interactions help the entrepreneurs move away from the traditional industries and create a social system of organisations that share interdependencies, common commitments and unique knowledge about the new business or technology. The interactions and interdependencies help to shape the emerging activity network of the new industry (Munir & Phillips, 2002).

The social systems framework (Van de Ven & Garud, 1989) continues as the move away from traditional industries creates a unique social system of organisations, which moves the process of industry emergence from initiation to the *start-up period*. During this period the sources of change on the individual firm level move from external to internal as new units draws resources, competence, and technology from the founding entrepreneurs of the nascent company. The emerging industry starts to isolate itself from traditional industries, leading to a structuration process in the new industry. The early adopters during this start-up period will be firms that are able to detect change in their environment and manage to balance strategy initiation and implementation (Webb & Pettigrew, 1999).

The emergence process described by Van De Ven & Garud (1989) is finalised by the *take-off period*, when entrepreneurs on the individual level turn the business idea into a self-sustaining company. During the take-off period the new business unit can exist and grow "on its own". On a collective level the number of actors begins to gain a critical mass and a complex network of relationships between the actors in the new industrial sector begins to accumulate.

2.1.2.3 A cyclical model of technological change (Tushman & Anderson)

The technological lifecycle model by Anderson & Tushman (1990) has similarities with the Utterback and Abernathy model. Tushman & Romanelli (1985) developed a punctuated equilibrium model of organisational evolution to illustrate how organisations evolve through periods of convergence. The periods are characterised by incremental development and are followed by reorientations.

The punctuated equilibrium model was further developed by Tushman & Anderson (1986), Anderson & Tushman (1990) and Tushman & Rosenkopf (1992) who demonstrate how industries initiated by discontinuities evolve

through periods of change. Tushman & Anderson (1986) introduced two types of technological change, competence-destroying and competence-enhancing.

Anderson & Tushman (1990) build on the work in the Tushman & Anderson (1986) to develop an evolutionary model of technological change, which was later developed into a technology lifecycle model (Tushman & Rosenkopf 1992). Later Kaplan & Tripsas (2008) adapted the evolutionary model (Anderson & Tushman, 1990) to include cognitive aspects. They argue that cognitive explanations should be at the heart of the understanding of technology evolution.

The Kaplan & Tripsas (2008) model is made up of the dynamics between three components: actors' technological frames and interpretive processes, a collective technological frame and the evolution of a technology through a technological trajectory. These components interact in four ways. Firstly, the interactions of the actors shape and are shaped by the emerging collective technological frame. Secondly, the actors' choices and actions shape the technology evolution and thirdly the technology also constrains and enables the actions the actors can take. This results in the emergence of a collective technological frame. The actions and interactions of the actors indirectly link the evolution of the collective technological frame with the technology itself.

In the Tushman & Anderson (1990) model, the technological discontinuity proposed by Tushman & Anderson (1986) initiates an era of ferment. It is a time of intense technological development during which a lack of knowledge about customer preferences leads to innovation development based on assumptions and to intense experimentation with the technology (Benner & Tripsas, 2012). The varying and developing technological frames of the industry participants contribute significantly to technical variation, alongside the possible direct or indirect effect of institutional actors. As the technological frames are still developing, the actors often rely on the prior frames in making sense of the technology – based on its perceived similarity to existing technology. Examples of companies using prior frames can be found from the personal digital assistant industry (Kaplan et al., 2003) as well as from digital imaging (Tripsas & Gavetti 2000). Managers often find it difficult to change their frames (Kaplan, 2008a), which means that companies continue to follow companies that have traditionally been their competitors and thus might fail to notice other companies, even though the competitive situation might have changed (Kaplan & Tripsas,, 2008).

During the era of ferment new activity networks begin forming as new companies come to develop the innovation reshaping the network of actors

(Munir & Phillip, 2002). This also presents companies with the possibility to shape and participate in creating standards for the development of the innovation (Rosenkopf & Tushman, 1998). The actors influence each other's frames to direct the technological change towards their own interests (Van de Ven & Garud, 1993). This happens through an interactive process of negotiation and learning, leading the industry towards a collective technological frame (Kaplan & Tripsas, 2008), which is embodied in the emerging *dominant design* (Anderson & Tushman, 1990).

The dominant design changes the nature of the technological development from being high-paced to incremental (Anderson & Tushman, 1990). Kaplan & Tripsas (2008) go on to state that the emergence of a collective technological frame from the individual technological frames is shaped by the interaction of producers, users and institutions. The literature on the emergence of dominant designs, illustrated in the earlier chapters, also emphasises non-technological drivers in the emergence of the dominant design (Tushman & Murmann, 1998), such as social, political and organisational dynamics (Anderson & Tushman, 1990); the co-evolution of networks and technology (Rosenkopf & Tushman, 1998); and cognitive drivers (Benner & Tripsas, 2012).

Tushman & Anderson (1990) argue that the emergence of the dominant design takes the lifecycle to *the era of incremental change*. Once a certain solution has become dominant, it becomes difficult to displace. Incremental development elaborates on the retained dominant design, but does not challenge it. The era of incremental change continues until it is ended by an emergence of another technological discontinuity, which initiates a new life cycle.

The status quo can be disrupted, as in the original model, by a *technological discontinuity*. Kaplan & Tripsas (2008) distinguish the emergence of technological discontinuity as an important cognitive phenomenon. They also reflect on the discussion of the incumbent versus new entrant dynamics in more detail, indicating that new entrants gain their advantage from not being burdened by inertia related to history, and especially because they see the world through different lenses or frames.

2.1.2.4 Low & Abrahamsson model

Instead of using the definition of companies producing similar products as the definition for the industry, Low & Abrahamsson (1997) define an industry as a group of firms with similar organisational form. The organisational form is also integrated into their definition of industry evolution, which they see as the diffusion of an organisational form.

They argue that industries evolve through stages of emergence, growth and maturity. The first stage, the *emerging* industry phase, is characterised

by the creation of new organisational forms. Creating legitimacy is an important issue for the pioneering entrepreneurs in this phase, leading them to create unique networks, that enables the production of new combinations. The connections between industry participants are based on co-operation and their strategic development actions are focused around innovating new solutions and experimenting with them.

When the industry moves to the *growth* phase, the innovations have gained legitimacy and new processes (termed bandwagons) aim to exploit the potential benefits of the innovation. The networks of entrepreneurs turn to high profile individuals to enable the rapid mobilisation of resources as the main challenge during this phase is to prosper during growth and change. The strategic emphasis is changes from innovative actions to following what other companies are doing.

In the *mature* phase of the industry evolution, clones replicate the existing organisational forms, utilising the learning processes of previous phases. This leads the industry to stronger competition and efficiency demands. The companies respond to these changes by making better use of the hierarchy in their organisations and turning to more conservative strategies as mistakes in the market can prove very expensive.

2.1.2.5 Sood & Tellis framework (2005)

Like Tushman & Anderson, but while also building on the work of Utterback and Abernathy, Sood & Tellis (2005) use S-curves to define three phases during the lifecycle of a technology. The model focuses on how the performance of a product innovation changes over its lifecycle. The first stage of the lifecycle, the *introduction stage*, is characterised by slow progress in performance and scarce researcher interest. The industry needs time to overcome important bottlenecks in order to improve the innovation.

As knowledge about the innovation increases, the research contribution also accumulates and eventually the industry moves to next stage, the *growth stage*. A dominant design or standard often emerges in this phase merging development interests. The performance of the innovation increases due to the accumulating research output around the dominant standard and this leads to increasing sales, creating support for further research into the standard.

The growth stage moves to the *maturity stage* as the improvement in the performance of the innovation becomes slower or starts to decline. The slowing down in the performance of the innovation is referred to as an inherent characteristic of technology (Foster, 1986). As previously explained, models also suggest that the emergence of a dominant design changes the nature of innovation development from high-pace to incremental (Tushman & Anderson, 1990) or evolutionary (Abernathy &

Utterback, 1978) and from product to process innovation (Utterback, 1996). Two reasons have been given for the decline in performance. Either the innovation, in reference to scale, becomes too big or too small, or then it becomes too complex to work without problems (Sahal, 1981). This leads the innovation's lifecycle to either redefinition (Sood & Tellis, 2005) or to a new discontinuity (Tushman & Anderson, 1990) initiating a new lifecycle. The stages of the model constitute an S-shaped curve with a slow introduction, rapid growth and a decelerating maturity phase.

2.1.2.6 Temporal phases from institutional change theories

Institutional change models dealing with industry emergence have been reviewed and summarised by (Van de Ven & Hargrave, 2004). They distinguish four theoretical perspectives on institutional change, which are illustrated below. The actions and roles of individual entrepreneurs in creating change are central to (1) the institutional design perspective, the outcome of which is "the rules of the game" enabling and constraining the actors in the market.

The proactive or reactive adaptation to institutional environments, in order to become legitimate for individual organisational actors, is the focus of the (2) institutional adaptation perspective. The perspective explores how and why organisations conform to similar institutions in the environment.

The third perspective deals with questions about the similarity of organisations and the reproduction and diffusion or decline of institutional arrangements. They are at the centre of the (3) institutional diffusion perspective. This perspective concentrates on how and why institutional arrangements are adopted and diffused by an organisational population. This is approached using the evolutionary processes of variation, selection and retention. The development of new institutions to facilitate or constrain innovations is the emphasis of (4) collective action, which deals with how networked actors become entrenched in the process of creating or changing institutions through a political process of framing and mobilising structures and opportunities for change. The collective action model highlights the role of politics, conflict and power in the process of institutional change (Hargrave & Van De Ven, 2006).

Van De Ven & Hargrave (2004) summarise research on institutional change by use of four models, as explained earlier. Hargrave & Van De Ven (2006) later extended the view to include a temporal perspective by stating that the models of institutional change represent the different temporal phases of a complete institutional process. The process described by Hargrave & Van De Ven (2006) includes phases of emergence, development and implementation or convergence. The models of institutional change

provide the basis for each of the phases. The institutional design aspect dominates in the *emergence phase* as the actors become interested in the innovation during that stage. However, because the actors have not organised themselves sufficiently well, nor introduced their proposals for the change, the development is driven by technology with little inter-organisational conflict. This is particularly emphasised with technologically novel innovations, because organisations find it difficult to make sense of the innovation.

The collective action processes in the industry become more important as the industry moves to the next phase, the *developmental phase*. Actor networks or activity networks (Munir & Phillips, 2002) start to emerge as responses to the different kinds of approaches to the institutional change, although it is still unclear which of the alternatives are best. Nonetheless, the actors developing the competing network strive to gain support from important institutional players in order to build legitimacy for their innovations. This changes the nature and focus of the institutional change from it being one of actors involved on an individual level and turns it into industry level competition between the different innovations and collective action within the competition to gain legitimacy for the innovations. Hargrave & Van De Ven (2006) refer to this competition between different innovations as a competition between the thesis and the antithesis challenging it, which eventually leads to a synthesis.

Once the synthesis has emerged and won the political dispute to become legitimate and accepted, the institutional change process moves to a phase of *implementation or convergence*, in which the adaptation and diffusion models of institutional change explain the changes. This leads to a winning innovation, the synthesis, which is diffused and adapted by the actors and the losing innovations being taken out of the market. Hargrave & Van De Ven (2006) argue that the synthesis then becomes the thesis. In the meantime divergent development begins to create a new antithesis, which will eventually challenge the thesis and provide the new synthesis. The cyclic process of divergence and convergence in the Hargrave & Van De Ven (2006) model is somewhat similar to the punctuated equilibrium model (Tushman & Romanelli, 1985) and technological lifecycle model (Anderson & Tushman, 1990). The basic idea of those models as well as other models of technological change and lifecycle will be explained in the next chapter.

This chapter has briefly illustrated the main elements of the most important frameworks that describe technological change. The frameworks have very much in common as they share many issues and stages, which leads Afuah & Utterback (1997) to summarise that as the technology evolves the companies that use the technology interact with their environment. The

evolution of the technology also changes the structure of the industry as well as the critical success drivers of the industry, thus different kinds of products are offered in the different stages of evolution.

However, something that the technological change models have rarely examined is taking into account the cognitive framing of technologies by companies. In particular, why do different companies respond differently to the same technological opportunity? The responses of individual companies constitute collective level changes in the technology. It is argued that cognitive framing and how companies make sense of technological opportunities provides an important source of variation to the technological change initiated in an existing industry or in an emerging industry. The next chapter explores the literature on how companies frame technological opportunities and how that affects the technological change process. This is important for the thesis's overall objective of understanding how companies responded and are responding to the change initiated in grocery retailing by the emerging online commerce technology.

2.2 Drivers influencing the responses of companies to innovations

This chapter explores the responses of companies to innovations. The review will investigate the drivers that previous research has seen as influencing how companies respond to innovations. Along with the drivers influencing the response, this chapter also explores the literature on how companies commercialise the innovations. It has been argued that business models are crucial in utilising innovations in the most profitable way because business models are the method that companies use to connect the innovation to the customer needs and/or firm resources (Zott et al, 2011).

The responses of individual companies are significant for research on industry transformation initiated by technological innovations, because the actions of the individual companies accrue to become a collective transformation on the industry level and thus are the source of industrial transformation. Kaplan & Tripsas (2008) argue that the cognitive frames of individual companies are the source of variation during the early years of the transformation and the frames also help us to understand why the transition periods are so difficult for many companies. They go on to state that the traditional models have neglected cognitive aspects of companies' responses and their influence on the industry transformation explained in the preceding chapters. It has been recommended that future organisational research should focus more on how organisations interpret and understand institutional pressures, such as technological innovations (Suddaby, 2010).

The existing literature largely argues that the nature of an innovation influences the way different companies frame and respond to it (Tripsas, 2009; Benner & Tripsas, 2012). Radical innovations have been perceived to be initiated by new companies entering the market (Tushman & Anderson, 1986). It has been suggested that those companies often search innovation from different solution spaces (Clark, 1985) and thus frame the innovations differently from the existing companies. This eventually leads the new companies to displace the incumbent companies who have difficulties in responding to radical change. This has been accredited to organisational structures and routines that are difficult to displace (Tripsas, 1997), the embeddedness of incumbents within an established industry that does not initially value a new innovation (Hill & Rothaermel, 2003) as well as too strong a focus on the needs of the current customers (Christensen, 1997). A growing body of literature has focused on the responses of incumbent companies (eg. Sull, 1999; Rosenbloom, 2000; Hill & Rothermael, 2003; Sorescu et al, 2003; Rothermael & Hill, 2005; Ansari & Krop, 2012). Some incumbent companies do survive and perform well with the arrival of radical innovations and some even develop radical innovations (Ahuja & Morris Lambert, 2001; Hill & Rothaermael, 2003). Nevertheless, the process of industry leaders relinquishing the dominance has been studied much less than the leadership of first movers (Sull, 1999).

Incumbent companies have been able respond to radical change in many industries. When an innovation becomes profitable it is probable that the incumbent companies manage to respond to the change (Ansari & Krop, 2012**)**. Industries where incumbents have prevailed include the television set industry (Klepper and Simon, 2000), the typesetter industry (Tripsas, 1997), the pharmaceutical industry (Rothaermel, 2001), cash registers (Rosenbloom, 2000) and the TV industry (Ansari & Krop, 2012).

The drivers influencing the response of individual companies when faced by discontinuous change are identified in this chapter as belonging to internal and external drivers.

- Internal: managerial cognition, technological frames, organisational capabilities and histories
- External: external institutions, value networks, customer adoption and the temporal aspects of the challenge or opportunity

The internal drivers include elements from within the organisations, such as the framing of innovative opportunities or the capabilities of the organisation. Also, the background or history of the organisation is emphasised as an important driver in determining the way a company approaches challenges. In the external part, the drivers are related to activities or actors, which are outside the companies. External institutions

play an important role in regulating and influencing the development of the innovation. The time it takes for an innovation to become adopted or developed as a mature product or service also has a significant impact on the way companies respond to innovations, and especially the kind of companies that succeed with innovations. All these aspects are summarised in Table 3 and are discussed later in the chapter.

Table 3. Summarising the drivers affecting company responses to innovation

	Constraining	**Enabling**
Internal	- Existing and conflicting technological frames within an organisation (Sull, 1999) - Old business models (Tripsas & Gavetti, 2000) - Organizational capabilities (Ansari & Krop, 2012) - Incentives (Markides, 2006) - Value networks (Hill & Rothaermel, 2003) - Organisational identities (Tripsas, 2009) - Products (Ghemawat, 1991; Chandy & Tellis, 1998) - Inertia (Gilbert, 2005)	- Embedded structural knowledge (incremental or modular innovations) (Lange et al, 2009) - Experimentation with different technologies (Ahuja & Morris Lampert, 2001) - Specialised complementary assets (Rothermael & Hill, 2005) - Prior experience with transformations (Tushman & Romanelli, 1985) - New management (Rosenbloom, 2000) - Collaboration between the incumbents and entrants o Entrants profit in the short term, incumbents in the long term (Singh & Mitchell, 2005).
External	- Organisational commitments (Sull et al, 1997) - External institutions analysing and regulating (Benner & Ranganathan, 2012) - Existing customers (Christensen & Bower, 1996)	- Slow consumer adoption (Ansari & Krop, 2012) - Length of the refinement and introduction period of technological innovations (Rothaermel and Thursby, 2007)

2.2.1 Internal drivers influencing responses

The drivers internal to a company have a significant role in the way organisations approach and interpret innovative opportunities. Previous literature has covered several drivers ranging from the managerial level to the capabilities and histories of the companies. The first section of the chapter investigates and summarises the most important literature about the internal drivers influencing the response. Firstly this section explores the influence of technological framing and managerial cognition to the responses. This will be followed by showing how an organisation's ability to respond and how the background of a company can sometimes become an inertial force, restricting possible responses that could exploit the opportunities in the innovation. Providing reasons and solutions for inertia within an incumbent company are also explored.

2.2.1.1 Managerial cognition and technological framing

In a study on the disk drive industry Christensen et al. (1998) found out that managerial choices, rather than the outside environment, are most important in determining the survival of firms. Managerial choices are related to the nature and framing of the selected technology and the timing of the entrance to the market, whether it is before or after the emergence of a dominant design and how that affects the strategies selected.

The academic literature illustrated in the chapter on the nature of innovation did not consider the cognitive aspects of how companies make sense of technological innovations (Benner & Tripsas, 2012). Technological frames are the cognitive aspects through which managers make sense of obscure information gleaned from the business environment (Kaplan, 2008a). Kaplan & Tripsas (2008) argue that most research on technological change has focused on how producers shape the direction of technological change. They argue that the technological frames of all actors (producers, users, institutions, etc.) involved in the process should be studied in order to better understand the technological change process. This is because, when organisations are faced with radical technological change, they need to identify whether the change requires the development of new technological capabilities and whether that requires the adoption of different strategic beliefs (Tripsas & Gavetti, 2000).

Technological frames have been defined by Orlikowski & Gash (1997) as a way to understand how people interpret technology. They state that if people have different kinds of technological frames within an organisation this can create difficulties when using the technology as well as in responding to technological change. The frames influence the actions that people take towards different technologies and provide an interpretative system for managers to understand the technological position and

opportunities of the company (Acha, 2004). Technological frames shape what the actors within the companies notice about the new technology and how they interpret it relative to other technologies, which translates into decisions and actions (Kaplan & Tripsas, 2008). The existing strategic frames and values of incumbent companies can also constrain their response to innovative opportunities (Sull, 1999).

Most of the studies about technological framing point out that technological frames influence the interpretation of a technology and thus also organisational outcomes. Kaplan et al. (2003) studied the emergence of the pharmaceutical industry and found that cognition on the senior management level plays a major role in shaping the response of the established firms towards discontinuous change. On the other hand, during the fibre-optic revolution, the CEO cognition of communication technology firms was an important driver in shaping those firms' strategies (as were organisational capabilities and incentives) (Kaplan, 2008a). Kaplan (2008b) argues that response to technological change is shaped by the interaction of managerial cognition with organisational incentives and capabilities. She states that in cases where the company does not have the necessary capabilities for the new technology, the effect of cognition is strengthened. This is demonstrated by Tripsas and Gavetti (2000) who showed how Polaroid – a company that lacked the required capabilities – was not be able to respond to technological change because managerial beliefs did not correctly support the new opportunity.

When new technologies are introduced, managers sometimes find it difficult to change or "unlearn" (Nystrom & Starbuck, 1984) their views on new technologies, especially if the views are based on accumulated knowledge incorporating the company's activities (Kaplan, 2008b). Consultants have been regarded as good in promoting change in the ways executives think about the business environment (Ginsberg & Abrahamsson, 1991).

2.2.1.2 Organisational capabilities and background

In addition to managerial cognition, framing is also argued to be affected by existing operations and company products as well as company history. Tripsas and Gavetti (2000) note that Polaroid was able to develop digital imaging solutions as long as they were based on the old business model of instant imaging thus making the old business model a significant source of inertia for the further development of the business. Benner & Tripsas (2012) illustrate how the backgrounds of the different actors affected the framing process during the early years of the digital photography. They state that the companies with a background in photography framed the digital camera as a substitute for an analogue camera, whereas consumer

electronics companies used the video system as the basis for their framing. Companies from the computer industry on the other hand framed the digital camera as a peripheral for the PC.

Existing organisational capabilities (Ansari & Krop, 2012) and value networks (Hill & Rothaermel, 2003) – that have provided an incumbent with their historical success – often prove to be difficult to displace, making the incumbent company less adaptive and responsive to radical innovations. Firms often select new technological areas, which they focus on based on how the technological areas fit with the firm's existing knowledge (Cattani, 2006). The inability of a new technology to conform to existing organisational identities (Tripsas, 2009) or dominant collective technological frames (Kaplan, 2008a) has been identified as constraining incumbent companies' responses to new technologies.

Embedded structural knowledge has been acknowledged as helping incumbent companies flourish when faced with modular, competence-enhancing or incremental change (Lange et al, 2009). Instead, activities related to process management tend to increase incremental innovation activities that exploit the existing knowledge of the company at the expense of exploratory innovation (Benner & Tushman, 2002). Thus, companies experimenting with different technologies can avoid the traps related to searching for solutions from their existing knowledge base because they have a wider variety of technologies that they have knowledge of (Ahuja & Morris Lampert, 2001).

The accumulated knowledge of prime movers – within organisations as well as those externally affiliated to them – is the source that defines how the actors frame new technologies (Kaplan & Tripsas, 2008). Competence-destroying (Tushman & Anderson, 1986) and trajectory-disrupting (Christensen, 1993) discontinuities require new kinds of approaches to technology from the existing companies and can erode the incumbents' knowledge about the utilisation of the technology (Henderson & Clark, 1990). Kaplan (2008b) goes on to note that industry outsiders possess different capabilities and also different technological frames, enabling them to develop and respond to new kinds of technologies. Thus, incumbent firms try to protect both existing products from cannibalisation (Ghemawat, 1991; Chandy & Tellis, 1998) and their core competencies from the challenge of new entrants. This leads the new entrants and incumbents to engage in a discursive battle about the meaning of new innovations and the old products/services they challenge (Munir & Phillips, 2005).

The role of complementary assets has also been emphasised in the literature. Complementary assets helped incumbent companies to protect themselves from the competence-destroying change in the typesetter

industry (Tripsas, 1997) and during the evolution of the digital camera industry (Benner & Tripsas, 2012). This leads to the argument that the incumbent companies can make best use of those innovations, which are commercialised through specialised complementary assets (Rothaermel & Hill, 2005). The entrant companies can access complementary assets through collaboration with incumbents (Rothaermel, 2001), allowing entrants to profit in the short-term, whereas incumbents tend to benefit from the collaboration in the long-term (Singh & Mitchell, 2005).

2.2.1.3 Inertia

Another element, which has been stated as an important reason for incumbents' slow responses to radical innovations is inertia. Inertial forces operate to maintain the status quo (Tushman & Romanelli, 1985) – being beneficial for organisations during stable or convergent periods, but in turbulent times they become a burden (Siggelkow, 2001). Cultural values, norms and beliefs can become so integrated into organisational processes that recognising and adapting to changes can become challenging (Bartel & Garud, 2009). Sull (1999) used the term "activity inertia" to illustrate how organisations tend to persist in activities that have enabled their past success. Gilbert (2005) on the other hand divided the inertia faced by incumbent companies during discontinuous change into resource rigidity and routine rigidity. Resource rigidity refers to a situation in which a company fails to use resource investment patterns, whereas routine rigidity relates to the failure to change the organisational processes that use resource investments.

When faced with radical technological change CEOs and other senior managers must break the links of embedded organisational routines and architectures, which are useful in stable market conditions but inhibit adaptation to radical changes (Kaplan, 2008b). Gilbert (2006) argues that this can be achieved by framing the change as both a threat and an opportunity. He goes on to state that if a change is seen only as an opportunity, there needs to be a visible decline in organisational performance, which is not often the case with discontinuous change. In his studies of newspaper organisations' responses to the rise of digital media, Gilbert (2005 & 2006) shows that a strong perception of threat helps to overcome resource rigidity, but increases routine rigidity.

Hill & Rothaermel (2003) state that inertial forces within an organisation can be counteracted by the legitimisation and institutionalisation of autonomous action. They argue that autonomous divisions inside an organisation can help to defend nascent technology from political resistance and other forms of inertia. Inertia can also be reduced if the company has experience of organisational transformations because

organisational reorientations decrease inertia that has been developed in organisations during convergent or incremental periods (Tushman & Romanelli, 1985). Changes in the leadership of a company have been stated as necessary to avoid institutional resistance when executing radical strategic changes (Ginsberg & Abrahamson, 1991). Rosenbloom (2000) shows how the National Cash Register Company's new management and fundamental organisational transformation enabled the company to overcome resistance to change.

2.2.2 External drivers influencing responses

The above discussion has focused on the drivers internal to companies. However, there are several issues outside the companies that influence responses to innovations. An incumbent company's response to radical change is also influenced by organisational commitments to employees, customers and communities (Sull et al., 1997) as well as by the external institutions analysing and regulating the companies (Benner & Ranganathan, 2012).

The interpretation of new technologies by incumbent organisations is also influenced by pressure from external institutions (Benner & Ranganathan, 2012). Benner (2010) discovered that stock market analysts respond positively to strategies that maintain existing technologies but that new technologies receive negative recommendations from them. Along with investors, government regulation through price setting or controlling products is also seen as having a negative effect on the possibilities of new entrants in the short term (Ansari & Krop, 2012). In the long-term, regulation favouring incumbents hampers their ability to respond to innovative challenges (Chesbrough, 1999) and compete against innovations.

With regard to organisation commitments, Sull et al. (1997) apply the Tushman and Anderson (1986) notion of discontinuous change to managerial commitment by dividing discontinuous changes into commitment-destroying and commitment-enhancing changes. Of the two, companies are more likely to adopt changes that enhance the existing commitments or value networks of the organisation. If the value network of an incumbent is emphasised by an innovation, the survival of the incumbent companies is enhanced (Ansari & Krop, 2012).

When challenging the incumbents, the new entrants can try to reconfigure existing value networks or alternatively develop innovations to appeal to fringe customers (Bryce & Dyer, 2007) because incumbent are often associated with being too concerned with the needs of existing customers (Christensen & Bower, 1996). New markets, rather than existing customers, are attractive for the different customer segments of the incumbent

companies, but require different kind of value-chains (Markides, 2006). Therefore, it is not surprising that radical innovations do not always pose incentives for incumbents, although the likelihood of incumbent survival is increased if the consumer adoption of the innovation is slow or if consumers perceive the benefit from an innovation for consumers as low (Ansari & Krop, 2012).

Similarly to the slow adoption of an innovation by customers, the refinement and introduction of technological inventions can take a long time (Rothaermel and Thursby, 2007). The length of the gestation period (Hill & Rothaermel, 2003) or incubation time horizon (Ansari & Krop, 2012) affects the possibilities of the success of challenger companies. The longer the time period, the more probable it is that incumbents will prevail. However, what is a long or a short period is dependent on the characteristics of the industry (Ansari & Krop, 2012).

The existing operations of a company can become central in constraining incumbent response to radical changes. Alternatively, the same existing operations can be the driving force for the incumbent companies in shaping a successful response to radical change. Complementary assets that the incumbent companies in different industries already hold (stores, logistical networks, etc.) – and which entrants possibly need to acquire or build – can be an advantage when entering new markets. The drivers affecting incumbent response and survival when an industry faces a discontinuity are reflected in the grocery retail industry in UK and how the incumbent companies responded to the challenge provided by the emerging online services.

2.2.3 Business models in the commercialisation of an innovation

The research on the business models of companies in a changing industry is important for understanding how companies utilise a new innovation to generate revenue. In fact, Chesbrough (2010) argued, "*a mediocre technology pursued within a great business model may be more valuable that a great technology exploited via a mediocre business model*". A successful industry transformation requires the ability to generate revenue (Gustafsson et al., 2012) and the business models enable individual firms to generate revenue and profit from the technologies and other innovations (Chesbrough & Rosenbloom, 2002; Teece, 2010) as well as connect the innovation to customer needs and/or firm resources (Zott et al., 2011).

Zott et al. (2011) state that rather than being part of the business model concept, technology is seen as enabling the business model. They go on to state that at the heart of business model research is the dual nature of the concept: value creation and value capture. They provide tension between the aspects that create value and those that capture part of that value

(Chesbrough, 2007). The elements of value creation have been classified by Amit & Zott (2001) to include: content, structure and governance. Firstly, the transaction content refers to what is exchanged as well as the resources and capabilities needed in the exchange. The participating parties, their interlinkages and sequencing in the exchange are included in the transaction structure. Lastly, transaction governance includes how resources, information flows and goods are controlled.

Demil & Lecoq (2010) define business models as consisting of three components. The first includes the internal and external resources of the company as well as the individual and collective competences that improve, change or recombine the resources. The second component deals with the organisational structure, incorporating the activities and networks of the organisation. The structure combines and exploits the resources found in the previous component. The last component includes the products and services that articulate the value propositions for value delivery. Value propositions reflect the content of transactions with customers as well as the utilisation of resources that organisations use to generate their offers (Amit & Zott, 2001). Amit & Zott (2001) state that business models constantly change because resources, competences, the organisational system and value propositions continuously interact.

In the research on industry transformation the research focus of the business models is on the development of the industry level business model, which can incorporate different business models used by the firms in their activity networks. The importance of the business models as well as the definitions and the content of the business models will be utilised to study how individual companies use business models to respond to innovative opportunities. The individual responses of companies leads to the transformation of their industry. On that level, the examination of business models focuses on the emergence of the dominant business model, which has been identified as a critically important event for the successful transformation of an industry (Gustafsson et al., 2012).

This chapter has presented prior research on companies' responses and the commercialisation of innovative opportunities. These findings are summarised in later on to provide an integrative framework of the most essential elements and stages related to the change initiated in an industry by a technological discontinuity and the subsequent response of the established firms in the industry. The next chapter explores research on the nature of technological innovations. It provides the basis for understanding the responses of the companies investigated in this chapter.

2.3 Nature and sources of innovations

The research on technological innovations has a long and established tradition in the management literature (Tushman & Anderson, 1986; Henderson & Clark, 1990; Christensen & Rosenbloom, 1995; Rothaermel & Hill, 2005). The innovations studied have initiated transformation in existing industries or enabled the emergence of new industries. The nature of technological innovation is important for research on industry transformation through technological innovation as it influences how an industry's transformation unfolds and reveals the type of actors active in the process. A technological discontinuity provides the starting point for models of technological innovations or lifecycles.

The nature of technological innovations has been classified in several ways over time. The main divide in the classifications is between the innovations that incrementally utilise existing competences in the industry and those that are radical and destroy or disrupt them. Incremental innovations build upon the knowledge base used by the established companies (Hill & Rothaermel, 2003). They introduce minor changes to the system and enhance (Tushman & Anderson, 1986) or sustain (Christensen, 1993) the existing competences and capabilities of the existing organisations and the dominant design (Henderson & Clark, 1990).

The incremental and cumulative process of technological change is sometimes punctuated by technological discontinuities, which provide sharp improvements in price-performance compared to existing technologies (Tushman & Anderson, 1986) and can open up new markets. The discontinuities that are either trajectory-disrupting (Christensen, 1993) or competence-destroying (Tushman & Anderson, 1986) change the way technology is used in the industry and therefore require new kinds of skills and approaches to technology from incumbent companies (Henderson & Clark, 1990). The disruptive innovations are not necessarily radically or technologically difficult, but they include a different set of performance attributes not yet desired by existing customers (Bower & Christensen, 1995). Chandy & Tellis (1998) on the other hand define radical innovations as being able to: "*(1) incorporate substantially different technology from existing products, and (2) can fulfil key customer needs better than existing products*".

Competence-destroying discontinuity changes the competences needed in the industry, creating a new product class or substituting an existing product (Tushman & Anderson, 1986). Competence-destroying discontinuity can be separated into product and process innovations (Anderson & Tushman, 1990) and it has also been referred to as radical innovation (Dewar & Dutton, 1986). Radical innovations should be defined

in comparison with the technologies established companies used before the discontinuity (Hill & Rothaermel, 2003).

The nature of the technology developed also affects the dynamics of the activity. When the innovations can be classified as competence-enhancing (Tushman & Anderson, 1986) or competence-sustaining (Christensen, 1997), the development is often led by established firms in a traditional industry. However, the majority of academic research tends to emphasise that new entrant firms develop most of the disruptive or competence-destroying discontinuities (Kaplan & Tripsas, 2008), which tend to "*break the grip of established firms*" (Tushman & Anderson, 1986). However, that has been questioned by some researchers (Hill & Rothaermel, 2003; Sood & Tellis, 2005; Ansari & Krop, 2012).

The concepts of incremental and radical innovations have been criticised by Henderson & Clark (1990) for not being able to account for the sometimes significant effect of initially minor improvements. They define a new concept of architectural innovation, usually keeping the technologies used in place, but changing the way the product's components are linked together. This leaves the basic technology unchanged, but can have a significant effect on the competitiveness of companies producing the innovation. Henderson & Clark (1990) use room air fans as an example. According to them, for the manufacturers of mounted ceiling fans, an architectural innovation would be the introduction of portable fans, because the primary components (blade, motor…) would remain the same, but the architecture and interaction of the components would change. Another example of an architectural innovation was seen in the smartphone market when the iPhone was launched in 2007. It utilised a lot of the existing technologies developed and trialled by other companies, but changed how the components were linked and used. Architectural innovations can erode an incumbent organisation's knowledge of how to utilise technologies. Architectural innovation is seen as most advantageous when used in new markets by new entrants (Christensen et al., 1998).

Another contribution by Henderson & Clark (1990) was to create a conceptual framework for different kinds of technological change. The framework shown in Figure 4 illustrates how the technology reinforces or diminishes expertise in two dimensions: the horizontal, which is about how the innovation influences the components or core concepts of the product; and the vertical, which illustrates how the innovation affects the linkages between the components.

Incremental and radical innovations represent the extremes in the framework, whereas architectural and modular innovations represent the other two. In the radical innovation a new set of concepts is used with a new

architecture. In contrast, incremental innovation improves existing concepts within an existing architecture. Alternatively, architectural innovation changes the relationship between the core concepts of the product or system (maintaining the concepts) and modular innovation changes the concepts, keeping the relationships between them untouched.

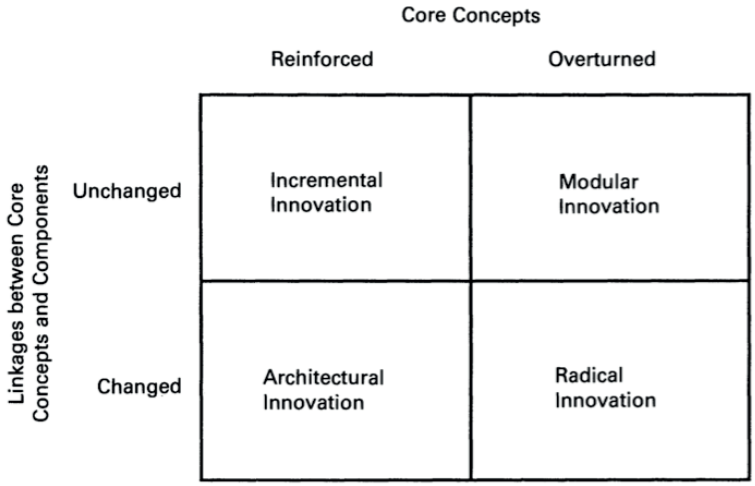

Figure 4. Henderson & Clark (1990) framework

The architectural innovation concept was used in a subsequent analysis of the disk drive industry by Christensen (1993). He went on to develop two new concepts: sustaining- and disruptive-change. Christensen (1993) found out that established firms were leading the technological development of sustaining innovations, which gave existing customers something more of what they already had in existing products. New firms entering the market had difficulties in leading the development of sustaining innovations. However, they were active in developing new technologies in their products. In other words, when entrant firms tried to challenge the established firms with existing technologies, they tended to fail. But they often introduced new, “trajectory-disrupting architectures,” which enabled the emergence of new market segments. The disruptive innovations are not necessarily radically new or technologically difficult, but provide an industry with different value proposition, which "fringe" customers value and are therefore less interesting for the mainstream (Christensen, 1997). The interaction of investment, technical capabilities and appropriability through complementary assets drives the performance difference of established companies and new entrants (Tripsas, 1997). On the other hand, Christensen (1993) states that “trajectory-sustaining innovations” were introduced within the established industries by the established firms.

The performance improvement trajectory was either sustained or strengthened by these innovations. Instead, the disruptive innovations disrupted the established trajectory of performance improvement. From a user's perspective the disruptiveness of the new technology is measure by how well the innovation gets embedded in their everyday lives of the users (Munir & Phillips, 2005).

Bower & Christensen (1995) state that the cost structure of a company is central in defining how a company evaluates a new technology because traditionally disruptive innovations seem financially unattractive for established companies. Bower & Christensen (1995) offered the managers of established companies two options. Firstly, they may accept the lower margins in an emerging market initiated by the disruptive innovation or a market with high margins and sustaining technologies.

Christensen (1993) argues that over time, small firms that initiated disruptive innovations manage to overcome established firms. This has been confirmed by Lange et al. (2009) who mapped how innovations fit with incumbent companies' customer sets and how they fit the embedded technical knowledge of the incumbent. They found that new companies entering the industry with disruptive, architectural and competence-destroying innovations prevail over incumbent companies.

The success of the new companies is not due to conservative attitude towards technology or to the failure to respond to customer needs by established firms. The poor response to competence-destroying change by established companies is shaped by their prior experience (Tripsas, 1997) or an overemphasis on the needs of the existing customer base (Christensen, 1993). Christensen (1993) argues that a focus on existing customers leads established companies to focus too much on the present needs of existing customers, while neglecting the potential and nascent technologies being developed. Even first adopters are said to be the wrong people to evaluate a disruptive innovation because they are better at evaluating sustaining innovations (Christensen & Bower, 1995).

Henderson (1993) states that the entrant companies also have greater strategic incentive to invest in radical innovations, because they make the technologies the incumbent companies use obsolete. Thus, incumbent companies' existing technologies can become a disincentive for adopting a radical innovation. Similarly the existing products of incumbent companies can make companies cautious regarding radical innovations as they fear the cannibalisation of existing products by the new innovation (Ghemawat, 1991; Chandy & Tellis, 1998). Furthermore, capabilities a company has created in one context can become its disabilities in another (Christensen, 1997).

Thus, new firms can offer the market something new and result in demand moving away from established companies and their technologies. Tripsas (2008) also argues, using the typesetter industry as an example, that changes in customer preferences can initiate technological transitions. She states that the relative attractiveness of different technologies can lead to the introduction of a new technology as new preferences change the relative value that the new and old technologies provide. This gives the new technology potential and makes it usable in the industry. This is connected to what Gustafsson et al. (2012) refer to as the chicken-and-egg problem in the early years of industry emergence. They state that in its simplest form the problem is that firms do not see demand for an innovation, while customers cannot articulate demand because they do not know the product or service.

Christensen & Rosenbloom (1995) define the value network where the firm operates (competes and solves customers' problems) as a major determinant of whether established or new firms will be successful in developing an innovation; an innovation which is within an established firms' value network can succeed. In contrast, new firms will dominate with innovations that are outside the value networks of the established firms. Christensen et al. (1998) puts this in other words by dividing the risk associated into market entry strategies and technological risks. When companies use proven technologies to enter new markets (market risk) they have a higher probability of survival, compared to when they enter an existing market with a new technology (technological risk).

Diverging from the previous definitions of innovations Sood & Tellis (2005) argue that previous researchers have defined innovations based on their effects rather than on the attributes of the innovations. They define the following three categories of innovations. Firstly, *platform innovations* are close to radical innovations, because the platform innovations are based on different scientific principles from the prior technologies used. *Component innovation* refers to innovations that use new parts or materials within the same technological platform. Lastly, *design innovations* resemble architectural innovations (Henderson & Clark, 1990) in that the same technological platform is used, although the way the components are linked together is rearranged.

According to Siggelkow (2001) technological change represents one particular type of environmental change. Thus, the framework of the relationship between organisational fit and inertia when confronted with environmental change is also closely related to discontinuous or radical technological innovation research. The framework uses concepts of internal and external fit to illustrate the relationship between environmental change

and the configuration of activities a firm has. The internal fit refers to how consistent the firm's configuration of activities is and the external fit refers to how suitable the firm's configurations are for its environment. Environmental change is thus divided into fit-destroying and fit-conserving change.

Siggelkow (2001) goes on to state that the organisational response to fit-destroying and fit-conserving change should be significantly different. Fit-conserving change is more difficult to detect, because the internal fit has remained. Siggelkow (2001) suggests three possible actions for companies facing fit-conserving change. Firstly the company can select to not change anything. Secondly, the organisation can change individual elements leading to even further decline in performance. Thirdly, the organisation can change a whole range of activities, taking the organisation to a new and higher level of performance. Of the actions the first two are easily defensible for managers as they use the old ways to operate. The third action is more difficult to execute because the manager needs to recognise the systemic nature of the new environment and the changes needed, which might contradict the traditional actions taken by the organisation.

This section has summarised the basic definitions for classifying the different natures of technological innovations. The traditional divide between incremental and radical innovation was complemented by additional definitions: architectural and modular innovations as well as platform, component and design innovations. The architectural and radical innovations have a significant effect on the industry, changing the way incumbent companies approach technologies and possibly generating new industries. They represent technological discontinuities that can initiate significant change in an industry or even enable the emergence of new industries. Most of the research reviewed suggests that new entrants who develop radical innovations often displace established or incumbent companies. This notion has been questioned by recent research (e.g. Chandy & Tellis, 1998; Hill & Rothermael, 2003; Sood & Tellis, 2005; Ansari & Krop, 2012). The next chapter summarises the research on the three perspectives of this research by providing an integrative framework on how companies frame and respond differently to discontinuous technological innovations and how this shapes the subsequent industry transformation.

2.4 Research framework

The research on decisions made about technological innovations by individual companies is important, because they influence consumer adoption and diffusion and further the development of industry and commerce (Sull et al., 1997; Rindova and Petkova, 2007). The decisions made by companies are strongly influenced by technological frames, through which companies make sense of the technologies (Orlikowski & Gash, 1994). Prior industry experience (Benner & Tripsas, 2012) and the environment in which the organisations are embedded (Djelic & Ainamo, 1999) are stated to shape, constrain and define the frames. Companies reflect the institutional settings from which they have emerged, but can shape their environments directly and indirectly (Carney & Gedaljovic, 2002).

However, it has been argued that only part of the variation of organisational responses can be explained by the environment or the past (Dijksterhuis et al., 1999). Lewin, Long & Carroll (1999) emphasise organisational adaptation to a changing environmental settings, which was first proposed by March (1991). Organisations and their populations are the outcome of managerial actions, institutional influences and other changes, such as technological, socio-political and other environmental phenomena (Lewin et al., 1999). In the innovation research context, Ansari et al. (2010) put adaptation at the heart of diffusion studies by arguing that the adoption of an innovation requires adaptation and interpretation by the adopting company when it attempts to integrate the innovation into an existing organisational context. An innovation almost never perfectly fits the user environment, thus making adaptation between the technology and the environment a necessary phase (Leonard-Barton, 1988). Ansari et al. (2010) define fidelity and extensiveness as the central aspects of adaptation. Fidelity referring to how true organisations are to the previous versions of the innovation; while extensiveness refers to how comprehensively the innovation is adopted (Ansari et al., 2010).

Managerial actions related to the adoption and adaptations of technological innovations are affected by managerial framing (Orlikowski & Gash, 1997), because the managers interpret the company's technological position and the opportunities through the frames (Acha, 2004). This interpretation leads to variation in managerial actions during the early years of the innovation development, which in turn influences how the collective technological frames and technological trajectories evolve and shape over time (Kaplan & Tripsas, 2008).

The purpose of this chapter is to build an integrated framework, which puts the cognitive aspects of innovation research into focus. The framework

builds on the prior research illustrated in the preceding chapters and proposes an integrated framework for analyzing how the technological frames of the companies influence the industry transformation. The framework includes three phases – resembling most of the summarised models: **early years and growth, stabilisation and twilight**. The framework will be used to analyse the cognitive framing and subsequent industry transformation of online grocery retailing in UK.

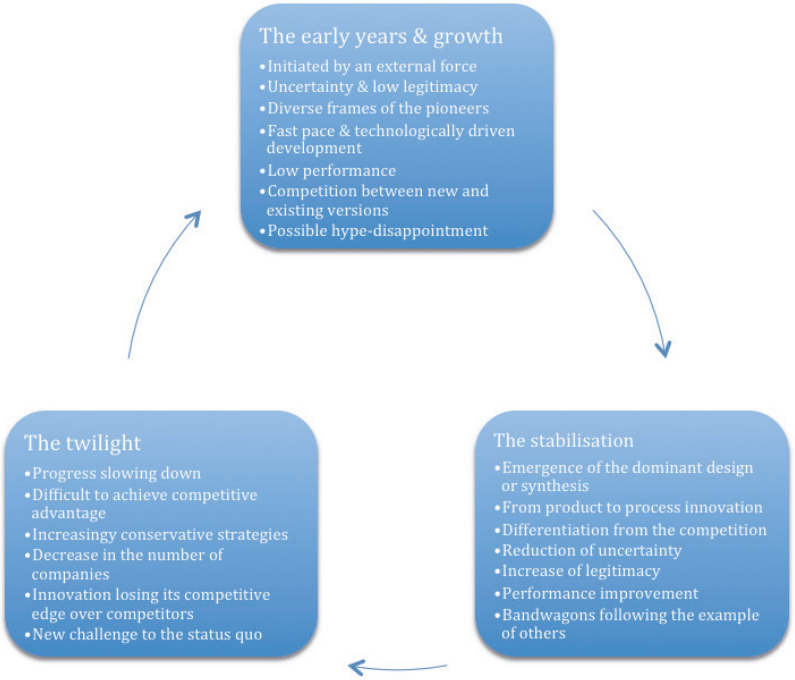

Figure 5. Phases in the integrated framework for analyzing industry transformation

2.4.1 Early years and growth

The first phase of the technological change commences when a discontinuous technological innovation interrupts the present state. Discontinuities often provide the industry with external jolts, disrupting existing institutions and initiating awareness of flaws in the present technology (Sine & David, 2003). The present equilibrium is disrupted by the actions of "quintessential Schumpeterian entrepreneurs" who aim to produce something new (Low & Abrahamsson, 1997). The firms adopting the innovation early on recognize the innovation by connecting to pre-existing users of the innovation (Attewell, 1992). The background of the firms developing the innovation depends on the nature of the discontinuity. When the innovations are competence-enhancing (Tushman & Anderson,

1986) or competence-sustaining (Christensen, 1993), the development is often led by established firms. Whereas, for competence-destroying or disruptive innovations, much of the academic research on technological change seems to point out that small firms develop innovations and challenge the established firms. However, many recent studies have challenged this notion.

The first phase is characterised by high levels of uncertainty (Tushman & Anderson, 1990; Santos & Eisenhardt, 2009). The uncertainty is especially related to the preferences of the potential users and to the future direction of the technological development and the characteristics of the innovation that eventually will become part of the dominant design (Tushman & Rosenkopf, 1992).

The uncertainty during the first phase is emphasised as the companies try to make sense of the innovation in the absence of technological frames for the innovation (Kaplan & Tripsas, 2008). Regarding their response, dominant organisations need to recognise whether the innovation requires the responses of new technological capabilities and/or the adoption of new strategic beliefs (Tripsas & Gavetti, 2000). As the technological frames of the new industry are still developing, the competitive environment influences the framing of the innovations, as companies often imitate other companies in similar fields (Greve & Taylor, 2000). As the competitive environment changes, companies can be slow to change the cognitive frames with regards to the competitive environment they are in (Kaplan & Tripsas, 2008). Alongside the competitive environment, the backgrounds of the established companies and their prior technological frames affect the framing of the new innovation (Benner & Tripsas, 2012), thus established companies' old business models can become a significant inertial force restricting the development of the innovation (Tripsas & Gavetti, 2000).

In order to overcome different inertial forces towards the innovation, managers have to frame the innovation as both a threat and an opportunity (Gilbert, 2006). The managers of established companies also need to cut off the new innovation from the routines and architectures useful in stable markets, so that those will not become inertial forces working against the adaptation of the innovation (Kaplan, 2008b).

The uncertainty and diverse frames surrounding the innovation, lead to variations in competing technological solutions as companies with different technological frames search solutions from different kinds of solution spaces (Kaplan & Tripsas, 2008). Development activities focus on improving the performance of the technology by means of intense technological development and experimentation (Tushman & Anderson, 1990). There exists little conflict between the technological alternatives,

because the actors have not been able to frame and make sense of the innovation (Hargrave & Van De Ven, 2006). Even with much research and development activity, the performance improvement remains relatively slow, because the market needs to overcome bottlenecks before the technology can develop profitable products (Sood & Tellis, 2005). On the other hand, the emergence of a new industry requires the ability to generate revenue (Gustafsson et al., 2012) in order for the different stakeholders to frame the innovation as legitimate (Suchman, 1995). The capabilities and frames needed to commercialise the innovation are eventually generated through the processes of experimentation and learning by doing (Garud & Karnoe, 2003). Hargadon & Douglas (2001) suggest that innovations should be embedded into familiar uses of the customers in order to retain flexibility and introduce others to the use of the innovation.

Anderson & Tushman (1990) name the first phase as the era of ferment and divide it into two competitive processes: one between the technical regimes (the new and the old) and one within the new technical regime. In the latter process, competing companies within a technical regime develop several versions of the discontinuous technology to differentiate themselves from their rivals. Thus, the competition for market shares is transformed into competition to define the new dominant design (Munir & Phillips, 2002) or collective technological frame (Kaplan & Tripsas, 2008). This leads the era of ferment to produce a great variety of technologies and old and new technology to exist concurrently (Schroeder et al., 1989).

During this period the network of actors is new and yet unorganised (Hargrave & Van De Ven, 2006). The actors seem to interact (Van De Ven & Garud, 1989) and co-operate (Low & Abrahamsson, 1997) in the technological and strategic development of innovative solutions. The most active actors, who are referred to as pioneers, do this and their role is to face the challenges of legitimacy (Low & Abrahamsson, 1997). The pioneers frame the innovation as an opportunity (Kennedy & Fiss, 2008) whereas the less active companies lack the incentives to adopt the innovation (Markides, 2006). The pioneers draw most of their resources for the development from external sources (Van De Ven & Garud, 1989). The unstructured nature of the activity networks together with uncertainty about the technological development contributes to an innovation's low legitimacy in the early stages of the technology lifecycle.

The advances in technology do not lead immediately to the success of the innovation. This is because legitimacy, in this stage, is based on how the innovation conforms to the existing institutional logic (Suddaby & Greenwood, 2005); the advantages of the innovation have to be moderated by institutional logic so that powerful institutional actors are motivated to

engage in the change process (Sine & David, 2003). The institutional actors and logics can be slow to change, thus inflicting inertia towards the development of the innovation and the development of the new technological frames (Kaplan & Tripsas, 2008). To change the prevailing institutional logic or the collective frame, organisations strive to shape their boundaries to achieve a better market position (Santos & Eisenhardt, 2009). In new industries, institutional entrepreneurs increase the legitimacy of the industry by creating norms, models and patterns of behaviour (Dejéan et al., 2004). Improving the legitimacy is important in reducing the uncertainty related to an innovation (Van De Ven & Garud, 1989).

In her study of diversification into new markets, Haveman (1993) found out that large and profitable organisations are strong role models for other organisations who imitate their behaviour. The presence of successful established companies makes the new market more attractive for possible entrants who imitate the legitimated technological frames set by the established companies (Aldrich & Fiol, 1994). Similar kinds of legitimating effects on new industries have been noted about the entry of the "children" of the established (Lange et al., 2009). This effect diminishes as the number of successful companies rises, making entry into the market less attractive (Haveman, 1993). The public acceptance of the new industry is referred to as socio-political legitimation (Aldrich & Fiol, 1994) and it is important for the creation of trust in the new industry as it enables the survival of new organisational forms (Suddaby & Greenwood, 2005) and the efficient operation of market mechanisms (Van De Ven & Garud, 1989). The use of rhetoric (Suddaby & Greenwood, 2005) and discourse (Lawrence et al., 2004; Phillips et al., 2004; Munir & Phillips, 2005) has also been emphasised as important in initiating and legitimating change as well as making sense of the innovation.

Additionally, the expectations towards the innovation have been stated as improving the legitimacy of an innovation (Konrad et al., 2012). Expectations shared by different actors in the industry attract investments (Borup et al., 2006), create momentum for the innovation (Konrad, 2006) and can coordinate innovation activities (Ruef & Markard, 2010). For technological innovations, positive expectations often rise suddenly during a hype cycle, which is then followed by a sharp decline in expectations in the disappointment phase (Alkemade & Suurs, 2012). Konrad et al. (2012) argue that the disappointment phase can damage the legitimacy of the innovation, especially for actors who are more sensitive to the hype-disappointment cycle. They go on to state that actors who change their strategies often during the hype are more sensitive and are typically

comprised of groups of actors with high sensitivity to external legitimation when framing the innovation.

The first phase of the development has been characterised by the fast pace of development and experimentation, although there is unclarity about the frames to use and uncertainty over the future direction of an innovation. The sales of the innovation during the first phase remain low because first versions of the innovation are often not very developed (Agarwal et al., 2002). Attewell (1992) states that the in-house development of the innovation is often delayed because know-how about the innovation is lacking. An innovation's momentum accumulates through the input of the different actors involved in the industry (Garud & Karnoe, 2003). This leads to accelerated diffusion and a transition in the way it is perceived and developed (Attewell, 1992). The first phase ends as a direction of future technological change is found and competition between competing solutions starts to converge towards a dominant solution or standard. This happens through a collective and politically charged process (Garud et al., 2002) that leads to development converging around the dominant solution.

2.4.2 Stabilisation

Technological change continues in the second phase as the dominant design (Abernathy & Utterback, 1978), synthesis (Hargrave & Van De Ven, 2006) or some kind of standardisation emerges. Murmann & Frenken (2006) identify two important points from the technological change and lifecycle literature. Firstly, one design eventually becomes dominant and is adopted widely. This design becomes a synthesis of the new policies and structures emerging from the conflicting interests of the actors in the market, who have developed opposing designs representing the theses and antitheses of the innovation (Hargrave & Van De Ven, 2006). This leads to Murmann & Frenken's (2006) second point, the nature of competition changes from the active development of designs to incremental modification around the dominant design (Tushman & Anderson, 1990), or from product to process innovation (Utterback, 1996) as institutional arrangements, resource endowments and technical economics activities begin to converge and embody the characteristics of the dominant design among the competing alternatives (Van De Ven & Garud, 1993). Christensen et al. (1998) argue that the emergence of the dominant design can be said to be a "watershed" in the competitive nature of the industry. They present evidence that the probability of the survival of companies is increased if they adopt the key elements of the dominant design. A design achieves dominance when competing designs abandon competition between the designs, and/or one design has gained a significant advantage in the market share (Suarez, 2004).

Utterback & Abernathy (1975) define the dominant design as "one whose major components and underlying core concepts do not vary substantially from one product model to the other, and the design commands a high percentage of the market share". The emergence of a dominant design leads to the reduction of the uncertainty around the technological development (Afuah & Utterback, 1997), which was prevalent in the previous phase.

The incremental development during this stage aims at differentiation from competitors (Benner & Tripsas, 2012) and development activities focus on quality, reliability, brand, and other aspects of the innovation (Teece, 1986; Utterback, 1996). The second phase has generally been called the growth phase because the amount of actors involved in developing the innovation increases rapidly (Low & Abrahamsson, 1997) and the performance of the innovation improves sharply (Sood & Tellis, 2005). This is represented in the S-curve as the steep increase after a slightly slow start in the first phase. Performance improvement and changing demand factors, driven by non-price factors, lead to a take-off in sales (Agarwal et al., 2002). As the dominant technological design emerges so does the dominant business model, which is critically important for the emergence of the industry (Gustafsson et al., 2012); the business model enables companies to generate revenue from the technology (Chesbrough & Rosenbloom, 2002; Teece, 2010).

Dominant designs arise from the need to reduce uncertainty around the technology, but the institutional and resource actions that lead to the emergence of the dominant design also become inertial forces that constrain further development in the direction of the dominant design (Van De Ven & Garud, 1993). Utterback (1996) argues that the design that eventually dominates may not be the technologically best solution but is probably the best bundle. This is, because the dominant design is a result of a co-evolution of the technology and the environment within which it has been developed (Rosenkopf & Tushman, 1998). Tushman and Murmann (1998) state that the emergence of the dominant design is not technologically driven, arguing that many non-technological factors are crucial in defining which design the market adopts. The non-technical factors, such as complementary assets and competitors, are important for complex innovations, whereas, for simple innovations, the best technologies are likely to succeed (Utterback & Abernathy, 1975). Anderson & Tushman (1990) argue that the time it takes for the dominant design to appear also depends on the characteristics of the innovation. With competence-destroying technologies it takes longer for the dominant design to emerge because much more uncertainty and less common understanding about the characteristics of the technology exist. As the competence-

enhancing technologies build on companies' existing knowledge, it can take less time to establish a common understanding of the technology and a dominant design to emerge. The trial and error nature of technological evolution poses risks for the firms involved because the firms, which invested in the failing design encounter significant losses (Murmann & Frenken, 2006).

The process through which the dominant design emerges is a complicated process of firm and environment level factors (Suarez, 2004) as well as cognitive, social, political and economic factors, therefore the most technologically advanced solution does not necessarily emerge as the dominant design (Benner & Tripsas, 2012). The emergence is also very much a collective action process as competing actors or networks of actors cooperate to gain legitimacy and support for the innovation (Hargrave & Van De Ven, 2006). This can be characterised as a process of joint learning and experimentation where actors pursue to influence each others frames to promote their own frame as the collective frame (Kaplan & Tripsas, 2008). The competitive nature of the second phase is characterised by a bandwagon effect (Low & Abrahamsson, 1997). Abrahamson & Rosenkopf (1997) illustrate how some innovations create bandwagon effects around them. They argue that new information about an innovation is created as the number of adopters increases. This leads to greater pressures on companies to adopt the innovation and follow the example of other companies in exploiting the advantages of the recently legitimated innovation (Low & Abrahamsson, 1997). The media's role in the formation of frames and markets as well as giving coverage to early entrants in emerging areas is acknowledged as important (Kennedy, 2008).

Dominant designs can be difficult to change, but this can happen through a technological discontinuity. The synthesis in the form of the dominant design starts to become the thesis and divergent development starts to create a new antithesis, which eventually challenges the thesis, becoming a new synthesis (Hargrave & Van De Ven, 2006). Benner & Tripsas (2012) argue that previous research on dominant designs has focused more on technological issues and paid less attention to market dimensions about customer preferences and use of the innovation. The process of achieving dominance is argued to contain the most potential for contributing to management practice and theory.

2.4.3 Twilight

As development enters the third and final stage, progress slows (Sood & Tellis, 2005) and it becomes difficult for companies to gain a competitive advantage. This is, because many companies, referred to as “clones” by Low & Abrahamsson (1997), try to replicate the innovation. They argue that this often leads companies to formulate ever more conservative strategies, which also result in more formalisation and hierarchy in their organisations. This stage also sees a shakeout of competitors leading to a decrease in the number of companies involved in the industry (Agarwal et al., 2002).

On the other hand, as the dominant design becomes a synthesis of the competing designs, some approaches lose, thus becoming the seed for the new antithesis (Hargrave & Van De Ven, 2006). The lifecycle nature of the models of technological change is illustrated in the last stage as the performance or attractiveness of the technology or innovation starts to lose some of its edge against competing technologies, thus making way for an antithesis (Hargrave & Van De Ven, 2006) or a new technological discontinuity (Tushman & Anderson, 1990) or a redefinition (Sood & Tellis, 2005), which eventually challenges the present status quo. This enables the cycle of technological change to roll again and to move into a new stage of early years and growth. The interaction between the technical options and the dynamics of organisations and their inter-organisational networks determine the direction of the technological lifecycle (Tushman & Rosenkopf, 1992).

This chapter reviewed the literature related to industry transformation from three inter-related perspectives: industry transformation, the responses of companies to the innovation and the nature of the innovation. The empirical part of the issues highlighted in the literature review will be explored in the following chapters, as the results of the research (Chapter 4) will illustrate the temporal development of the industry transformation through different phases, as depicted in the literature review (Chapter 2.1.2). Chapter 5 investigates the themes arising from the data about the industry transformation. The themes relate closely to the industry level drivers enabling the industry transformation (Chapter 2.1.1) as well as the drivers influencing the responses of companies (Chapter 2.2). The literature review concluded with an integrated framework that summarises the research and provides the basis for a discussion of the research results in Chapter 6. The next chapter explores the methodology chosen for the research.

3 Research methodology

This research approaches industry change and innovation development research from the process research perspective. Process research gathers and analyses data to determine the time-ordered sequence of a set of events (Mohr, 1982) as well as the generative mechanisms behind patterns of event sequences (Sminia, 2009). The chronology built in the research is a crucial building block in processual analysis (Pettigrew, 1997) and it can be argued that the succession of events creates processes from individual events. The chronology of online grocery retailing in the UK has been analysed to compare and characterise the phases of the emergence process. This led to the identification of the turning points or milestones in the data and the explanation of the reasons behind the milestones and the kinds of actions the companies conducted during those time periods. The milestones thus represent important time periods during which the development of the market encountered a significant change, which had a profound impact on the way the market would develop. The actions of different retailers before and after the milestones were analysed to find out how the milestones were created, what effect the milestones had on the market and how companies responded to the changes. The purpose of using the process approach and pointing out the milestones is that it provides direction and context for the analysis of the change process (Van de Ven & Poole, 2005) as well as to link the context, processes and outcomes of the change (Pettigrew et al., 2001).

The longitudinal process approach to the industry transformation process is investigated as an longitudinal single case study. The purpose of this chapter is to illustrate the reasons for the methodological positioning and the data collected for the research. The chapter is structured so that the first part explores the dichotomy between process and variance research; justifying this research as a longitudinal process study. Longitudinal process research is important because there is a need to study industry transformation longitudinally over an entire process and with particular emphasis on the early years of the process (Forbes & Kirsch, 2011). The "processual world-view" (Van De Ven & Poole, 2005) of the industry transformation is needed because the processes of variance during such transformation (Van De Ven & Garud, 1993) as well as the market dimensions that lead to a convergence over a dominant design (Benner & Tripsas, 2012) have been studied inadequately.

The following parts of this qualitative case study illustrate the framing and concepts of the research along with the description of the case studied. This is followed by a review of the data collection and the selection of the theme for the research. The chapter is concluded with an exploration of the validity and reliability of the research.

3.1 Longitudinal process research on industry transformation

Organisational behaviour on the organisational and industry level during the transformation of an industry is the central concern of this research. Research into organisational behaviour has been classified by Mohr (1982) into two approaches: process and variance, which have become influential distinctions, although they have been criticised for being rather mechanistic (Van De Ven & Poole, 2005).

The more quantitative of the two approaches, variance research, focuses on determining statistical relationships among important variables affecting innovation or change in organisations. Innovation is regarded as a dependent variable and the independent variables explain the magnitude of and effect on the changes in the dependent variable. However, variance research does not take into account the time order of the variables (Van De Ven & Rogers, 1988), its implicit goal is to establish the conditions necessary to bring about an outcome (Van De Ven & Poole, 2005).

The variance approach has been the dominant method in the study of organisational behaviour related to innovation and change, but some limitations have been identified. Slappendel (1996) argues that the limitations of the approach stem from the tendency to develop individualist and structuralist perspectives. She goes on to state that the advantages of the variance approach include its relatively low cost data collection – usually through surveys, and the possibility to make generalisations.

As mentioned earlier, variance research is appropriate for exploring variables related to organisational innovativeness, but the approach is not able to go back in time and study how the events unfolded over time and influenced each other in an individual innovation-decision process (Rogers, 2003). Those kinds of aspects are covered by the process approach to organisational innovation and change.

The variance approach is oriented towards large sample sizes, structural explanations and generalisable results, but the process approach is qualitative in nature and oriented towards explaining innovation development through the temporal order and sequence of steps that unfold as an innovative idea is transformed and implemented (Van De Ven & Poole, 1990).

The variance approach used to be the most used approach for studying innovations. However, the approach to studying innovation development gradually started to move to also studying the processes of innovation development, representing the beginnings of a change from “variance” research to “process” research (Van De Ven & Rogers, 1988). Process research gathers and analyses data in order to determine the time-ordered

sequence of a set of events (Mohr, 1982) as well as the generative mechanisms behind the patterns of event sequences (Sminia, 2009). The process approach is also capable of taking into account the aspects of the processes that variance is not able to account for (Van De Ven & Poole, 2005).

According to Rogers (2003) the main reason for the lack of a definitive understanding of the degree to which stages exist in the innovation development processes is the scarce use of process research approaches. The process approach studies the unfolding of change processes by narrating the temporal sequence of events (Van De Ven & Poole, 2005). Poole et al. (2000) go on to argue that the research methods of narrative research have not been developed well enough. This view is supported by Sminia (2009). Poole et al. (2000) state that the scarce of use of the process approach in innovation development studies is due to the traditional conceptualisation of problems in terms of variance research. Poole et al. (2000) illustrate this with the "*law of the hammer*", which, according to them, is in operation in innovation research: "*Give a child hammer, and everything seems to be made to be hit; give a social scientist variables and the general linear model, and everything seems to be made factored, regressed, and fit*".

In their exhaustive guide to process methods in the study of organisational changes and innovations, Poole et al. (2000) compare the use of variance and process approaches (see Table 1). The seven assumptions of both approaches are summarised in Table 4. Poole et al. (2000) further argue that the variance and process approaches are complementary. According to them, the variance approach can provide power and protection from biases in the research, whereas the process approach offers a more comprehensive picture of the development of an innovation.

Table 4. Comparison of the variance and process approaches (Poole et al., 2000)

Variance approach	**Process approach**
Fixed entities with varying attributes	Entities participate in events and may change over time
Explanations based on necessary and sufficient causality	Explanations based on necessary causation
Explanations based on efficient causality	Explanations based on final, formal and efficient causality
Generality depends on uniformity across contexts	Generality depends on versatility across cases
Time ordering among independent variables is immaterial	Time ordering of independent variables is critical
Emphasis on immediate causation	Explanations are layered and incorporate both immediate and distant causation
Attributes have a single meaning over time	Entities, attributes, events may change in meaning over time

When studying the development of change in an organisational setting, theoretically valid as well as practically relevant research should study processes, content and contexts of change including their temporal interconnections (Pettigrew, 1997) as well as take into account micro- and macro-level dynamics and constraints (Van De Ven & Rogers, 1988). Multiple levels of analysis should also be taken into account when studying change, due to the fact that the rate and trajectory of change can be significantly different in the industrial sector than within individual companies inside the sector (Pettigrew, 1997). Issues enabling and constraining change, such as history, structure, culture, power and politics arise from the inner context of organisations, whereas questions regarding the behaviour of firms and within firms, boundaries and the composition of industrial sectors as well as the macroeconomic conditions for change arise from the sector and economy levels (Pettigrew et al., 2001).

Changes in the multiple levels need to be identified across different time perspectives: past, present and future (Pettigrew, 1990). Pettigrew (1997) argues that time acts as a link to connect the processes to outcomes created by the processes. He continues that the "*irreducible purpose of a processual analysis remains to account for and explain the what, why and how of the links between context, processes and outcomes*".

Sequencing and the flow of events is an essential part of studying change processes and researchers should try to identify recurrent patterns in the processes (Pettigrew, 1990) by studying historical process narratives that indicate the significance of the events and the forces that influenced them (Van De Ven & Poole, 2005). This would help to understand the structure and underlying logic of the processes because changes in short-term may appear similar, whereas in the long-term multidirectional patterns start to arise (Pettigrew, 1997). Process research is well suited to incorporating time due to its flexible nature, which allows researchers to identify and explore the paths that the processes follow (Poole et al., 2000). Thus, this research is a longitudinal single case process research that explores the process of industry transformation over time (Yin, 2009).

This research implements the above-mentioned characteristics of process research in order to explore the processes through which industry transformation in grocery retailing has unfolded. The research explores the industry transformation on different levels by taking into account the different directions of change that can occur on the industry and individual company level and by putting the actions of companies into context. The drivers enabling and constraining change on both levels can also be accounted for as can the transformation of the industry. In this research, temporal issues are emphasised in the identification of the phases through

which the transformation of grocery retailing has unfolded, pointing out the significance of individual events in the overall process of change.

This chapter has explored and compared basic elements of variance and process approaches to the study of organisational innovation and change processes. The choice of the process approach was also explained. The next chapter will explore the reasoning behind the use of a case study.

3.2 Case study approach

The main objective of the research is to explore how the emergence of online grocery retailing transformed the retail industry and how firms responded to the innovation. The empirical context of the research is the grocery retail industry in the United Kingdom from the start of the process in 1994 until 2011. The research design connects the research questions to the data gathered and the conclusions drawn from the data (Yin, 2009**).** A case study approach was selected for the research to explore the phases, actors and their interrelation because case studies are more likely to take into account the context of the research (Eisenhardt, 1989) and are better suited to exploring industry emergence and transformation (Forbes & Kirsch, 2011).

A case study as a research design is not so much a methodological choice as a choice of what is studied (Stake, 2005). The exploration of how and why and who causes an industry transformation in grocery retailing in this research follows many of the main characteristics of the qualitative research approach (Yin, 2009). The case approach also emphasises the rich context of the industry's transformation (Eisenhardt & Graebner, 2007) and enables the research to get closer to the studied constructs as it illustrates the causalities in the research, which are especially important for longitudinal studies such as this one (Siggelkow, 2007). According to Greenwood & Suddaby (2006) a qualitative approach is useful for research on a complex and dynamic phenomenon, such as industry transformation, where the motivations and actions of the various actors involved are not clear from the start. They propose that inductive techniques are useful for clarifying event sequences and disentangling overlapping causal forces. This research used a deductive-inductive cycle between the reading and data collection and data analysis as suggested by Pettigrew (1997). The deductive approach at first enabled the research to be based on the previous research in the three theoretical fields when structuring the literature review chapter depicted in Figure 2. The inductive part of the cycle made it possible to modify the frameworks and themes based on the interview questions and the findings from the empirical data collection.

The longitudinal research perspective is important for studying a

phenomenon, which spans a long time period, such as industry transformation. During the industry transformation, the industry's structures change and make the attractive elements and competences of one time period obsolete in the next (Afuah & Utterback, 1997). In order to investigate the longitudinal process of industry transformation, the research needs to take into account how, when and whose activities were central in the emergence of the industry and what kind of outcomes the activities led to (Van De Ven & Garud, 1989). The research also explores the variations in the responses to the same pressures involved in the adoption and change processes as Greenwood & Hinings (1996) recommend, instead of the speed of diffusion and the rate of adoption (Ansari et al., 2010).

Therefore, the main objective of the research is to study the processes of change in order to explore the actors involved and their roles and actions in the process as well as the outcomes of the actions. The actors studied include all actors who have influenced and been involved in the transformation process and include retailers developing the services and external industry commentators, such as consultants and media representatives. The latter group has an influence on collective expectations about the process. The actions, which will be reviewed in the research, comprise the actions that the actors have taken to promote or supress the transformation. They can include actions to enter or abandon the industry or to develop new business models to utilise the innovation. Additionally, the actors promote the legitimacy of the innovation emphasising the good aspects of their own approach for the innovation. The outcomes of the process include changes in the amount of actors in the industry and in the legitimacy of the industry. Alternatively, the outcomes reveal the success of individual actors and their actions.

3.3 Data collection and analysis

The primary data in the research is constituted from secondary material, mainly newspaper and magazine articles (Mazza & Alvarez, 2000; Suddaby, 2001) covering the emergence of online grocery retailing in UK. The importance of studying media and its role with regards to technological framing and industry transformation has been emphasized (Fiss & Hirsch, 2005; Fiss et al, 2012). This is, because the issues emphasized in the media provide frames through which actors make sense of the innovations (Vaara & Tienari, 2008). Managers increasingly use several media to gather information to back the decision-making (Leonardi et al, 2012). According to Kennedy (2008) media has an important role during the market formation through market sense making, constructing meanings. He goes on to state that the sense making in new markets provides visibility or

cognitive legitimacy (Aldrich & Fiol, 1994) for new companies along with legitimating their actions. Vaara et al (2006) emphasized that the media is an important, but little used arena for legitimation of organizational phenomena. The business media creates, diffuses and legitimates management theories, practices as well as fads and fashions (Mazza & Alvarez, 2000) and thus it has been used as the major data source in this research about the framing, diffusion and legitimation of the online grocery retailing in UK.

The data collection and analysis using the process approach creates large data sets for the researcher to analyze. One consequence of the multitude of data and the structuring of complex processes is "death by data asphyxiation" as an initially good and clear idea becomes a big and sinking mess of processes (Pettigrew, 1990). This is managed by an iterative processes going back and forth between the data, the literature and the emerging results (Smets et al, 2012).

This chapter explores how data has been gathered from secondary sources and interviews and been interpreted based on the analysis of the data. The data analysis concentrates on the identification of the themes and phases from the chronology.

3.3.1 Data collection

The data collection for this research came from two main sources:

1. Semi-structured interviews
2. Secondary material

The data collection included a cycle of deduction and induction as illustrated by Pettigrew (1997). The iterative and inductive approach used in the research is normal for case studies (Yin, 2009). Early pattern recognition and the initial writing on the process followed the early data collection. This then leads to further data needs regarding the additional questions arising from the initial chronology.

Data related to the sales or geographical coverage of either individual companies or the market in general is very scattered and inadequate. Therefore, this research focuses on the public information of the major actors in the market. The market for online grocery retailing saw some small players briefly trialling an online service with a limited amount of products on offer in a limited geographical region. Data from these kinds of retailers is not reliable as they might be mentioned once and then not mentioned at all in the secondary data. The development of the major actors in the market has been covered widely in the secondary data and interviews with representatives of those major actors complemented the data on their actions. The major actors in the market are briefly introduced in chapter 4.

The first part of the research included initial discussions with knowledgeable people about the significant elements, phases and actors during the development of online grocery retailing in the UK. This led to the gathering of initial secondary data from magazine archives, which provided the basis for building the chronology of the overall transformation process, making it able to identify the essential events during the process. The search for events had no restrictions, the main objective was to collect all the material related to online grocery retailing in UK. This produced a substantial amount of events more or less related to the study's context. The filtering of the events is explained next.

The chronological database of events was mainly collected from three sources (later modified by the interviews) the retail magazines The Grocer and Retail Week as well as The Guardian newspaper. Three different keywords were used to search for articles: online, multichannel & e-commerce. Table 5 illustrates the results from the queries using the keywords. Regarding the keywords, online resulted in a very large amount of hits, thus for the word searches of Retail Week and The Guardian filtering was used. The database of the Grocer extends all the way back to the 1980s, whereas Retail Week's archive begins from 1995 and the Guardian's archives begin in 1999. The searches were conducted during spring 2011 and an additional round of collection was done in November 2011. Thus, the data covers key events between 1994 and 2011. The amount of secondary data confirmed that business press can be a good source of information for studying new kinds of businesses or industry transformation as indicated by Aldrich & Fiol (1994). Even though the secondary data proved to be extensive, there was very little data about the growth of the market or the coverage of the services of the individual retailers. Therefore, references to sales in either the market or by individual retailers are derived from individual events in the secondary data.

Table 5. Keywords and sources used for the secondary search (1994-2011)

	online	multichannel	e-commerce
The Grocer	3574	17	5
Retail Week	774 (industry filter: food retailing)	74	241
The Guardian	411 (keyword: online grocery)		

The secondary searches resulted in over 5000 hits. All of the articles were browsed and the ones related to the development of online grocery retailing were selected for further reading. In the second round, only the articles relevant for this research were selected. This resulted in a database with 892 articles about the development of online grocery retailing in UK. The articles primarily consist of individual events. However, it has to be noted that some of the events overlap. The amount of key events included in the final chronology is 430. The distribution of key events per year is illustrated in the Figure 6. It shows how much events are clustered around the dotcom boom at the turn of the millennium. Only during recent years has the amount of events been able to grow as high as between 1999 and 2001.

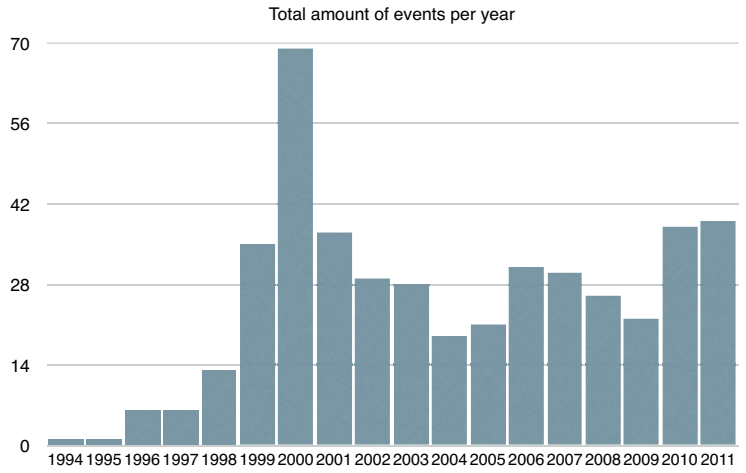

Figure 6. Events per year between 1994-2011

The second part of data collection included 14 semi-structured interviews between October 2011 and January 2012. The interview dates and interviewees (broadly classified) are identified in the Appendix 1. The interviews were mainly conducted as telephone interviews (11 interviews), which were recorded and later transcribed. For recording purposes Skype was used to contact the interviewees. However, for the interviewees the interviews were traditional telephone interviews, because Skype was used to call to their telephones. Only one interview was conducted from Skype to Skype. Three of the interviews were done as face-to-face interviews and were also recorded and transcribed. In addition, notes were taken during all of the interviews.

The interviews provide an in-depth understanding of the reasons behind the events identified in the chronology and supply additional events for the chronology. For the interviews, a snowballing technique (Brewerton &

Millward, 2001; Jupp, 2006) was used. At the end of each interview the interviewee was asked if he or she could name other people knowledgeable about the topic. The interviewees were selected based on the chronology of events and the companies they represented, so that they would provide the research with varied perspectives on the transformation process – both external and internal to the companies. The interviewees also represented people from varying backgrounds. The interviewees included retailers, industry representatives from industry associations, retail journalists and consultants. For privacy purposes the interviewees have been classified to either retailer or a consultant, implying a non-retailer. Some of the interviewees had been active during or after the early years of the development and also those who had come to the market during the later years. This provided insights from all phases of the development and from different actor perspectives.

As the interviews were semi-structured, it was possible to cover certain pre-defined questions and also make important insights during the interviews. This enabled the interviewees to influence to the direction of the interview. Interviewees were asked general questions about what they felt were important events and drivers behind the transformation. This allowed them to identify the critical events themselves before more structured questions, related to the transformation process, were asked. The interview process occurred simultaneously with the analysis of the secondary data. This enabled the researcher to modify the chronology and the interview questions based on insights arising from the interviews. As insights arose during the data analysis and the understanding of the transformation process improved, the interviewees were once again contacted, but by email, in February, 2012. They were asked questions on issues related to the legitimation of the online businesses during the early years of the transformation. Three interviewees replied with extensive responses. The overlapping data analysis and data collection enabled the research to be more flexible (Eisenhardt, 1989).

3.3.2 Data analysis

The analysis was characterised by an inductive and open-ended analysis including going back and forth between data, literature and the emerging analysis results as often used in management research, ie. Smets et al (2012). The purpose of the analysis was to attend to processes by which organisations make sense, experience and interpret their environments (Suddaby, 2010). In the first stage based on the secondary material and interviews, a chronology of key events was created similarly to Greenwood et al (2002). The events consisted of a wide variety of activities, which were significant from the perspective of the emerging industry (Suddaby, 2001).

It formed the basis for creating a narrative account (Bourgeois & Eisenhardt, 1988) depicting the emergence and transformation processes.

The iterative reading of the chronology enabled the second stage, the identification of the key actors who had initiated and led the process (Maguire et al, 2004). The main actors involved in the transformation included mainly companies adopting the innovation or third party actors, such as consultants and other industry experts, commenting on the innovation development. The objective for creating the chronology is to enforce some order to the raw data, illustrate the pattern and sequences of actions and responses as well as identifying patterns of events in the raw data (Suddaby, 2001). The archival material behind the chronology also provided a data bank (Greenwood et al, 2002) for the analysis on which the further analysis and interviews were built on.

The narrative analysis of the chronological data centres on two objectives: the identification of themes (Pettigrew, 1990) and phases (Langley, 1999). The themes were generated by going through the raw data behind the chronology to categorise the events into broader themes and further reducing them into more detailed categories (Maguire et al, 2004; Greenwood & Suddaby, 2006; Smets et al, 2012). The thematic analysis (Vaara et al, 2006) helped to distinguish different types of discourses arising from the raw data. The emergent themes (Eisenhardt, 1989; Spicer & Fleming, 2007) arising from the data were interrogated more systematically in a way, which resembled a textual analysis used by Vaara et al (2006). Through this analysis four themes were identified to provide understanding on the kinds of topics that were brought up to discussion by the different stakeholders during the industry transformation.

In order to take time into consideration by looking temporal patterns (Mazza & Alvarez, 2000) an analysis of phases was conducted. The objective was to identify turning points in the chronology, which would indicate a significant change in the transformation process (Gersick, 1994; Lampel & Shamsie, 2003). The themes were used for the identification of the phases, as the phases are differently characterised by the themes.

The themes were selected based on an extensive analysis of the event database. The analysis of the event database occurred simultaneously with the reading of the literature. This way the themes arising from the chronology were influenced by both the academic literature on industry transformation and the empirical evidence gathered about the transformation of retailing in the UK. After extensive reading and re-reading of the event database combined with the literature review, the themes were identified as consisting of four somewhat overlapping streams of events (amount of events in each theme in brackets):

- Activity network (162 events)
- Commercial viability (136 events)
- Technological and institutional environment (91 events)
- Product assortment (75 events)

The themes were deductively inspired by the literature and reflect the drivers of industry transformation explored in Chapter 2.1.1. The first three themes resemble the frameworks by Van De Ven & Garud (1993) and Gustafsson et al. (2012). The inductive part of the research process, as suggested by Pettigrew (1997), resulted in the emergence of the last theme, product assortment. It was specifically relevant for the online grocery retailing and was thus selected as an individual theme.

The events in the chronology were coded according to which theme they belong to. Some events were coded into two themes, because they clearly represented issues, which were important for both themes. An example of an event coded into two themes is an event where a company entered or considered entering the market (activity network theme) and at the same time introduced the business model (commercial viability theme) they planned to use. A total of 33 events, from the 430 events in the chronology, were coded into two themes. Besides the aforementioned themes, events related to other aspects, were also identified. These events were used to deepen the understanding of the context and market atmosphere in which the online channel was being developed. These were not part of the analysis of the themes, but they were used to provide the bigger picture of the market context in which the events occurred. Two additional categories of events were gathered including these events:

- alternative technologies developed alongside the online channel (30 events)
- predictions related to the market (244 events)

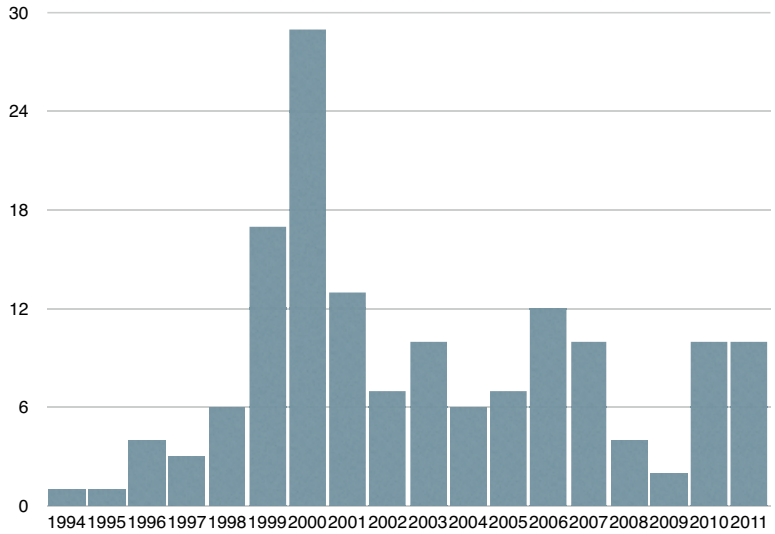

Figure 7. Amount of events per year in the activity network theme

The first theme on activity networks arises from the literature. The distribution of events per year in the activity network theme is illustrated in Figure 7. Previous research on industry transformations emphasises the importance of the network of actors involved in the transformation process (Van De Ven & Guard, 1989; Aldrich & Fiol, 1994; Mezias & Kuperman, 2000; Gustafsson et al., 2012). The term activity network has been coined by Munir & Phillips (2002) to include a wide group of companies shaping the transformation process. The events, which were related to the companies considering or entering the online business, were included in the first theme. Furthermore events concerning the abandonment of the online business were also included in this theme because decisions to abandon the online business influenced the activity network. In general, events associated with the amount of actors in the market belonged to the theme about the activity network.

The activity network theme is notable during the during the dotcom boom as the amount of companies involved in the market grew and developed rapidly. Over time the amount of companies in the market stabilised and other themes started to emerge.

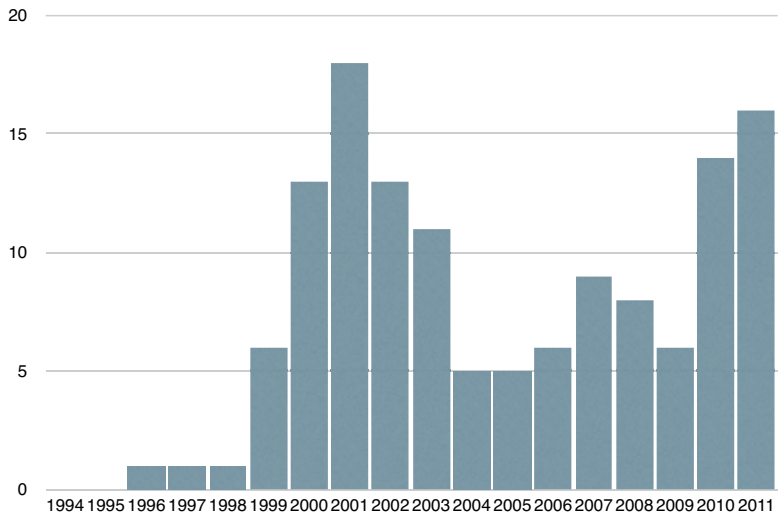

Figure 8. Amount of events per year in the commercial viability theme

The theme of commercial viability (events portrayed in Figure 8) focuses on the actions of the companies to make the online business commercially viable. Many of the events are related to the business models used by the companies and the overall profitability of the online businesses. As in the first theme, the commercial viability theme arises from previous research. The actions of individual companies have been emphasised by Van De Ven & Garud (1989) in the instrumental activities category of their framework. The instrumental activities were further used by Mezias & Kupermann (2000). Gustafsson et al. (2012), on the other hand, emphasise the importance of commercial viability for the transformation of the industry.

The events related to the theme started to increase around the same time as the dotcom boom, even though the amount peaked after the boom. This emphasises disappointment with the online business and shows how the companies started to change their business models as a result of the disappointment. Events related to commercial viability in the online business increased rapidly during the final years of the chronology. This is a result of the heavy interest in the planned launch of Morrisons' online service as well as the transformation of the business models due to the increase in dotcom stores.

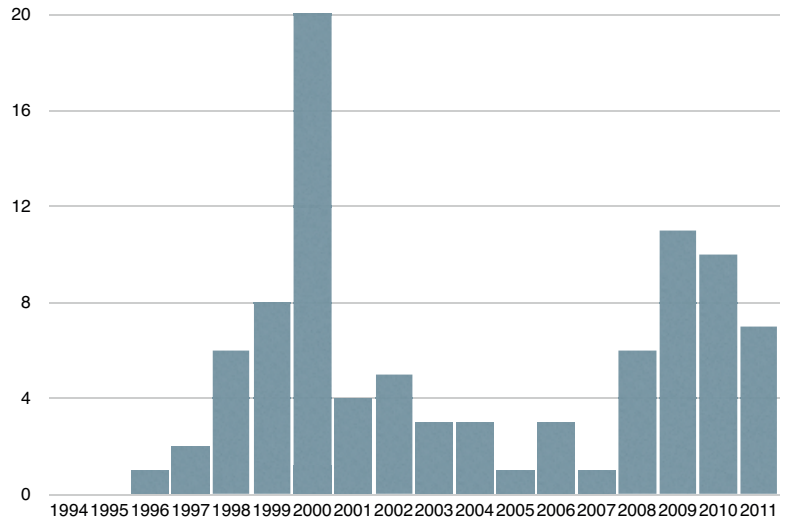

Figure 9. Amount of events per year in the technological and institutional environment theme

The third theme involves the technological and institutional environment in which the companies were developing the online business, which was also selected from the previous research. Figure 9 illustrates how the events related to the third theme occurred over the transformation process. Technological development as well as the institutional environment were emphasised by the majority of the studies reviewed for this research. The frameworks developed by Van De Ven & Garud (1989 & 1993) and Gustafsson et al. (2012) particularly stress the importance of technological development for overcoming bottlenecks (Sood & Tellis, 2005) associated with poor technological performance. In particular, the technological development of the online business and the alternative technological solutions that first rivalled the online channel and were later on integrated into the online channel are central to the theme. The theme also included the institutional environment in which the actors can promote, individually or collectively, the legitimacy of the innovation (Aldrich & Fiol, 1994; Suddaby & Greenwood, 2005) and also allow the public sector to govern or regulate the transformation of the industry (Van De Ven & Garud, 1993).

The events in the third theme are concentrated in year 2000. During that time, the development of both interactive TV and mobile services was active alongside the online business. Since 2008, and the launch of the iPhone, the re-emergence of mobile services has increased the amount of events.

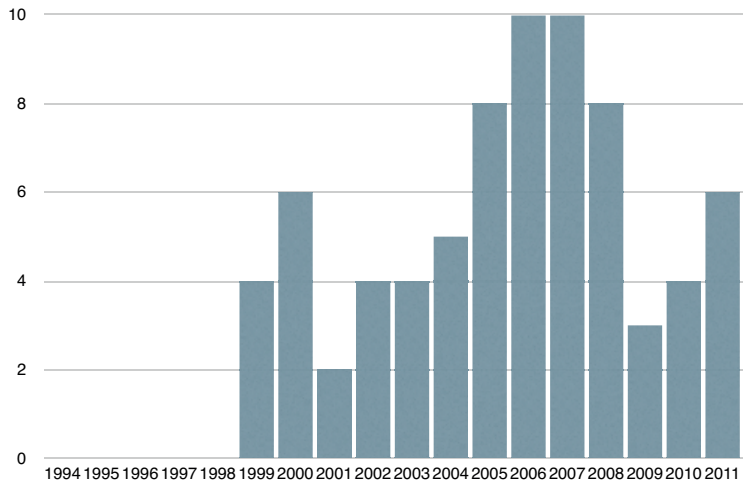

Figure 10. Amount of events per year in the product assortment theme

The last theme deals with the growth of the product assortments of the companies over time. This theme emerged mainly from the chronology during the data analysis. It has not been emphasised by the previous research. However, it has been notable during the transformation of the grocery retailing industry that the amount of products and services offered has proliferated as the businesses have grown. Figure 10 depicts how events related to product assortments did not emerge before 1999. The amount of events per year became more important in the chronology around 2005 with Tesco's plans to launch the non-food service Tesco Direct.

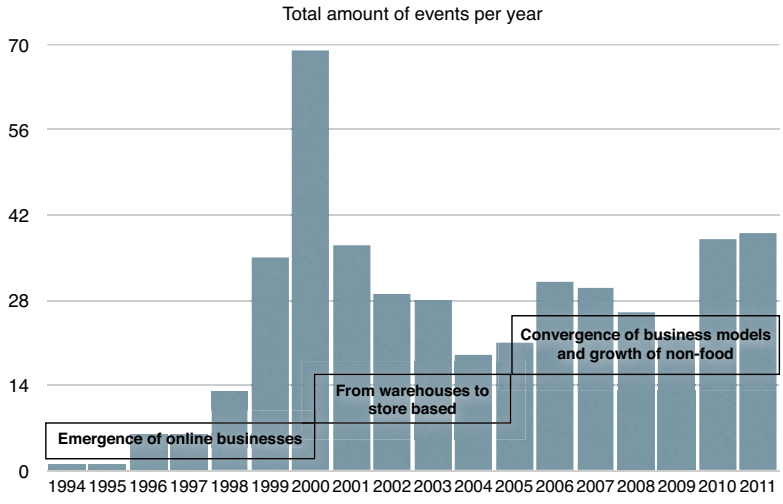

Figure 11. The amount of events per year and the phases of industry transformation

The other objective of the data analysis was the identification of the turning points in the development of the online grocery market. The transformation process was divided into three phases:

- Emergence of online grocery retailing and growing hype
- From a warehouse-based business model to a store-based one
- Convergence of business models and growth of non-food

The first consists of the first years of the transformation during which the first retailers started developing their online services. Towards the end of the phase, most of the retailers suddenly became interested in the online business. The phase lasts from 1994 to the height of the dotcom boom in 2000. The second phase starts during the peak of the dotcom boom and is characterised by the disappointment phase resulting from the overhyping of the industry and the move from warehouse-based business models to store-based ones. The second phase ended in 2004 as Sainsbury's abandoned their last warehouse. This led to the third phase, which is characterised by the convergence of the business models into a store-based model. However, the store-based model was incrementally developed into a hybrid model soon after the third phase started.

3.4 Validity and reliability

In order for the research to meet academic requirements it must use scientific research methods to be credible (validity) and be objective and replicable (reliability). Validity is concerned with the truthfulness of the interpretations made based on the data (Peräkylä, 2005). Yin (2009) identifies construct, internal and external validity and reliability. This chapter illustrates the actions taken to ensure the validity and reliability of the research.

The first of the validity classes identified by Yin (2009), *construct validity*, deals with whether the correct operational measures were established for the phenomenon studied. This forms the basis for the research design of the qualitative research. To enhance the construct validity for the case studies, Yin (2009) proposes the use of multiple sources of evidence and the establishment of a chain of evidence. He goes on to recommend that construct validity is assessed by allowing the key informants to review the drafts of the case study reports. *External validity* refers to the generalisability of the results of the research, i.e. can the results be generalised to other areas outside the case. Yin (2009) suggests that external validity can be improved by the use of theories to generalise the results – within the theoretical discussion – by use of further cases. External validity deals with the environment of the research phenomenon and *internal validity* focuses on the internal causality and logic of the

research. Yin (2003) argues that internal validity is relevant for causal studies in which relationships and causalities between factor x and y are being identified. Internal validity is not relevant for studies, which are not concerned with making causal claims, like this research. With regards to validity issues, Ferlie et al. (2005) suggest that case studies are strong on internal validity and strong for case data but weak on external validity and have weaker generalisability outside the case. Yin's (2009) last aspect concerns the *reliability* of the research, focusing on whether later researchers are able to replicate the same research procedures and come to the same conclusions (Yin, 2009).

In this research the validity issues have been tackled in the following ways. The *construct validity* of the research was addressed by the use of multiple sources of evidence. The multiple sources included secondary data sources, which were complemented by semi-structured interviews. The secondary material provided the research with information from past events without the burden of recollection problems. In order to get acquainted with the phenomenon studied, the topic was discussed with a variety of people before the actual interviews. During the interviews, the aspects arising from the chronology were covered with the objective of understanding why the actors involved in the transformation process acted as they did. The interviewees were also interviewed a second time if some topics about the process needed clarification. On the other hand, the interviews with the secondary sources gave the event data a more in-depth view of the reasons behind the events. Another aspect improving the construct validity was the establishment of a chain of evidence in the data collection phase. The chain of evidence was established by describing the data collection and analysis procedures in detail in the methodology chapter. In order to further improve the construct validity, the initial drafts of the case study reports were submitted to interviewees, so that they were able to go through them and suggest corrections. Only a handful of minor comments were received and taken into account.

The *internal validity* of the research has been addressed by building the research on the theoretical basis of technological innovation and industry transformation, which are complemented with the theoretical approach of incumbent challenger dynamics theory. These have been illustrated in the literature review chapter. Multiple levels of industry transformation were taken into account to improve the explanation and build a more extensive picture of the retailers' response to the technological innovation. An extensive understanding of the phenomenon studied was also achieved by interviewing people holding different perspectives on the industry and who also hold different positions on different levels of the industry. This

provided variety and somewhat rivalling explanations of the phenomenon.

The generalisation of the results of the research is important for the *external validity*. In this research generalisability to other communities, such as grocery retail markets in other countries or other areas of retailing, is a topic worth studying. This would illustrate how externally generalisable the results of this research are. The reliability of the research for later researchers has been ensured by gathering all the data related to the research phenomenon into a single database.

This chapter has illustrated the most essential methodological questions about the research. The research data is based mainly on secondary sources and interviews conducted with people holding diverse opinions and positions in the industry. Based on the data, the chronology of the transformation process was written to illustrate how the change unfolded. This will be explored in the next chapter.

4 The development of online grocery retailing in the UK

This chapter illustrates how the market for online grocery retailing has emerged and been developed throughout its lifecycle. Starting from the mid-1990s and moving to the present day the chapter explores how online grocery retailing in the UK has become a market worth about £5.9 billion. The chapter is divided into three sections based on the temporal development of the market and identified during the data collection and analysis. The phases represent changes in the way the industry transformation process unfolded.

The chapter commences with a summary of the main players in the market, illustrating the background of the major actors depicted in the event database and how they have approached the online business. This will be done in chronological order based on when the companies entered the market.

The second section deals with the early years of the development of online grocery retailing. This time period covers the period from 1994 to the height of the dotcom boom in 2000. The first years were characterised by the introduction of online services and the gradual increase in interest about them. In 1999, the interest grew rapidly and in 2000 the number of retailers operating an online service peaked.

The next section begins in 2000 when the amount of retailers in the market started to decrease. Simultaneously, the industry seemed to reach consensus on the business model for online grocery retailing. Asda had constructed a warehouse for its home shopping operation (initially operating through phone and fax) already in 1998 – it started to fulfil online orders in 2000. Simultaneously, Sainsbury's built Europe's biggest online grocery warehouse in London. Tesco was the only major online grocery retailer not to operate a warehouse for its online operation. They received significant criticism for their decision to fulfil online orders from stores. However, the use of warehouses ended in 2004 when Sainsbury's decided to close its last warehouse for online orders. Ocado remained the only online grocery retailer to operate a warehouse as it did not have a physical network of stores to rely on.

The last section explores how the in-store picking developed by Tesco became adopted by all major online grocery retailers. In spite of that, Tesco transformed its business model from in-store picking to a hybrid model (resembling the one Sainsbury's operated two years earlier). Tesco opened the first warehouse for its online operations before Christmas 2005. Tesco did not operate a traditional warehouse, but a dark store (or a "dotcom"

store). It was laid out like a normal store, but customers were not allowed to enter the store. This allowed the picking personnel to operate more efficiently so that Tesco could better serve the most densely populated areas around London. After Tesco other grocery retailers started to adopt the hybrid model. Concurrent with the emergence of the hybrid model of fulfilment, two other important themes occurred in the online grocery business. The first was the growth of the non-food products that the retailers began to sell online alongside food products. Tesco initiated this and subsequently other retailers followed suit. Early 2000 saw retailers offering non-food in their websites. This development culminated in Tesco's launch of a separate service alongside online grocery for non-food, Tesco Direct, in 2006. The other important stream in the development of online grocery has been the emergence of mobile apps as well as different interactive services for grocery retailers. Mobile services were trialled in 2000 with WAP services, but it was after the introduction of iPhone in UK in 2007 that mobile services really picked up in grocery retailing. The growth of mobile apps (Ocado launched the first app in 2009) enabled the integration of online and mobile channels into an emerging multichannel service. Around the same time as the growth in mobile services, retailers started to introduce interactive services into their online sites. This allowed customers to write and review products and with the rise of social networking and Facebook, retailers were able to communicate with costumers in new ways. This happened through both Facebook and the discussion forums of the retailers.

4.1 Summary of the main players in the market

The main players in the online grocery market have been: Tesco, Sainsbury's, Asda and Ocado. The market has included more actors than the ones illustrated in this section, but these actors provide the core of the market.

4.1.1.1.1 Tesco

Tesco is the market leader in UK grocery retailing as well as in online grocery retailer in the UK. It has even been stated that Tesco would have the biggest online grocery retail service in the world with estimated revenue of approximately £2.5 billion. It has also been suggested that Tesco would control about 50 % of the overall online grocery market in the UK. Tesco was established in 1919 and in 1995 it became the market leader in the UK. Around the same time it expanded internationally, and covers 12 countries outside the core UK market. With its international expansion, Tesco has become the third largest retailer in the world. It was the first grocery retailer in the UK to start developing an online service in 1994. Tesco

decided to build the online service alongside existing operations, meaning online orders were collected in its stores.

4.1.1.1.2 Sainsbury's

Sainsbury's was established in 1869 and it was the market leader in grocery retailing in the UK from 1922 to 1995. Presently Sainsbury's is the third biggest grocery retailer in UK. Sainsbury's trialled online grocery retailing already in 1998 by picking orders from stores, but turned to the warehouse-based business model in 1999. They developed the warehouse-based business model into a hybrid in which stores were also used for collecting the orders, while the warehouses complemented the stores in major metropolitan areas. Sainsbury's abandoned the last warehouse in 2004 as they moved to using only stores for picking online orders.

4.1.1.1.3 Asda

Asda is the third major grocery retailer in the UK. It was established in 1949 and was acquired by WalMart in 1999. Asda is the second biggest grocery retailer in terms of market share in the UK. Amongst the three largest grocery retailers, Asda adopted the online business last. It launched its online grocery service from a central warehouse in 1999. However, it turned to a store-based model after the collapse of the dotcom boom in 2002. Asda has actively developed its non-food product offering and followed Tesco in establishing warehouse-like dotcom stores.

4.1.1.1.4 Ocado

Ocado is a unique player in the UK grocery retail market. It operates only as a web-based service and it does not have any stores. Thus, Ocado has developed a business model with a highly automatized warehouse in north London and further spokes around UK. The system is different to the ones operated by Ocado's competitors. Ocado's system includes "pods" (a kind of container), which either leaves straight from the main warehouse on an Ocado van or alternatively is loaded on a large truck. A truck can fit six pods, take them to a spoke, which are pick-up depots for the "pods". In the spoke, the "pods" are loaded to Ocado vans to serve the areas close to the spokes. Ocado was established in 2002 and in the beginning it operated only in London region. It formed a close collaboration with Waitrose and therefore with the parent company of Waitrose, the department store chain John Lewis Partnership, which was a significant owner of Ocado until 2011.

The subsequent sections of this chapter explain in detail the outlines sketched above.

4.2 Emergence of online grocery retailing and growing hype, 1994-2000

The first time period in the development of the online grocery market was characterised by the growth in the amount of retailers active in the market. The first notions of online grocery date back to 1994 when Tesco was rumoured to be starting the development of its service. Another early mover was Food Ferry, which launched its service during the mid-1990's. Asda was also active in the home delivery business, but they did not have an online offer because the offer was based on a telephone and fax service. It has been argued that Tesco had also been running a similar service before the online business. Towards the end of the time period more retailers became involved in the emerging market. The year 2000 saw the amount of retailers and events peaking during the height of the dotcom boom. This section of the chapter explores in more detail how and what kind of events unfolded during the first time period between 1994 and 2000. Table 6 summarises the key events.

Table 6. Key events in the first phase

Year	Key events
1995	A six-strong team at Tesco tentatively starts exploring the possibility of selling groceries on the Internet
1996	Food Ferry allows office workers to shop direct from their desks and have the goods delivered to their homes in the evening
1998	Sainsbury's Orderline launched
1998	ASDA @t home's first warehouse opened in Croydon
1999	ASDA @t home's second home shopping warehouse opened in Watford. The first two warehouses started by offering a phone/fax ordering service.
1999	Food Ferry launches its catalogue on the internet.
1999	Asda acquired by Wal-Mart for £6.7bn.
1999	Launch of Somerfield 24-7, available to customers via catalogue, internet and digital television.
1999	Sainsbury's decides that the store-based picking system will be phased out and the service's geographical reach extended using a warehouse-based business model. Home shopping experts argue that a warehouse-based model is far more efficient for both retailers and customers.
1999	Waitrose@work extends and customers can now order at home via the internet with deliveries made to the place of work (51 companies use it at that time).
2000	Somerfield plans to open a new warehouse in London. Somerfield has plans to substantially increase the service in 2000.
2000	Webvan in the US is seen to be winning the internet grocery race by offering a level of service (delivery within an agreed half-hour, more products and a more efficient internet site) unmatched by competitors.

4.2.1 First years of low interest

The development of the online grocery business was initiated around the mid-1990s as two retailers, Tesco and Food Ferry, started to explore possibilities to utilise the Internet. Thus, Tesco and Food Ferry were the

first movers into online grocery retailing. Tesco started to develop its online service already in 1994, whereas Food Ferry launched its intranet service in 1996. Prior to the intranet service, Food Ferry had been operating a telephone and fax based home shopping service since 1990. As the first grocery retailer, Tesco went on to launch their service, Tesco Internet Superstore, online in November 1996. Tesco was the first big company to use Microsoft software in this way.

When Tesco first started to develop its online service, not many retailers were utilising the Internet. Amazon has been credited as being one of the first online retailers. It was launched online in 1995 and as only a few companies were offering services for corporate websites and software development, creativity was required from Tesco's IT team. Nick Lansley, the head of R&D in Tesco, recalls in an internet (www.computing.co.uk) interview in 2010 what the development was like: "*We had to invent. There was nothing we could buy off the shelves and we had very little money for warehouses.*" With few resources available, Tesco considered different business models. Nick Lansley recalls, *"If we were to make any money, we would have to deliver across a radius of hundreds of miles around the warehouse, because only a minority of people were shopping online at the time*". This led Tesco to start developing the business model around an existing network of stores.

In terms of the business model for the fulfilment of online orders, Tesco did not have many examples to study and find out how online operations should be organised. The only clear example came from the US where a start-up called Peapod launched its website in 1996. The online grocery retailers in the US mainly delivered from central warehouses at that time.

The US based business models utilising big warehouses did not convince Tesco, though the model convinced Asda and Sainsbury's later on. The tight budget control of Tesco can be seen as one of the important issues on how and why they decided to arrange the fulfilment of online orders. Tesco was active in developing new solutions and finding new ways to serve customers, but big investments in warehouses were not seen as attractive. On the other hand, relying on the existing store network provided an easier and cheaper way to extend the service as demand picked up. Conversely with Tesco's approach, the choice of business model was obvious for Food Ferry. They were a dedicated home delivery service without stores, thus warehouses were the only choice.

At the same time as the launch of the Tesco Internet Superstore, a dedicated home-delivery company, Food Ferry, was developing its own online service. Food Ferry was one of the first dedicated grocery home-shopping retailers in the UK. It was established in 1990 and originally

operated in a few London postcodes using catalogues for their two-van home delivery business. The company trialled an intranet service with CapGemini in 1996. The idea was to take orders by e-mail as well as by offering an intranet service for people buying groceries while at work, which were then delivered at home. Tesco also considered developing an intranet service in 1997 but planned to offer office employees the possibility to order groceries from work and have them delivered there. This would have bypassed the logistical problem of delivering to homes, which the Food Ferry model and traditional home delivery had.

During late 1997 when Tesco was the only grocery retailer offering an online home delivery service, it started looking at possibilities to increase the number of stores handling online orders. It planned to increase the number to 20 within the London area from then five there as well as one in Leeds. The extension would allow Tesco to deliver to all areas inside the greater London area. However, the extension did not happen as quickly as planned. Tesco passed the 20 store threshold in 1999. During the same year Tesco managed to accelerate the number of stores offering the online service to 72. Sainsbury's was able to pass the same number during 2003 but by then Tesco had around 300 stores offering online services. This shows how active Tesco was in extending the coverage of its service.

4.2.2 Experimentation with alternative technologies

While grocery retailers had been active in developing online services, many of them also developed services to be offered using interactive TVs. During the late 1990's interactive TV was seen as an alternative to ordering products from the Internet. Some industry experts even argued that interactive TV would become the dominant home shopping channel.

In October 1998, Iceland became the first grocery retailer to announce plans to develop an interactive TV service for selling groceries. Iceland was in talks with BskyB and the interactive TV format was widely acknowledged as a technology that could rival the Internet as a medium for ordering groceries to one's home. Somerfield became the first grocery retailer to sign a deal with a digital TV company, BIB. Initially the service offered about 600 items, but Somerfield was planning to launch a full range later the same year. It was launched in July 1999 together with the launch of Somerfield 24-7.

Early in 1999 Tesco started utilising interactive TV for its home shopping operation. A couple of months later Tesco admitted that sales through interactive TV hadn't picked up, as they would have hoped. The company still thought that interactive TV had future potential and wanted to be an important part of that. "*Interactive TV offers a huge potential market but it has a long way to go it isn't fast enough for one thing. But this will*

change in the future and we will be there." (Tesco spokesman, The Grocer, 28.8.1999.)

During the late 1990s, simultaneously with the introduction of interactive TV, grocery retailers were also developing other technological solutions for the nascent online service. Tesco was boosting its home shopping service with the introduction of a CD-ROM, which allowed customers to place orders alongside the Internet shopping service. This enabled Tesco to handle more orders at the same time – customers processed orders on their computers and then ordered the products using the Internet connection. During the late 1990s, Internet connections were not able to handle many simultaneous connections.

In order to help the customers in connecting to the online service, Tesco started to provide the customers with the technology that was needed to use the Internet. In 1998 only 9% of households had access to the Internet. Hence, Tesco's plans to work as an internet provider and include their own shopping software in PC's sold in Tesco stores can be said to have been an important step in gaining ground in the online grocery market.

In 1999 Food Ferry launched an online service and followed Tesco's example in 1999 by including CD-ROMs to complement the Internet connection. The CD-ROM was seen as providing a more user-friendly shopping experience. According to Food Ferry it enabled the improvement of the quality and efficiency of the online service. The online connection was only used to place the order. CD-ROMs were used to browse and put the products in the shopping basket as well as for updating stock and pricing information. Food Ferry also included the possibility for customers to attach notes about possible substitutions for individual products.

One problem online grocery retailers dealt with was the substitution of out of stock products. Some retailers were criticised for making unpredictable substitutions, meaning that the ordered products were substituted with products that the customer did not want. Food Ferry approached this by enabling the customer to give instructions to the people picking the orders. This helped in making the substitutions match the customers' orders more precisely. The substitution issue was one of the main arguments for the warehouse-based model. The retailers argued that from warehouses the rate of substitution would be significantly lower than from stores.

This section ends in 1998 when two other retailers became involved in the online business. After 1998, the entry rate of retailers continued to increase. Thus the next section is about the increasing amount of entries to the market between 1998 and 2000.

4.2.3 Increasing amount of entries to the market

The period of an increasing amount of companies entering the market began when Waitrose, a traditional British grocery retailer, owned by the department store chain John Lewis, followed Food Ferry and Tesco's example. Waitrose launched their office delivery service waitrose@work in June 1998. It was an intranet based office shopping service initially serving workers at the headquarters of British Airways. The service was expanded to cover several other big corporations. Waitrose delivered the products for the office deliveries from its stores – as it did for online deliveries to homes, which was launched in 2001.

In 1998, two other grocery retailers entered the online market. Sainsbury's launched its Orderline service in March 1998 after successful trials during the previous year. At first Sainsbury's followed Tesco's example and used stores for picking the online orders. Another retailer to launch an online service in 1998 was Budgens, a small chain of independent retailers. Budgens acquired Teleshop Services in order to get the infrastructure for entering the online market. Teleshop Services used to be part of Asda's home delivery business, which was based on phone and fax ordering and delivered grocery to homes and elderly care homes. However in 1991 Asda decided that the home delivery service was not needed anymore and abandoned it. Subsequently Teleshop Services was established using the infrastructure of Asda's home delivery service.

As Tesco was increasing the coverage of its online service in the late 1990s, Iceland was able to provide a nationwide home delivery service already in 1999. Although, the service wasn't yet available online, Iceland was still considered to be the only grocery retailer to offer home delivery to all parts of the country. Based on the nationwide home delivery service, the online service was launched nationwide during late 1999. Using in-store picking for the fulfilment of online orders, just like Tesco, Iceland became the first retailer to offer free home delivery to the whole country for orders over £40 as well as the sixth company to offer online grocery retailing in the UK. Of those six companies, Waitrose had an intranet service, but not yet an online home delivery service. The total amount of retailers operating an online service was to reach its peak in 2000 with 10 companies.

While Tesco was operating their online business using its network of stores and having customers collect online orders at stores, some retailers became interested in other ways of operating their online businesses. US-based start-ups were active in developing online retailing in the late 1990s. As they were start-ups without a network of stores, they developed their business models around large warehouses, which enabled precise operation with low substitutions. US-based start-ups influenced the UK market,

because UK grocery retailers studied how the online grocery retailing had been organised in US. The US was perceived as a more advanced market in terms of online retailing, due to high profile online ventures, such as Amazon and eBay.

4.2.4 Proliferation of business models

The proliferation of business models in the UK started when Asda and Sainsbury's abandoned in-store picking and opened large warehouses for online businesses. Asda became the first UK grocery retailer to build a warehouse for home shopping in 1999. Briefly, and prior to Asda, Amazon had reserved a slot in Slough for their UK business, which was launched in December 1998. The entry of Amazon to the UK market created a storm in the book market because for the previous three years the Internet had been described as the channel of the future and Amazon was a pioneer in selling online. Asda went on to add another warehouse in Watford in May 1999 with plans for a rapid roll out of further warehouses.

From the start Asda at Home was available for orders made either by phone or by fax, but not online. A bit later Asda developed a CD-ROM for ordering products. Asda at Home became available online during late 2000.

Asda's decision in 1998 to centre its home shopping network in a warehouse system marked the start of an era during in which many grocery retailers and market experts believed that the warehouse-based model was the most economically sustainable way to organise online grocery retailing. When planning the business model for online operations, Asda also went to the US to see how online grocery retailers, mainly start-ups like Peapod and Webvan, operated. The main arguments for the warehouse model were related to the accuracy of the orders as well as the use of the shop floor to collect products for online orders. The warehouse model allowed the orders to be fulfilled accurately with fewer substitutions of products compared to picking from a store. In-store picking also was seen to interrupt customers in the store and to require too much time.

Besides the advantages of the warehouse model, some experts acknowledged that in-store picking allowed a low-capital approach to online grocery retailing with good coverage. The apparent advantages of the warehouse model were reinforced by the news from the US about Webvan's aggressive rollout of a nationwide service to 28 markets over the next two years. Webvan was also spending one billion US dollars on a new high-tech distribution centre. In the summer of 1999, Webvan was operating in San Francisco area and about to open in Atlanta.

Following Asda's example, in May 1999, Sainsbury's indicated that they were going to phase out the store-based picking model and change the fulfilment method for the online operation. Simultaneously Sainsbury's

extended the coverage of their online business. They became another company to offer groceries online using a warehouse-based model. The chief executive Dino Adriano devised Sainsbury's strategy for online fulfilment. He used evidence from the US (in a similar way to Asda) to illustrate that picking products from stores cannot be cost-effective.

Concurrently with Asda and Sainsbury's – and with a similar business model in mind, Somerfield launched the Somerfield Direct online home shopping service in March 1999, after trialling it with an intranet offer. There were plans to expand the service further and build a network of 20 warehouses. Somerfield was planning to extend online operations using a tripartite approach. In the first phase the online operations were expected to utilise stores for picking the orders, just like Tesco did. The second phase would include depots within stores as a transitional period to dedicated warehouses. In March 1999 Somerfield acquired the home shopping service Flanagan's to get an experienced team of people that had been running home delivery services since 1995. Somerfield predicted that in the near future they would have over 300 stores taking shopper's orders. In July 1999 Somerfield rebranded the Direct service as Somerfield 24-7. The new online home shopping service was also available to customers via catalogue and digital television, as mentioned earlier.

Meanwhile, Tesco announced during early 2000 that they had become the biggest online grocery retailer in the world with annualised sales of £125 million. Inspired by the success of the online business, Tesco decided to set up a separate business, Tesco.com, to run the online operations. Tesco's strategy director John Browett became Tesco.com's chief executive while e-commerce director Carolyn Bradley was chosen as chief operating operator. Tesco also invested an extra £35m to boost the development of Tesco.com.

Despite Tesco's success, in April 2000 Sainsbury's head of strategic development Jennifer Baker-Hirst stated (The Grocer, 1.4.2000) that Sainsbury's wouldn't use in-store picking for fulfilling online orders. "*The long-term sustainable model is through a network of warehouses complemented by in-store picking to give greater geographical coverage*." At the same time Sainsbury's also introduced a new objective to increase the geographical coverage of the service to cover 60 % of the country in one year's time. The service was also rebranded as Sainsbury's to You.

Shortly after the statement about building warehouses, Sainsbury's revealed that their first warehouse would become Europe's biggest warehouse for picking online grocery orders. The warehouse in Park Royal, London was seen to put Sainsbury's in a strong position to offer a good service to its online customers. The old model of solely using warehouses, which Asda had initiated in the UK became a new hybrid model,

incorporating stores to complement the service offered by the warehouses.

Asda initiated a review of its e-commerce activities in spring 2000 to find out the correct balance between stores and online activities. The review was commenced due to the imbalance between the Asda strategy and the needs of Asda at Home. The needs of Asda at Home were different to the needs of the physical store network, the bricks and mortar business. Asda wanted to modify their existing business model to incorporate Asda at Home in a better way with the operations of the parent company. Asda did not see a stand-alone business for e-commerce as a possibility. However, Asda's parent Walmart spun off its online business WalMart.com and established its head office in Silicon Valley, California. The Asda review aimed to learn from the experiences of other online retailers.

In its review, Asda argued that the warehouse based model would be more beneficial for online operations because it had the potential to be economically more efficient and provide a better service with low substitutions. Also, the fact that in-store pickers wouldn't be disturbing the customer experience in stores was seen as important. The Director of Home Shopping, Octavia Morley, stated (The Grocer, 5.2.2000): "*Dedicated depots are more cost effective, don't compromise customer services in store and ensure a very high level of availability, which is a major issue with home shopping customers*." Asda came to these conclusions after carrying out a lot of research about the business models of US online grocery retailers. As mentioned before, most of them were small start-ups working without an existing network of stores. This was a significantly different setting to the one for Asda in the UK. Asda had operated a physical network of stores for decades since it was founded in 1949. As the online market was so different to the previous operations of the traditional supermarkets, moving online had initiated proved to be difficult for the grocery retailers. As Octavia Morley put it (The Grocer, 6.5.2000): "*A lot of retail is about evolving. But this is about making it up as we go along.*"

The importance of the choices made regarding business models was emphasised by industry experts. Many industry experts drew attention to the need to improve the service levels of the online services. They stated that the issues relating to the delivery and substitution of the products are essential drivers in determining the success of online grocery retailers. With this background, warehouses seemed to be the inevitable winner in the online grocery market. With higher investments warehouses were able to offer a higher quality service. The disadvantages of the in-store picking model were summarised by two consultants from Roland and Berger Partners in 2000 as: out of stock, high picking costs, capacity constraints, store customer disruption and range inconsistency. To all of these, the

warehouse based retailers were supposed to be able to offer a superior service. For Webvan in the US, customers were able to see whether the product was in stock when selecting the product. On the other hand, in-store picking allowed retailers to expand the service with considerably smaller investments.

Tesco argued that there were no examples of businesses that would have successfully operated the warehouse-based model of online groceries. The US based online grocers had not been able to turn a profit despite the publicity around them. Webvan was one of the most well-known of the US start-ups and its development was covered extensively in the British retail press. During early 2000, it was still thought that Webvan and its business model would become the dominant business model. The business model aimed to create total customer satisfaction with 30-minute time slots for home delivery and low levels of product substitutions. This was seen to be unmatched by rivals. Nevertheless, the success story of Webvan took a turn for the worse during summer 2000, when the company indicated that its financial problems were getting worse.

This section has explored how the amount of actors in the emerging online grocery retail market changed during the first period until 2000. The phase was characterised by growing interest in the online business. However, in the latter part of the phase some retailers started to abandon the online business. This was partly due to the changing market attitude after the collapse of the of the IT boom, which coincided with a change in the phases of the industry.

4.3 From the warehouse-based model to the store-based model 2000-2004

The first period in the development was characterised by a growing interest in online services in grocery retailing and the growing amount of companies in the market. The second period saw a stabilisation in the amount of companies involved. The emphasis on the need to use warehouses to fulfil the orders from the online channel was initiated already during the first period, but the second period is strongly influenced by the importance of the warehouses during the first part of this period and the decrease in their importance towards the later part of the period. This chapter will explore the events related to the second period. The key events in the second phase are summarised in Table 7.

Table 7. Key events in the second phase

Year	Key event
2000	Ocado founded by Tim Steiner, Jason Gissing and Jonathan Faiman as L.M. Solutions (UK) Limited
2000	Sainsbury's insist that in-store picking is not the best solution for online grocery retailing (The Grocer, 1 April, 2000): "*The long-term sustainable model is through a network of warehouses complemented by in-store picking to give greater geographical coverage*."
2000	Waitrose launches the first WAP service.
2000	Sainsbury's opens the biggest online grocery warehouse in Europe (120,000 sq ft) at Park Royal in London.
2000	Somerfield abandons online shopping one year after its launch. It was selected as a complete warehouse-based solution to order picking.
2000	John Lewis Partnership buys a 40 per cent stake in LM Solutions.
2000	Asda launches an online grocery service with the name of Asda At Home Web. Previously, customers had to log on to the site to order a CD-ROM to be able to use the Asda At Home service.
2000	Waitrose Deliver online grocery service is launched as a home delivery service. This was previously an intranet service.
2001	Asda shuts two warehouses serving online shoppers and starts to fulfill orders from stores.
2001	Safeway trials a new internet ordering service called Collect.
2001	Webvan files for bankruptcy after losing US$700 million since its launch in 1999. It attracted US$1 billion in investment, but said declining orders and high operating costs made it impossible to continue.
2001	Safeway abandons its online shopping activities just nine months after their launch.
2002	According to Tesco.com chief executive John Browett, non-food represents a key growth driver
2002	Sainsbury reaffirms its commitment to using warehouses as well as stores.
2002	Sainsbury's online shopping service shuts its picking centre in Gorton, Manchester. Stores still offer the service; and it remains committed to using the hybrid model.
2002	Ocado is launched using the hub and spoke system.
2004	Sainsbury's invests millions of pounds in rolling out a new in-store picking strategy.
2004	Sainsbury's changes its fulfilment method and closes its warehouse in London. "*In the past two or three years our in-store picking operation has improved dramatically. We have improved speed, availability and substitutions. Taking all that into account, we believe that it is more cost-effective to use a in-store picking model.*" (The Grocer, 3 April 2004)

4.3.1 Peak of the IT boom and subsequent problems

As mentioned in the previous chapter, the number of online grocery services peaked in 2000 when 10 companies offered an online grocery service. Since 2000, the number of companies decreased as some retailers abandoned the online businesses. The retailers first started to face problems in 2000 and some of them abandoned the online business then. This coincides with the collapse of the dotcom boom, which began during spring 2000.

Somerfield became the first business to face problems, as the online business suffered a setback during summer 1999 when five members of their management staff left the company to set up Simply Organic. Simply

Organic was established later on in 1999 to offer organic products online. At first it operated by phone ordering from warehouses and shortly after that Internet ordering went live. Simply Organic worked from a 10,000 square feet warehouse in New Covent Garden Market in London. They offered a guaranteed next day delivery throughout the country with a 600 strong range of organic products. Slightly later, in June 2000, Somerfield abandoned the online business. Somerfield went online in early 1999, so their venture into the online world lasted approximately one year.

Even though Somerfield abandoned the online business already in 2000, the warehouse-based model was still seen by many industry experts as the most cost effective way to organise online businesses. However, all experts agreed that the warehouse model required high volumes of orders, which the market did not have. Somerfield's warehouses were able to handle up to 15,000 orders a week, but orders were not able to match the figures that the warehouses would have to handle to be economically sustainable.

Another retailer to give up the online business in 2000 was Budgens. Its endeavour in the online world did not last much longer than Somerfield's. Budgens' online service was launched in 1998. Like Somerfield, Budgens' business model had also been relying on depots. They used depots of Teleshop Services, which Budgens had acquired earlier for the online business. Budgens spent a lot of money on the online business, but saw no opportunity to compete with the bigger retailers, who had increased their investments in the online business. Instead Budgens decided to focus on their core business in local grocery stores.

Both Somerfield and Budgens suffered from the basic problem of warehouse-based business models, the high costs of setting up the business. The warehouses are costly to set up and would have to be able to handle and require high volumes of orders. However, the market did not have high volumes during 2000. Even the sales for Tesco were only around £237 million and they most probably covered the majority of the geographical market. Accordingly it is fairly easy to conclude that the smaller grocery retailers, Somerfield and Budgens, were too early with the warehouse-based business models. The scale of the market wasn't yet ready to support warehouses. However, some industry experts continued to argue that the online market represented a long-term investment for which benefits could be expected by 2003 or 2004 at the earliest.

Another early developer of online grocery retailing, Waitrose, decided in 1999 not to develop a comprehensive online service. Besides these Waitrose operated and extended Waitrose@work, which had been established a year earlier. Waitrose used their own store network to fulfil online orders.

During spring 2001 Waitrose went on to launch an online grocery home delivery service. Initially it worked from six stores. Although Waitrose had high hopes for extending the service rapidly to cover more stores. In autumn 2001, Waitrose saw the integration of three separate services, Waitrose Deliver, Waitrose@Work and Waitrose Direct, into an upgraded service: Waitrose.com. This was done to combine the three separate services under one brand. During 2002 and 2003 the Waitrose online service was extended to include 35 stores serving online customers.

Safeway became the second retailer after Waitrose to launch an online service in 2001. Safeway launched the service with a couple of trials and a full launch happened in April 2001. Orders were processed centrally and then sent to individual stores for collection. Designated staff picked up the products and the customers were able to collect them from a collection point in store. The purchases were paid for during the collection, rather than online, which was the norm for other services.

After Waitrose and Safeway, the third online grocery retail service to be launched during 2001 was a website gourmetsupermarket.co.uk developed by Innovative Foods. The service was launched in July 2001 two months after Safeway and four months after Waitrose. Gourmetsupermaket.co.uk offered 6,500 products, within 72 hours of the order, from a warehouse through the national delivery service operated by ParcelForce.

4.3.2 Alternative technological solutions

Alongside the troubles of online grocery retailing, the development of alternative technological solutions, mainly based on interactive TV and WAP technologies, continued during early 2000 when Asda also indicated that it would be interested in launching a product range via interactive TV in the Open channel. Sainsbury's announced its joint venture with Carlton Communications in May 2000, but the service was officially launched during spring 2001. Iceland went live with interactive TV in August 2000, even though the company had plans for a launch in 1999. June 2000 saw Tesco ruling out digital interactive TV as a medium for its store-based home shopping service.

WAP became another technology to be developed alongside the development of online grocery retailing. WAP was based on mobile phones and allowed users to connect to the Internet. Waitrose and Sainsbury's were active in developing WAP services. In May 2000, Sainsbury's stressed the importance of harnessing the opportunities provided by the emergence of new selling channels, something that has become a very important issue in the current decade. The new channels for Sainsbury's were interactive TV and mobile phones using WAP technology. In June Waitrose became the first grocery retailer to launch a WAP service.

Despite its scepticism towards interactive TV and WAP services, Tesco launched a website called Tesco Access that was accessible from a pocket PC and a smartphone (The Grocer, 21.7.2001): "*Since the launch of Tesco Access, our customers can shop any time, any place on any device, whether through the internet, digital TV, or pocket PCs*."

An additional mobile service was introduced in November 2000 when Iceland went on to launch ShoppingPad, a device that could be held in the hand. It had an 8 inch screen, a touch screen display and five buttons, and it plugged directly into a standard domestic telephone socket.

The period of late 2000 was a time when the future or interactive TV was seen as very positive. Some industry experts thought that the success of interactive TV would really pick up during 2001 and some even went on to predict that interactive TV would pass the Internet as a sales channel during 2004. However, in June 2001, some experts started asking why retailers were still launching interactive TV services, even though there Iceland and Tesco had had bad experiences and sales were not picking up. Iceland complained about technological incompatibility problems, whereas Tesco was not satisfied with the high costs associated with interactive TV. The arguments about interactive TV's potential were based on the fact that TV was familiar to most people and more homes had access to interactive TV than to the Internet.

The prospects for the future of interactive TV remained open until 2003, which is when the last retailers using interactive TV, Asda and Woolworths, abandoned it and it finally became clear that sales through interactive TV would not pick up. This was mainly blamed on the difficulty of using interactive TV for ordering groceries at home. Roughly, 40 % of the customers had the possibility to order with interactive TV, but did not use it. Of the two technologies, the Internet obviously succeeded as the way for home shopping. The usability of the Internet as a selling medium had developed more than that of interactive TV; online sales also passed catalogue sales in 2005.

4.3.3 Initial interest in non-food

During the same time as the experimentation with alternative technologies, Tesco started to increase its product assortment. Product assortment and the proliferation of non-food weren't noticeable in the first phase.

During the late 1990s, Tesco started carrying out a strategy of increasing the amount of non-food items they sold online. This was initiated in foreign markets where Tesco operated hypermarkets, which traditionally stored more non-food items than superstores in UK. The strategy was highlighted by the opening of a Tesco Extra store in Peterborough in 1999 as the store

stocked a large number of non-food items. Tesco was rumoured to have a strategy of having equal sales from food and non-food during the next decade. This was to have a significant effect on the online grocery business during later years.

A new move in Tesco's strategy to increase the non-food assortment online was a joint venture with iVillage, a US-based women's Internet portal. Tesco struck the strategic partnership with iVillage in 2000, who were to provide content such as news, information, chatrooms and links to the Tesco website about topics including parenting, fitness and beauty. Tesco would provide products for the site encouraging more women to shop at Tesco.com. Tesco told IVillage of its plan to forge other alliances to develop the offering of the website. In 2003 Tesco bought iVillage.co.uk from the iVillage Inc, but in 2005 the transaction was reversed as iVillage Inc bought the UK namesake of iVillage.co.uk back from Tesco.

Tesco's advance in non-food was further developed after the launch of the partnership with iVillage in autumn 2000 when Tesco entered the electrical sector to challenge specialist electronics retailers. Tesco offered more than 1,000 household products ranging from dishwashers to DVD players. Tesco.com CEO John Browett emphasised Tesco's advantage against specialist retailers to be the fact that Tesco had a special arrangement with a home delivery partner. Additionally, Tesco didn't have a physical network of stores to support. Tesco continued its challenge specialist electronic retailers by offering more products in autumn 2001. Tesco went on to declare that they had a more comprehensive range than specialists like Dixons or Comet. Tesco saw electrical goods as offering as a key area for the growth of the non-food part of the online business. In the meantime Tesco also opened a help line to offer assistance to customers with non-food products and developed its non-food offering to include parenting and childcare products. With the launch of You and Your Child, Tesco targeted specialist rivals Boots and Mothercare. You and Your Child was developed based on experiences from iVillage.

During the early years of the new century, non-food started to become more important for the online operations of grocery retailers. During spring 2001, Sainsbury's promised to launch a non-food range in the near future. Tesco restated the importance of non-food as an important growth driver in January 2002. At the same time Asda vowed to add non-food items to the range offered online and launched a website, asdahealth.co.uk, offering information on health and lifestyle related issues. In July 2002 Asda relaunched their website doubling the range on offer to 12,000 items and promising an aggressive roll-out of the service in the future. However, the non-food range had yet to be introduced.

4.3.4 Launch of Ocado

Ocado was the last online grocery retail service to be established during the early years of the online grocery retail market because, after Ocado, no other retailers entered the market until 2010. Ocado was founded in April 2000 as Last Mile Solutions (LM Solutions) by three former Goldman Sachs bankers Tim Steiner, Jason Gissing and Jonathan Faiman. In July 2000, the department store chain John Lewis Partnership (parent company of Waitrose) purchased a 40% stake in Ocado. Initially some experts saw Ocado as an online arm of Waitrose. Despite this, Waitrose had for some time been developing its own online service and even launched it before Ocado was launched. On the other hand, Ocado and Waitrose had an agreement that Waitrose would not enter London area with its online service (except for a handful of stores). The London area represented the primary trade area for Ocado and it was difficult to serve efficiently using store-based picking, which Waitrose used. Both Ocado and Waitrose did comment on the relationship being complementary rather than competitive. Ocado went on to launch in January 2002 in the Hemel Hampstead area around its warehouse. The initial product range consisted of 10,000 items.

Ocado's business model differed from other online grocery retailers, because it operated only on online and did not have a physical network of stores. Furthermore, Ocado sold only Waitrose products.

Five months after their launch in the Hemel Hampstead area in January 2002, Ocado stated that they had solved the problems of online home shopping. The accuracy of delivery times for Ocado was 99 % and the substitution rate was less than 2 %. According to Ocado the substitution rates of their rivals were around 15 % to 20 %. In September 2002 Ocado extended their service to London covering over 1.8 million households in the top half of M25 (the ring road around London). They also had plans to soon roll out to the other half.

During late 2002 Ocado opened its first spoke in Weybridge, Surrey. That was followed by further ones in Aylesford, Kent, and Rugby, Warwickshire, during autumn 2003. Between 2004 and 2009, the network of spokes was extended to cover Manchester, Southampton, Leeds and White City, London. Later on, in the third phase, in October 2010, Ocado further extended the network with a spoke in Bristol. In February 2011 Ocado announced that they would open a new spoke in Wimbledon, London to take capacity from some of the existing spokes in the London region. Lastly, Ocado opened a second warehouse in Oxfordshire in November 2011.

Ocado faced problems during late 2003 as their pre-tax losses increased by nearly £6 million from the previous year to £39.1 million in 2002. Sales

growth had been 300 % according to Ocado and it planned to double turnover during the next year. Ocado claimed it had orders worth £1.5 million per week by the end of 2003. During 2004 Ocado also promised to break even. In comparison, Tesco had managed a turnover of £447 million per year with a profit of £12.2 million. Around the same time in November 2003 Ocado had other problems as two managing directors left the company only one year after its launch. First, Roger Whiteside left and two weeks later Nigel Robertson departed.

4.3.5 Changes in the business models

Alongside the developments in technological solutions and product ranges offered, the business models used for the commercialisation of the online technologies has been a significant issue, especially during the first two phases of industry transformation. As mentioned in the previous chapter on the first phase, Sainsbury's and Asda, alongside many industry experts, continued to think that Tesco's model would eventually prove to be wrong. Sainsbury's and Asda were both investing heavily in large warehouses to serve online shopping. Tesco CEO Terry Leahy commented on the future direction of the Tesco model (The Grocer, 15.4.2000), "*If it's more economic to add warehouses further down the line that's fine because consumers don't care. But at the moment we will use our store base to grow the business*".

During 2001 Sainsbury's restated their commitment to a hybrid model. The model included two automated warehouses. The bigger warehouse in London was able to handle 18,000 orders a week and a smaller one in Manchester handled 5,000 orders a week. Sainsbury's also developed their in-store picking processes so that efficiency was increased by 25 % during the year.

One of the role models for warehouse-based business models, Webvan, started to encounter problems in 2001 and had to file for bankruptcy after losing $700 million since its launch in 1999. Webvan had managed to attract $1 billion in investments, but high operating costs as well as declining orders finally forced Webvan to close.

Following Webvan's, example Safeway discontinued its online service only some months after its launch. The service was also based on the warehouse model and it never really got started. Thus, Safeway wasn't willing to invest the necessary resources to improve its online business. Instead, Safeway decided to focus on its core business, just like Somerfield and Budgens the previous year. Common to each of the three businesses was the fact that they were small players in the grocery retail market in the UK and launched warehouse-based online services. The companies decided to abandon the online channel as sales did not pick up as rapidly as

expected and the overall market attitude towards online retailing started to change after the burst of the dotcom boom.

During autumn 2001, Asda also started to question the purely warehouse-based model and adopted a hybrid model and began to follow the path laid out by Sainsbury's. Asda still continued to use its existing warehouses in Croydon and Watford, but also started picking orders from stores. During late 2001, the service was extended outside the M25 (greater London area) with plans to extend to Scotland, but January 2002 saw a change in the Asda model of online grocery retailing. The company closed its two existing warehouses for online operations and cancelled plans to build a further 11 across the nation. In the new model, from April 2002, all orders were to be processed from the stores. Asda also reported plans to soon introduce non-food items to the product range offered.

At the same time in spring 2002, Tesco.com announced that its service was making a profit. During the previous year, sales growth was more than 50 %, reaching £356 million with over one million registered users and 85,000 orders per week. Early in 2002, Tesco was one of the few online retailers to become profitable, joining online bank Egg.com and online retailer Amazon. Being able to become profitable proved that Tesco's model for developing online grocery retailing with small investments first and then extending the service – as demand picked up – had been successful.

In trying to follow Tesco's success, Asda, Sainsbury's and Waitrose halted the roll out of their online businesses. Each of them explained this as their need to focus on improving the service level in their existing operations. The decision by Asda was interesting because only half-a-year earlier they had talked about an aggressive roll out of the online business. Asda and Sainsbury's went on to continue the rollout of online services during autumn 2003.

After Asda's decision to close its warehouses and Tesco.com's profitability, some industry experts started to think that using warehouses might not be an optimal model for the online grocery businesses. Ocado and Sainsbury's remained the only grocery retailers to use warehouses for the online business. Ocado relied solely on warehouses and Sainsbury's used a hybrid model of warehouses and stores. After being questioned about the use of warehouses, Sainsbury's reasserted their commitment to the hybrid model because they believed it was able to offer flexibility and a mixture of solutions, especially in the London area where stores had problems in fulfilling online orders.

After reaffirming their commitment to the hybrid model in January 2002, Sainsbury's closed their warehouse in Manchester in May 2002. This was made possible as the stores became able to handle online orders. However,

Sainsbury's again stressed their commitment to the hybrid model using stores and warehouses where it was needed, namely in London.

The other grocery retailer to operate warehouses for online orders, Sainsbury's, started major investments in a new in-store picking strategy for online operations. By implementing a zone-picking strategy, store staff were able to become specialists in certain product categories and find products quicker. The change of strategy marked a major change in the search for the best business model. Sainsbury's was the last grocery retailer with a store network to still use warehouses for the fulfilment of online orders. By investing in an in-store picking strategy, Sainsbury's indicated that the model Tesco had been using from the start was the most economically sustainable. Two months later, in April 2004, Sainsbury's announced that they were closing their last warehouse for online orders at Park Royal, London.

The main reason for Sainsbury's move to using only stores was the fact that the in-store picking operations had improved positively. As the substitutions, speed of the service and availability of delivery slots had improved, Sainsbury's saw in-store picking as more cost-effective than a warehouse-based or hybrid model. Sainsbury's stated that its Sainsbury's to You online service had managed to break even in March 2004.

The period from 2000 to 2004 can be characterised by a couple of activities in the market. The first of which was the change in the opinions of the companies and industry experts that the store-based model would become the dominant business model for the fulfilment of online orders. The era of warehouses for the fulfilment of online orders can be said to have ended during spring 2004 as Sainsbury's closed their warehouse at Park Royal in London. Four years earlier Park Royal warehouse had opened as the biggest of its kind in Europe. During that time the general conception in the industry was that Tesco's model of fulfilling orders from stores was not economically sustainable in the long run. Gradually over the four years, Tesco's model won the backing of the industry and after Sainsbury's only Ocado used a warehouse to fulfil online orders.

The second important feature during the second period was the end of the use of interactive TV. The developments in the speed and amount of online connections at homes enabled the dominance of online services for home shopping services. Lastly, the second period in the chronology saw increasing activity in the development of the product assortment offered online. Tesco led this development and continued to broaden its product assortment in the third period. The next chapter explores how events in the transformation of the industry unfolded during the third period from 2005 to 2011.

4.4 Convergence of the business models and the growth of non-food 2005-2011.

This chapter reviews how the market developed during the final period analysed. The most important events were related to changes in the business models of the companies and in the product assortments offered through the services. Also the technological development enabled retailers to offer new services to customers, especially through the mobile channel. The development of mobile services has initiated a new era of multichannel retailing in online grocery retailing. This has allowed retailers to start integrating the different channels of grocery retailing into a combined, multichannel service. The key events are summarised in Table 8.

Table 8. Key events in the third phase

Year	Key event
2004	Ocado expands into the north of England with the launch of a satellite depot in Manchester.
2004	Tesco launches Tesco Jersey, offering VAT-free CDs and DVDs.
2005	Tesco prepares for the Christmas rush with the opening of a 750,000 sq ft distribution centre dedicated to its growing non-food division.
2006	First Tesco.com dot.com store opened in Croydon, London.
2006	Food Ferry abandons the industry that it helped to pioneer.
2006	Launch of Tesco Direct.
2006	Launch of a price comparison website mysupermarket.co.uk.
2008	Ocado signs a new five-year contract with Waitrose.
2009	Tesco Direct allows customers to post ratings and reviews of products on its site.
2009	Waitrose launches social networking site Mywaitrose.com to drive interactivity with its customers.
2009	Waitrose scraps delivery charges on all orders above £50.
2009	Ocado launches its on the Go iPhone application.
2009	Asda's first dotcom store opens in Morley close to Leeds.
2010	Tesco enters social media with Twitter and Facebook accounts for Clothing at Tesco.
2010	Ocado signs a new 10-year partnership with Waitrose.
2010	Amazon launches an online grocery service in UK with 22,000 grocery items available.
2010	Morrisons unveils its plans to enter online grocery retailing.
2011	John Lewis Partnership's pension trust sells its remaining 10% stake in Ocado for £152m.
2011	Morrisons' acquires online specialist Kiddicare and a 10% stake in online US grocer FreshDirect. CEO Dalton Philips announces that the retailer will launch an online shopping operation within two years.

4.4.1 Rise of non-food – the launch of Tesco Direct

An aspect of the second phase that continues in this phase is the extension of product categories. This continued as Sainsbury's launched its non-food product assortment in March 2004 to become the second grocery retailer to offer non-food items online. Some industry experts felt that Sainsbury's arrival was a bit late because Tesco had already operated in the market for more than three years.

A few months after the launch of Sainsbury's' non-food offer, the new chief executive Justin King halted the expansion of the online service. The focus for the company was turned to improving customer service and existing operations in the areas it already served. Later on, in autumn 2004, Sainsbury's continued the extension of its online service. Sainsbury's introduced one-hour delivery slots as the first grocery retailer with a physical store network. In addition to Sainsbury's, Ocado (no physical stores) offered one-hour delivery slots.

At the same time as Sainsbury's launch of a non-food range, Asda also signalled that it was ramping up its non-food online product range as well as the coverage of its online service. The number of lines available from the website was doubled and the coverage of the service extended, in autumn 2004, to cover 53 stores. This took Asda's geographically coverage to almost half of the UK (40%).

Tesco continued to develop and extend its non-food service by launching Tesco Jersey in December 2004. It sold products from the Jersey Islands and allowed Tesco to sell CDs and DVDs VAT-free. Soon after the launch, the Forum of Private Business (FPB) claimed that Tesco Jersey endangered the future of independent music shops. Tesco replied that other major online music retailers, like Amazon, already operated from the Jersey Islands. In May 2005, a few months after Tesco, Asda also launched a VAT-free range of CDs and DVDs from a Jersey-based site. Soon after that, in June, Sainsbury's retaliated with a VAT-free product range. However, Sainsbury's offer was a promotion, which was available in-store and online. Thus, Sainsbury's was paying the VAT on the products sold.

In June 2005, Asda tried to reduce Tesco's dominance in the non-food online service by giving out offers of free delivery for non-food. Sainsbury's also tried to challenge Tesco's dominance in online groceries by relaunching its online shopping service. The site was made more user-friendly and quicker. Also the name Sainsbury's To You was scrapped and replaced by Sainsburys.co.uk. The new name was seen to be less confusing for customers. Tesco retaliated by also offering free home delivery for non-food.

Around the same time Tesco increased its focus on non-food by recruiting finance director Steve Robinson from Argos, a general merchandiser that was seen as strong in the catalogue and online non-food business. Mr Robinson was recruited to spearhead the development of online non-food in Tesco and challenge Argos. The objective for Tesco was to be as strong in general merchandise as it was in food, which was rumoured to be an objective already in the late 1990s. Tesco was also considering launching a fashion range online, traditionally a challenging area of online retailing.

The first proof for the launch of a non-food catalogue was seen when Tesco integrated its food and non-food buying teams in July 2006. This was done to create a harmonised buying team for products sold through the catalogue and online service. The service was called Tesco Direct.

Tesco Direct was launched in September 2006. Tesco had invested £35 million in the new online and catalogue service offering 8,000 non-food items online and 2,000 items through the catalogue. Tesco expected the online service to be the main source of orders, even though the catalogue was sent to two million customers. The launch of Tesco Direct represented a major change in the way Tesco operated its online business. A year earlier Tesco improved the way it fulfilled online orders when it incorporated warehouses and dotcom-stores into its business model. Tesco Direct was a major initiative that Tesco had prepared for years in order to challenge non-food catalogue retailers like Argos at their own business.

During spring 2007 Tesco had been busy developing the coverage of Tesco Direct. It aimed to increase the amount of products available by 25 % to 10,000 products. Also the amount of stores offering catalogues was increased to be able to compete with retailers like Argos and Amazon.

Tesco launched another non-food service in autumn 2007 when they became the first grocery retailer in the UK to sell clothing online. Initially, Tesco offered women's clothing online, but in early 2008 they announced a range of menswear clothing would be sold online. Tesco was encouraged by positive results from the trials with women's clothing. Yet, due to a performance review, Tesco removed the online clothing offers in March 2008. Tesco reviewed the results and came back with an online fashion assortment in 2009. Asda launched their George fashion range online in February 2008.

Tesco Direct's first competitor was Asda Direct, which was launched in October 2008 with 10,000 products. In comparison, Tesco Direct still offered onöy 7,500 products, but the Argos catalogue had 18,000 products. The launch was preceded by a trial called "Click and Collect" in four stores in Northern England during autumn 2007. Customers were able to order toy and electrical items online and collect them from stores. Sainsbury's on the other hand stated that the size of its stores was holding back their launch of its non-food offer. Chief executive Justin King accepted that the grocer had yet to launch fashion online because of size limits at stores and the in-store picking model.

During spring 2008 Tesco branched into another new area with the launch of its online music download store. Tesco wanted to go head-to-head with Apple's iTunes music store and it became the first British grocery retailer to enter the digital music market. Tesco had been developing the

service since 2003.

During spring 2011, Tesco continued to develop its online range as it acquired an 80 % stake in online movie streaming service, Blinkbox. Tesco was also planning to launch an online fashion marketplace in late 2011 or early 2012, selling mainstream fashion brands via its website. Tesco admitted that the grocery business might seem frightening for some of the fashion brands but likened the development of the market place to the growth of non-food (Retail Week 13.5.2011), "*In electricals, it took some time to build up relationships with brands such as Sony and Apple but we've done that now and they are big sellers for us. It might seem different in clothing but this is what we do in our business in every category*".

During autumn 2011 Asda announced it was going to challenge entertainment websites like Amazon or Pay.com with the launch of an entertainment product range on its Asda Direct website. This followed Tesco's acquisition of the movie streaming service Blinkbox during spring 2011; Asda plans to launch its full entertainment range via a new entertainment store in the Asda Direct site.

4.4.2 Re-emergence of the hybrid model – the dotcom stores

In autumn 2006 Tesco opened their first version of warehouses for online business in Croydon, London (the same place where Asda opened its first warehouse in 1999). The first warehouse was constructed for the rapidly growing non-food division and the new Tesco Direct service. Besides the non-food warehouse, Tesco adopted a strategy of using so called dotcom or dark stores. These are like normal stores with the exception that customers are not allowed to use them. The dotcom stores serve online customers and complement the service provided by the store network. This resembles the hybrid model initiated earlier by Sainsbury's because the basic idea in both is to use the store network as the main source for online deliveries, which is then complemented by warehouses. Sainsbury's abandoned the hybrid model only two years before the launch of Tesco's dark stores. This time the difference was that the scale of the business (especially for Tesco) was considerably bigger. The development of hybrid models was emphasised as Tesco opened a second dotcom store in Aylesford in October 2008 and a third one in Enfield, London, in early 2011.

After the launch of Tesco Direct and the opening of the dotcom store, the online grocery market can be said to have entered a new stage in its development. Before the dotcom stores, it seemed that the market had reached a dominant business model with the in-store picking mode and also because Sainsbury's had turned to fulfilling its online orders solely from its stores. After Tesco altered their business model and launched the new non-food service, other grocery retailers followed suit.

Inspired by Tesco's dotcom stores, Asda transformed the way it fulfilled online orders. Three years after the opening of Tesco's dotcom store in Croydon, Asda planned to build a warehouse or "virtual store" for online order picking. It was explained as a "halfway house" between Ocado's purely warehouse model and the in-store picking model. Similarly to Tesco's dotcom-stores, Asda warehouses would stock the full range of products and be closed to the public. This enabled the staff to pick online orders more efficiently and increase the slots available for home delivery. The first picking centre for online orders was eventually opened in Morley, Leeds in August 2009. Half a year later, the second picking centre was opened in Enfield, London. Asda also announced it would extend the amount of non-food lines it offered online. Simultaneously with Asda's first online picking centre, Sainsbury's launched its online non-food assortment. Initially the service stocked 4,500 products with plans to increase that to 8,000 products in the near future.

The Waitrose Deliver brand was first rebranded as Waitrose.com during the relaunch of the site in spring 2011. A more significant change came when Waitrose announced it was to open a dark store in Acton, west London. Dark stores are similar to the dotcom stores that Tesco initiated five years ago. The construction of a dark store was seen as a signal that Waitrose was seriously going to extend its operations in London, where it previously was not allowed to operate due to its collaboration with Ocado. The London region represented the core of Ocado's operations. At the time of writing sales represented about 3% to 4% of Waitrose's total sales.

4.4.3 Introduction of new mobile services

The development of alternative services was slowed down when interactive TV and WAP services were abandoned by retailers. However, mobile services were to emerge again as a channel for retailers to offer services to customers. The new emergence of mobile services was made possible by the release of Apple's iPhone. Mobile services had been developed in the early 2000s in the form of early mobile sites and WAP services. However, WAP technology and other solutions were not mature enough to deliver sufficient value to customers. After the WAP services, mobile phone manufacturers continued to develop phones, while browsing the internet was made easier through continuous advances in technology. In autumn 2006 Ocado launched a new mobile website for customers on the move. "*We are constantly innovating to make our service more appealing and had requests to develop a service customers can use on PDAs. We built this to meet that demand*" (The Grocer, 28.10.2006).

The iPhone was released in the UK in November 2007. It still took some time for retailers to develop services for the new smart phone. Ocado was

the first to develop an iPhone application. Ocado's On the Go iPhone application was launched in July 2009. Two months later Tesco launched its own application. Tesco's application also allowed customers to order groceries via the smart phone. A couple of weeks after the launch of Tesco's application, Ocado reported that its iPhone application accounted for 2% of sales. Given that the application had been available for only two months, the amount of sales through the new channel was notable.

In October 2009 Tesco went on to launch another app that enabled customers to find the closest store and locate the products on the shelves of the store. A year later in autumn 2010, Tesco added a barcode scanner to the iPhone app. The scanner lets customers scan products and add them to the shopping basket. Soon after the launch of the app both Tesco and Waitrose announced that they had developed optimised versions of their websites. This was done to enable easier navigation for mobile devices. Waitrose also launched its iPhone app, however it did not have transactional possibilities like the previous apps from Tesco and Ocado. The growing interest in mobile services and apps gave way to a larger change in retailing, which was referred to as multichannel retailing; the integration of the different channels used by retailers to connect to customers.

4.4.4 Emergence of interactive services

The rise of interactivity in the operations of grocery retailers is one major issue in the development of online grocery retailing. The use of the Internet as a way to interact with customers grew during the last years of the industry's transformation. Spring 2009 can be seen as the start of the rise in interactivity with customers. In January 2009, Waitrose launched an online interactive magazine to attract new customers and Waitrose launched a social networking site Mywaitrose.com a month later. The purpose of the site is to create more interaction with customers and give them more information about what is happening behind the scenes. The site also included tips from staff and the possibility to exchange ideas with experts and special offers. Asda followed Waitrose by launching its social networking site during autumn 2009. In March 2009, an Asda spokeswoman told Retail Week (6.3.2009) that, "*The next stage will be to interact with our customers in real time, and we're working on the best way to have easy discussions and respond to our customers immediately*".

Also in spring 2009, Tesco provided another element of interactivity when it gave customers the possibility to review and post ratings of products on its site. Ocado followed the example set by Tesco in early 2010.

Tesco went on to launch Twitter and Facebook accounts for Clothing at Tesco in 2010. Around the same time Tesco also launched a Facebook

application, My Shopping Assistant. It allows customers to add items to a shopping list and plan meals while using Facebook. The application was developed by a third party developer. Tesco developed its social media presence further in spring 2011, when it soft-launched a new Facebook page. The purpose of the site was to connect better with the customers and it was designed to handle customer service queries as well as alert customers to exclusive offers. Additionally the site had an online forum where customers were encouraged to leave feedback for Tesco; the company is seen to respond quickly to comments on the site. The site was seen to be the first time Tesco had developed a centralised presence within a social media site. Tesco's Head of Social Strategy for Clothing, Zoe McErlean, saw social media as a key part of improving Tesco's reputation as a credible fashion retailer. In February 2011 Tesco announced that its clothing division had generated £1.5 million in sales through social media in the past year.

The decline in the number of retailers operating online services from 2002 to 2009 ended in 2010 when two US retailers announced their launches of online grocery services in the UK. Morrisons also announced, after much speculation, that they would launch an online service during 2012.

4.4.5 Changes in the network of actors – new entries and collaboration activities

In early 2006 one the pioneers of online grocery retailing, The Food Ferry Co, abandoned the business. Food Ferry was one of the first grocery retailers to offer an online service. Initially the service delivered to offices as early as in 1996 and to homes in 1999. However, when the multiple grocery retailers became seriously interested in online operations, after the year 2000, Food Ferry became marginalised and lost too much business. The scale of the operations of multiple grocery retailers as well as Ocado eventually forced Food Ferry out of the business. Food Ferry also stated that the costs of running the business had become too high due to the Congestion Charge in London.

The establishment of new online grocery services ended with the launch of Ocado in 2002. The next retailer would enter the market in 2010. In October 2006, over four years later, the market saw a new kind of entrant, as price competition website mysupermarket.co.uk was launched. It was not a retailer, but a service provider providing market transparency. It claimed to be the first independent website that allowed customers to compare prices at Tesco, Asda, Sainsbury's and Ocado. The website received a great deal of interest when it began operating and had more than 120,000 visitors during its first five days. During spring 2007, the site

added the possibility for customers to reserve delivery slots from the four biggest online grocery retailers.

In 2005 M&S had indicated that they might be launching an online grocery service but they shelved these plans in late 2006. M&S believed that it would not be able to make money online, even though other retailers were very active in developing their online presence. However, Tesco had been the only online grocery retailer to make a notable profit (Sainbury's had also claimed that they had broken even in 2004). This decision was a major change in the way M&S saw online grocery retailing. In 2005 chief executive Stuart Rose told Evening Standard (The Grocer, 11.11.2006), "*It's on our radar screen. It's the sort of service customers expect from Marks & Spencer in the 21st century*".

The collaboration between Ocado and Waitrose, which had been established during the launch of Ocado, was renewed as John Lewis Partnership and Ocado signed a new five-year deal in November 2008. The agreement was seen as a boost for Ocado and as giving it long-term certainty of supply. The deal also had a clause that would limit Waitrose's own home delivery service's expansion inside the M25. This was, because that was the biggest market for Ocado. Both parties saw that the new deal enabled Ocado and Waitrose Deliver to complement rather than compete with each other. At the same time, John Lewis Partnership moved its stake in Ocado to the John Lewis Partnership pension fund. This was interpreted in the market as a sign of decreasing interest in Ocado.

Shortly after announcing the new deal with John Lewis, Ocado introduced plans to develop a discounter range, Everyday. This was seen as a major step to challenging Tesco. Meanwhile Ocado also received notable investments. Procter & Gamble bought a 1% stake in Ocado and the Rausing family who had made their fortune with Tetra Pak, invested £13 million in Ocado. A year later Ocado received a third high profile investment as the former US Vice President Al Gore's investment company invested £15 million in Ocado.

In May 2010 Ocado reached an important milestone, as they delivered 100,000 orders a week for the first time since their launch in 2002. Tesco had been reported as delivering 475,000 orders per week in 2009. However, Sainsbury's announced in May 2011 that it was operating a fairly similar service with 130,000 orders per week. Ocado saw this as a proof that their business model was working. On the other hand, several industry experts criticised Ocado for not being able to become profitable after eight years of operation.

Another important milestone for Ocado in May 2010 was a new 10-year deal with John Lewis Partnership (the parent company of Waitrose). The

deal was completed several years before the existing five years deal, made in 2008, was to expire. The new contract included some terms that were not in the previous deals. Firstly, Waitrose was now able to compete directly with Ocado. The previous agreements had prevented Waitrose from offering its service inside the greater London area. Secondly, the agreement was an exclusive agreement preventing Ocado from making a similar deal with a competitor like Marks & Spencer. In fact, some industry experts saw Marks & Spencer as another logical partner for Ocado.

The deal between Ocado and John Lewis Partnership was also seen as important for Ocado's plans to float its business. The deal would alleviate fears about the viability of Ocado's Initial Public Offering (IPO). Some analysts felt that the fact that Ocado had not been able to make any profit so far was a problem for the flotation. Other analysts preferred to judge Ocado on a long-term growth basis. Also the technology in the high-tech distribution centre was seen as an advantage in the future. Ocado moved a step closer to the flotation with the appointment of five further banks in June 2010 when it also finally confirmed its intention to float on the London Stock Exchange. Ocado did manage to go through with its IPO in December 2010. However, they had to reduce the share price to 180 pence from 200 pence. The City labelled the original price as too ambitious. One major argument had been the inability to make a profit. In February 2011, Ocado's share price fell as John Lewis's pension trust sold its remaining 10% stake.

The new wave of entries to the online grocery market began in 2010 as two American retailers made their debut in the online grocery business in the UK. Firstly, Whole Foods launched an online grocery service in 2010. Whole Foods had entered the UK already in 2007 with a store in London and an online cookery show. The online service in 2010 allowed customers across the UK to order natural and organic products.

Amazon entered the online grocery retail market in UK in July 2010. The online giant launched a range of 22,000 grocery items, a wider assortment than Ocado's. Amazon had launched the online grocery service in US already in 2007, but this online grocery service was dissimilar from its other services because it was mainly aimed for bulkier orders and did not have a single delivery service, which could deliver all orders at once.

Besides the American retailers, autumn 2010 also saw the first UK grocery retailer since Ocado to enter the online business as Morrisons introduced its plans to launch an online range. Ronan Hegarty of The Grocer (11.9.2010) saw the change as the "*biggest change in strategy since taking over Safeway in 2004 if not since 1958 when it moved from market stall to town-centre store*". Morrisons wanted to start exploring different

options for the fulfilment of customer orders in the online business, but CEO Dalton Philips presented a clear notion of how a profitable online business should be conducted, "*The most profitable growth is the growth that comes through your existing network*". Morrisons also thought there was a second-mover advantage in entering the market at this stage and that most of the rivals were not making money from the online grocery business.

For Morrisons the journey to become an online grocery retailer had been a long one. In September 2006 the company confirmed that it is considering the Internet as a channel to sell groceries (The Grocer, 23.9.2006), "*We are looking at that and we will deliver a view on it in March*". At the same time Morrisons tested an interactive version of its weekly Best Buys leaflet. This was seen as a move towards a bigger online range, even though Morrisons said that it didn't have a plan to build an online grocery store. The Best Buys online trial was only a way of seeing if Morrisons' customer base valued online offers. "*This is a trial to see if our customers find it of value. We will evaluate its success before deciding if it will become a regular feature*" (The Grocer, 9.9.2006).

In March 2007 Morrisons' CEO Marc Bolland told the media that the company didn't have any further plans to look at the online grocery business. A lack of profitability in the online grocery business was a major problem for Morrisons and the company said that they wanted to further investigate the issue. Some analysts thought that Morrisons had already missed the boat by not having an online store. About half a year later Morrisons relaunched its web site and announced a three year plan to improve its online range. Online was still used mostly as a communication channel, rather than as a medium for selling. However, Morrisons' customer research had shown that customers enjoyed the store experience and the site aimed to extend that experience online.

Almost two years later Morrisons was said to be developing a strategy for an online grocery store. CEO Marc Bolland re-emphasised the need to find the correct business model before launching the online product range, "*It is not a matter of time, it is a matter of having the right model and offer*" (The Grocer, 23.9.2006). Industry experts then seemed to become more positive towards Morrisons chances of developing a successful online offer, "*The advantages of leaving it so late is that the technology is now cheaper, and there are more experienced people*" (The Grocer, 6.6.2009). However, two months later CEO Marc Bolland left Morrisons to join Marks & Spencer. Bolland was replaced by Dalton Phillips who was seen as a surprising choice by many industry experts. Mr Phillips joined Morrisons from Canadian retailer Loblaw's.

Morrisons development of online grocery offer was advanced in February 2011 as the supermarket group acquired online specialist Kiddicare. With this acquisition Morrisons was able to acquire technology for the online shopping service as well as get people on board with long experience of the online business. A month after the Kiddicare acquisition, Morrisons continued to invest in online expertise as it purchased a 10 % stake in US online grocer FreshDirect. Morrisons planned to learn from FreshDirect how to operate an online grocery business and thus be able to circulate the problems associated with the online grocery business. Morrisons finance director Richard Pennycook said (Retail Week, 18.3.2011), "*FreshDirect has had a long journey to profitability, and has the scars on its back. We can leapfrog that pain*". Morrisons CEO Dalton Phillips also announced that Morrisons was to launch an online grocery shopping service within two years. This was further backed up by the recruitment of Apple's worldwide strategy and customer experience director Simon Thompson.

Spring 2011 saw four high profile changes in the managerial positions in UK grocery retailing. Firstly, one important period in Tesco's history ended as Sir Terry Leahy retired from the company after being CEO for 14 years. Sir Terry Leahy's influence on the development and success of Tesco.com has been widely acknowledged. He was succeeded by Philip Clarke. Secondly, Sainsbury's had persuaded Google's UK chief Matt Brittin to join the board of Sainsbury's. Mr Brittin had been voted "Most Influential Person in the Digital World" by Wired UK in 2010. Another significant managerial change for Tesco was the announcement by Marks & Spencer that they had persuaded Laura Wedy-Gery, CEO of Tesco.com, to join M&S. Laura Wade-Gery was another CEO from Tesco's online businesses to move away from the company. Before her, John Browett (CEO of Tesco.com) and Steve Robinson (CEO of Tesco Direct) had left Tesco. This move was also seen as a sign that Marks & Spencer was taking the online business seriously. However, the CEO of M&S, previously at Morrisons, was known to be sceptical about the profitability of selling groceries online. Per Bank replaced Laura Wade-Gery at Tesco. He said that Tesco would be increasing its non-food assortment both in store and even more dramatically online. A third managerial change happened in March 2011 as Ocado announced that it had poached Tesco's multichannel development director Simon Belsham. The move was seen as a serious move to diversify Ocado's non-food assortment.

4.4.6 Rise of multichannel retailing

The years 2009 and 2010 were characterised by the launches of apps for smart phones, while 2011 was about integrating mobile services and the mobile selling channel with other channels. This view of multichannel

retailing was emphasised during 2011. Multichannel retailing was not a new phenomenon, it had been discussed already in the early 2000s when interactive TV and WAP services were developed alongside online and physical channels.

In August 2010 Tesco trialled a new concept for collecting online orders, Click and Collect, in two of its Tesco Extra stores (Baldock and Romford). The service allowed customers to order their shopping from Tesco.com and pick up the products from a delivery van parked in the store parking area. The cost for Click and Collect was £2 compared to the minimum home delivery fee of £3. The service was part of Tesco's strategy to grow its multichannel operations and offer customers new ways to shop.

The Click & Collect concept had already been developed in France by Chronodrive, founded in 2004. Chronodrive has often been credited as the innovator of the Click & Collect concept of grocery retailing. While Chronodrive operates only a dedicated drive-thru concept of grocery retailing, it has gained some competitors from traditional grocery retailers in France. By the end of 2010, Chronodrive operated 28 Click & Collect stores around France.

Sainsbury's joined Tesco and Asda as a grocery retailer offering the Click and Collect service. In May 2011, the retailer promised to roll out the service to 800 stores by Christmas 2011. Currently the service is available in 300 Sainsbury's stores. Sainsbury's also stated the aim of increasing its share of non-food sales from the present 25 % to 45 % of total sales by 2020. Presently, more than a third of online non-food sales came through the Click and Collect service. Sainsbury's initially launched a non-food offer in summer 2009 in a bid to try and catch up with Tesco and Asda.

Tesco also introduced plans to increase the amount of stores offering the Click and Collect service from 300 to 600 in June 2011. Tesco CEO Philip Clarke emphasised the importance of multichannel retailing at a conference when he stated the business was entering a new era of retailing that would be built around the merger of online and offline channels. Another example of Tesco's plans to integrate the online and offline channels was the trial of a virtual supermarket in a South Korea's capital, Seoul. Tesco's South Korean subsidiary, Home Plus, pasted posters with pictures of shelves stacked with products in Hangangjin subway station. Commuters were able to "shop" the products by using QR codes with their smartphones. QR codes are somewhat similar to barcodes and they can be read with a smartphone. Reading the QR codes can provide specific information for the customer. In this case the customer was able to order the product by scanning the QR code of a product. The orders would then be delivered to their homes.

Soon after Tesco's trial in South Korea, Ocado launched a "shopping wall" in a shopping centre in London. The trial used a barcode scanner with which customers were able to order the products to their home.

The late 2000s and early 2010s have also been characterised by the rise of mobile services and thus the integration of online and offline worlds has become ever more important for retailers. Nonetheless, mobile services are still at a very embryonic stage. Ocado has indicated that its mobile app represents 14 % of overall sales. The mobile channel has the potential to generate sales, but also it enables retailers to provide a diverse offering of services and touch the points of the online world within the offline world. This development has been identified by retailers and retail experts as one of the biggest challenges of the coming years. Mobile services as well as the rise of social media have enabled retailers more channels for communicating with customers.

The third phase in the transformation of grocery retailing that has been initiated by online technologies is characterised by three main elements. Firstly, the development of the business models has become institutionalised as store-based picking gained wide acceptance in the industry during 2004. This was incrementally developed by Tesco to include dark stores that were similar to those Sainsbury's had been operating earlier. Secondly, the product assortments offered in the online services of grocery retailers started to increase substantially during the last phase. The turning point can be seen to be the introduction of a standalone non-food service by Tesco. Many retailers followed Tesco's example into non-food. This enabled the grocery retailers to challenge retailers in other areas than just groceries. Thirdly, technological development reached a state where the service ideas of the early 2000s could be implemented. This was one enabler for the emergence of multichannel services in retailing, giving retailers the possibility to integrate the different channels of retailing. This has been argued to present retailing with a new era of services that can possibly challenge the role of stores. During the early years of online retailing, some commentators argued that physical stores would suffer greatly due to the emergence of online. However, in grocery retailing the physical stores represented 95 % of all sales in 2011. The development of multichannel services and other events during the growth of online grocery retailing will be analysed in the next chapter. The analysis will be based on the themes – activity networks, commercial viability, technological development and product assortment – identified in previous literature. The purpose is to summarise the main content of the narrative illustrated in this chapter and to integrate that with the observations gained from the interviews in order to develop more in-depth perspectives.

5 Drivers and phases of industry transformation after a technological innovation

The previous chapters have illustrated the events that unfolded during the development of online grocery retailing in the UK since 1994, illustrating in detail the kinds of actions individual retailers conducted to develop an online service and capitalise on the innovation. The research was divided into three main temporal phases based on the important turning points and changes in the development of the service:

- Emergence of online grocery retailing and a growing hype
- From a warehouse-based business model to a store-based one
- Convergence of business models and the growth of non-food

Besides the temporal classification, the analysis is divided into four themes based on the previous research presented in the literature review and issues arising from the chronological presentation of the development of online grocery retailing. The themes represent and are in line with the influential drivers of the industry transformation, the literature of which was described in the Chapter 2.1.1. The drivers influence the way the companies framed the innovation over the process and therefore shaped the responses of the companies in each phase.

The themes are presented in Figure 12 below. Table 9 summarises the themes:

- activity network
- commercial viability
- technical development
- product assortment

This chapter will review the characteristics of each phase through an analysis of the development of the four themes during the phases. The chapter is divided into three sections, one for each phase. The review illustrates how the themes acted as drivers directing the transformation of the industry in each phase. The main emphasis in this chapter is put in identifying how the drivers (themes) influenced the cognitive framing of companies and their responses. The responses consequently shaped the way the industry transformation unfolded. This integrates the literature about phases and drivers of industry transformation in Chapter 2.1 to the elements influencing the cognitive framing and responses of companies presented in Chapter 2.2.

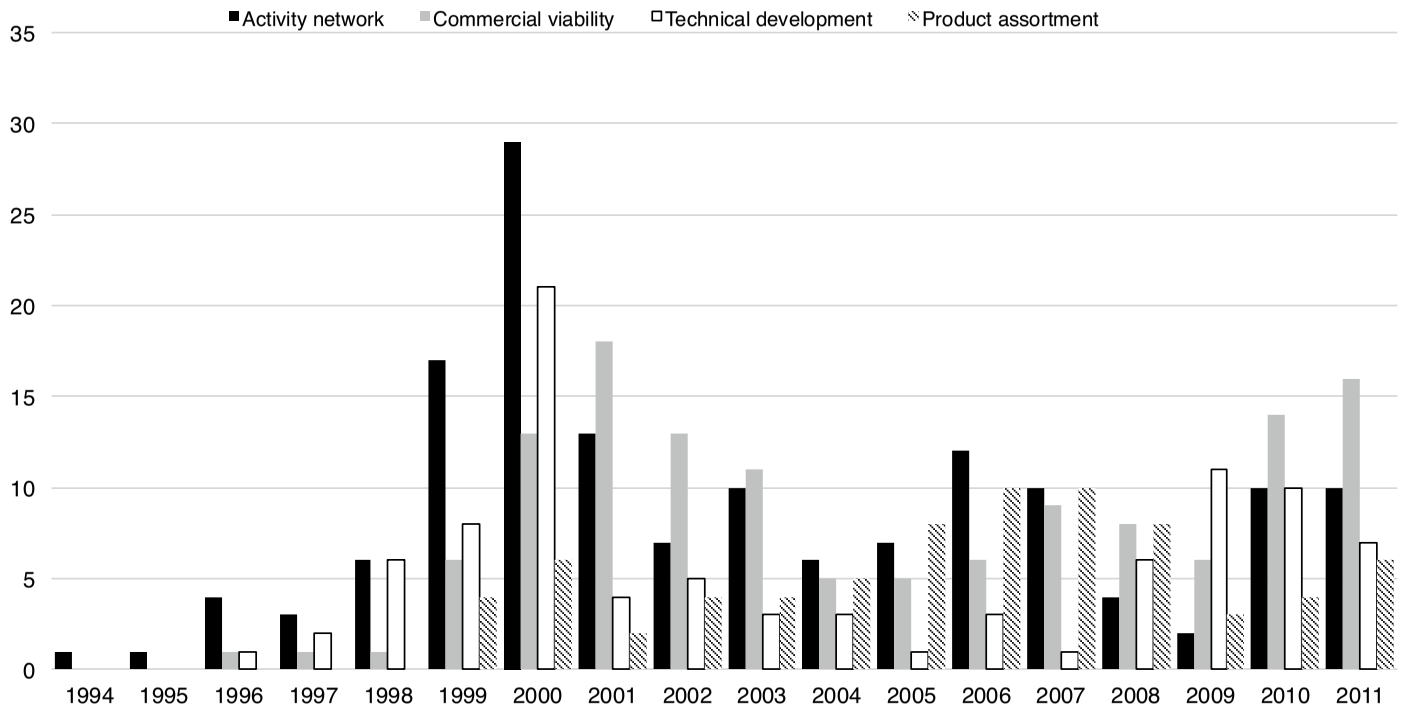

Figure 12. Events, themes and phases illustrated temporally

The activity network theme shows events in the chronology that involve different actors – including people, companies and the public sector – operating in the market. The theme discusses how the network of actors in the market has changed over time, how the framing of the innovation has influenced the entries and exits of different companies as well as why certain retailers, like Morrisons and Marks & Spencer, have not framed the online as an opportunity for their existing business and thus have not entered the market. The activity network is important for research on industry transformation as the actors entering and exiting the market shape the framing of the other companies, when the actions can either reinforce or challenge the existing frames. Thus the events within the actor network influence the dynamics and structure of the transforming industry.

The commercial viability theme incorporates events from the chronology that deal with the commercialisation of the online grocery market. In particular, how the companies have organised their activities to provide a good service for customers as well as a profitable business. The fundamental discussion in the commercial viability theme is about the different business models used for the fulfilment of online orders. The debates between the business models represent clearly the opposing frames that were competing in the marketplace during much of the process. The commercial viability theme is significant for the research because both long-term sustainable viability and the business models utilised to commercialise the innovation are essential requirements for a successful transformation (Gustafsson et al, 2012).

The third theme in the chronology discusses the technological and institutional environment. Technological development involves events related to the development of the technologies suitable for the online service. The theme also includes technological development related to the other channels used for home shopping and customer interaction, including interactive TV, mobile services and the recent development of multichannel retailing to integrate the channels used. The theme is not an extensive review of how interactive TV or mobile services have developed. It is done from the perspective of online grocery retailing, looking at how the two technologies existed concurrently. The development of interactive TV dates back further than this section illustrates, but this time period deals with interactive TV being developed alongside developments in online retailing. Customer interaction includes events concerning the use of social media alongside online grocery retailing and the possibility for customers to read and write reviews of products.

The last of the themes, product assortment, arises from the empirical data, whereas the other themes are derived from the literature. The

influence of an increase in the product assortments was so significant during the transformation process that it was selected as an individual theme in the chronology. The theme deals with events related to the proliferation of the product categories sold online. The development of product categories dates back to the late 1990s when Tesco was rumoured to be planning to launch non-food items and significantly increase that assortment.

Table 9. The themes in the chronology

Theme	Description	Important events
The development of the activity network	Actors (people and companies) involved	Entries and exits of retailers to the online marketplace. Expansions of services.
Commercial viability	Different business models used during the development Dominant design Market tipping Sales take-off	Grocery retailers tried different business models to fulfil online orders. Initially the companies used the in-store picking model developed by Tesco. In late 1999, ASDA opened a first warehouse for online orders. Sainsbury's was the first to use both warehouses and stores in their hybrid model, introduced in 2000. All grocery retailers had returned to the in-store picking model by 2004 when Sainsbury's closed their last warehouse. In 2005, Tesco returned to the hybrid model when they opened their first warehouse for non-food products.
Technological & institutional environment	Technological development of online grocery retailing	The development of technologies has enabled the growth of the online grocery market. Retailers have also utilised interactive TV and mobile services for providing home shopping services. The first grocery offering through interactive TV was launched in 1999 by Somerfield. ASDA was the last grocery retailer to abandon interactive TV in 2003. Mobile services were developed during early 2000, but they picked up after the introduction of the

Theme	Description	Important events
		iPhone. Ocado was the first grocery retailer to launch an iPhone app in July 2009, slightly less than two years after the introduction of the iPhone. Since 2009, the rise of social networking has enabled grocery retailers to connect and interact in different ways with their customers.
Product assortment	How retailers have extended the range of products sold online	Already in 1999 Tesco was rumoured to be aiming to heavily increase its non-food offerings online. In 2006, Tesco launched Tesco Direct to sell solely non-food items and challenge specialist retailers like Argos.

5.1 Emergence of online grocery retailing and the growing hype

The first phase starts from the initiation of the market in the mid-1990s as Tesco framed the nascent innovation as an opportunity, which required further investigation. They started developing the service in 1994 and based it on the existing store network. This was followed by a slow start in terms of the amount of companies developing the online service, as majority of the companies perceived the online as an uninteresting innovation, which was neither a threat or interesting enough. Due to the low penetration of Internet connections at homes, the online home shopping service was not regarded as a legitimate channel for grocery retailing. That also led to the simultaneous development of alternative technologies for the home shopping service. Alternative services, such as intranets and interactive TV, were developed alongside the online service.

The slow start of online development is illustrated in the event database, as during the first years there are only a handful of events. The events were mainly related to the themes of the activity network and, to a lesser extent, the technological development part. The amount of events started to pick up during the last years of the 1990s as more companies started to enter the market. This was partly led by the increasing interest in Internet-based business during the late 1990s. Some interviewees claimed that it was due to the “millennium bug” that the major grocery retailers really became interested in the online channel. The retailers started to perceive the growing Internet businesses as a threat to their existing business and did

not want to be left behind by the development of the technologies of the new millennium. That resulted in a rumour mill and "*panic driven by the year 2000,*" as a retailer noted:

> *"I suspect very much that it was because the rumour mill and the networks that operate within the world of supermarkets were probably telling them that Tesco was doing it better and you'd better get on with doing it as well, otherwise you'll get left behind."*

5.1.1 Activity network and technological development

The low amount of companies involved in the activity network of the nascent market together with the competing technological solutions and little knowledge about future customer adoption emphasised uncertainty about the essential characteristics of the elements that were necessary to create a sustainable home shopping service. As there was little knowledge on how the service would grow in the future, companies struggled to frame the innovation correctly, because it did not fit with the technological frames of the existing business. This led the companies to problems in defining the correct business models through which to create and capture value from the service. This was summarised by a retail consultant:

> *"In 1997, 1998 the Internet was not, it was really not very much on people's radar. The internet was this sort of techy thing that had a bit of potential, but nobody really knew what was going to happen to it. It wasn't really until 1999 that the internet became viewed as a real opportunity."*

The increase in the amount of events in the activity network theme included companies planning to launch or launching an online service. Some companies which had been active in the market earlier on – namely Tesco and Iceland – moved on to expand the business in late 1990s, when others were only launching their service.

Another characteristic trait in the first phase was the slow technological development of the online channel. During the mid- and late 1990s, the technological solutions were not developed for a fully working online grocery retail service. This led retailers to develop solutions (CD-ROMs, intranets, WAP, etc.), which could avoid the problems of slow internet connections and the low penetration of Internet connections. In fact, interactive TV was seen as a rival to online services as the main channel for home shopping.

5.1.2 Commercial viability

The growing amount of companies entering the market together with the environmental pressure to operate an online-based business resulted in an increasing consensus about the way the innovation should be framed and commercialised. The external pressures on the UK's grocery retailing industry included overall hype about online businesses and the experiences from the US. In the US, the market for online groceries was dominated by small start-up companies who used very different frames compared to the established players. The start-ups drew their framing from other purely online based dotcom start-ups, such as Amazon.com or Ebay. Webvan and other start-up companies had established their businesses to use highly automatised warehouses. In the UK the situation was markedly different as the first active players in the online grocery market were established retailers with an existing store network and extensive experience of running a store-based business. Thus, the influence of the existing assets in the framing of the innovation was significant. Before the launch of Ocado in 2002, most of the new companies launching an online service remained relatively small and often operated mainly in the London region. This was largely, because of the need for scale in grocery retailing. The small retailers were not able to offer that as highlighted by a retailer:

> *"They all failed as well, mainly because food is highly, highly competitive. Unless you have scale you cannot buy cheaply. And if you can't buy cheaply, you can't get the gross margin. And if you can't get the gross margin, you can't make a profitable business."*

In relation to the theme of commercial viability, business environment pressures led retailers and industry experts to forecast high growth figures for the future of the industry, thus justifying the emergence of a collective frame and understanding of the needed business model for the sustainable commercialisation of the innovation. The discussion in the retail and public media in the UK about the business models for the online grocery retail business centred on the benefits of the warehouse-based model in 1999. This happened at the same time as Tesco was extending the geographical reach of its service and the amount of orders it received per week increased very rapidly compared to its competitors. Simultaneously, Asda established their home delivery service to run from a dedicated warehouse. The service did not yet work online, but Asda's choice to use warehouses for home delivery service can be seen as a turning point, which strengthened the idea of the benefits of the warehouse model. Asda became the first major retailer to opt for the warehouse-based model and it heavily influenced the industry's framing in favour of warehouses. Consultants and journalists

used the decision by Asda as an example and this encouraged other companies to adopt the warehouse-based model. The more incremental frame used by Tesco was challenged heavily by the radical frame promoted by Asda. The emergence of the warehouses as an accepted business model by the majority of companies in the industry led to the first turning point in the phases, which has been identified as the adoption of warehouse-based business models. This is important, because the warehouse-based business model was significantly different to the store-based model, as it did not utilise the existing capabilities of grocery retailers. The store-based model relied on the existing store network and was built on top of that. The warehouse-based model represented the opposite approach to online grocery retailing, because it was established as an unconnected business alongside the store's core business.

The adoption of warehouse-based business models was a long process spanning over two years and culminated in 2000 when industry thinking favoured the warehouse-based business model. The media and the retailers emphasised how the warehouses enabled a more efficient service with less substitutions compared to the store-based model. The proponents of the radical technological frame also stressed how the online channel was different as an innovation to previous retail innovations. The radical frame was highlighted by Octavia Morley of Asda, who led the online development at Asda during the turn of the millennium. "*A lot of retail is about evolving. But this is about making it up as we go along*." (The Grocer, 6.5.2000.) This led retailers to more radical framing, instead of the traditional incremental frames to innovations. The warehouses offered an efficient alternative, which did not interrupt and was not interrupted by everyday activities in the stores. For the creation of customer trust in the new online service, retailers emphasised that the warehouse-based businesses could offer customers significantly less substitutions compared to store-based businesses. This was seen as important for customer adoption and the creation of legitimacy for the new market. Another reason for retailers to select the warehouses was the high growth estimates made for the future of the online grocery market. This led retailers to frame the innovation as a disruptive innovation to retailing, just like it seemed to be at the time for book or music retailing. Thus, one can argue that the companies emphasising the radical frame drew their frames from the other parts of retailing and were very vulnerable for the external hype towards the innovation. Many of the retailers adopting the radical frame had originally framed the innovation as uninteresting and started to act only when they framed the innovation as a threat.

The growth of the radical technological frame led some retailers and industry experts to criticise Tesco for framing the innovation incrementally. Tesco's response highlighted the importance of cost effectiveness in their framing as they emphasised the lack of profitability of the warehouse-based model (The Guardian, 20.1.2000), "*There is no business model anywhere that proves picking centres can be profitable*." The first major retailer to react to Asda's decision to select the warehouse-based model was Sainsbury's, which decided to move from the store-based model to warehouses in May 2000. The new companies entering the market also opted for the warehouse-based model. Besides Tesco, store-based business models were also operated by Waitrose and Iceland. At the height of the dotcom bubble, many industry experts stressed that Tesco should also change their framing and turn to the warehouse based model if they wanted to remain competitive against Asda and Sainsbury's. Tesco rejected the criticism and stated that they would use a business model, which would enable a commercially profitable business. Tesco's framing to online grocery retailing was much more incremental and built on the existing assets and capabilities of its core business. In contrast, Asda and Sainsbury's adopted a more disruptive frame, which aimed to change the way grocery retailing was conducted and did not utilise their existing core assets and capabilities.

The first turning point transformed the way the grocery retail industry framed the business models required to operate a profitable online business. One of the main reasons for the change could be seen as originating from the surrounding economic climate, which emphasised oversized growth expectations for online business in general, not just grocery retailing. The framing and subsequent response of the later adopting UK-based grocery retailers was influenced by the high expectations of growth and the US-based start-ups emphasising total customer satisfaction. At the turn of the millennium, online retailing was framed as a disruptive innovation that would change the business fundamentals of retailing. For some parts of retailing, such as book and music retailing, the online market has proved to be significant. The idea of an online business disrupting existing operations led some retailers to frame online grocery retailing radically, thus the choice of warehouses, when seen from that perspective, seems obvious.

The first phase can be characterised by the growth and formation of the *activity network*, the growing hype surrounding online businesses and the emergence of competing frames towards the innovation. The radical technological frame questioned the financial sustainability of the business because future forecasts suggested very fast growth for the business. At the

same time, the online channel was technologically incapable of delivering a good enough service to customers and therefore solutions to avoid this were developed as well as alternative technological channels. The first phase can be distinguished as a start-up period during which grocery retailers started to notice the emerging online channel for home shopping and the undeveloped technological frames led to experimentation with the development of the innovation. Interest built up rapidly as hype around the innovation suggested the enabling of radical frames to business model innovation. The bursting of that hype left its mark on the second phase, which is illustrated in the next section.

5.2 From the warehouse-based business model to the store-based model

If the first phase was characterised with emerging hype for the online businesses, the second phase was marked by the decline of the hype and its impact on the framing of the innovation and subsequently to the development of the online channel. Most significantly this can be noted in the discussion around the business models in the events of the *commercial viability* theme and in the decline of *alternative technologies* for home shopping. The growing amount of companies in the market and the environmental pressure to setup online businesses peaked in spring 2000 as the dotcom boom started to burst. The amount of events in the field peaked during 2000 as did the IT boom. In relation to the themes, events, especially those connected to activity networks and technological development, reached their peak. This was greatly influenced by the launch of new online services during early 2000 as companies were encouraged to frame the innovation radically by the example of other companies as well as by the growing hype. Towards the end of the year some companies who had adopted the radical frame abandoned the market. The peak in the IT boom is usually said to have occurred during spring 2000.

5.2.1 Activity network

Fairly soon after the burst of the dotcom boom Somerfield and Budgens decided to withdraw from the online business to focus on their core businesses in stores. Both of them had operated warehouses for the online business and stated large investments and losses combined with low orders as the main reasons for their withdrawal.

After the withdrawals, a couple of years elapsed before another retailer entered the market. Ocado entered the market in 2002 with their business model, which was distinct from the competitors' models. As a start-up with no existing experience from the industry, they drew the framed similarly with the American start-ups. Initially, Ocado operated only as an online

business in the London region, but since then it has been extended its service to cover most of the UK. For 10 years Ocado has been able to gather external investment and compete with major grocery retailers who operate in the physical world, gaining significant financial backing.

5.2.2 Commercial viability

Based on the changes in the actor network after the dotcom boom, Asda started to review its online business model. The review resulted in a change in the technological frame as they decided to close the two warehouses they were operating and focused on the store based picking model in January 2001. This, together with the unrest coming from the burst of the dotcom boom, led to changes in the collective technological frame and further towards the business models used. As the growth estimates were downscaled during the volatile times, the radical technological frame became less attractive. This resulted in the questioning of the legitimacy of the online business in grocery retailing and decreasing interest from the media. The uncertainty of the time was characterised by Sainsbury's, Asda and Waitrose. Each of the companies became uncertain on how to frame the innovation and put the roll-out of their online businesses on hold so that they could focus on improving the service levels.

In spite of the problems in the online grocery business, Tesco – the market leader – became profitable in 2002. It was one of the first online businesses in retailing to become profitable. Around the same time, the other companies also started to adopt the incremental frame of Tesco and turn more towards the alternative business model of store-based picking. Despite this, Sainsbury's re-stated their commitment to the hybrid model of warehouses and stores. However, in May 2002, they shut down their smaller warehouse in Manchester, because their stores in the Manchester area were able to use the store-based model.

The collective technological frame gradually started to turn to the store-based model. Contrastingly, the amount of events related to the business models remained high compared to other event classes. During the entire second phase, the business model theme continued to have the most events. The events were related to the continued discussion about the competing models and which one would become the standard accepted by most of the companies in the industry. Towards the latter years of the phase, the events became related to the actions of companies turning from the warehouse-based model to the store-based one.

Gradually the discussion in the theme about commercial viability changed from business models to competition between the services. Hence one can argue that the incremental technological frame started had become a

collective technological frame of the industry. The central aspects in the competition for customers in the second phase were pricing and the length of the delivery slots as well as the amount of substituted products. Also, the theme included events in which companies extended and improved their services.

The second phase, the time of warehouses, came to an end as the last company operating a warehouse along a store network, Sainsbury's, completely adopted the incremental technological frame and turned for the store-based business model. Sainsbury's had turned from the warehouse-based model to a hybrid model using the store-based model complemented by warehouses in the most densely populated areas. However, in spring 2004 Sainsbury's abandoned their last warehouse to focus only on the store-based business model. Ocado was to remain the only company, which framed the innovation through a radical technological frame. They were operating warehouses for the online business, primarily because they did not have any stores. One could argue that the store-based model became the dominant business model for the industry. However, Tesco was to develop its business model further by adding dark stores (warehouses which are laid out like stores) to complement the fulfilment of orders alongside the stores in the most densely populated areas. This has not been selected as another turning point, because it was an incremental change to the store-based model, just like all the previous developments in the Tesco's online business model.

What was the reason for the failure of the warehouse-based models and the radical technological frame? The main reason for the failure could be seen in the high forecasts for the growth of market in the late 1990s. The forecasts were influenced by the US start-ups, which gained significant coverage in the UK retail media. The hype related to online businesses during the dotcom boom also had an impact on the positive forecasts for the online grocery market.

Together these issues led retailers to frame the development of the online channel radically as a disruptive innovation, which should be approached in a completely new way. Unfortunately, the warehouse-based business model can become profitable only if the warehouse can work with a high capacity in a fairly small delivery area, mainly in metropolitan areas. This would require significant sales through the online channel. More than ten years later, the market has not yet developed to support many warehouses. Thus, it could be argued that the development of the volume required for the warehouse-based model was a lot slower than expected. The business fundaments for the warehouse-based model was summarised by an interviewee (a retail consultant) as follows:

"Warehouse operation only works well when you have significant volume, and significant volume within a small delivery area. Basically, it's about, you know, delivery cost is bigger than your warehouse cost. You have to keep it local, your delivery. And, you know, warehouses only work when they are pretty much at full volume, large volumes."

5.2.3 Technological development

The emergence of the store-based model as an industry standard enabled the companies to focus more on improving the service levels, products offered online and legitimacy of the online businesses. Simultaneously, the alternative technological solutions of CD-ROMs, interactive TV's, intranets and mobile services were discontinued because technological development had enabled the online user interface to become the most user-friendly for consumers.

The events related to technological development fell after the year 2000 to a low level and remained there for the rest of the second phase. The year 2000 was characterised by high experimentation with alternative solutions, but during 2001 the tone of the comments towards alternative solutions changed to become more critical, especially about interactive TV, which was abandoned when Asda discontinued its interactive TV development in 2003.

5.2.4 Product assortment

The end of the first phase saw Tesco launching some non-food product lines in their online business as part of their overall strategy to have equal sales of non-food and food products. The product assortments during the second phase continued to grow with Tesco leading the way. They widened their digital electronics offering and started to compete with specialist electrical retailers and, in 2002, re-emphasised that non-food was one of its key growth drivers.

Eventually during 2002 and 2003, Asda and Sainsbury's also noted the importance of non-food for the grocery business and started to talk about extending their non-food range. The gradual increase in the amount of events related to non-food is identified in Figure 12. Non-food remained in the margings during the first and second phase, but interest in it increased year on year from the collapse of the IT boom. The third phase would be characterised heavily by the proliferation of individual non-food services lead by Tesco.

The second phase can be distinguished by the fall in the hype of the online business and the subsequent recovery towards the growth of the market. The phase was significantly shaped by the transition from the warehouse-based model, seen as the dominant business model in the first phase, to the

store-based model, which became dominant in the end of the second phase. Along with the business model discussion, the discontinuation of alternative technologies and channels for home shopping became a significant trait for the second phase, along with the continually accumulating increase in the extension of the product assortments of the online services. The actions of retailers in the product assortment theme prepared the ground for a major change during the third phase, as the non-food offering became a significant aspect of the online grocery market.

5.3 Convergence of the business models and the growth of non-food

The third phase started when the market had found a design for the business model, which was seen as the best by most of the companies. Thus, a collective technological frame had been reached. Simultaneously, the market had started to receive more interest from the media and its legitimacy was being improved. During the third period online grocery retailing became established as a legitimate channel of grocery retailing.

5.3.1 Activity network

The events in the activity network in the third period remained at the same level at which they had levelled off at after the decline of the dotcom boom. The nature of the events changed slightly from the entries and exits of online businesses in the market and moved to the competitive actions of existing retailers. The actions were either related to the expansion of the businesses or to changes in managerial positions. This illustrates how the shared understanding about the collective technological frame shapes the competition in the marketplace from competition between rivalling frames to competition to improve the dominant frame. During this time Tesco was active in expanding their online business, which was more focused outside the core UK market – Tesco had managed to increase the geographical coverage of the service to cover 95% of the UK population already in 2002. Their competitors were also active in expanding their geographical coverage.

The amount of companies in the market had already stabilised during the second phase as increasing competition and reduced growth forecasts led many smaller retailers to exit the market. The increased competition was a result of the growing interest in the business by the major grocery retailers (Tesco, Sainsbury's, Asda). The last company to abandon online grocery retailing as a result of increased competition was Food Ferry. It was one of the early pioneers of online grocery retailing and had had an online grocery service already in the mid-1990s.

In contrast to the second phase, during which only Ocado entered the market (and Safeway very briefly had an online service), the third phase saw increasing activity in the launching of new services. The gradual improvement in the technological performance alongside with a growth in the legitimacy of the online channel enabled the companies to frame the online channel as lucrative enough for adoption. Alternatively, one could argue that it became a too big threat for the companies to remain outside the online marketplace.

Three new players entered the market and more importantly the existing players extended to new areas of online retailing. Therefore, the third period is characterised by a gradually increase in interest about online grocery retailing after the disappointment resulting from the burst of the hype in 2000.

The first of the three new services launched was price comparison site mysupermarket.co.uk. The launch initiated a new kind of competition, enabling customers to compare prices with ease. Also two US-based retailers, Wholefoods and Amazon, entered the online grocery market in the UK. Amazon's possible entry to UK grocery retailing had been a topic of speculation during the previous phases as the media had framed it as a possible threat for the existing companies. However, the entry of Amazon did not have a substantial impact on UK grocery retailing, because their offer was focused on bulk orders and was not seen as a threat by the biggest operators.

5.3.2 Commercial viability

Concerning the business models, the store-based business models based on the incremental technological frame had seemed set to become the dominant design towards the end of the second period. However, two years after the start of the third period, the market leader, Tesco, adjusted their framing of the online channel due to the growth in the business. This led them to modify the business model to include warehouses for complementing the store service. This hybrid model, which had been initiated and later abandoned by Sainsbury's started to become the new dominant design for the market as some companies followed Tesco's example. The fact that Sainsbury's had led the way for online stores was emphasised by an interviewee (a retail consultant):

> *"But I think that's particularly interesting now within the past couple of years, as the scale of online has really developed, we've started to see these home shopping only stores coming much more to the fore. I guess ultimately showing that Sainsbury's was on the right track but just too soon."*

Another aspect of the introduction of the dark stores stems from the strict planning permissions for large stores. The warehouse based "dark stores" reduce the need to develop large stores and enable the more efficient service of the online business.

> *"The problem is that you need large stores to fulfil online grocery. And to open new large stores in the South East of England is incredibly difficult." (A retail consultant.)*

5.3.3 Product assortment

Alongside the business model development, the market also faced a rapid increase in the variety and number of products offered through the online channel. In the chronology of events, the amount of events regarding the product assortments saw increasing activity during the first years of the decade as grocery retailers introduced new areas of products to the online services. Tesco was leading the development in many areas ranging from electrical products to music. Early in 2006, Tesco introduced their first plans to challenge general merchandise retailers with a dedicated non-food online service. They recruited a manager from Argos to run the development of the new Tesco Direct service, which was launched in September 2006. The proliferation of non-food products has been identified as a turning point for the online grocery market, because a) it changed the way many companies organise their business and b) it increased the amount of non-food products offered by the online grocery businesses. The product assortments were larger in number than those grocery retailers traditionally offered in their stores. This also represented a significant challenge to general merchandise retailers.

The launch of Tesco Direct initiated a rapid increase in the amount of events in the chronology related to the product assortments. Some of the events were about retailers extending the non-food assortments in their online grocery services. However, Asda followed Tesco's highly successful Tesco Direct and launched their dedicated non-food service, Asda Direct in October 2008. Around the same time, Sainsbury's also stated that extending their non-food range was one of their main priorities in the online business. Sainsbury's has not yet launched a dedicated online service for non-food, but has increased significantly the amount of non-food products sold online.

Competition became centred on non-food as retailers started to compete for market shares in this rapidly growing market. Tesco challenged Apple's successful iTunes service for the online downloading of music in 2008. This was later followed by Sainsbury's who launched their online music and film downloading service in 2010. In the last years of the chronology, film

downloading became an important part of the service, which has started to transform the home-entertainment market. The grocery retailers, led by Tesco, have gone on to challenge companies in new markets as Tesco purchased a stake in the movie and TV streaming service Blinkbox.

Another area of non-food that has received a growing amount of interest is clothing. Soon after the launch of Tesco Direct, Tesco announced plans to launch a clothing offer in the online service. Clothing was often referred to as a difficult area, like groceries, for retailing to make profitable in an online environment. In November 2007, Tesco started their first trials for selling clothing online and extended them in 2008. The clothing offer was launched as a standalone offer in 2010. Tesco's venture into the online clothing market was followed by another grocery retailer, Asda, who launched their fashion label, George, online in February 2008. The last of the three major grocery retailers, Sainsbury's, has not launched its clothing range, TU, online, though it has discussed plans to launch it there.

The non-food ranges became highly varied and increased significantly during the last years of the chronology to include new ranges, such as home entertainment and clothing. Other retailers also became interested in the non-food categories; for example, Waitrose launched some non-food products in collaboration with its parent company, John Lewis Partnership. The collaboration with the two companies included opportunities for customers to order John Lewis products online and collect them from a Waitrose store.

Tesco also planned to diversify its online business during the period of the chronology by opening up the Tesco Direct service for third-party companies to sell. This action is aimed to challenge the dominance of Amazon within the online non-food market. In spring 2011, Tesco announced its plans to launch a marketplace in a year's time.

5.3.4 Technological development

Alternative technologies for online grocery retailing were discontinued during the early years of 2000 because they were not able to offer a good user experience for the customer. In the third phase, technological development advanced significantly, especially compared to the second phase which had very few events related to technological development. The first of the advances in technological development concerns increased interaction with customers. This consists of the launch of interactive magazines online as well as social networking forums. Another aspect of the interaction was the possibility for customers to rate the products sold online.

The last significant advance as well as the last turning point in the online grocery market was the introduction of the iPhone in the UK in 2007. At the time of its launch, it was not regarded as important for online grocery retailing. However, over time it started to offer retailers ways to integrate the different channels of retailing (mainly physical stores and the online channel) through multichannel retail services. Many of the ideas behind the new mobile services were somewhat similar to the ones in place with WAP services in the first and second phases. However, technological development was not advanced enough at the time of the first WAPs. The latest WAPs have led to the introduction of mobile services and to the emergence of a multichannel retail service that integrates the different channels of grocery retailing (stores, online, mobile, etc.) in new ways. The new multichannel services offer physical stores and online channels that have product ranges that complement each other. Additionally, the mobile channel offers customers new ways of accessing retail services and information about the products and prices. The mobile applications are being used to find out and compare price information between products. This is notable in the non-food product categories where customers can go and see the products in stores and order them from a competitor using the mobile channel. The barcode scanning utility on the other hand, provides the possibility to order products using the mobile application. The transparency of price information is emphasised by an interviewee (a retail consultant):

> *"Consumers have more control and more power than they have ever had. With the internet and with their mobile phones they can compare prices. So it's very important that you can make it transparent, so they can choose."*

The introduction of the iPhone and especially the development of the new mobile apps have been defined as the final turning point in the development of the online grocery business. This is because the iPhone (and the other smartphones launched after it and the introduction of cloud services) has enabled the proper integration of the different channels of retailing into a multichannel retail service, which connects the online and offline worlds. In recent years retail industry experts and the retailers have emphasised multichannel retailing as being important for the future of retailing.

Another aspect of multichannel retailing has been the emergence of click and collect services. The basic idea of the click and collect service is that instead of waiting for products to be delivered, they can collect the online orders themselves. The click and collect services were mentioned in the

previous turning point with regard to Waitrose's service that offered customers the possibility to collect products purchased from the John Lewis website. The Waitrose service was launched in 2009 and Tesco trialled the click and collect service at its dark stores during autumn 2010. Since then Tesco, Sainsbury's and Asda have emphasised the importance of multichannel retailing and especially this service. The number of stores offering the click and collect services has increased dramatically and in spring 2011 all the major retailers announced plans to expand it. Click & collect has been seen as an important source of orders, especially for non-food products.

The new multichannel services are embodied in the "virtual shopping walls" trialled by Tesco and later by Ocado. The basic idea is that customers can order products using the barcode scanning in the mobile applications and the products are delivered to customers' homes. Tesco trialled the service in a South Korean subway station and Ocado trialled it in a shopping centre in London. This integrated the online and physical channels to create multichannel retailing, which embodies very different principles to those of the online retailing of the late 1990s when the physical stores were mostly seen as a burden for online retailing. This is summarised by Zoe Wood in The Guardian (8.7.2011), "*When internet retailing first took off, the "pure play" web-only retailers were expected to triumph because they were not saddled with costly stores, but the picture looks different today*."

During the early years of online retailing and high growth expectations, some industry experts framed the physical store network as a burden because online retailing was perceived to reduce the need for stores and online-based companies were supposedly more agile. However, multichannel retailing emphasises the role of physical stores in the integrated service. The growing share of grocery sales through the online channel might eventually affect the physical store network, so that the store network and the online channel would complement each other. However, it is difficult to say how and through what kinds of business models multichannel retailing will shape online grocery retailing.

The third phase of online grocery retailing is the longest of the three periods and it includes two turning points. The turning point initiated by multichannel retailing could also represent a transition between the phases. It is too soon to say whether multichannel retailing represents such an important change for online grocery retailing. The transparency of price information and the possibility to switch between channels are the notable challenges that grocery retailing faces during the multichannel era. Switching between channels was emphasised by a retailer in an interview:

"I think the future is very much that people switch very, very easily between channels. And our job is to make that as easy as possible. So I see that very much being the case in groceries as well."

The possibility to switch between service providers and the issue of price transparency highlight the importance of customer retention. As the size and commercial viability of the online grocery market in the UK has grown and the legitimacy of online grocery retailing – as an individual channel – has improved, retailers need to improve customer loyalty in the online market.

"The big challenge for all these people is about customer retention. A lot of people will try the service and either not use it again or not use that particular service and go to a competitor. So, the economics on the marketing side... it's not so much about acquiring customers, it's about retaining them and keeping them." (A retail consultant.)

The commercial viability of the online businesses has been an important topic since the end of the dotcom boom. Slow customer adoption eroded the benefits of the warehouse-based models and subsequently the adoption has remained relatively low. This has proved a significant challenge for grocery retailers. The only retailer to operate a profitable online business has been Tesco. As a service for the customer, the online business offers several advantages. Grocery retailing has usually been perceived as a chore not an experience. With the online service, the grocery retailer puts together and delivers orders to the customer. This is done for a relatively small fee, which is not in proportion to the actual costs for the retailer. Some of the interviewees estimated that the actual cost of an online order delivered to a customer is about £10. Despite the unprofitable level of the delivery fees, the size of the market and subsequently the profitability of the business has grown, but remained relatively low. The profitable expansion of the market poses a significant challenge for the online grocery industry in the future.

"From the service proposition it's great, customers love it, but from an operational point of view, how do you make money?" (A retail consultant.)

5.4 Summary of the analysis

The development over the three phases can be summarised in the debate between the incremental and radical technological frames, which was concretized by the business models. This shaped especially the first two phases. The radical frame highlighting the warehouse-based business model was initiated by the environmental volatility of the dotcom boom.

After the downgrading of the overly optimistic growth forecasts, the radical frame started to lose its ground and the warehouse-based business model became less tempting during the second phase. In the beginning of the third phase the business model debate converged towards the incremental frame to take a unified view about the store-based business model. The competition between the frames illustrated how the emergence of a collective frame is a process of political, social and technological competition during which companies promoted their own frames and business models in order to make them the standard. Eventually, the frame that became accepted as the collective frame was not technologically most optimal, but it consisted of a best bundle of elements required from an online business in grocery retailing.

However, Tesco shook the industry by adopting a new, hybrid, frame, which Sainsbury's had abandoned two years earlier. This indicates that Sainsbury's had been on the right track, but did not see far enough into the future. Since Tesco's first dotcom store, Asda and Waitrose have adopted the same approach. It remains to be seen what Morrisons, the latest retailer to adopt online grocery comes up with. They have had time to reflect on the debate between the different technological frames and it remains to be seen how that has influenced their framing of the innovation.

In terms of the other themes, the activity network theme had a large amount of events at the turn of the millennium and the dotcom boom. After the disappointment of the dotcom boom had faded away, the amount of actors in the market stabilised, thus the amount of events in the theme has remained relatively low. During the last phase, the theme received more events as some companies entered or planned to enter the market.

The technological development theme was also very active during the turn of the millennium when the Internet was a very new invention (for most people) and its development was very much driven by technological ambitions, rather than business objectives. The external hype about Internet related technologies increased the amount of experimentation with different technologies. The technological development theme changed, like the actor network theme did, after the bursting of the hype. The amount of events in the theme remained low until 2008, when technological development started in earnest again. The iPhone had been introduced a year earlier and it provided retailers with the possibility to offer customers new kinds of services. This eventually led to the emergence of multichannel retailing, which some industry experts see as another major change in grocery retailing, as physical, online and mobile services can be integrated.

The last theme of product assortments shows a distinct development from the other three themes. It is also the only theme, which has not been

derived from prior research on industry transformation. The hype about the dotcom boom did not influence the product assortment theme at all. The amount of events in the theme has gradually increased as retailers have increased the amount of products offered by their online businesses. The amount of events peaks in 2006 and 2007 when Tesco launched its non-food service, Tesco Direct, which operated individually alongside the food service of Tesco.com. Tesco's challenge to general merchandise companies was followed with great interest by competitors and the media. Many of Tesco's competitors have since followed Tesco's example and launched their own versions of a standalone non-food service.

Table 10. The main characteristics of the phases

Phase	Characteristics of the phase
Emergence of online grocery retailing and growing hype	Initially few market entries Uncertainty about the essential characteristics of the business models Diverse technological solutions for home shopping Increase in market entries Environmental volatility (dotcom bubble) Increasing consensus about the business model (warehouses)
From warehouse-based business model to a store-based one	Decreasing interest in the market Volatility in the business models Discontinuity of alternative technologies Proliferation of products offered
Convergence of business models and growth of non-food	Increasing interest in the market Establishment as a legitimate channel Newly growing consensus about the business model Emergence of a dominant design New introduction of technological alternatives Increasing proliferation of products sold

This chapter has explored the basic characteristics of each phase in the development of the online grocery market and introduced the important turning points that have significantly transformed market development. The next chapter will reflect on the main findings of the analyses in relation to important findings from previous research.

6 Discussion

The purpose of this thesis is to study the kinds of responses and industry transformation the online channel in grocery retailing, as an innovation, has led to. The empirical context of the transformation has been explained in the results chapter as well as summarised and thematised in the analyses section. The academic basis of the research is based on the extensive prior research on industry change that has been initiated by a technological innovation (Abernathy & Utterback, 1975; Tushman & Anderson, 1990; Van De Ven & Garud, 1993; Low & Abrahamsson, 1997). The contribution of this research to the industry change research comes through the use of the cognitive perspective applied to the traditional models of industry change through innovations. This is done by using the cognitive framing approach to innovation development as suggested by Kaplan & Tripsas (2008). The cognitive perspective is an under-theorized area, which does not have much empirical research exploring the influence of cognition to the unfolding of the industry change (Benner & Tripsas, 2012). There exists a lack of understanding on how the heterogeneity of companies' responses to innovations arise (Helfat and Peteraf, 2003) and how innovations are interpreted within organisations (Suddaby, 2010). This research provides one of the first empirical contributions to studying how and from where the cognitive frames arise and how they influence the industry transformation. The research has explored the phenomenon on two levels: responses of individual companies and the subsequent industrial change. The dual level approach is important for the research, because the change on the industry level is made possible and shaped by the responses of companies involved in the industry transformation (Munir & Phillips, 2002; Ansari & Krop, 2012).

In this research the cognitive framing of companies is derived from the discourses the companies have used during the industry transformation. The discourses in the public media have been stated to be a good source of data in the analysis of framing and sense-making (Fiss & Hirsch, 2005; Vaara et al, 2006; Vaara & Tienari, 2008). Another contribution of the research deals with how the results of this research explore the characteristics of the innovations. The previous research has traditionally focused on the technological differences between the innovations (Benner & Tripsas, 2012). In this research, the competition is centred on the debate between the business models. The business models have been identified as an essential tool in the commercialization of technological innovations (Chesbrough & Rosenbloom, 2002). Like the cognitive perspective to

industry transformation, the business model is a concept with little empirical academic research (Zott et al, 2011).

The purpose of this chapter is to reflect the findings from the literature review to the results found in the results chapter. This will be done by investigating the empirical results of the research through the framework in Chapter 2.5 summarising the literature review chapter

The chapter reflects how the actions of individual companies generate change on the industrial level. Previous research has developed phase models illustrating how the change process unfolds. These models were summarised in the literature review chapter and here the integrated framework will be compared to the results of the research with a special emphasis on how different frames of companies lead to variation in the actions of individual companies and how that has shaped the phases of the industry transformation.

6.1 Phases of industry transformation

Results of this research lend general support for the innovation life-cycle research depicted in the literature review. However, the results of this research highlight two issues that the traditional models have not regarded. First emphasis is on the importance of cognitive factors and their influence on the actions of individual companies and subsequently the industry as a whole. Secondly, the results point out to the important influence of the hype and disappointment phases in the development, which the traditional models have ignored.

The first part of the chapter explores how the phases in the development of the innovation reflect to the phases depicted in the traditional models in the literature. The second investigates the framing and responses of the individual companies to the innovation. The part deals with the sources of the responses and the nature of the companies responding.

First phase: The early years and hype-disappointment

Table 11. Framing by individual actors to events during the first phase

Research framework	Framing by individual actors
Initiated by an external discontinuity	Pressure to change existing frames
Uncertainty & low legitimacy	Actors unaware on how to act
Low performance	Not a threat to existing business -> interesting only to pioneers
Diverse frames of the pioneers	Pioneers frame as an opportunity
Fast-paced technologically driven development	Framing through the technological attributes of the innovation
Competition between new and existing versions of technologies	Competition between frames of old and new as well as within the new innovation
Increasing legitimacy through the actions of pioneers	Later adopters start to frame the innovation as a threat -> considering adoption
Growing adoption of the innovation	Smaller companies duplicate the frames of the big incumbents
Growing expectations	Growing adoption creates more legitimacy, more radical frames enabled
Possible hype/fashion phase	Radical frames enable the overly positive expectations
Disappointment phase	Hyped up expectations plummet, lack clarity about the framing
Gradual development towards the collective/dominant frame	One frame achieves dominance over others

The transformation process was originally initiated by an external discontinuity (Tushman & Anderson, 1986) outside the industry. The early years of industry transformation were characterised by uncertainty related to the innovation and the various approaches to commercialise the innovation (Hargrave & Van De Ven, 2006). The actors were unaware on how to approach the innovation. This implies that the technological frames of the companies had not yet developed and the companies did not know how to frame the innovation (Kaplan & Tripsas, 2008). This led to uncertainties on which features of the technology or the business model would eventually come to dominate (Anderson & Tushman, 1990).

Technological development was also immature and progressed slowly, thus inhibiting the development. Additionally, some of the big incumbents lacked incentives to adopt the innovation and thus were not particularly interested in the innovation (Markides, 2006). This led to institutional inertia towards the new innovation slowing down the adoption (Djelic & Ainamo, 1999). Hence, the role of the early developers of the innovation, the pioneers, became important for the technological development (Low & Abrahamsson, 1997). The pioneers framed the innovation differently to the majority of the actors. This enabled and encouraged the, to actively initiate the development of the nascent innovation. The pioneers experimented between and within different technological alternatives (Tushman & Anderson, 1990) to figure out the best solutions and business models. During the first phase of the transformation the innovation also needed to competed with the other technological alternative, which it had started to challenge (Abernathy & Utterback, 1978).

Despite the active development of the innovation, the performance and adoption of the innovation remained relatively low, because of bottlenecks in the technological capabilities of the innovation (Sood & Tellis, 2005) and the slow response by customers (Ansari & Krop, 2012). Over time, technological development improved the technological capabilities and the usability of the innovation. However, the results from the technological advances were most noticeable during the later phases.

Another important aspect where the role of the pioneers was important was the quest to overcome problems associated with the lack of legitimacy for the innovation (Low & Abrahamsson, 1997). During their active effort to legitimate the innovation, the pioneers developed new elements to the innovation teaching the customers to use and trust the innovation. This laid the foundation for further success of the innovation.

The legitimating actions based on the diverse frames of the different actors led to a competition between different technological frames within the innovation development (Afuah & Utterback 1997). Besides a competition between technological alternatives a discursive battle (Munir & Phillips, 2005) between two different approaches to the innovation was also initiated. The discursive battle was a result of diverse cognitive frames of the companies. The other part framed the innovation as an incremental addition to the existing business, whereas the other saw a radical innovation having the potential to disrupt the existing business. Both sides strived to legitimate their own frame in order to make it a collective frame for the industry.

The discursive strategies (Vaara & Tienari, 2008) of the both sides illuminated the different sources of the frames. For the incremental frame, the important elements in the discourses were the importance of the cost aspect of the innovation, making sure that the innovation development was economically sustainable. The proponents of the radical frame emphasised the overall customer service in their discourses. In order to legitimate the radical approach to the innovation, the proponents used rhetoric from the ole institutional logics (customer service) to legitimate the new approach. Legitimacy has been argued to be based on the comprehensibility of the innovation to the existing institutional logics (Suddaby & Greenwood, 2005). The debate between the frames received a lot of attention from the press, thus promoting the entire innovation. In this way the press served as an important arena for legitimating the innovation (Mazza & Alvarez, 2000).

6.1.1 Hype-disappointment within the first phase

The models of technological change state that the first phase ends as the amount of companies active in the market increases rapidly and the technological trajectory reaches a dominant design (a collective frame) for the commercialisation of an innovation (Anderson & Tushman, 1990). The results in this research do not confirm this traditional view.

The discursive battle of the technological frames was influenced by an external pressure, an increasing boom around the dotcom companies. The radical framing of the innovation was based on this external pressure, whereas the incremental frame ignored the external hype. During this externally induced hype, the incumbent companies rapidly entered the market emphasizing the radical frame. This far, the incumbents had not had a big enough incentive to overcome the rigidity associated with the innovation. The incumbents framed the emerging hype around the innovation as a major threat, which was enough to overcome the rigidity inhibiting the response (Gilbert 2005 & 2006).

The adoption of the incumbent companies encouraged smaller players to enter the market, as it was made more attractive (Aldrich & Fiol, 1994). The smaller players also imitated the actions of the incumbents (Haveman, 1993). The increased legitimacy as a result of the entrance of the big incumbents (Dejean et al, 2009) together with the support from the media and other external stakeholders, such as analysts (Benner & Ranganathan, 2012), moved the collective frame gradually towards the radical approach to the innovation. Traditionally analysts are more positive towards the incremental strategies (Tripsas, 2000), but the externally induced influence shaped the way they framed the innovation.

These events enabled the generation of overly positive expectations in the

radical frame (Konrad et al, 2012). This led the technological trajectory to turn to a hype phase. In addition to the hype-disappointment cycle, the phase consisted of the characteristics of a management fashion (Abrahamson, 1991). This can be argued, because the adoption of this inefficient innovation (the radical frame) was lead by outside pressure and experiences. Additionally the discourses before and after the hype cycle resemble the ones depicted by Abrahamson & Fairchild (1999). They identified the upswing to include more enthusiastic and unrealistic discourses, whereas the upswing was characterized by more reasoned, less emotional and humble discourses.

The combined effect of the frames from the actors as well as from the institutional actors (e.g. media) shaped the collective technological frame of the industry and subsequently also the technological trajectory of the innovation. This process of rapid legitimization during hype phase and the ensuing de-legitimization in the disappointment phase highlights point made by Gustafsson et al (2012) that real legitimacy for an innovation can be gained only by generating enough revenue, not through inflated expectations.

The emergence of the hype and rapid legitimization together with subsequent disappointment and the de-legitimization that ensued have not been regarded by the traditional models of innovation development and industry transformation. They state that the emergence of the dominant design signifies move from the first phase to the second phase (Anderson & Tushman, 1990) and don't take into account the possibility of a reverse development.

This research points to a development pattern whereby external expectations influence heavily on the frames of some actors. This can lead the technological trajectory to a hype-disappointment (Konrad et al., 2012) or a fashion (Abrahamson, 1991) cycle within the first phase. This is followed by a slow recovery, which eventually results in the emergence of the dominant design and the move to the second phase.

Second phase: Stabilisation

Table 12. Framing by individual actors to events during the second phase

Research framework	Framing by individual actors
Emergence of the dominant design or synthesis	Major competitive advantage for the companies adopting the frame before it becomes dominant
Bandwagons following the example of others	Proponents of the losing frames abandon the losing and adopt the collective frame thus taking the technological trajectory to second phase
Dominant design, not the technologically most advanced solution, but the best bundle	Competing frames influence the dominant collective frame as it incorporates elements from them
From product to process innovation and differentiation from the competition	Competition of frames is faded away. Identified as the structure of the arguments focuses around the collective frame.
Reduction of uncertainty and the increase of legitimacy	The collective frame guides the development of the innovation

The technological trajectory of the innovation entered the second phase as the collective frame or the dominant design emerged. The results of this research for the emergence of the dominant design (about 10 years) are in line with the results from previous research (Anderson & Tushman, 1990). This can be identified from the data as the structure of the arguments in the media (Green et al, 2009) started to focus around the incremental business model. Hence, as the justifications about the incremental model became taken for granted, one can say that the innovation reached stability or institutionalization (Green, 2004).

The incremental frame introduced by the biggest incumbent became the collective frame as most of the companies had adopted it and the market share for the frame covered majority of the market (Suarez, 2004). The process of gaining dominance was a political struggle as the different actors' tried to get their own frame to dominate (Kaplan & Tripsas, 2008). This was illustrated in the discursive battle of the frames. The competing alternatives influenced the collective frame and thus it included elements from the competing frames.

The major incumbent gained significant competitive advantage for developing the business model, which eventually became the collective frame (Murmann & Frenken, 2006). This derives from the fact that the incumbent avoided most of the financial problems that its main competitors had due to adopting for the failing frame. On the other hand, some smaller companies which opted for the failing frame did not survive in the market after the emergence of the collective frame (Christensen et al., 1998). Hence, it can be agreed that the adoption of a collective frame or dominant design is a significant advantage for companies that adopt it from the start or before it becomes the dominant frame.

Also in accordance with previous research, this research points out the importance of non-technological factors in the competition between the frames (Tushman and Murmann, 1998). The business model used by the collective frame, which became dominant, was not the optimal business model by many standards. However, it was the "best bundle" (Utterback, 1996), which was built upon the existing businesses and assets thus emphasising the importance of complementary assets for complex innovations (Utterback & Abernathy, 1975). The complementary assets eventually became the key for the success of the winning frame as the slow maturation period of the innovation enabled the incremental frame and its business model to succeed (Ansari & Krop, 2012).

This part of the discussion has focused on the phases in the development of the innovation. The phases and the existing literature on industry change were investigated through the cognitive framing framework (Kaplan & Tripsas, 2008). This highlighted the variation in the responses of individual companies. The sources of the responses will be explored in the next part of the discussion.

6.2 Sources of the responses of different actors

The frames and subsequent responses of the companies as well as other actors varied significantly during the first phase. The literature review chapter summarized the drivers enabling and constraining the incumbent companies' responses to innovations, which are framed as radical. Most significant constraining drivers include incentives (Markides, 2006), existing business models (Tripsas & Gavetti, 2000) and technological frames (Benner & Tripsas, 2012), existing customers (Christensen & Bower, 1996) and products (Ghemawat, 1991; Chandy & Tellis, 1998) of the company along with the external institutions (Benner & Ranganathan, 2012). Alternatively the incumbents' embedded structural knowledge (Lange et al., 2009) and specialised complementary assets (Rothermael & Hill, 2005) along with prior experiences of transformations (Tushman &

Romanelli, 1985) and technological experiments (Ahuja & Morris Lampert, 2001) were identified in the literature review as drivers that help the incumbents to respond to innovative opportunities.

In the results of this research the effect of the constraining drivers on the framing and subsequent response of the innovation is not as straightforward as depicted in the literature. Because the incumbents were able to respond successfully to the innovation, the enabling drivers can be seen to have been more essential during the industry transformation. External to the companies, the slow adoptions by customers (Ansari & Krop, 2012) or long introduction periods (Rothaermel and Thursby, 2007) for the innovation were seen as important enablers from the perspective of the incumbents. The slow adoption by customers gave the incumbents with significant amount of time to respond and even fail before the market had reached maturity. Additionally, one incumbent company was able to avoid the challenge of entrant companies by collaborating with an entrant. This was profitable for the entrant as well as for the incumbent (Singh & Mitchell, 2005).

The incumbents in this research had somewhat similar backgrounds with regards to the drivers identified above as restricting the incumbent companies' responses. Each of the incumbents had been operating with similar business models, core customers and products for decades. Besides the similarities in the drivers, the incumbents framed the innovation very differently leading to variation in the technological trajectory of the innovation. Why was there such a variance in the way the incumbents framed the innovation and why two of the incumbents became vulnerable for the hype and one managed to avoid the bad decisions during the hype?

The reasons for this can be attributed to numerous things, but the most significant relates to the long-term commitment of the market leader. It started to develop the innovation first and framed it as an incremental innovation. The innovation was adopted on the managerial level very early on and the board of the company became committed to the development from the start. This enabled them to develop a sound long-term strategy for developing the innovation. The strategy was developed during a time when there did not exist any kind of external pressure towards the innovation. Thus, the incumbent was able to develop an incremental strategy, which reserved the possibility to easily extend to the radical innovation in case the diffusion of the innovation changes dramatically. By sticking to the strategy even when the external pressure (caused by inflated expectations, not the diffusion of the innovation) became high, the company was able to resist the problems associated with the hype-disappointment. Thus, it can be argued that the managerial cognition (Kaplan, 2008a) of the market leader

was a significant enabler for its successful response. Additionally, prior experience of transformations within an organisation (Tushman & Romanelli, 1985) as well as with technological experiments (Ahuja & Morris Lampert, 2001) can be seen as influencing the successful response of the market leader- This is, because it had just recently successfully transformed its organization and became the market leader. Besides that, it has been regarded to be more active in experimenting with different innovations compared to its main competitors.

Alternatively, the other two big incumbents remained less interested towards the innovation for quite some time. Only the threat posed by the external environment was significant enough to make them adopt the innovation seriously. However, during that time the public expectations towards the innovation were becoming a hype thus making the radical frame more lucrative. With less time on planning the strategy and adopting the innovation, the incumbents were not able to see through the overly positive expectations and adopted the radical frame.

The proponents of the radical approach did not frame the existing business assets (especially the store network) as a complementary part of the business model in commercialisation of the innovation. It can be said that the store network represented a specialised complementary asset for the innovation, because of the one-sided (unilateral) dependence between the asset (store) and the innovation (Teece, 1986). The specialised complementary asset was not dependent on the innovation, whereas the successful commercialisation of the innovation required the utilisation of the specialised complementary asset. Thus, it can be said that incumbent companies have the greatest potential for commercialising innovations that are commercialised through specialised complementary assets (Rothaermel & Hill, 2005). The business model of the incremental frame utilised the specialised complementary assets to their full capacity. This enabled them to extend the innovation nimbly as the demand picked up simultaneously keeping the costs low. In other words, the internal fit (Siggelkow, 2001) of the radical business model was not coherent with the other operations of the companies. Alternatively, the incremental frame kept the internal fit in place leaving room for changes in case the external fit of the model changed due to changes in the environment.

The success of the incremental frame can also be analysed using the risk classification of market and technological risks identified by Christensen et al. (1998). According to them, companies face market risk, when they use proven technologies to enter new markets. On the other hand, the companies using new technologies to enter existing markets face technological risk. If the technology is replaced with business models, one

could argue that the companies using the incremental frame faced market risk. The companies adopting the radical frame were faced with a market risk and a business model risk when they invested in an unproven business model. Together these produced a higher total risk, which came true, as the market did not grow as was expected and the business model turned out to be wrong for the slower growth.

The discussion about the framing of the innovation can be summarized by the notion that the early adopters of the innovation framed the innovation as an economic and social opportunity, whereas the later adopters perceived the innovation as a threat and acted to avoid losses in economic and social terms (Kennedy & Fiss, 2008). The opportunity framing enabled the early adopters to adopt the innovation early on and gave them time to develop strategies for adapting the innovation in the existing business model. The framing as a threat was a defensive reaction, when the innovation had already gained interest. Thus, the amount of time available for generating long-term strategy was short making the later adopters more vulnerable for the external pressure.

The traditional models of innovation life cycles have traditionally seen the new entrants successfully challenging the incumbent companies (Anderson & Tushman, 1990; Henderson & Clark, 1990). Especially the new entrants have been able to shake the industries, when they have entered the market with new and disruptive technologies, which the incumbents have not framed as opportunities or threats (Christensen, 1997). Even though the innovation featured many characteristics of radical or disruptive innovations, its influence has remained marginal. As explained above, the entrants have not been able to challenge the incumbents. Thus, this research supports the more recent research (Ansari & Krop, 2012), which has questioned the traditional models emphasising the demise of the incumbents in the face of radical innovations.

6.3 How cognitive framing contributes to the innovation life cycle literature?

The cognitive framing of different actors has influenced each part of the innovation development and the subsequent industry transformation. Therefore, adopting the cognitive framework has enabled a more thorough understanding of the phenomenon. This section briefly summarizes the main contributions of the cognitive framework for this research on the development of an innovation and the ensuing transformation of an existing industry.

First aspect deals with the low interest and uncertainty related to the innovation development during the early years. Instead of simply stating

that the early were characterised by low interest, this research has identified reasons why the interest was low during the early years. An important reason for this are the different frames of companies involved in the industry.

Most of the incumbents in the industry did not have enough incentives to react to the innovation, because the companies framed the innovation as unappealing for the existing business. Thus the innovation did not require any committed action. However, the framing is emphasised as out of the similar incumbents who had operated similar kind of business for decades, one framed the innovation as an opportunity. This lead them to explore the possibilities of the innovation. The approach used by the incumbent was derived from the existing business of the company and therefore the existing technological frames were utilised in the development during the early years. This changed when an external management fashion started to influence the industry.

The second contribution of the cognitive approach is seen in the results after the early years, when the other incumbents became interested about the innovation. An external pressure heavily influenced their framing. The pressures initiated by a management fashion in other industries made the later adopting incumbents frame the innovation as a threat. This happened, when there was enough momentum for the innovation from other areas of society.

The threat framing resulted in a diverse response compared to the early adopting incumbent. This led the development to a discursive battle where the frames competed on which were to become the collective (dominant) frame. Thus, the technological frames of the actors drove the competition involved. The early adopting incumbent emphasised a business model developed on top of the existing business. Therefore the existing technological frames of the business shaped its response. On the contrary, the other incumbents were aggressively pursuing a business model, which was influenced by very different kinds of technological frames. Industries and actors outside the traditional actors of the industry promoted the frames. Hence the frames were derived from different business logics and were radically different to the incremental model. The entrance of the major incumbents encouraged also smaller companies to enter the market copying the radical technological frame of the big incumbents. This further increased the momentum of the radical frame towards becoming a collective frame.

Thus, it can be argued that two opposing technological frames from very different backgrounds shaped the discursive battle. Similarly, as the external management fashion had generated the threat to which the radical

frame of the innovation had reacted, the fall of the external influence took away the legitimacy of the radical frame.

This chapter has reflected on the results of the research with regard to the findings of previous research. The findings emphasised how the incremental frame became the collective frame after an economic, social and political process (Tushman & Rosenkopf, 1992). This was enabled by the slow adoption by customers. The emergence of the collective technological frame was preceded by the discursive battle between varied frames of different actors involved in the process. Contrary to recent research on innovation life cycles, the first phase saw the technological trajectory to encounter a hype-disappointment cycle. The varying frames of individual actors in the industry influenced heavily on the development of the hype-disappointment. The traditional research has emphasised the role of small and new entrants to the market as a force challenging the incumbents with new technologies (Benner & Tripsas, 2012). This research has provided some contradictory results to this finding.

7 Conclusions

This research has focused on how companies have framed a technological innovation and to what kinds of phases of an industry transformation that has lead to. The main interest has been in the transformation of grocery retailing as a result of the introduction of Internet-based services. The technological innovation of the Internet seemingly enabled dramatic opportunities for the industry at the turn of the millennium, coinciding with the dotcom boom. The research examines the diverse responses by companies in the industry and how and what kind of change the responses created. This made it possible to study the drivers and actors of the process in context over time. The conceptual framework developed in the literature review chapter integrates the perspectives into a uniform framework depicting the industry transformation process.

The first perspective in the research deals with the technological innovation initiating the process. The nature of the innovation affects how different companies frame the innovation. Thus, it is important to understand how different kinds of innovations can be defined and it is equally important to identify what the nature of the innovation has been in this case. This was followed by the second perspective, which explored the different responses the innovation initiated in companies. The background of a company affects how it frames the technological opportunity and its response. The drivers of the responses of the companies were investigated in the second perspective along with the commercialisation of the innovation. Business models have been identified as the most important tool for commercialising technological innovations.

As the responses of individual companies accumulate into collective action, they promote transformation in an existing industry. The last perspective on the phenomenon has been the change process of industry transformation. Special attention has been given to the phases through which the change unfolds asking: What kinds of actors and actions are characteristic of the different phases of the process?

This chapter produces a summary of the main findings of the research along with a discussion of the main limitations and implications of the research. The chapter and the thesis conclude with suggestions for further research on the topic.

7.1 Summary of the main findings in relation to the research questions

The main findings of the research are summarised according to the three perspectives depicted above and the research questions laid out in the introduction chapter. The first part examines the transformation initiated by a technological innovation and subsequent responses by companies. This leads to the responses of the retailers to the innovation and is further narrowed down to the nature of the innovation.

- How have companies (incumbent and entrant) responded to the innovation?
    - How the companies framed the innovation?
    - What kind of internal and external drivers influenced the frames and responses of companies?
    - How the nature of the innovation has influenced the framing by companies?
    - How have the technological frames held by companies influenced their response to the innovation?
    - How and why have business models for commercialising the technological innovation developed during the industry transformation process?

7.1.1 Phases of the industry transformation process

The first perspective of the research dealt with the unfolding of the industry transformation. The research question was: "*How has the industry transformation progressed?*"

The pattern of the hype-disappointment cycle depicted in the results conflicts with the traditional models of technological transformation. They depict a gradual increase in the interest of the technological innovation during the first phase. Similar to the findings of previous research, the early years of the industry transformation were characterised by uncertainty about the future direction of the technological development. This led the pioneers to experiment within and between technological alternatives in order to find out the best business models for the online business and legitimate the new channel. The actions of the pioneers, along with the growing hype around the radical approach, gave rise to a clash between the incremental and radical approaches.

In contrast to the traditional models, the first phase in the transformation process of UK grocery retailing included a hype-disappointment cycle. External pressure influenced by the dotcom boom increased the pace of the transformation process with many companies entering the online grocery business. This was encouraged by rapidly growing sales estimates.

However, the burst of the dotcom bubble led to disappointment in the online channel. During the disappointment period, the amount of actors was reduced significantly and the commercial viability of the industry was questioned. This resulted in a dramatic decrease in the amount of events in the chronology of the transformation process. The amount of events reached their lowest figure in 2004, after which a gradual recovery started. Thus, the rapidly created legitimacy of the online channel suddenly disappeared, because it was not based on actual but expected revenue forecasts.

The gradual recovery of the online channel coincides with the emergence of the collective design of the business models in the industry, as the incremental approach developed by Tesco became the accepted model for other companies. The incremental approach was not the most optimal solution for the online business, but it was the best bundle of elements for the new and slowly growing online channel. The utilisation of complementary assets in an industry based on large-scale business was crucially important. Additionally, it can be noted that the adoption of the dominant design early on in the transformation process became a notable competitive advantage for the company adopting it. The adoption of the losing design resulted in expensive failures – with some companies having to abandon the online channel.

It took about 10 years for the dominant model to emerge and this can also be seen as a transition period from the first phase of development to the second phase. The traditional technology lifecycle models emphasise that the emergence of the dominant design acts as the transition from the first phase to the second phase. In this respect, the online grocery retail market in the UK resembles traditional models. However, as pointed out earlier, the transformation deviates from traditional models due to the hype-disappointment cycle within the first phase.

7.1.2 Responses of the companies

The second part of the research as well as the second part of the research questions explored the responses of companies to the innovation. The main research question was: "*How have companies (incumbent and entrant) responded to the innovation?*" With this perspective an important emphasis was placed on the backgrounds of the companies, i.e. were they incumbents or entrants and what drivers influenced their framing of the innovation and the subsequent responses?

The slow growth of the market enabled the incumbent companies (namely Tesco) to utilise incremental responses for the online business. During the early years of the transformation process some companies, especially entrant start-ups, launched disruptive businesses, which utilised entirely

new business models. For the start-ups this was natural, as they did not have the assets required to run the traditional store-based grocery retail business. The incumbent companies, which adopted a disruptive strategy for the online businesses saw online grocery retailing as a rapidly growing market that would fairly soon disrupt traditional business. This was highly reinforced by the media and external commentators. Conversely, Tesco was the first grocery retailer to launch an online business and adopted an incremental strategy utilising existing assets and capabilities from its traditional business.

The business models depicted in the chronology of the companies' responses were important during the industry transformation. The incremental business model developed by Tesco utilised the existing store network to cater for orders from the online business, whereas the disruptive business models built standalone logistical networks around warehouses. The disruptive business model would have required significant sales through the online business, but sales grew slowly making warehouse investments costly. Eventually, the incremental business model became dominant in the industry. The companies using the disruptive business model faced significant losses and most abandoned it. The problem for the incumbent companies adopting the disruptive model was that they needed to operate two parallel businesses, which needed different assets and capabilities. As the market has grown in size, the incremental business models have evolved into a hybrid model including elements from both stores and warehouses for the fulfilment of online orders.

It can be concluded that the responses of companies varied from radical responses by entrants and incumbents to the incremental approach by Tesco. The incremental approach was driven by a managerial cognition that allowed Tesco to frame the online channel successfully as an incremental innovation, even though external pressures said otherwise. Other important drivers enabling the incremental response were the possibility to utilise core business elements as complementary assets alongside the large-scale the business requires for the commercialisation of the innovation. Regarding the constraining drivers, the results of the research suggest that some of the incumbents did not have incentives to adopt the online channel until non-adoption was perceived as a threat. The threat emerged from the fact that the incumbents were afraid that they would lose the game during the new millennium if they were not involved in the online business. The rapid adoption initiated by this fear made incumbents vulnerable to the influence of hype around online businesses.

The characteristics and differences between the definitions of the innovations found in the literature were reflected in the effect the Internet

had on grocery retailing in the UK. The online businesses developed to utilise Internet technologies had some characteristics, which were similar to the radical and disruptive innovations. The disruptiveness of online business was related to the fact that it made it possible for customers to shop for groceries regardless of where they were. This had the possibility to reduce the use of the physical stores for buying groceries, potentially changing the way grocery retailing would operate. However, similar to disruptive innovations, online businesses were attractive to customers (affluent and time-poor people living in big cities) who required and appreciated different things from grocery shopping and were not traditional customers. Although both of these attributes are related to disruptive innovations, the innovation has not changed the grocery retail industry as much as some experts would have expected. Also, incumbent companies have been able to respond to the challenges posed by the entrant companies and were the most active developers of the online grocery retailing business.

The special nature of grocery retailing and the slow adoption of online shopping by its customers were the reasons why the incremental approaches of the incumbent companies was successful. The freshness of the products, subsequent delivery issues and the requirements of scale for the business make up the special nature of grocery retailing. It is a major reason why the online channel has not grown as much for grocery retailing when compared to other forms of retailing. More than 15 years since the first launches, online grocery retailing represents approximately 5 % of the sales of the total grocery retail industry. Therefore, it can be concluded that the nature of the technological innovation of the online channel for grocery retailing includes elements of disruptive innovations, regardless of that the fact that the innovation has been incremental in its existing operations.

This chapter has summarised the most important findings of the research. The findings have been illustrated through the three perspectives used throughout the research. The summary will be followed by an investigation into the limitations of the research.

7.2 Limitations

Conducting research is all about making choices when specifying the research topic, there are limitations in every research. For this research, three areas of limitations have been identified:

- generalisability of the results
- amount of in-depth data
- temporal aspect: the incompleteness of the process

Firstly, the *generalisability* of the research results is limited due to the case study nature of the research. The focus in UK grocery retailing limits the generalisability to (1) other retail markets and to (2) other countries. The decision to focus on grocery retailing in the UK was made in order to be able to explore thoroughly the different aspects of the transformation process. The focus on one case enabled the investigation over time and in desired detail. With several cases, whether from different areas of retailing or other countries, it would not have been possible to gather and analyse the extensive data as this research has done. The use of multiple cases would have enabled the research to identify similarities and differences between the cases. This would have provided the research with a better basis for analysing the nature of the online environment as an innovation for retailing in general. This research has been able to explain the nature of the online channel as an innovation for grocery retailing, especially in the UK. However, the nature of retailing in other areas, such as fashion or books, can be significantly different to grocery retailing. On the other hand, the nature of companies active online in other areas of retailing is somewhat different, therefore the responses of the incumbents may vary notably to the responses found in this research.

Another limitation of the research can be identified from the *inability to collect enough in-depth data* about the responses and framing of companies. Additional in-depth interviews and secondary data would have enabled the research to focus more on the framing processes. After all, the framing underlies the responses of the companies and subsequently the industry transformation process. This would have provided the industry transformation research with an in-depth understanding of the questions related to why the process unfolded as it did. This approach would have required much more data collection, especially with regards to interviews. The outcomes of the interviews for the research were very varying, because of the variation in the backgrounds of the interviewees. Some interviewees had operated for a very long time in the industry and with multiple different positions, whereas some other interviewees had much shorter time perspective for the process. Each interviewee was possible to contribute something fro the research, but some interviewees were able to

really provide in-depth understanding behind the information from the secondary data. This being said, the secondary material was extensive and thus gave a wide-ranging view to the events in the industry transformation. The more in-depth perspective would have moved the focus of the research to the micro-level actions of companies instead of focusing on the overall transformation process on the industry level.

The last limitation in the research deals with the *temporal aspect* of the transformation process. Even though the process of the industry transformation initiated by Internet technologies has unfolded for more than 15 years, it has not yet reached maturity. Therefore, it is difficult to make a definitive conclusion about the transition points in the process. The investigation of the formative points during the process, after the process has ended, is more reliable because the final form of the process is visible. On the other hand, studying change as it unfolds is emphasised by process researchers (Pettigrew, 1997).

This section has illustrated the limitations of the research. Three limitations were identified. The next section explores the main implications of the research for both theory and practice.

7.3 Theoretical implications

This research has explored how technological innovation initiates transformation in an existing industry. The individual companies through their responses to the innovation have prepared the foundation for the transformation. As several companies respond to the innovation, the collective responses of the companies make up the transformation of the industry. This dynamic is at the heart of the research questions set out in the introduction chapter. The research questions are approached from three theoretical perspectives in the research. The main theoretical implications of the research are related to the perspectives and their integration.

Firstly, the research empirically examines the nature of the online technologies as an innovation for one area of retailing. This compares the different classifications of the innovations to provide an empirical case study for innovation research. The outcome states that an innovation can have the characteristics of a radical or disruptive innovation, but notes that an incremental approach by an incumbent can become the dominant design.

The other implication from the research deals with the response of incumbent companies to the innovation. As mentioned in the previous paragraph, this research illustrates that incumbent companies can successfully respond to an industry transformation initiated by a

technological innovation with radical characteristics. The main reason for this was the slow adoption of the innovation by customers, which made gradual investment feasible. If customers would have adopted the innovation more rapidly, a more radical business model could have survived and might have become financially sustainable over time as the market for online groceries grew.

The successful responses of the incumbents were shaped by managerial cognition and the overall culture of innovation in the company. For online groceries, the background of the company influencing the framing of the innovative opportunity is not able to explain the response by the companies. A culture of innovation along with commitment as well as a patient and long-term perspective for the innovation's development influenced the successful response of the market leader. It developed the innovation actively, but simultaneously utilised its existing business for the commercialisation of the innovation. The long-term perspective and commitment to the innovation enabled the market leader to avoid expensive mistakes during the hype phase. The utilisation of the existing business and cautious funding for the innovation's development enabled the market leader to grow a substantial business with little investment compared to its main competitors.

One implication of the research on companies' responses relates to the classification of technological and market risk by Christensen et al. (1998). This research has extended the classification by including a business model as an important element in the risks related to technological innovations. If a company uses a new business model to enter a new market that has been initiated by a technological innovation, the company also carries a business model risk.

The third theoretical implication area of this research is linked to the research about the process of transformation. This research confirms findings from traditional technological change models that the early years of a transformation are characterised by uncertainty and experimentation. The technological advancement of the innovation remains low, thus restraining the adoption of the innovation both by consumers and organisations. This emphasises the role of the pioneer companies in developing and legitimating the innovation. As the technology advances, the above-mentioned aspects become less important and the transformation process begins to move forward. Due to the experimental nature of the early years, competing solutions for the innovation's development and commercialisation exist. These compete for attention in the media and try to promote their alternative discourses, which promote the advantages of the each alternative.

However, external forces, such as hype around the innovation, can interrupt this development. This means that without significant technological advancement, the innovation starts to gather notable interest around it, rapidy increasing its legitimacy. Nevertheless, the sustainable legitimacy of an innovation cannot be formed without an increase in the commercial viability of the innovation. This requires the ability to generate revenue. In this research, the hype around the innovation was shown to disrupt the first phase and one finding is that a development within a phase may not be progressive. Instead, the first phase can have significant variation within it, in the form of a hype pattern. As the interest around the hyped up innovation fades away, the transformation continues. However, it cannot be argued that the transformation would alter change in a second phase, which is characterised by the convergence of development around towards a dominant design. In this research the dominant design was reached several years after the burst of the hype and with significant assistance by technological development, which enabled better services for the customers.

The last theoretical implication relates to the emergence and adoption of the dominant design. For complex innovations, the adoption of the dominant design before it becomes dominant can prove to be a significant advantage. Conversely, the inability to adopt the design that becomes dominant may prove to be financially disastrous. It may force a company out of the market or lead to considerable competitive disadvantage. Another aspect of the dominant designs for the theoretical implications of the research relates to the nature of the dominant design. This research confirmed the argument by Tushman & Murmann (1998) that the design which emerges as dominant is often not the technologically most advanced solution, but the best bundle.

To conclude, the research contributes to three individual research streams related to technological innovation literature. An additional contribution of the research is to integrate the streams. Besides the theoretical implications of the research, there are also practical implications, which are discussed in the next section.

7.4 Practical implications

This section will investigate the managerial implications of the research. It emphasises those issues which retail managers who are developing or interested in developing an online service ought to take into account.

The three implications presented in this section are associated with the special nature of grocery retailing with regard to the channel. Another important implication arises from the use of the existing business as a

complementary asset for innovation adoption. The final implication explores the managerial involvement and vision of Tesco as the reason for Tesco's success.

Implication 1: *The special nature of grocery retailing demonstrates the disruptiveness of the online channel*

This research shows that the radical possibilities that online retailing enabled took a long time to realise due to the special nature of grocery retailing. In some other areas of retailing, such as book or music retailing, the online channel has become an important challenger to traditional business models. Grocery's special nature includes the need to have a large-scale business to cope with its narrow margins. The most distinctive feature of grocery retailing, in relation to other areas of online retailing, is the freshness of the products sold. This has required that retailers teach customers and build their support so that they trust retailers to pick fresh products. Another aspect in the freshness of the products is the cold chain in the delivery. Online retailers in other areas can outsource the delivery to third-party companies and thus save significant resources. In grocery retailing, an online retailer needs to establish a delivery fleet capable of transporting products with varying temperatures. Despite the high costs involved in the delivery, the delivery fee has become an important issue in the competition for customers. Retailers have trialled different kinds of fee structures and some have even abandoned the fee. This makes the establishment of an online business economically difficult and emphasises the role and advantages of incumbent companies, who operate traditional business alongside their online business.

Implication 2: *The use of complementary assets for the online business provided the winning business model for online grocery retailing*

Business models have been used in the majority of the actions retailers have conducted during the process. The debate between the business models was intense during the late-1990s, with considerably different approaches and arguments. The incremental approach by Tesco utilised the core business elements, the stores, as complementary assets for its online business. In contrast, the radical approach based the business on an independent and unconnected business model alongside its core business. As well as the market risk associated with the new market initiated by the online channel, the radical approach also included a business model risk for the companies. The use of stores and their existing infrastructure enabled Tesco to expand rapidly without significant investment. As the Tesco model of utilising stores has become more widely adopted by retailers, the debate between the business models has turned to discussing the modifying of the store-based model with the benefits from the warehouse-based model.

Implication 3: *Commitment and a vision were the key elements of Tesco's success*

The reasons why Tesco was able to respond correctly and stay on the right track during the volatile years of the late 1990s and early 2000s were its clear vision for the development of online retailing and its commitment to the online channel.

This vision held by Tesco and coupled with their competitors' lack of a vision was noticeable in the actions and discourses during the volatile years of the dotcom boom. The competitors, especially Sainsbury's and Asda, were susceptible to the influences coming from the external environment. At first, they were not particularly interested in the online business as they did not seem to have any incentive to adopt the innovation. As the external hype about online businesses started to build, the companies instigated rapid development. The pressure to act fast resulted in somewhat hasty decisions, which were not necessarily in line with existing operations. The sales forecasts blinded almost everyone in the market into believing the online channel would grow to challenge the existing store-based business.

However, the clarity of Tesco's actions was made possible by the committed and patient involvement of Tesco and its management in developing the online service. Even though Tesco's online business went from success to success, the company has been constantly monitoring its environment and was ready to make changes in the business model – if advantageous for them. The transformation from a store-based model to a hybrid model with dark stores complementing traditional stores illustrates this sensitivity. One could argue that Tesco held the clearest vision about the future of the online grocery retail business.

The commitment and vision of Tesco enabled them to keep calm during the hype. Even though their business had the biggest growth and largest overall sales figures, the company remained conservative and measured in its approach. A contrasting example of commitment can be identified from the hybrid business model developed by Sainsbury's. They were the first company to use warehouses to complement the store-based business in major metropolitan areas, especially in London. For years they remained the only company to operate the model but eventually they lost faith in it. However, two years after the closure of Sainbury's Park Royal warehouse in London, Tesco opened their first warehouse (or dark store) to complement the store-based business in London.

7.5 Further research

The conclusions chapter concludes with suggestions for further research. The suggestions are based on issues identified in the limitations section.

The first topic suggested for further examination is related to the generalizability of the findings of this research. As this research was a case study of a transformation process in one part of the retailing industry in one country, the generalizability of the results could be improved by conducting similar types of studies in other markets and possibly in other countries. This would provide interesting points of comparison for the results of this research. For example, studying the transformation of book or music retailing in the UK would indicate how much the results of this research are related to the special nature of grocery retailing. Many of the reasons why online firms in grocery retailing have not grown rapidly are related to the special characteristics of grocery retailing, such as the cold chain for home delivery or the requirements for freshness in certain product categories. Studying the transformation of grocery retailing in other countries would show how different country specific characteristics have influenced the transformation process.

Another area for future research is a more in-depth approach to the phenomenon. Even though the framing of innovations has been an important topic in this research, a more in-depth approach would enable a more thorough examination of how the underlying drivers of framing in individual companies affected their decision-making. This research identified different retailers as having framed technological opportunities during the transformation process very differently, leading to varying responses to online grocery retailing. The types of frames used by grocery retailers and the reasons why those were chosen would contribute to the results of this research by exploring more thoroughly the variances in the companies' responses and the subsequent unfolding of the transformation process.

The building of legitimation for new online businesses also requires more research. Technological innovations and industry transformation studies show that the early years of an innovation are characterised by uncertainty, which leads to low legitimacy for the innovation. An in-depth study of the roles and actions of pioneers in legitimating the online channel during the early years of an industry's transformation would provide an important contribution to the research on industry transformation. Pioneers can be seen as institutional entrepreneurs with various objectives and ways to influence an innovation's legitimacy and promote their competing designs for it. Studying how discourses for legitimation are developed and used would produce interesting contributions to the research on industry

transformations.

The need to continue research on industry transformation initiated by Internet technologies is the last suggestion for further research. The transformation process related to the online grocery retail businesses has not yet reached maturity. Therefore, the continuation of research on the topic would be important for following how the transformation continues. This would provide an understanding of the way the online businesses and later multichannel businesses really did transform the industry and whether the technological innovations driving the change prove to be incremental, radical or even disruptive in nature.

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Appendix I

Table 13. The interviews conducted

	Interviewee	Date	Interview type	Length
1	Consultant	10.10.2011	Telephone interview	35 min
2	Consultant	20.10.2011	Face-to-face interview	1 h 15 min
3	Consultant	21.10.2011	Face-to-face interview	55 min
4	Retailer	09.11.2011	Telephone interview	45 min
5	Retailer	16.12.2011	Telephone interview	55 min
6	Consultant	22.12.2011	Telephone interview	45 min
7	Retailer	09.01.2012	Telephone interview	45 min
8	Consultant	10.01.2012	Telephone interview	1 h 20 min
9	Retailer	12.01.2012	Telephone interview	1 h 20 min
10	Consultant	13.01.2012	Skype-interview	55 min
11	Retailer	18.01.2012	Telephone interview	2 h 20 min
12	Retailer	19.01.2012	Telephone interview	1 h 20 min
13	Consultant	03.02.2012	Telephone interview	45 min
14	Consultant	21.03.2012	Face-to-face interview	1 h

Appendix II

The basic structure for the interviews. The interviews with the retailers included more detailed questions about the actions of the individual companies. These questions provided the basic structure for the discussion related to the main events from the chronology.

Background

Background of the interviewee

What do you see as the most important issues in the emergence/history of online grocery retailing?

What are most important recent developments?

From the chronology (sent in advance for the interviewee)

Were there any noticeable issues to change in the chronology?

Activity network (entries and exits of companies)

- When, why and by whom retailers became interested about developing online?
    - How did they come up with the business model?

- Many small retailers seemed to be active developing online services in late 1990s. Do you know why?
- Why Ocado has been able to stay in the business for so long even though other small players have exited the market?

- Did the purchase by Walmart affect Asda's online operations?
- Why M&S & Morrisons have not been interested in food online?
- How Tesco has been able to manage the constant flow of managers going out, still managing to create new great managers?
- Has Amazon's entry to online grocery had an effect to others?

Business models

- Did the IT boom in general have an effect to online grocery and how it was perceived?
- Why Asda and Sainsbury's adopted the warehouse-based models? Where the idea came from?
- Why industry expert seemed to be against Tesco's model during the turn of the century?
- How Sainsbury's developed the hybrid model?

- Why did Webvan and other warehouse models fail?
- From where and by whom was Ocado's hub and spoke model initiated?
- Why Tesco opened dot com-stores? Where Tesco initiated the model?
- Where Tesco initiated the Click & Collect concept?

Technological development

- Why did several companies start by offering an intranet service?
- Why were CD-ROM's used at first?
- Why was interactive TV service developed?
- Why the interactive TV and early mobile services failed?
- How different the multichannel retail offer of today is from the past?

Product assortment

- Why did Tesco initiate non-food strategy for online? When was it really started? Where the idea was initiated from?
- Where, when and why was Tesco Direct initiated?
    - How competitors reacted to the launch of it?

Biggest challenges for the future?

Other people to interview?

Technological innovations often produce hype-disappointment cycles and initiate significant transformations in existing industries. It has also been argued that existing companies respond slowly to the challenges of the innovations whereas new companies are capable of framing novel technologies more successfully. As this argument has recently been questioned, it is important to improve our understanding of how technological innovations affect industries and how companies respond to the innovations. The context of the research is the growth of the online grocery retailing in UK. For many industries the online channel has represented a disruptive innovation, which has changed the way the business is conducted. The online grocery retail market in UK has been regarded to be biggest in the world. The utilization of the existing capabilities and competencies by incumbent companies along with the long maturation period proved to be the reason for the success of the incremental approach to the innovation.

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