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E-COMMERCE 2025

Delphi-based Scenario & Trend Analysis for the Future of Digital Commerce

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The only thing we know about the future is that it will be different.

Peter Drucker (1909-2005), management professor

EXECUTIVE SUMMARY

Situation and Complication

E-commerce is growing globally and an end to positive growth rates is not yet in sight. However, a high level of changes and risks through innovative startups and disruptive technologies is an inherent characteristic of the online retail industry. As consumer demand shifts constantly and new technological possibilities as well as an ongoing digitization foster the transformation of commerce, retail managers are confronted with great uncertainty. Nevertheless, academic foresight studies for e-commerce technologies are missing. This thesis closes this prevailing research gap.

Question

The central research question is: »*What are plausible scenarios for the development of business-to-consumer e-commerce by 2025 focusing on technologies?*«

Answer

Four distinct, plausible, and innovative scenarios are developed on the basis of desk research, nine qualitative expert interviews, and two quantitative Delphi-survey rounds with 61 industry experts. The scenarios differ along two bipolar dimensions of uncertainty, *i.e.* the changes in lifestyles and the pervasiveness of technologies. The scenarios for B2C commerce in 2025 and its main traits are:

- *Vortex of Innovation*: Technological innovation supported by citizens and politics
- *Avalanche of Technology*: Information overload due to technology fear of people
- *Desertification of Imagination*: Preservation of *status quo* and protectionism
- *Earthquake of Prosumption*: Slow technological progress but strong shifts in lifestyles

The experts assess 3D printing and cross-channel big data technologies with the greatest potential to disrupt the retail industry. Furthermore, digital personal shopping assistants with autonomous purchasing rights as well as an ongoing forward integration by suppliers and producers are very likely to occur by 2025. There is high dissent among the experts as to whether e-commerce will replace traditional commerce because online and offline retailing are merging.

Strategic Implications

This study is very practice-oriented and provides five clear implications to retail managers. First, the results of this study shall be used to rehearse the future. Second, retailers have to monitor changes in the local and macro environments. Third, retail businesses ought to be transformed to technology businesses. Fourth, customer-centricity should be established as the core value. And fifth, multiple shopping experiences have to be served across different channels.

ABSTRACT

Electronic commerce sales are increasing with double-digit growth rates and a high level of change and uncertainty characterizes online retailing. In order to keep up with volatile consumer demand and new technological possibilities, strategy makers require profound foresight studies. However, academic foresight analyses in the e-commerce domain with a focus on technologies did not exist. Hence, this thesis investigated the future of B2C electronic commerce with a Delphi-based scenario analysis to develop four scenarios for 2025 on the basis of macro and meso environmental drivers of change. This study accurately applied Schwartz's Eight-step approach for scenario building and assessed retail trends in nine qualitative expert interviews and two quantitative Delphi-survey rounds with 61 industry experts. It was found that shopping continues to change and technological and social factors are more important than political and economic developments for the future of digital commerce. 3D printing and cross-channel big data technologies possessed the greatest impact to disrupt the retail industry. A high level of dissent among the experts regarding the very basic industry setup in 2025 indicated the inherent uncertainty about the future of e-commerce and emphasized the need to apply foresightedness. The industry experts expected online retailing to have a share of at least 33% of total B2C retail within ten years. It was obtained that digital personal shopping assistants with autonomous rights as well as an ongoing forward integration by suppliers and producers are very likely to occur by 2025. The four developed scenarios differ along two bipolar dimensions of uncertainty, *i.e.* the changes in lifestyles and the pervasiveness of technologies. This study extended the body of existing knowledge with a novel conceptualization for future B2C commerce that reflects the complex and multifaceted industry by differentiating between five shopping experiences. This framework can be applied to prospective retail studies.

Keywords

Electronic commerce, e-commerce, retailing, future, foresight, technology management, Delphi technique, scenario analysis, trend study

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ABBREVIATIONS & ACRONYMS

3D	Three-dimensional
a.k.a.	also known as
ASC	Accredited Standards Committee
ARPANET	Advanced Research Projects Agency Network
B2B	Business-to-business
B2C	Business-to-consumer
C2B	Consumer-to-business
C2C	Consumer-to-consumer
CEO	Chief executive officer
cf.	compare (Latin: *confer*)
CSR	Corporate social responsibility
DACH	Germany-Austria-Switzerland
EDI	Electronic data interchange
EFT	Electronic funds transfer
e.g.	for example (Latin: *exempli gratia*)
et al.	and others (Latin: *et alii*)
EU	European Unions
FMCG	Fast-moving consumer goods
GDP	Gross domestic product
ibid.	in the same place (Latin: *ibidem*)
ICT	Information and communications technology
i.e.	that is (Latin: *id est*)
IP	Internet Protocol
IPO	Initial public offering
MACTOR	Matrix of Alliances and Conflicts: Tactics, Objectives and Recommendations
MICMAC	Matrix of Crossed Impact Multiplications Applied to a Classification (French: *Matrice d'Impacts Croisés-Multiplication Appliquée à un Classement)*
n	Sample size
NFC	Near field communication
NGO	Non-governmental organization
NSA	National Security Agency
NSF	National Science Foundation
PEST	Political, economic, social, technological
PESTEL	Political, economic, social, technological, environmental, legal
RFID	Radio-frequency identification
RICE	Russia, India, China, (United Arab) Emirates
ROI	Return on invest
R&D	Research and development
SEPA	Single Euro Payments Area
SMIC	Cross Impact Systems & Matrices
SSL	Secure Sockets Layer
STD	Standard deviation
TCP	Transmission Control Protocol
TTIP	Transatlantic Trade and Investment Partnership
UK	United Kingdom
US	United States
USD	United States dollar
VP	Vice President

1 INTRODUCTION

This chapter outlines the context of the study at hand and presents its research problem and goal. Building on the research gap and research questions, the methods of the study are briefly outlined. Furthermore, the delimitations mark the scope and boundaries of this study.

1.1 CONTEXT OF STUDY

Electronic commerce has been booming for almost two decades and its decline is not yet to come as online retailers like Amazon.com are growing steadily (*cf.* Lohr, 2014). E-commerce is defined as the transaction of products and services using electronic data over the Internet (*cf.* Schneider, 2008, p. 5). E-commerce has changed the way of doing business in general and particularly the logistics, payment, and retail industries are under constant pressure to adapt to the developments of online shopping and digital technologies.

According to research institutes, worldwide e-commerce sales are forecasted to increase from USD 1,042 billion in 2012 to more than USD 1,859 billion in 2016 (*cf.* eMarketer, 2013a). The highest growth rates are seen in China; however, also traditionally strong e-commerce markets in North America and Western Europe have yearly double-digit-growth rates throughout 2016 (*cf. ibid.*). Furthermore, e-commerce's share of total retail sales is also rising to more than 10% in 2016 (*cf.* Forrester, 2013). At the same time, brick-and-mortar retailers are struggling. Abercrombie & Fitch is closing one-third of its US stores (*cf.* Jopson, 2013), Macy cuts 2,500 jobs (*cf.* Fitzpatrick, 2014) and UK high streets are projected to lose 5,000 stores by 2018 (*cf.* Kuchler, 2013).

Per se, technology has always played a major role in e-commerce and continues to be a major source of innovation and disruption because of its transformative character (*cf.* Garud & Nayyar, 1994, p. 365). Thus, the only constant in the e-commerce industry seems to be the change itself and, as Peter Schwartz puts it, "uncertainty is the new normal" (Deutsche Post, 2012, p. 27). Recent technology-driven transformations are mobile commerce (*cf.* Ngai & Gunasekaran, 2007), social commerce (*cf.* Wang & Zhang, 2012), and omnichannel retailing (*cf.* Brynjolfsson *et al.*, 2013). All of these milestones mark the ongoing convergence of technologies and disappearing boundaries between physical and online shopping.

As the e-commerce industry is shaped by an increasing occurrence of changes, the level of uncertainty is increasing (*cf.* Burt & Sparks, 2003, p. 284). This is not only a recent phenomenon but the uncertainty was already high one decade ago (*cf.* Maamar, 2003). Hence, senior retail managers are confronted with uncertainty about the future and thus unfavorable conditions for decision-making. In order to keep up with changing consumer demand and new technological possibilities, corporate strategy makers require foresight studies with mid and long-range time horizons.

1.2 JUSTIFICATION FOR RESEARCH

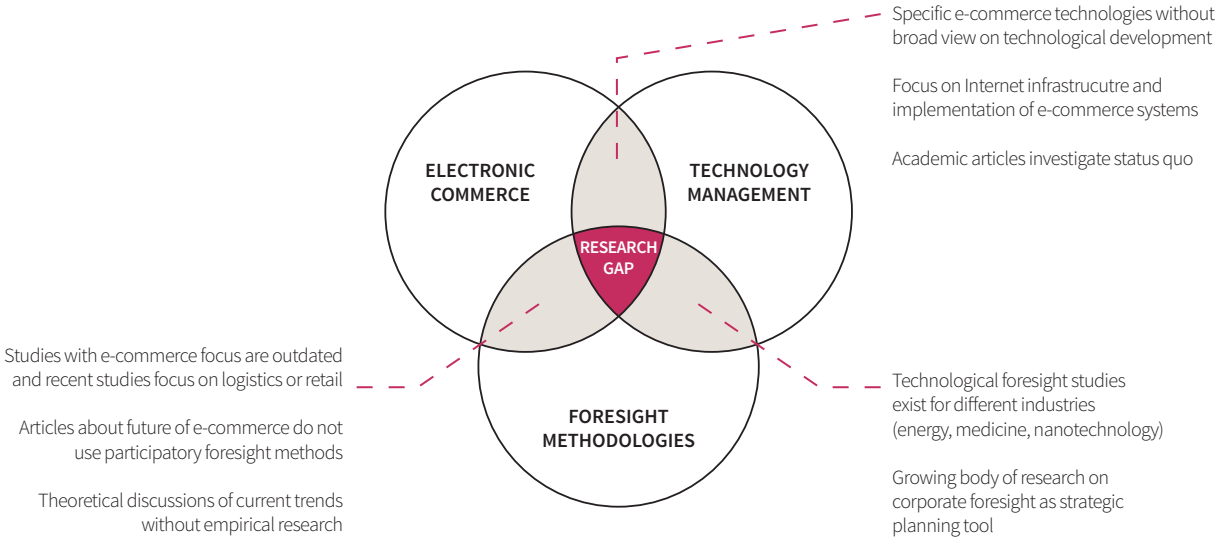

Figure 1: *Research domains and research gap (own depiction)*

As illustrated in **Figure 1**, this thesis is rooted in the intersection of three research domains: Electronic commerce, technology management, and foresight methodologies. In order to identify a research gap, intersecting areas between the research areas are examined. The prevailing research gap enables to propose a unique research design and the justification for the study at hand.

Technology management research with foresight methodologies was conducted for various industries like energy (*e.g.* Czaplicka-Kolarz *et al.*, 2009), medicine (*e.g.* Postma *et al.*, 2007), and nanotechnology (*e.g.* Su *et al.*, 2010), amongst others. Moreover, the body of corporate foresight research as a strategic planning tool in technological uncertainty is growing (*cf.* Vecchiato & Roveda, 2010, p. 1530). However, academic foresight studies dealing with electronic commerce technologies do not exist.

Publications on the intersection of e-commerce and technology management focus, on the one hand, on Internet infrastructure and application of e-commerce systems (*e.g.* Patel, 2003) and, on the other hand, on technology management frameworks like the technology acceptance model in Pavlou (2003) or technology diffusions in Wong (2003). Furthermore, more recent technology-related e-commerce research investigates the technological *status quo* (*e.g.* Lin, 2008) or concentrates on specific technologies. E-commerce technology research that exhibits farsightedness for the technological development in general is still scant.

Existing journal publications in the e-commerce domain that utilize foresight methods are outdated (*e.g.* Oliver, 1997; Komiya *et al.*, 1998) and relevant future studies from practice concentrate on logistics (*e.g.* Deutsche Post DHL, 2014). In addition, papers featuring discussions about the fu-

ture of e-commerce do not use participatory foresight methods but merely reason about extrapolations of current trends (*e.g.* Numberger & Rennhak, 2005; Baquero & Taylor, 2012).

In order to remain competitive in the long run, managers need predictions about mid- and long-term developments that serve as a basis for strategic decisions. Hence, a mid-term horizon of ten years for the study at hand fits to managers' requirements because it facilitates out-the-box thinking and unfolds currently unseen evolutions (*cf.* von der Gracht & Darkow, 2010, p. 49). Furthermore, 2025 is near enough for all stakeholders to experience it and far enough to prevent merely extrapolations of current trends but creative thinking and evaluations. Since the exact future cannot be predicted, it is important to forecast alternative futures to prepare organizations for possible future needs, *i.e.* scenario building. According to Inayatullah (*cf.* 2002, p. 296), scenarios are the most popular tools in future studies due to their supporting effect on strategic planning. Thus, managers and strategists are the owners of the problem this thesis should solve.

Indeed, the endeavor to forecast digital commerce in 2025 is ambitious in light of the complexity to even foresee short-term technological changes. However, this is exactly the reason to face this challenge and to provide valuable insights for the turbulent environment of e-commerce.

1.3 RESEARCH GOAL AND RESEARCH QUESTIONS

From the description of the current state of e-commerce arises the study's research goal: The central aim is to develop four plausible and consistent scenarios for B2C online retailing in 2025 that yield innovative results. This research goal implies three additional objectives. First, current drivers in the macro and meso environments of the B2C retail industry shall be identified and assessed. Second, an outlook on major e-commerce technologies of the future and their indicators should be given. And third, indicators for the scenarios are to be proposed. In addition, a conceptualization of digital commerce in 2025 should be developed on the basis of scenarios because up-to-date frameworks to explain e-commerce are missing (*cf.* Budd & Clear, 2003, p. 18).

The central research question that guides the study is: **What are plausible scenarios for the development of business-to-consumer e-commerce by 2025 focusing on technologies?**

This question comprises five sub-questions that need to be answered in order to substantiate the central research question and to meet all research goals:

- What are the macro environmental drivers that shape the development of the B2C online retail industry?
- What are driving forces in the meso environment of the e-commerce industry?
- What are current technological e-commerce trends?
- How certain and important is the future resolution of the driving forces and trends?
- What are leading indicators for the different e-commerce scenarios?

1.4 RESEARCH DESIGN

To answer the research questions, Schwartz's (*cf.* 1991, pp. 226-233) *Eight-step approach* for scenario building is used as a framework. According to this method, the study's main aspects are the identification and assessment of drivers as a fundament for the scenario building. The research design features a triangulation of data sources as well as a combination of quantitative and qualitative methods to gain a deeper, more holistic, and more reliable view on the needs of tomorrow (*cf.* Nowack *et al.*, 2011, p. 1609).

To build scenarios on the basis of driving forces and uncertainties, data in the form of ideas, visions, and predictions will be collected both by desk research and participatory approaches. Nine semi-standardized trend-scouting interviews with industry experts set the ground for the subsequent web-based survey of 61 experts to assess trends identified in the previous steps. The quantitative Delphi survey is repeated once to achieve higher consensus for the trend valuation among the experts and to identify important disagreements.

The mixed-method design requires multiple methodologies for the data analysis. First, data collected by desk research and qualitative interviews will be analyzed with the open coding technique. Second, the web-based Delphi rounds are analyzed with statistical methods to identify driving forces with the highest importance and variance. These important and uncertain driving forces are used as the dimensions of uncertainty for the scenarios. Third, creative thinking techniques help to pair key trends for the scenarios and to build plausible, innovative, and distinct scenarios.

1.5 CONTRIBUTIONS

This study mainly addresses decision-makers and strategists at retailer as well as e-commerce specialists at consulting firms. Although these target groups from practice are the potential users of e-commerce scenarios, the study at hand provides contributions to both academia and practice.

The *academic* contribution of the E-Commerce 2025 study to the research community is manifold. First, the application of a combined Delphi and scenario study is the first of its kind in the retail. Second, the analysis of scenarios and trends sets new directions for future research. Third, the study serves as an extension of the foresight literature because of its ambitious research design accurately following Schwartz's (1991) approach. And fourth, the new conceptualization of commerce in 2025 provides a definition and common understanding for prospective retail research.

The study yields valuable implications for *managers* in the retail industry because of its strong practical orientation. Following Gabor's famous quotation, "the future cannot be predicted but futures can be invented," (Gabor, 1964, p. 207) organizations need to be innovative and engaged in creating the future. Thus, foresight studies are a meaningful decision-making support for senior

managers and strategy implementation. Furthermore, this study sheds light on the uncertainties regarding technological trends and possible future outcomes. Not only does this thesis serve as inspiration for corporate foresight projects, it also helps to build consensus among strategy makers, to develop attributes for competitive advantage, and to allocate resources with foresightedness.

1.6 DELIMITATIONS AND SCOPE

Both *e-commerce* and *technology* are very broad terms that raise varying expectations among different people in the context of a scenario analysis. It is thus important to clearly define the research focus in order to deliver meaningful and detailed results. The scenarios describe four possible perspectives for the future in 2025 that do not claim to be exact forecasts of how the future *will* be like. Instead, the scenarios reveal distinctive projections of how the future *might* be like. Furthermore, the forecast horizon neither goes beyond 2025 nor does the study provide prognoses for the nearer future.

In terms of technologies the study's aim is to point out technologies with a touch point for customers. Hence, technologies used for internal business processes like logistics or procurement are neglected in the study at hand. Because technology is not the only determinant of future commerce, political, economic, and social factors are also under scrutiny.

As far as the study's understanding of commerce is concerned, the boundaries are spanned more broadly. Accordingly, any commercial business-to-consumer activities facilitated mainly by digital technologies are used as the playground for the scenario development. Thus, the research focus is on the e-retailing industry but not on specific companies.

Although e-commerce is growing globally at different paces (*cf.* eMarketer, 2013a), the study at hand does not go into detail for technological or economic development at a country-level but portrays scenarios for the future of shopping in Western Europe. Hence, experts mostly from Germany are interviewed and surveyed to grasp knowledge for the Western European market.

1.7 OUTLINE OF THESIS

The structure of this thesis follows Perry's sequence (*cf.* 1998) and is therefore organized in five chapters. The second chapter reviews the literature and frameworks for e-commerce, technology foresight, and existing retail foresight studies. Chapter 3 describes the methodological setup with great attention to details. The fourth chapter answers the research questions: It presents the trend assessment and scenarios on the basis of explanations of the driving forces and trends in the e-commerce landscape. Chapter 5 places the results into the wider retail context and provides a conceptualization of e-commerce in 2025. The thesis closes with implications for retail managers and future research.

2 LITERATURE REVIEW

Chapter 2 establishes the theoretical foundation of this study. As this thesis mainly covers two research fields, the literature for *e-commerce* and *technology foresight* is reviewed. An overview of existing foresight studies in the e-commerce domain combines both research fields. On the basis of a review of different technology foresight methods, this chapter also poses arguments for the selection of the Delphi-based scenario analysis method.

2.1 E-COMMERCE

2.1.1 Definitions and Frameworks for E-Commerce

Although the term *e-commerce* originates in the early 1990s (*cf.* Turban *et al.*, 2008, p. 10), there is still no generally and universally accepted definition of what electronic commerce exactly is (*cf.* Numberger & Rennhak, 2005, p. 271). Two reasons can be given for the existence of multiple definitions with different scopes. Firstly, by nature, e-commerce is very interdisciplinary and spans computer sciences, marketing, finance, management information systems, consumer behavior, and economics, amongst others (*cf.* Turban *et al.*, 2008, p. 12). Secondly, e-commerce changes quickly and includes more areas of the economy as well as technologies making it difficult to establish a permanent definition (*cf.* Choi *et al.*, 1997, p. 12).

On the one hand, broad definitions include "any form of economic activity conducted via electronic connections" (Wigand, 1997, p. 2) and "the exchange of information across electronic networks, at any stage in the supply chain" (UK Department of Trade and Industry, In: Chaffey, 2009, p. 11) including post- and pre-sale activities. On the other hand, others define the concept of e-commerce more restrictively as "the process of buying, selling, or exchanging products, services, or information via computer networks" (Turban *et al.*, 2008, p. 4; similarly in: Schneider, 2008, p. 5) or simply as "the buying and selling of goods online" (Jackson *et al.*, 2003, p. 5). Furthermore, the terms *e-business* and *e-commerce* are often interchangeably used, whereas the latter is a subset of the former (*cf.* Jelassi & Enders, 2008). This study follows the wider definition by Constantinides (2006, p. 425):

> "E-Commerce can be defined today as a collection of Internet-based tools, processes and activities supporting, supplementing, improving or replacing traditional commercial (and sometimes non-commercial) practices. Such practices include Promotion, Acquisition, Sales, Communication, Customer Retention, Personnel Recruitment, Market Research etc."

Thus, Constantinides' definition is in line with the four fundamental perspectives on e-commerce proposed by Kalakota & Whinston (1997): Communication, business process, service, and online perspective (*cf.* Ngai & Wat, 2002, p. 415). However, Budd & Clear (2003) note that e-commerce

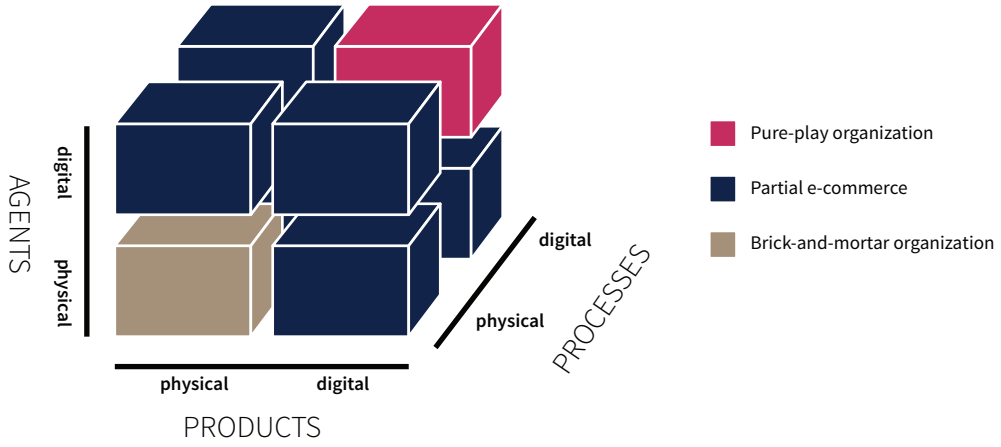

Figure 2: *Areas and dimensions of e-commerce (adapted from Choi et al., 1997, p. 17)*

lacks "appropriate models by which to examine, analyze and explain it" (p. 18). Hence, recent textbooks still refer to rather old frameworks by Kalakota & Whinston (1997) and Choi *et al.* (1997) to explain the business environment, areas, and transaction types of e-commerce (*cf.* Turban *et al.*, 2010, pp. 49ff.; Manzoor, 2010, pp. 4ff.).

According to Turban *et al.* (2008, p. 7; modified from Kalakota & Whinston, 1997, p. 12), the ***business environment*** of electronic commerce can be recognized by applications, which are the result of the ICT infrastructure and five support areas: People, public policy, marketing and advertisement, support services, and business partnerships. As the last element of the framework, "all of these components require good management practice" (*ibid.*, p. 8). This framework depicts that shopping applications for buyers are only the tip of the iceberg in the e-commerce environment.

Furthermore, Choi *at al.* (*cf.* 1997, p. 17) categorize ***e-commerce areas*** along the market dimensions products, processes, and agents/players that may either be digital (online) or physical (offline). As **Figure 2** illustrates, this matrix can either result in a pure physical approach, *i.e.* traditional brick-and-mortar, or a hybrid approach as a combination of digital and physical dimensions, *i.e.* click-and-mortar/partial e-commerce, or the pure-play e-commerce organizations with digital-only dimensions (*cf.* Turban *et al.*, 2008, p. 5). Thus, it is considered e-commerce if one dimension is digital, although it might be only partial or conventional e-commerce (*cf.* Choi *et al.*, 1997, p. 18). The distinction between pure-click and brick-and-click companies as the players in the e-commerce market is supported by Kotler & Keller (*cf.* 2012, p. 439).

The ***types of transaction*** in e-commerce are distinguished into commercial or informational transactions among business-to-business (B2B), business-to-consumer (B2C), consumer-to-business (C2B), and consumer-to-consumer (C2C) (*cf.* Chaffey, 2009, pp. 26f). B2C is "also called e-tailing" (Turban *et al.*, 2008, p. 8) or e-retailing and has the highest popularity due to strong

advertising of existing B2C players. However, B2B accounts for most of the total purchases (*cf.* Haag *et al.*, 2004, p. 251; Kotler & Keller, 2012, p. 439). Hence, ***e-retailing*** or online retailing can be understood as all B2C activities via electronic channels excluding e-marketing actions without direct transactions, such as branding (*cf.* Dennis *et al.*, 2004, p. 2). This definition decouples online retailing from being exclusively conducted by traditional retailers, like department stores or supermarkets, but being an umbrella term for all B2C selling of goods and services.

2.1.2 History of Electronic Commerce

As shown in **Figure 3**, the history of electronic commerce dates back to the 1960s with an increase in milestones in the 1990s driven by regulatory and mainly technological progress on the infrastructural grounds of the previous decades. However, the term "e-commerce" was not invented until the beginning of the 1980s (*cf.* Jacobson, 1981).

In the 1960s, 70s and 80s, the ARPANET and standards (EDI, EFT and ASC X12) were established, which enabled the electronic exchange of business documents between large organizations (*cf.* Turban *et al.*, 2008, p. 10). In 1979, Michael Aldrich's teleshopping via telephone and television is considered to be the invention of online shopping (*cf.* Mazur & Mazur, 2009, p. 255). But it took another 15 years until the first modern Internet-based shop with secure transactions was launched, titled NetMarket (*cf.* Gilbert, 2004), and the term e-commerce became popular (*cf.* Manzoor, 2010, p. 13). This was made possible by the birth of the World Wide Web in 1990 (*cf.* Berners-Lee *et al.*, 1994, p. 76), the first browser Mosaic in 1993 (*cf.* Andreessen & Bina, 2010, p. 472), the invention of SSL for encrypted communication in 1994 (*cf.* Hickmann, 1994) and the permission to use the Internet for commercial purposes by the National Science Foundation in 1991 (*cf.* Shim *et al.*, 2000, p. 51).

The last five years of the 20th century form the "era known as the dot-com boom" (Kalyanam & McIntyre, 2002, p. 487) with hundreds of pure-players taken to IPOs, high growth rates and technology-driven online businesses (*cf.* Laudon & Traver, 2004, p. 28). A big bust followed the boom and the burst of the dot-com bubble happened in 2001 (*cf.* Kalyanam & McIntyre, 2002, p. 487). This led to a consolidation of the industry and a global rebirth of e-commerce with more sustainable, efficient and cross-channel business models with strong brand names (*cf.* Laudon & Traver, 2004, p. 35; Schneider, 2009, p. 11).

When the rise of social media platforms paved the way for social-commerce (*cf.* Wang & Zhan, 2012, p. 4; Haderlein, 2012, p. 24) with Web 2.0 (*cf.* O'Reilly, 2005), e-commerce changed once again and shifted more power to the consumers (*cf.* Carpenter, 2013, p. 5). In 2007, the launch of Apple's *iPhone* became a game changer for mobile-commerce (*cf.* Kotler & Keller, 2012, p. 592) and multichannel (*cf.* Levy *et al.*, 2013, p. 67) or omnichannel retail strategies with intermediated

channels (*cf.* Burt & Sparks, 2003, p. 279; Brynjolfsson *et al.*, 2013, p. 4). Accordingly, the department store chain John Lewis introduced the click-and-collect model in 2008 (*cf.* Traynier, 2013) and retailers began to utilize social media services (*cf.* Constantinides *et al.*, 2008). More recently, worldwide e-commerce sales continue to grow topping $1 trillion in 2012 (*cf.* eMarketer, 2013b) with global competition from China, such as Alibaba (*cf.* Demos & Jarzemsky, 2014).

The look at the history of e-commerce shows that an opening for private consumers happened from B2B-only offerings to B2C and C2C services in the 1990s. In the beginnings, only big organizations could participate in e-commerce and, nowadays, every consumer can be a merchant or producer with social-commerce and auction platforms (*cf.* Haderlein, 2012, p. 24) or access electronic shops from smartphones with m-commerce. Remarkably, e-commerce players from the first days like Amazon, eBay and PayPal who started back in 1995 and 1998, respectively, are still among the top companies. In the recent past, mobile devices seem to hold a big potential because they "are still in their early days" (Einav *et al.*, 2014, p. 494).

To conclude, placing e-commerce history into the context of commerce's history in general, "it is still Day 1", as Amazon founder Jeff Bezos (2014) recently wrote to his shareholders.

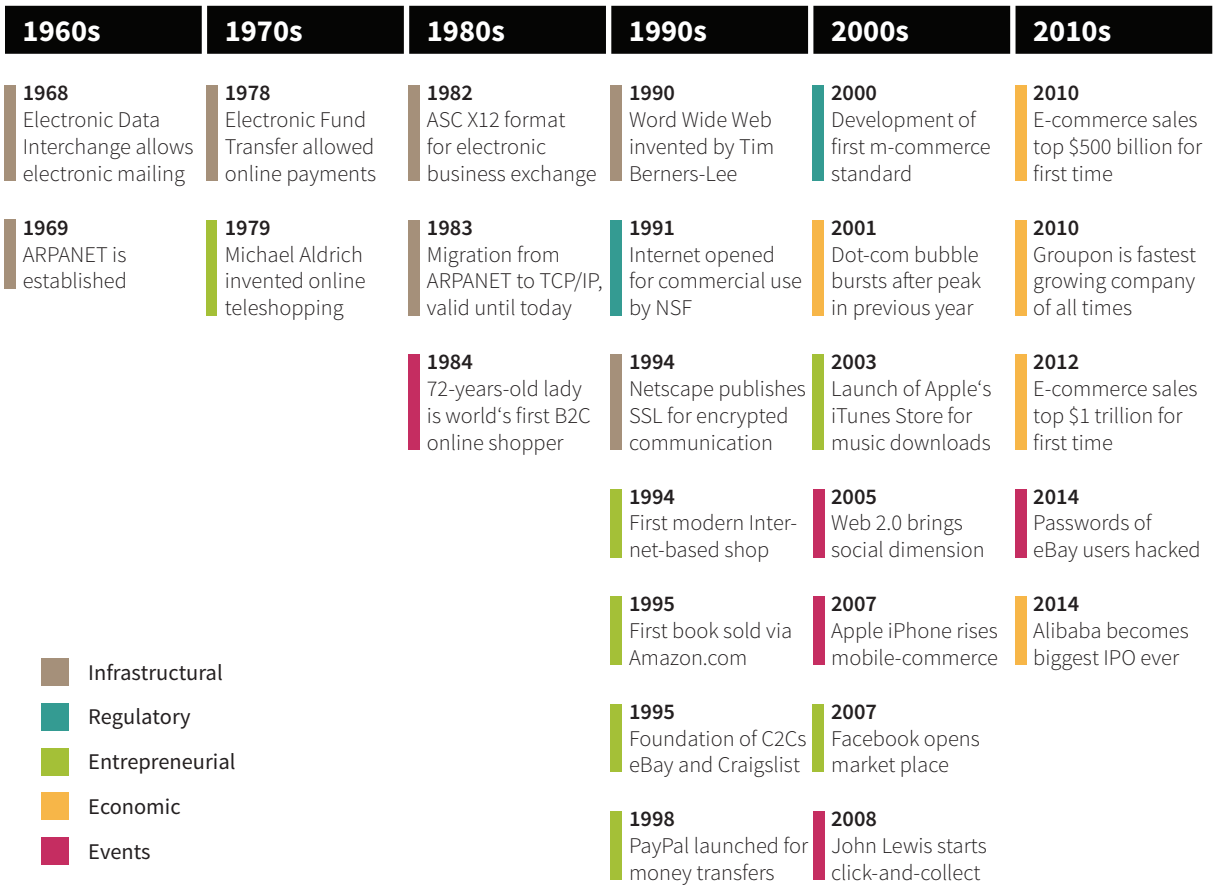

Figure 3: *Grouped milestones in the evolution of electronic commerce (own depiction)*

2.2 EXISTING E-COMMERCE FORESIGHT STUDIES

An in-depth review of the e-commerce and foresight literature did not reveal publications of e-commerce foresight studies in peer-reviewed journals. However, the discussion of disruptive and trending technologies is very advanced among practitioners. **Table 1** gives an overview of e-commerce-related studies with a foresight horizon of at least 2020 that feature academic methods. Studies that are either merely an assessment of current retail trends and do not provide predictions or representations of the future for a defined time horizon (*e.g.* eBay, 2014) or that do not focus on retailing (*e.g.* Münchener Kreis, 2009) are not listed.

Unintentionally and despite a global research for English-language studies, the most identified foresight studies were developed and sponsored by German organizations. Deutsche Post, Germany's biggest logistic company is strikingly active in the foresight domain, as it has sponsored almost half of the recognized studies. Moreover, five out of seven identified studies are scenario analyses based on expert interviews and one publication applies the Delphi technique. The median foresight horizon of the recognized studies is eleven years and is thus on par with the foresight period of the study at hand.

The foresight studies listed in **Table 1** arrive at widely diverse results as each publication has a different focus. However, five patterns of the future are repetitive among the studies. Firstly, omnichannel retailing will be the glue between the online and offline retail channels and is predicted by most of the studies (*cf.* Deutsche Post DHL, 2014, p. 21; IFH, 2014, p. 250; 2b Ahead, 2014, p. 30; PWC, 2012, p. 30). Secondly, mobile-commerce will be more advanced and smartphones or wearable devices emerge as shopping assistants that recommend items to buy and feed customers with product information (*cf.* Deutsche Post DHL, 2014, p. 61; IFH, 2014, p. 271; 2b Ahead, 2014, p. 31). Thirdly, new payment concepts will feature digital, smartphone-enabled wallets and Internet currencies that reduce the effort for checkout processes according to Deutsche Post DHL (2014, p. 24), 2b Ahead (2014, p. 39) and PWC (2012, p. 15). Nevertheless, e-commerce experts in the Delphi survey by Münchener Kreis (2009, p. 38) predicted that cryptocurrencies will not replace conventional payment means before 2030. Fourthly, 3D printing will have a huge impact on retailing and especially logistics because it will meet the customers' awareness for the environment and need for individualization (*cf.* Deutsche Post DHL, 2014, p. 58; 2b Ahead, 2014, p. 44; Deutsche Post, 2012, p. 70). Fifthly, customer needs are forecasted to change, which increases the importance of personalization of touch-points and communication leveraged by Big Data analytics (*cf.* 2b Ahead, 2014, p. 40; PWC, 2012, p. 32; Deutsche Post, 2009, p. 130).

Table 1: *Retail foresight studies with academic rigor and foresight horizon of 2020 or beyond*

Study	Sponsor	Method	Horizon	Focus	Main results
Global E-Tailing	Deutsche Post DHL (2014)	Scenario analysis based on ethnographic trend scouting in 12 cities and expert interviews	2025	Global retail and implications for logistics	Four future scenarios: 1) Hybrid consumer behavior in convergent worlds of retailing; 2) Self-presentation in virtual communities; 3) Artificial intelligence in the digital retail sphere; 4) Collaborative consumption in a regionalized retailing landscape
The Future of Stationary Trading *[original title: Die Zukunft des stationären Handels]*	2b Ahead (2014)	Scenario analysis based on trend scouting and 9 expert interviews	2020	Stationary retailing in general	Five trend fields for brick-and-mortar retailers: 1) Omnichannel; 2) Out-of-store touch points; 3) Digital technologies in stores; 4) Personalized sales approach; 5) New shopping experiences with added value
Retail Scenarios 2020 *[original title: Handelsszenario 2020]*	IFH (2014)	Scenario analysis and calculation of sales volumes	2020	Retailing in Germany	15 theses about retail industry in Germany and 4 future scenarios: 1) E-Basic 1.0; 2) E-Motion 1.0; 3) Discount 2.0; 4) City Revival 2.0
Delivering Tomorrow: Logistics 2050 – A Scenario Study	Deutsche Post (2012)	Scenario analysis based on 22 expert interviews	2050	Logistics	Five future scenarios: 1) Untamed economy, impending collapse; 2) Mega-efficiency in megacities; 3) Customized lifestyles; 4) Paralyzing protectionism; 5) Global resilience, local adaptation
Retailing 2020: Winning in a polarized world	PWC (2012)	Expert interviews and desk research	2020	Retailing in US	Six key trends: 1) Consumer-driven supply chain; 2) Growth fragmentation of retail channels; 3) Retail growth from unfamiliar markets; 4) Omnichannel; 5) Consumer-driven transparency; 6) Consumer-centric retailing
Delivering Tomorrow: Customer Needs in 2020 and Beyond – A Global Delphi Study	Deutsche Post (2009)	Delphi study based on 38 expert interviews	2020	Logistics and consumer behavior	Assessment of 81 theses: Consumers are always on, China will join club of technological leaders, Internet will transform customer expectations, convenience is central requirement
Retail futures	Unilever & Tesco (2007)	Scenario analysis based on 60 expert views and workshops	2022	Retailing in UK of fast moving consumer goods	Four future scenarios with emphasize on sustainability: 1) My way; 2) Sell it to me; 3) From me to you; 4) I'm in your hands

2.3 FRAMEWORKS FOR ENVIRONMENTAL SCANNING

Since the research questions involve the macro and meso environment, frameworks are reviewed.

2.3.1 PEST Framework for the Macro Environment

The most popular framework to scan the macro environment is the PEST framework (*cf.* Fahey & Narayanan, 1986) that provides a "satellite view" (Peng & Nunes, 2007, p. 230) onto physical and social factors surrounding organizations. PEST is an acronym for political, economic, social, and technological, which form the segments of the macro environment. Political factors include laws, trade restrictions, tariffs or political stability, amongst others. The economic dimension comprises economic growth, inflation, unemployment and interest rates or the availability of resources. Exemplary factors in the social area are values, education, culture, and age distribution. Technological aspects cover R&D activities and product lifecycles, *inter alia*. Sometimes, environmental and legal aspects extend the PEST framework, *i.e.* PESTEL analysis (*cf.* Walsh, 2005).

Changes in the four or six, respectively, environmental segments affect organizations across industries (*cf.* Ginter & Duncan, 1990, p. 91). According to Peng & Nunes (2007), PEST analyses can be used either to analyze a company or industry's position within the environment or to evaluate the viability of management decisions in the ecosystem. In this regard, Ginter & Duncan (1990, p. 92) propose four interrelated steps that guide PEST(EL) analyses:

1. "Scanning macroenvironments for warning signs"
2. "Monitoring environments for specific trends and patterns"
3. "Forecasting future directions of environmental changes"
4. "Assessing current and future trends"

Macro environmental trends and changes on the contextual level have an impact both on the meso environment – *i.e.* the transactional level of an industry in between macro and micro – and thus indirectly on the organizational microenvironment (*cf.* House *et al.*, 1995).

2.3.2 Porter's Five Forces for the Meso Environment

Industry characteristics can be assessed with Michael Porter's well-known Five Forces framework (*cf.* Porter, 1979). According to Porter, the attractiveness of an industry in terms of profitability is contingent upon five competitive forces that determine the value for the players of an industry, namely buyers, suppliers, competitors and producers of substitutes (Porter, 2008, p. 39). The forces that form the industry competition and structure are (Porter, 1979):

1. *Threat of new entrants*: Barriers to entry and "reaction from existing competitors" (p. 138)
2. *Bargaining power of buyers*: "Demand higher quality or more service, and play competitors off against each other" (p. 140)
3. *Bargaining power of suppliers*: "Raising of prices or reducing the quality" (p. 140)
4. *Threat of substitute products*: "Price reduction or performance improvement" (p. 142)
5. *Rivalry among existing competitors*: *e.g.* price competition (p. 142)

2.4 TECHNOLOGY FORESIGHT

During the past century, an ever-growing importance of technological innovations has aroused politics and companies to actively prepare for the future in order to shape and to overcome uncertainties (*cf.* Linstone, 2011, p. 69). The technology foresight analysis is a strong tool for decision-making and innovation management (*cf.* Villacorta *et al.*, 2011, p. 867) as competitive advantages can be sustained by preparing for the future (*cf.* Hitt *et al.*, 1998, p. 22). The fundamental understanding of technology foresight is to see the future as a set of multiple forthcoming possibilities and to explore these alternative futures systematically (*cf.* Martin, 1995, p. 140; Cuhls, 2003, p. 94). Although the future is unpredictable, technology foresight aims to prepare for different future options (*cf.* Cuhls, 2003, p. 93) and to manage uncertainties through the interaction of stakeholders (*cf.* van der Meulen *et al.*, 2003, p. 220). Therefore, the identification of a wide horizon of possible outcomes and their driving forces is the main purpose of foresight activities (*cf.* Saffo, 2007, p. 122; Martin, 2010, p. 1441). However, future projections can merely be generated interpretations without indicating the best or even correct one (*cf.* McMaster, 1996, p. 154). Accordingly, the most quoted definition portrays technology foresight as:

> "The process involved in systematically attempting to look into the longer-term future of science, technology, the economy and society with the aim of identifying the areas of strategic research and the emerging generic technologies likely to yield the greatest economic and social benefits" (Martin, 1995, p. 140).

Technology foresight is rooted in the same research domain as forecasting and planning, even though the underlying principles differ. In the early 1990s, the terminology shifted from *technological forecasting* to *technology foresight* (*cf.* Martin, 2010, p. 1439) and, today, foresight appears to be used as a synonym for forecasting (*cf.* Miles, 2010, p. 1449; Cuhls, 2003, p. 93). In forecasting – or prediction –, the assumption is that not multiple futures but only one probable future exists that should be predicted with "a relatively high confidence level" (Wills, 1972, p. 263). Thus, predictions attempt to have scientific justifications for a limited scope of the future to one outcome. Future studies have acknowledged this drawback and developed from predicting *the* future toward discovering *alternative* futures (*cf.* Rohrbeck & Gemünden, 2011, p. 223). Technology planning deals with the short-term future by targeting specific events and defining milestones to make progress. Hence, planning techniques result in structured plans (*cf.* Cuhls, 2003, p. 102).

The selection of the appropriate methods for foresight projects is crucial. However, Martin (*cf.* 1995, p. 140) emphasizes that the foresight *process* itself is more important than the *method*. The set of techniques to choose from is both huge and divers, as Porter *et al.* (*cf.* 2004, p. 287) list 51 technology future analysis methods. According to Vecchiato & Roveda (2010, p. 1527) as well as Kreibich *et al.* (2011, p. 18), technology roadmapping, the Delphi method, and scenario analysis

are the most popular techniques in technology foresight. Other well-known methods are technology s-curves (*cf.* Foster, 1986) and prediction markets (*cf.* Graefe *et al.*, 2010), amongst others.

Technology s-curves, introduced by Foster (1986), help to optimize productivity through illustrating R&D efforts in relation to its technological performance (*cf.* Asthana, 1995, p. 49). Based on technology lifecycles, technologies show an s-shaped curve in their lifetime as they undergo three phases with slow improvement in the beginning, accelerated development in the growth phase and withdrawing improvement after the inflection point until a performance limit is reached (*cf.* Schilling & Esmundo, 2009, p. 1768). At the inflection point in the growth phase, R&D effort should be invested in a new technology with a higher performance potential and a steeper or higher s-curve (*cf. ibid.*; Astana, 1995, p. 49). Thus, technology s-curves provide useful insights for planning although the application is ambiguous according to Christensen (*cf.* 1992, p. 353) because the limits of technologies as well as the exact lifecycles are difficult to know (*cf.* Schilling & Esmundo, 2009, p. 1769).

In ***prediction markets***, participants trade contracts about certain future events to make market predictions with prices (*cf.* Manski, 2006, p. 425). Prediction markets thus challenge participants to think about the future and are appropriate to forecast short-term events (*cf.* Graefe *et al.*, 2010, p. 398). The speculative markets aggregate group information in a structured approach (*cf.* ibid., p. 397), are mostly web-based (*cf.* Wolfers & Zitzewitz, 2004, p. 110), and often used for election outcomes (*cf.* Berg *et al.*, 200, p. 283). They may also be applied to quantify technological trends.

Technology roadmapping is a planning technique to recognize technological interdependencies over time and to visualize a planning horizon of technologies in a graphical way (*cf.* Phaal *et al.*, 2004, p. 5). The essence of roadmapping is the collaborative process of a heterogeneous team to get collective learning and a shared vision (*cf.* Phaal *et al.*, 2004, p. 23). Thus, the primary function of roadmapping is not the representation of technological projects but more importantly the communication, coordination, and selection of technology projections (*cf.* Rinne, 2004, p. 68). The method's strengths are therefore derived from the process to develop consensus for decision-making and a future commitment (*cf.* Kostoff & Schaller, 2001, p. 134).

The ***Delphi method*** is a foresight tool for idea generation, judgment, and consolidation purposes executed by a "group of experts by subjecting them to a series of questionnaires in depth interspersed with controlled opinion feedback" (Dalkey & Helmer, 1963, p. 458). After each round and until consensus is reached, the experts are confronted with a qualitative or quantitative questionnaire including the entire group's results from the previous round to re-evaluate their answers (*cf.* Grisham, 2008, p. 114). Hence, the method can yield strong insights in the form of converged expert opinions especially in domains, where reliable data is either unavailable or very difficult to

acquire but indispensable (*cf.* Munier & Ronde, 2001, p. 1543; Okoli & Pawlowski, 2004, p. 16). The main aspects of the structured interview process are anonymity, iteration, controlled feedback, and experts (*cf.* Linstone & Turoff, 1975). The technique has developed over time and is now used in multiple areas and variations as numerous literature reviews depict (*e.g.* Linstone & Turoff, 2011; Landeta, 2006; Rowe & Wright, 1999; Gupta & Clarke, 1996).

Scenario analysis aims at constructing *different* futures and does not have the purpose to predict *the* future. Scenarios can therefore exploit their strengths only as a bundle of alternative future projections (*cf.* Müller & Müller-Stewens, 2009, p. 236), *i.e.* scenario building, in order to initiate discussions about long-term strategies and to integrate scenarios in corporate decision-making, *i.e.* scenario planning (*cf.* Schoemaker, 1995). As there is not *the* scenario method (*cf.* Bunn & Salo, 1993, p. 301), Bishop *et al.* (2007) as well as Börjeson *et al.* (2006) illustrate scenario types, techniques and underlying theories. The typology by Börjeson *et al.* (2006, p. 725) distinguishes three distinct scenario types. First, *predictive* scenarios are forecasts of the future and answer the question "what will happen". Second, *explorative* scenarios have a strategic intent, start from past and present trends and answer questions regarding "what can happen". Lastly, *normative* scenarios are built on different visions of the future and answer "how can a specific target be reached" (Godet & Roubelat, 1996, p. 166). Literature reviews by Bradfield *et al.* (2005), van Notten *et al.* (2003), and Chermack *et al.* (2001) cover detailed descriptions of scenario methodologies.

Mietzner & Reger (2005) compare four leading scenario-building approaches, of which three follow rather similar eight-step approaches (Schwartz, 1991; von Reibnitz, 1988; Heinecke & Schwager, 1995) and one a combination of different tools in a three-stage approach (Godet & Roubelat, 1996). Similarly, Masini & Vasquez (2000) compare qualitative with quantitative scenario-building frameworks and highlight the approaches by Schwartz (1991) and Godet (2000).

2.5 METHODS FOR SCENARIO ANALYSIS

As the study's results ought to be scenarios, two popular techniques are presented in this section.

2.5.1 Godet & Roubelat's Scenario Method

According to Villacorta *et al.* (*cf.* 2011, p. 867), Michel Godet's scenario method belongs to the most frequently used methods for scenario analyses and it is characterized as "highly formalized" (Mietzner & Reger, 2005, p. 227) insisting on mathematical models (*cf.* Masini & Vasquez, 2000, p. 52). The approach combines various techniques and is structured around nine logical steps (Godet, 2000, p. 10) grouped into the following three stages:

1. "Construction of the basis and identification of essential variables"
2. "Identification of major issues at stake and key questions for the future"
3. "Elaboration of exploratory scenarios" (Arcade *et al.*, 1999, pp. 2-3)

For the first stage, Godet proposes the MICMAC tool for the structural analysis of the key variables and its relationships (*cf.* Arcade *et al.*, 1999). The so-called MACTOR method aids the second stage to analyze trends and to develop hypotheses (*cf.* Godet & Roubelat, 1996, p. 166). In stage three, the most likely scenario is selected using uncertainty-reducing methods like cross-impact (called SMIC in the case of Godet's approach; *cf.* Bishop *et al.*, 2007, p. 15) or morphological analysis both based on expert judgment (*cf.* Godet & Roubelat, 1996, p. 166).

Due to its mathematic basis, Godet & Roubelats's scenario method seeks "to use the most objective means possible" (Godet, 2000, p. 9) to develop scenarios. However, this strong focus on academic rigor is not well suited for the needs of managers and therefore criticized (*cf.* Martelli, 2001) whereas Schwartz has introduced his scenario building approach for management purposes (*cf.* Mietzner & Reger, 2005, p. 222).

2.5.2 Schwartz' Eight-Step Approach

Peter Schwartz developed his scenario building approach before and established it during his time at Royal Dutch Shell as the head of scenario planning. This method became popular as the Global Business Network method in the 1990s (*cf.* Ringland, 1998, p. 227; Bishop *et al.*, 2007, p. 5). According to Millet (2003), the method is "the gold standard of corporate scenario generation" (p. 18). Starting from the past and present, its aim is to reveal large-scale driving forces that can shape the future into different ways (*cf.* Mietzner & Reger, 2005, p. 230). *Driving forces* are societal, technological, economic, political and environmental changes with an impact on the future (*cf.* Pillkahn, 2008, p. 140). Schwartz's approach consists of eight steps, as follows:

1. "Identify focal issue or decision"
2. "Key forces in the local environment"
3. "Driving forces"
4. "Rank by importance and uncertainty"
5. "Selecting scenario logics"
6. "Fleshing out the scenarios"
7. "Implications"
8. "Selection of leading indicators and signposts" (Schwartz, 1991, pp. 226-233)

In the fist step, the scenario planner should isolate an impending decision that involves a high level of uncertainty by starting from inside out rather from outside in (*cf.* Ringland, 1998, p. 228). The second step identifies the factors that determine the success or failure of the focal issue (*cf. ibid.*, p. 230). Step 3 is the most research-intensive (*cf.* Schwartz, 1991, p. 228) because it lists forces in the wider environment that influence the key forces identified before (*cf.* Ringland, 1998, p. 228). Next, two factors with the highest importance *and* uncertainty are selected (*cf. ibid.*) that are used as axes for the scenario matrix in step 5 (*cf. ibid.*, p. 231). Thus, two dimensions of uncertainty frame the matrix resulting in four cells, which "represent alternatively the four combinations of

the poles of the two uncertainties" (Bishop *et al.*, 2007, p. 14). Step 6 is based on the scenario matrix and the forces listed in the first three steps to write scenario narratives (*cf.* Ringland, 1998, p. 232). The future is rehearsed in step 7 and implications for the focal issue from step 1 are given (*cf. ibid.*, p. 232). Finally, the last step investigates a few key indicators for each scenario to support the scenarios and its implications (*cf. ibid.*, p. 233).

2.6 JUSTIFICATION FOR DELPHI-BASED SCENARIO BUILDING WITH SCHWARTZ'S EIGHT-STEP APPROACH

Building on the literature review of technology foresight, this study utilizes the scenario analysis method in combination with the Delphi technique as it is suggested by Nowack *et al.* to improve the quality of the scenarios (*cf.* 2011, p. 1607). Nowack *et al.* (*cf.* 2011, p. 1613) also recommend integrating the Delphi method only in one phase of the scenario building process due to its high complexity through multiple survey rounds. The combination of the scenario analysis and Delphi method has already been conducted in the fields of agriculture (Rikkonnen & Tapio, 2009), medical technology (Postma *et al.*, 2007), and educational technologies (Volman, 2005), among others.

According to Saffo (*cf.* 2007, p. 123), foresight and forecasting are always iterative processes. Hence, the study at hand follows the iterative scenario building approach by Schwartz (*cf.* 1991) because it is "much more pervaded" than Godet's approach, according to Postma & Liebl (2005, p. 163). Furthermore, it is known as "the default scenario technique" (Bishop *et al.*, 2007, p. 14) and is also being used for ambitious foresight projects in the recent past (*e.g.* Rockefeller, 2010). The qualitative-driven scenario technique helps to reveal hidden business opportunities and risks through environmental analyses and trend investigations rather than quantitative estimates or calculations (*cf.* Chermack, 2006, p. 24).

For foresight studies, "a mix of methods and instruments seems to be most promising," according to Cuhls (2003, p. 98). Therefore, this study achieves a triangulation of methods with qualitative interviews and two quantitative Delphi rounds to build scenarios on the basis of multiple data sources. Qualitative and quantitative methods are combined because quantitative data collection is only sufficient in environments with a constant and linear future (*cf.* Bijl, 1992), which does not apply to online retailing. Consequently, the quantitative Delphi survey serves as a confirmation of the qualitatively collected data through expert interviews and desk research, which is suggested by Linstone & Turoff (*cf.* 1975, p. 188).

According to Chermack (*cf.* 2006, p. 24), the analytic and creative thinking capabilities of the people involved in the foresight process determine the quality of the outcome. Therefore, the methodological framework of this study features expert participation in order to increase the richness

of different views and variety of input (*cf.* Porter *et al.*, 2004, p. 292), which should lead to greater quality *of* and support *for* the results. The participation of experts through the Delphi method is advantageous because it increases the robustness, innovativeness, objectivity, and credibility of the results, as the Delphi or scenario method could not provide the same findings when used alone (*cf.* Nowack *et al.*, 2011, p. 1609).

The time horizon for the scenarios is ten years and thus medium-term (*cf.* van Notten *et al.*, 2003, p. 430). Ten years are not so near from today that only trivial results would be achieved and not too far away for the findings to be too vague or meaningless. However, ten years are far enough from the present that the resolution of currently emerging trends can be projected (*cf.* Martin, 1995, p. 159). Schaars (1987) notes that the "ideal time horizon […] is specific to the industry, product, or market under consideration" (p. 108). As explorative scenarios are built on the development in the past, Saffo (*cf.* 2007, p. 129) recommends looking into the past twice as long as the desired foresight horizon is. Taking his suggestion strictly, the time horizon for electronic commerce scenario studies is thus limited to ten years because modern electronic commerce exists for only 20 years (*cf.* section 2.1.2).

In terms of the quantity of scenarios, four scenarios are the logical outcome of the 2x2 matrix from Schwartz's (1991) framework (*cf.* Postma & Liebl, 2005, p. 163). Furthermore, only two scenarios could result in a good and bad future and three scenarios would merely add a more probable middle scenario (*cf.* Schaars, 1987, p. 112; Schwartz, 1991, p. 233), whereas more than four scenarios are too complex to build and use for decision-making.

To conclude, the scenario building follows a structured framework rather than merely bringing different methods together. Moreover, both the member checking and the triangulation of methods and data sources emphasize the methodological thoroughness and robustness of the results.

3 METHODOLOGY

The previous chapter justified the use of Schwartz's Eight-step approach for scenario building in combination with the Delphi technique. As the participation of experts is crucial in both methods, chapter three explains how the experts are selected. Furthermore, this chapter describes which methods will be used in each stage of the Eight-step approach to collect and analyze data. The level of detail in this chapter is so sufficient that other researchers could replicate this study.

3.1 RESEARCH METHODS

As indicated by **Table 2**, Schwartz's (*cf.* 1991, pp. 226-233) *Eight-step approach* for the scenario building serves as a structure for the research. Following Masini & Vasquez, Schwartz approach is "characterized by its emphasis on pragmatism rather than abstraction" (2000, p. 52). Therefore, the approach merely says *what* the result of each step should be and the researcher has to interpret *how* to accomplish the desired results. So, expedient methods for each step are chosen in light of the research questions.

According to Gibson (1990), "the future is already here – it's just not very evenly distributed." Hence, the development of scenarios is based on past and present trends, which are indicators for the future and thus need to be uncovered by desk research in ***step 1*** of the research framework. Consequently, this study uses an explorative scenario building approach according to the typology of Börjeson *et al.* (2006). The desk research comprises primary and secondary sources. Since environmental scanning is an essential component of futures studies (*cf.* Vecchiato & Roveda, 2010, p. 1530), the identification of driving forces in ***step 2*** engages nine qualitative expert interviews besides desk research. ***Step 3*** involves the qualitative coding of the interviews to disaggregate the data into small units with labels for each trend (*cf.* Saunders *et al.*, 2009, pp. 509ff.) as well as the listing of identified trends and drivers from previous steps with the mind mapping technique. The identified data is sorted into the dimensions of the PEST framework as well as Porter's Five Forces (1979). Grounded in the findings of the qualitative data collection, 30 statements about the future of digital retailing are generated (see **Appendix 1**), which are assessed in ***step 4*** by a quantitative Delphi survey of 61 industry experts with two rounds. The outcome of the survey is an assessment of the most important trends in terms of importance for the retail industry and probability of occurrence on a Likert scale. The survey results are then statistically analyzed in ***step 5*** to determine the two most uncertain *key* driving forces by importance and lacking consensus for probability of occurrence, which serve as axes for the scenario matrix. Hence, the 2x2 matrix with axes of the two key driving forces determines the characteristics of the scenarios.

Schwartz's 8-Step Approach	Methodology	Results
1 Identify focal issue & trends	Desk research	Unstructured list of trends
2 Identify driving forces in macro and micro environment	Desk research, qualitative expert interviews (n=9)	Unstructured collection of driving forces
3 Listing of driving forces and trends	Qualitative coding of data from steps 1 and 2	Structured, condensed driving forces and trends
4 Ranking of driving forces and trends by importance and uncertainty	1st and 2nd Delphi round with quantitative expert surveys (n=61)	Expert ratings on Likert-scale for trends and driving forces
5 Selection of two most uncertain key driving forces as scenario axes	Statistical analysis of Delphi results	Scenario matrix
6 Fleshing out the scenarios based on identified trends in steps 1 to 3	Creative thinking techniques, desk research	4 scenarios
7 Exploration of implications	Content analysis of scenarios	Managerial implications
8 Selection of leading indicators	Desk research	Indicators for each scenario

Table 2: *Research framework based on Schwartz (1991, pp. 226-233)*

Subsequent to the data collection and analysis, ***step 6*** requires creative thinking techniques to pair and play with the driving forces that are both highly important and highly uncertain in terms of their future outcome because the resolution of the uncertain drivers can only be guessed but not known (*cf.* Wang & Lan, 2007, p. 357). The results of the previous empirical steps are used to narrate four plausible and yet innovative as well as distinct scenarios for digital commerce in 2025. Again, desk research is employed for ***steps 7 & 8*** in order to provide implications for practitioners and academia with respect to the focal issue defined in the first step. Finally, the outcome of ***step 8*** demonstrates indicators for each final scenario from visionary projects that already exist today.

3.2 EXPERT SELECTION

The input and judgment of experts play a central role in the study at hand and experts are recruited both for the qualitative interviews and the quantitative survey. The use of the term *expert* and what qualifies someone as an expert have been debated for decades (*e.g.* Hasson *et al.*, 2000, p. 1010; Meuser & Nagel, 1991, p. 443) and are linked to *knowledge*, which determines the level of expertise (*cf.* Munier & Ronde, 2001, p. 1539). Thus, this study proposes its own definition of an expert based on specific criteria related to working experience and diversity of expertise (see below) to capture a high level of online retailing knowledge.

The selection of experts is a main challenge for Delphi surveys and the choice of like-minded individuals should be avoided (*cf.* Linstone & Turoff, 1975, p. 580). Furthermore, representative sampling techniques and random samples of panelists are not required (*cf.* Beretta, 1996, p. 83;

Goodman, 1987, p. 730) because statistical analyses like regressions are not the aim of Delphi surveys (*cf.* Okoli & Pawlowski, 2004, p. 6). The sampling of experts was therefore conducted in a purposive, criterion-based and very selective manner.

There is not only little agreement for the procedure of how to select experts (*cf.* Steinert, 2009, p. 293) but there is also no generally valid recommendation about the appropriate sample size of Delphi surveys. Some scholars propose a minimum sample size of 10 to 25 experts (*e.g.* Parenté & Anderson-Parenté, 1987; Cavalli-Sforzar & Ortolano, 1984, p. 325; Linstone, 1978) and others suggest a range between 25 and 50 respondents (*e.g.* Delbecq *et al.*, 1975; Brooks, 1979; Turoff, 1970, p. 153). As there are different Delphi survey types and varying levels of complexity, the number of experts should be altered accordingly (*cf.* Loo, 2002, p. 765). Following the suggestion by Murphy *et al.* (*cf.* 1988, p. 37) that the bigger the panel is the better, the present study intends to sample more than 50 experts.

The procedure to identify and select a heterogeneous group of experts for the study at hand is based on an iterative process previously used by Delbecq *et al.* (1975) and Okoli & Pawlowski, 2004, pp. 20f.). ***Firstly***, relevant organizations in the DACH-region were identified (*i.e.* online retailing companies, multichannel retailers, e-commerce associations, retail research institutions, digital commerce consulting firms, trend research agencies with retail focus, and innovative e-commerce start-ups). ***Secondly***, these organizations were populated with names of top-level executives and contact details. In addition, authors of relevant retail foresight studies as well as speakers at e-commerce conferences and editors of popular e-commerce blogs were explored. Furthermore, two business-oriented social networks (LinkedIn and Xing) were used for a broader search for additional experts. There, professionals were selected that fulfilled the following criteria:

- Either C-level positions or job title is “senior manager”, “head of”, “vice president”, “partner”, or “director”
- Employed at retailer, online shop, or e-commerce consulting firm
- Responsibility for strategic management, innovation management, or business development
- German-speaking

The study samples only German-speaking experts because the DACH-region is a representative retail market for Western Europe (*cf.* Zentes & Rittinger, 2009) with low access barriers for the author of this thesis. Furthermore, the drop-out-rate for the interviews and surveys is likely to be lower because the experts were contacted and surveyed in their native language.

Thirdly, the experts are ranked based on the area of expertise, reputation, and experiences with foresight tasks to distinguish between respondents for the quantitative surveys and those who also qualify for the qualitative interviews. Moreover, the ranking ensures a balance of interviewees

between representatives from the worlds of academia, consultancy, and the retail industry. A selective sampling was conducted to recruit a full range of industry representatives from a stationary retailer (Metro AG), a pure e-commerce player (eBay), and a traditional retailer that has shifted to e-commerce (Otto Group) in order to interview experts from big players in each of these categories. ***Fourthly***, the experts were contacted. 23 experts had to be contacted to recruit ten interviewees for the second step of the research framework (response rate 43%). However, one interviewee cancelled the interview appointment too shortly before the quantitative surveys so that it was not possible to recruit a new tenth participant.

In addition to the iterative sampling procedure, the pyramiding approach was used to extent the sample for the Delphi survey (*cf.* von Hippel *et al.*, 2006). Hence, the experts for the qualitative interviews were asked to name professionals that are at least as knowledgeable as they are. The advantage of this technique is that the interviewees serve as gatekeepers to contact very reputable experts. Furthermore, this technique reduces the potential of a "selection bias" (Hill & Fowles, 1975, p. 182) for the choice of experts because the researcher foregoes his exclusive right to select the experts for the Delphi surveys.

In total, the expert research yielded a sample of 189 German-speaking experts that were individually contacted to participate in the quantitative Delphi survey. As recognition of participation, the experts were incentivized with a digital copy of the study results and publishing of the qualitative interview panel membership as a social reward (*cf.* Rowe & Wrigtht, 2011, p. 1489).

3.3 DATA COLLECTION METHODS

3.3.1 Desk Research to Identify Trends and Driving Forces

Existing resources are used for desk research to collect data, *i.e.* secondary research. The main advantage of using secondary in addition to primary data is to take the body of accessible knowledge with multiple perspectives into account at manageable efforts (*cf.* Saunders *et al.*, 2009, p. 268). The study at hand uses desk research in steps 1, 2, and 8 of the research framework for environmental scanning activities. Thus, the secondary literature is scanned to identify, firstly, online retailing trends and driving forces in the environment as input for the interviews and scenario building as well as, secondly, leading indicators for scenarios.

The scope of the desk research is neither limited to the retail industry nor to Western Europe. On the one hand, the driving forces in the macro environment are surrounding the specific industry under scrutiny and are therefore also present in non-retail publications. On the other hand, trends can be spotted globally that serve as inspiration and indicators for future scenarios. However, the balance between breadth and depth need to be maintained in a manageable way. Hence, the desk

research focuses on publicly available data sources with high-credibility by reputable institutions, associations, or individuals published within the last three years in either German or English.

Due to the practice orientation and high degree of topicality of the study's research goal, the desk research is not limited to academic publications. Using relevant databases and search engines, the following types of secondary sources are considered:

- Scientific papers in peer-reviewed technology and retail journals
- Books about retail industry and commerce trends
- Retail industry-specific trend reports and future studies by retailers, consulting firms, and research institutions
- Cross-industry trend studies about global megatrends, digital transformation, disruptive technologies, consumer preferences, and marketing
- Scenario studies without a focus on a specific industry but the world in general
- Publications in trade press about retail trends
- Expert interviews and symposia accessible via online video platforms
- Articles in leading technology and retail blogs
- Presentation slides from retail conferences

The above-listed secondary data are searched online via scientific databases (ebscohost.com, scopus.com, lexisnexis.com, and scholar.google.com), commercial search engines (google.com and youtube.com), and document libraries (scribd.com and slideshare.net).

3.3.2 Qualitative Expert Interviews to Identify Driving Forces and Future Outlooks

The environmental scanning encompasses qualitative interviews with retail experts as a shortcut for the complex monitoring of the industry. The purpose of the data collection with expert interviews is to spot trends and driving forces that were not determined by the precedent desk research as well as to gather personal views of the future. In addition, the interviews serve as an instrument to separate important from unimportant driving forces and to give a greater perspective of the environment. Ultimately, the opinions of the interviewees are used to develop statements for the Delphi survey in the subsequent research step. Hence, the expert interviews can be considered as a relatively unstructured base round of the Delphi survey (*cf.* Rowe & Wright, 1999, p. 354).

In total, nine qualitative interviews were conducted with a heterogeneous group of experts (see **Table 3**). Each interview lasted roughly 45 minutes and was conducted via telephone; all interviews were recorded. The interview guide and information about the study's background and goals were e-mailed to the experts in advance. At the beginning of each interview, again, the background and purpose was explained and questions of the interviewee were answered, if necessary.

The interviews were semi-structured with open-ended questions because this interview technique is appropriate to generate qualitative data of expert opinions (*cf.* Whiting, 2008, p. 36; Muskat *et al.* 2012, p. 11). Furthermore, an interview guide gives orientation to have a focused conversation (*cf.*

Köhler, 1992, p. 321) considering the research-economical usefulness while developing the interview framework. For the study at hand, the interviews were structured into two parts (see **Appendix 2** for interview guideline). The first part aims at exploring present trends and driving forces using the PEST framework as well as the aspect of rivalry among competitors from Porter's Five Forces. The rivalry force is selected as the only one because the remaining four forces determine this force according to Porter (*cf.* 1979, p. 142). Furthermore, only one aspect of Porter's framework is translated into a question in order to use the available interview time as effectively as possible. Due to the same reason, the *PEST* instead of the *PESTEL* framework was used and the legal aspect is inherent in the political dimension whereas the environmental factor is neglected. The second part is more visionary and deals with the expert's personal 10-years-outlook into the retail future in general and asks, more specifically, for the impact of disruptive technologies on the retail industry in 2025. The experts are asked to comment on the potential of those technologies that have been identified as the most disruptive technologies in recent publications (*e.g.* Manyika *et al.*, 2013; Gartner, 2014; Dürand *et al.*, 2014).

Due to the semi-structured character of the interviews, the majority of questions are generated during the interview based on what the respondent said and what might lead to previously uncovered areas. Demographic questions were not raised because this aspect is not the subject of investigation. All qualitative interviews were conducted between September 19 and October 6, 2014.

***Table 3**: Expert panel for qualitative interviews*

Name	Institution	Position	Area of expertise
Dr. Kai Hudetz	IFH Institute for Retail Research	CEO	Research
Prof. Dr. Nikolaus Mohr	Mücke, Sturm & Company	Managing partner of consulting firm	Digital transformation
Prof. Dr. Dominik Große Holtforth	Fresenius University Cologne	Professor for online marketing and e-commerce	Research
Prof. Dr. Holger Schneider	University of Applied Sciences Wedel	Professor for e-commerce	Research
Gabriele Riedmann de Trinidad	Metro AG	Group director business innovation	Traditional retailing
Dr. Remigiusz Smolinski	Otto Group	Head of Innovation Management	Online retailing
Martin Barthel	eBay Germany	Senior director verticals	Online retailing
Frank Logen	Medion AG	Head of Medion Connect	Omnichannel
Sandro Megerle	TrendONE	Trend analyst	Retail trends

3.3.3 Quantitative Delphi Survey for Expert Assessment of Trends

Step 4 of the research framework is a mostly quantitative web-based Delphi survey. The goal of the expert survey is to assess the results from the previous research steps, to increase knowledge and to set priorities for the trends and driving forces (*cf.* Bijl, 1992, p. 240). Although consensus-oriented Delphi surveys traditionally intend to "minimize the expert estimation variance" (Steinert, 2009, p. 292), in the present case particular consideration is given to items where no consensus is achieved amongst the experts in order to identify uncertainties.

189 experts were individually invited to contribute to the Delphi survey, resulting in a sample size of 61 experts (32% response rate) for the first round. This outweighs the target sample size of 50 respondents. See **Appendix 3** for the full Delphi panel. As a main characteristic of the Delphi method, anonymity is preserved to reduce "undesired psychological effects amongst participants" (Landeta *et al.*, 2011, p. 1630). With regard to demographics, 69% of the respondents have more than ten years of working experience in retail or e-commerce and 23% between six and ten years. According to Müller & Müller-Stewens (*cf.* 2009, p. 19), one of the main challenges of Delphi surveys is to motivate experts for multiple iterations; wherefore intangible incentives of learning and having an active influence on the study as well as the tangible donation of the study's results were offered as means for motivation (*cf.* Salo, 2001, pp. 698f.).

Pursuant to Köhler (*cf.* 1992, p. 325), Delphi questionnaires typically feature statements about certain events in the future that are assessed with regard to the probability of occurrence. Hence, the present study uses closed-ended judgment questions and one open-ended question for idea generation. Following Aichholzer's (*cf.* 2002, p. 146) recommendation for the number of statements, 30 statements were extracted from or inspired by the qualitative interviews and secondary literature (see **Appendix 1**). Furthermore, the statements mostly use less than 20 words as suggested by Parente & Anderson-Parente (*cf.* 1987, pp. 149f.). Since there is no direct dialogue between the researcher and the respondents, special attention was given to articulate clear, precise, and unambiguous statements with exact instructions to avoid misinterpretations (*cf.* Day & Bobeva, 2005, p. 110). The experts answer two questions for each statement in regard to the probability of occurrence (*Will this statement occur?*) and the importance (*How strongly will online retailing change in general, if this statement occurs?*) on a 5-point Likert scale. Like the questionnaire for the expert interviews, the Delphi questionnaire is also structured along the PEST framework for the macro environment and the industry characteristics of Porter's Five Forces for the meso-level.

The statements about future events in 2025 express opinions and forecasts that rose during the qualitative expert interviews or discovered by desk research. However, the statements are in most cases no direct quotations as the theses needed to be reformulated or enriched with concrete fig-

ures to guarantee a shared understanding. Furthermore, those statements were selected that are not trivial or very likely to happen until 2025 but that currently seem to have a low probability of occurrence though a high impact if they do so, *i.e.* wild cards (*cf.* Kreibich *et al.*, 2011, p. 11).

By nature, the Delphi method is an iterative process providing a deeper reflection through multiple survey rounds. In line with most Delphi-based scenario studies (*cf.* Nowack *et al.*, 2011, p. 1611), the present Delphi survey also uses only two rounds to achieve higher consensus. The reasoning of just one additional iteration instead of more is the shrinking motivation of experts to participate (*cf.* Aichholzer, 2002, p. 149) that would lead to an increased attrition rate (*cf.* Walker & Selfe, 1996, p. 679). Moreover, the requirement for long times between rounds would decelerate the research progress (*cf.* Brown, 2007, p. 138). After the first round, "aggregated group response" (Mullen, 2003, p. 47) and an invitation to participate in the second round were mailed individually to the 61 round-one respondents. As a result, the dropout rate between the two rounds is 39,3% (37 respondents participated in round 2). The questionnaire of the second round encompasses nine statements where no consensus was reached in the first round. Hence, the experts received controlled feedback of the first round results (arithmetic means, median, and distribution of responses) for each of those statements and, again, forecasted the probability of occurrence while the importance was not subject of the second round.

Both the questionnaires for round one and two were pretested and slightly adopted to increase the usability and to reduce redundancies. The survey period of round one was from October 14 to 24, 2014 and round two was conducted between October 26 and November 4, 2014.

3.4 DATA ANALYSIS METHODS

3.4.1 Coding of Raw Data to Abstract Identified Trends into Driving Forces

In order to cope with the huge volume of data collected in steps 1 and 2 of the research framework, an efficient and structured process of data analysis is essential. The qualitative data are thus coded into manageable information with the purpose of identifying current trends and driving forces in the environment. Here, it may be necessary to differentiate between trends and driving forces.

Trends are forms of driving forces. The former are constant and unidirectional developments of certain variables with a long duration of action (*cf.* Müller & Müller-Stewens, 2009, p. 4) and the latter act as a higher-level bundle of similar but sometimes differently directed trends. Driving forces are broad factors that determine the future because they represent trends but cannot be actively controlled by stakeholders (*cf.* Kreibich *et al.*, 2011, p. 11). Hence, each trend (*e.g. abandonment of shopping in supermarkets*) possesses a superior driving force (*e.g. changes in lifestyles*).

The function of the qualitative data analysis is to identify firstly the current trends that have an impact on digital commerce, and secondly to assign these trends to driving forces at a higher-level. This inductive approach comprises six steps to extract trends from raw data and identify driving forces. First, a coding scheme is developed using the PEST framework and Porter's Five Forces. To distinguish between current trends and predictions, each factor of the PEST framework is divided into the present and the year 2025. Second, the raw data from desk research are coded with the open coding technique into words or short sentences to extract trends (*cf.* Berg, 2001, p. 251) by having the research questions in mind as suggested by Strauss (*cf.* 1987, p. 30). Third, the raw data from the expert interviews are coded in the same way including direct citations to excerpt also statements about the future (see **Appendix 4** for a shortened version of the coding results of the expert interviews). Fourth, the codes for trends are transferred into a mind map that has the PEST dimensions and Porter's Five Forces as main branches to cope with the complexity of the coding data (see **Figure 5** for the results of the mind mapping). Hereby, the hierarchies between codes can be displayed as branches (*i.e.* axial coding) until no new nodes with novel trends can be created. Fifth, developing superordinate nodes for similar trends through merging related trends into meaningful categories reduces the amount of data and redundancy inside the mind map. Sixth, looking for patterns reveals the driving forces behind the trend categories. Then, the identified driving forces are further abstracted to retain only the most important and non-redundant driving forces to yield the final overview of driving forces and its related trends (*cf.* Anderson, 1993, p. 44). **Appendix 5** illustrates the development from the pre-final list of driving forces to the final driving forces by inductive abstraction.

3.4.2 Statistical Analysis to Rank Driving Forces and Select Axes of Scenario Matrix

Descriptive statistics are used to analyze the quantitative data from the Delphi rounds. Indeed, "the Delphi method does not use standard statistical tests" (Steinert, 2009, p. 293) and Delphi studies do neither "produce clinical testing-type accuracy" (Grisham, 2008, p. 125) nor can the results be tested in terms of representativeness or significance (*cf.* Steinert, 2009, p. 293) due to small sample sizes. However, the data is well suited to expose uncertainties in the research field through divergent opinions among experts (*cf.* Linstone & Turoff, 1975, p. 578). These characteristics fit to the explorative purpose of the Delphi survey in the present study.

The goal of step 4 in the research framework is to rank the judged statements in order to identify the two most important and uncertain driving forces that form the bases of the scenarios. According to Schwartz, the determination of the scenario axes "is among the most important steps of the entire scenario-generation process" (1991, p. 229). In this context, the importance is measured by the arithmetic mean of the importance item and uncertainty is defined as those statements having

a relatively large standard deviation for the probability of occurrence. Uncertainty can thus be described as a "state uncertainty", according to Milliken's (1987, p. 133) typology, because the evolution of the driving force is unclear.

Unfinished attempts in the raw data of both survey rounds are excluded and the remaining data are analyzed by measures of central tendency (arithmetic mean and median) and dispersion (standard deviation) (*cf.* Grisham, 2008, p. 117). The analysis of the first round resulted in nine statements with both high variance and importance (each measure in top 50% range of importance and standard deviation of probability). In the second Delphi round, these nine statements are fed back to the respondents including the measures of central tendency in order to investigate whether consensus increases or uncertainty remains.

After the completion of the second round, the standard deviation of the probability of occurrence and the mean importance of each statement will be used to calculate an ***index value*** for the statements to identify two outstanding key driving forces. This pair of key driving forces will be used as the scenario axes. Each statement is therefore assigned to the associated driving force based on the results of the qualitative coding and mind mapping. Hence, the evaluated statements represent the importance and uncertainty of the respective driving forces. The index value is calculated for each statement by multiplying the standard deviation of probability of occurrence with the mean of importance. As the factors of the index value have different scales, both the mean of importance and the standard deviation of probability of occurrence are rescaled on the range between 0 and 1. Consequently, each factor contributes proportionally to the index value as intended because both values are equally important for the ranking of the driving forces (see **Appendix 6** for the detailed calculations of the adjusted factors and the index value). Due to the normalization, the formula of the index value calculation is as follows:

$$\text{Index Value} = \left(\frac{\sigma_{\text{Prob. of Occ.}} - \min(\sigma_{\text{Prob. of Occ.}})}{\max(\sigma_{\text{Prob. of Occ.}}) - \min(\sigma_{\text{Prob. of Occ.}})}\right) \times \left(\frac{\bar{x}_{\text{Import.}} - \min(\bar{x}_{\text{Import.}})}{\max(\bar{x}_{\text{Import.}}) - \min(\bar{x}_{\text{Import.}})}\right)$$

The driving forces of the two statements with the highest index values are selected as the axes of the scenario matrix. Since driving forces do not have a prescribed direction, both ends of one axis characterize opposite resolutions (*e.g.* low vs. high, or weak vs. strong). The index value embodies the level of consensus and importance of the statement or driving force, respectively.

3.4.3 Building of Scenarios with Creative Thinking Techniques

The building of scenarios is impossible without the previous research steps as the findings of the empirical research come together in the writing of a clear and vivid narrative for each scenario. However, the academic literature about the "fleshing out the scenarios"-step in Schwartz's (1991, p. 230) framework remains inconsistent (*cf.* Mietzner & Reger, 2005, p. 229). Since this study does

not follow Godet's approach with computer-based cross-impact calculations (MICMAC software), qualitative methods are applied to construct and write the scenario narratives. The narratives ought to be compelling stories that do not merely describe a snapshot of e-commerce in 2025. However, fictitious milestones between today and 2025 are also portrayed to make the scenarios easier to follow by narrating "how events might unfold between now and a future date" (Wilson, 1998, p. 91). Each scenario is also labeled with a "vivid and memorable" (Schwartz, 1991, p. 234) name. Since the target users of this study are retail managers, managerial key questions are posed for each scenario to better prepare for the future.

According to Linstone & Turoff (*cf.* 1975, p. 190), the results of Delphi studies are depending on more interpretation than other research findings. But, the scenario matrix provides guidance and determines the construction of the scenarios through the arrangement of driving forces. Although only two driving forces are *a priori* integrated into each scenario, the remaining driving forces are logically linked in terms of cross-impact and integrated into the scenarios in different combinations. Hence, uncertain driving forces vary between scenarios and driving forces with an outstandingly high probability of occurrence are fix in each scenario.

Creative thinking techniques are used to embrace the factors that do not fit (*cf.* Saffo, 2007, p. 127) and also to build surprising scenarios with low probability but high impact. According to Amabile (1998), creative thinking is the "capacity to put existing ideas together in new combinations" (p. 79). This study uses the creativity techniques brainstorming and checklists to encourage convergent thinking in the domain of retailing technologies, *i.e.* the association of previously unconnected ideas (*cf.* Kilgour & Koslow, 2009, p. 299). The results of the data collection and analysis are utilized as the input for these creative thinking methods. To overcome a potential threat of lacking imagination, existing scenario studies with a similar foresight horizon are used for inspiration and informal conversations and small brainstorming sessions with trend researchers are conducted.

In order to select the right scenarios, Chermack (*cf.* 2006, p.23) highlights relevancy as well as plausibility of the scenarios and Wilson (*cf.* 1998, p. 91) suggests four additional criteria: Differentiation, consistency, decision-making utility, and challenge of conventional wisdom. Even though it might be tempting, an assessment of the probability of occurrence of each scenario is avoided in order not to limit decision-makers input and to facilitate a preparation only for the most probable scenario (*cf.* Schwartz, 1991, p. 233).

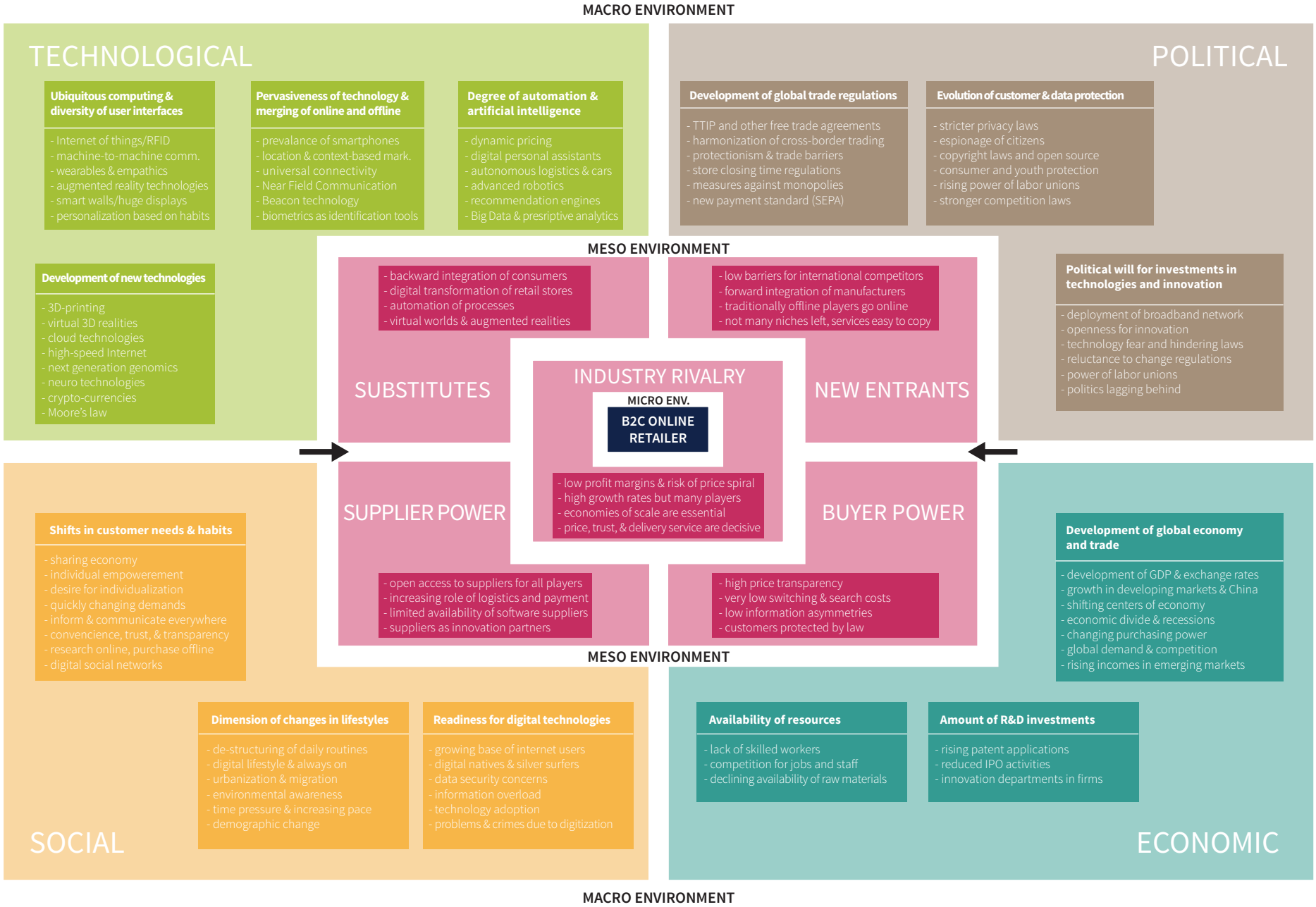

Figure 4: *Driving forces (printed in bold) and associated trends in macro and meso environment of B2C online retailing (results from desk research and expert interviews*

4 RESULTS

Chapter 4 presents the findings of the data collection and analysis described in the previous chapter. The research questions are answered and, hence, the identified driving forces in the environment as well as technological trends in the e-commerce industry are clarified. Moreover, the Delphi results are explained in terms of quantitative trend assessments. Patterns in both the qualitative and quantitative results are integrated in the scenarios. This chapter narrates the four scenarios for digital commerce in 2025 and also depicts leading indicators for each storyline.

4.1 DRIVING FORCES OF B2C ONLINE RETAILING INDUSTRY

Using the mind mapping technique, trends expressed by the experts (see **Appendix 4**) and numerous trends from the desk research as well as the open-ended question from the Delphi survey were grouped based on similarities. Through a process of inductive abstraction as described in section 3.4.1, disjoint driving forces were obtained from these groups in order to reduce redundancies and the number of groups. **Figure 4** offers a bird's-eye view of the environments and driving forces online retailers have to cope with. Looking from inside out, each retailer forms its own microenvironment (not investigated in the present study) that is affected by the meso environment (Porter's Five Forces; section 4.1.2), which, in turn, is influenced by the macro environment (elements of PEST framework; section 4.1.1). Thus, the external business environment shapes retail organizations directly and indirectly.

4.1.1 Driving Forces in Macro Environment

According to Zentes & Rittinger (2009), the macro environmental influence is "of major importance" (p. 165) for the retailing industry. After the first round of abstraction, 23 driving forces were identified in the macro environment and the final abstraction of these driving forces yielded 13 driving forces (see **Appendix 5** and **Figure 4**). In the following paragraphs, the driving forces are emphasized in bold italics and quotations from the expert interviews are highlighted in color).

Political

Politic needs to address multiple and yet divergent claims of economy and society. In the complex world of today, it is unclear how numerous interest groups will influence legislation and the allocation of budgets. While cross-border trading is more harmonized within the EU (*cf.* Kalemli-Ozcan *et al.*, 2010, p. 75), a free trade agreement between the European Union and the United States (TTIP) was recently proposed, and EU bank transfers are simplified (SEPA), it still remains uncertain whether ***global trade regulations*** will assert themselves or trade barriers will prevail. Despite recently introduced policies, *"the EU needs a stronger harmonization regarding cross-border trading and the right of withdrawal within its borders,"* declares Frank Logen.

While *"data privacy is at the core of the discussion about digital commerce"* (Nikolaus Mohr), there is still great uncertainty as to whether new regulations will favor buyers and enforce ***data protection and consumer rights*** or whether they will enable more excessive data exploitation and facilitate the next generation of online services. Fittingly, Dominik Große Holtforth describes the *status quo* of digital consumer protection as *"Wild West in some areas while there is excessive protection in others."* Furthermore, the ***political will for investments in technologies and innovation*** is a driving force with an uncertain resolution. Although policy makers across countries want to offer a fertile breeding ground for innovation and entrepreneurship in Europe (*cf.* for instance the Startup Europe Leaders Club by Neelie Kroes, the VP of the European Commission), technology fear and a reluctance to change laws impede policy-making on the EU level for digital technologies. As a result, regulation still has not caught up with the technological development, which poses a significant barrier to innovation (*cf.* European Business Summit, 2014, p. 40).

Economic

While the growth paradigm is highly characteristic for today's economy, the sources of growth potential are diverse. In this context, the ***development of the global economy and trade*** with worldwide competition, *"rising purchasing power of consumes"* (Remigiusz Smolinski), and shifting centers of economic power pave the most frequented avenue. As the nominal gross world product is growing and emerging markets – especially China – catch up with rising middle classes, businesses expand internationally serving a global demand. The downsides of today's global economy are recessions, financial crises (*e.g.* in the Eurozone), economic sanctions (*e.g.* recently against Russia), and a growing income disparity (*cf.* Eurostat, 2014).

Furthermore, prospective economic growth is dependent upon the ***availability of resources***. Although the availability of raw materials sets natural limits to growth, resources are still exploited regardless of tomorrow. While digital industries require less *physical* resources, the availability of skilled *human* resources constitutes a bottleneck for sustained growth and innovation.

Moreover, the ***amount of R&D investments*** is indeed essential for economic growth but also highly uncertain in the contexts of Western Europe and the digital economy. Despite the rising number of general patent applications in Europe (*cf.* EPO, 2014), the San Francisco Bay Area remains the center for ICT innovation. In today's technology-driven world, R&D investments are a two-edged sword: Technological innovation can benefit and impede the economy at the same time through the replacement of workforce and thus a decrease in employment and purchasing power.

Social

In the complex world of today, technological progress shapes society and vice versa. This induces significant ***shifts in customer needs and habits***. Consumers of the 21st century change their de-

mands dramatically fast and the requirements placed on convenience, personalization, corporate social responsibility, and resource efficiency become ever more intense and *"have increased tremendously within the last 2-3 years"* (Martin Barthel) for B2C business models. Due to the prevalence of new media and smartphones, individuals interact in digital social networks and are constantly connected and informed. Customers desire individualized products and services tailored to their specific needs while, at the same time, demanding transparency and lower prices. Looking ahead, it is uncertain how customer needs evolve and whether recent trends like the sharing economy (*cf.* Sundararajan, 2013) will continue to prevail or consumers will exhibit a resistance to change. Undoubtedly, however, the power seems to continue to shift from sellers to buyers (*cf.* Carpenter, 2013, p. 5), which ushers in a customer-driven era.

Shifting needs are obviously accompanied by substantial ***changes in lifestyle***. Although more flexible working times, increasing education, and a longer life expectancy strengthen individual empowerment, the drawback of these changing living conditions, however, are an accelerated course of life and time pressure, more time spent in working life, an aging society, and a rise in chronic illnesses. Moreover, de-structured daily routines in conjunction with digital lifestyles and the *"urge for time optimization"* (Kai Hudetz) are placing new demands on businesses.

Despite all technological advancement and a growing base of Internet users, the society's ***readiness for digital technologies*** with regard to digital emancipation is still uncertain. Currently, the generational chasm between digital natives and digital immigrants clearly hints at the imminent digital divide in society (*cf.* Zillien & Marr, 2013, p. 56). Whereas digital natives are familiar with the Internet like fish in water and are aware of data collection by enterprises, digital immigrants often express technology fear, information overload, and serious concerns over privacy issues. These fears have been aggravated recently in view of the latest NSA surveillance scandals (*cf.* Landau, 2013, p. 54). Hence, modern society can either adopt digital native behavior patterns by accepting data collection and exploitation or decide to fight the increasing infiltration of technologies into everyday life through counter movements.

Technological

The overarching driving force in the technological dimension is the ***development of new technologies*** because the actual degree of technological disruption is anything but certain. Through a decrease in cost and size of computer chips and improved efficiency of power consumption, the vindication of Moore's law (*cf.* Moore, 1998) indicates potential for upcoming technological breakthroughs. Hence, the ***pervasiveness of technology and merging of online and offline*** is likely to increase although the pace and degree of change is yet to be determined. In our high-tech world, the remaining barriers to an unlimited connectivity between people and devices appear to be of

social and legal nature. However, in terms of technology, the Internet of Things adds to the already vast amount of Internet traffic by integrating RFID sensors, NFC technologies, and new ways of machine-to-machine interaction into a diverse landscape of networked communication (*cf.* Atzori *et al.*, 2010, p. 2789). Moreover, the lines between online and offline worlds are blurring with the help of smartphones, wearable, and biometric technologies, which leverage contextual information via sensory data and cloud computing to provide relevant social-local-mobile services (*i.e.* SoLoMo; *cf.* Heinemann & Gaiser, 2014).

According to Dominik Große Holtforth, *"we are experiencing an evolution of human-computer interaction that yields individualized touch points"*. The advent of speech, touch, and gesture-based human-computer interaction has paved the way for new generations of *smart* user interfaces (*e.g.* walls, glasses, wristbands). But nonetheless, the paths of ***ubiquitous computing and diversity of user interfaces*** lead into different directions. It is thus unclear whether a radical *"inflation of user interfaces"* (Nikolaus Mohr) with augmented realities and smart displays in public places will prevail against a merely incremental diffusion of smartphones and tablets, as we know them today.

Since customers are more and more worried about their dependence on the ubiquity of technologies that may even have negative effects (*cf.* Mesman *et al.*, 2013, p. 451), the pressing question concerning the ***degree of automation and artificial intelligence*** yields an ambiguous answer. On one side, advanced robotics and digital personal assistants like Apple's *Siri* or *Google Now* play a bigger role in everyday life and companies conceive Big Data strategies to capture economic value from the massive flood of data, whilst on the other side humans have legitimate concerns about gradually losing control and being replaced by machines (*cf.* Frey & Osborne, 2013, p. 16).

4.1.2 Drivers in Meso Environment

After the first round of abstraction, the coding of the desk research and qualitative interviews yielded four driving forces in the meso environment that were further abstracted (see **Appendix 5**). Finally, one driving force remains for the meso environment that covers all forces of Porter's Five Forces framework, *i.e.* the ***level of change in the structure of the online retail industry.*** In regard to the complexity of the scenario building and Delphi execution, it is reasonable to condense the amount of meso-environmental driving forces because the macro environment holds greater potential to mold the future. Drivers in each of Porter's forces determine the degree of industry change and are discussed in the following.

Threat of New Entrants

The "barriers to entry into e-commerce have fallen" (Chui *et al.*, 2013, p. 31) for national and international competitors, making it difficult to compete in the online retail industry. Furthermore, it is challenging to sustain a competitive advantage as "*innovations in e-business are extremely easy*

to copy" (Remigiusz Smolinski) and, now, also the most laggard traditional retailers are going online with multichannel strategies. Moreover, forward vertical integration of suppliers and manufacturers are creating worries amongst retailers since producers start to sell directly to the consumer via the Internet (*cf.* Kumar & Ruan, 2006). The threat of new entrants, however, is mitigated due to the fact that "*most e-commerce markets are already covered*" (Holger Schneider) and not many niches are left for new online retailers.

Bargaining Power of Buyers

With the spread of the World Wide Web, power is switching from companies to consumers (Porter, 2001, p. 67). The online retail industry is no exception and buyers benefit from low information asymmetries, almost non-existing switching costs, and customer protection laws (*cf.* Niemeier *et al.*, 2013, p. 91). As prices are transparent and products homogeneous, online shoppers are in a good bargaining position to make high demands and traditional retailers have lost their information monopoly. Very low search costs add fuel to the fire of industry competition.

Bargaining Power of Suppliers

Nowadays, suppliers take on a greater role in e-commerce since *"the trustworthiness of suppliers is crucial to establish consumer loyalty and trust"* (Dominik Große Holtforth). Accordingly, payment and logistic partners can be a competitive disadvantage if they do not fulfill customer needs. Moreover, e-commerce players can involve suppliers early in innovation projects to extend the knowledge base and access to customers. It follows that, *"for example, hardware manufacturers can be technological gatekeepers to enable easier access to customers"* (Remigiusz Smolinski). Access to suppliers is rather open in the online retail industry as wholesalers and suppliers can be identified and compared via B2B online marketplaces such as Alibaba (*cf.* Tian *et al.*, 2013, p. 13).

Threat of Substitutes

As consumers demand highly customized products and emerge into *prosumers* (*cf.* Toffler, 1980, p. 264) by showing *prosumption* behavior (*cf.* Ritzer & Jurgenson, 2010), the greatest threat of substitution for B2C online retailers is thus posed by customers. Nascent technologies like affordable and small 3D printers or new peer-to-peer marketplaces facilitate the backward integration of buyers and let producers *"lose their sovereignty over products"* (Sandro Megerle). Furthermore, traditional retailers do not only pose a threat as new entrants into the e-commerce industry, they could also substitute e-commerce services due to a digital transformation of retail stores. In the technology-driven e-commerce business, technological breakthroughs always have the potential to become a substitute if they are socially accepted. Regarding this, current technological drivers of change are the automation of processes, virtual realities as well as software and algorithms that autonomously make decisions, which can give rise to digital shopping assistants.

Industry Rivalry

None of the interviewed experts denied a high competitive rivalry in the B2C online retail industry and the above-described four forces indicate why: Buyers have strong bargaining power, the threat of new entrants is high, too, and the threat of substitutes and supplier power are at least moderate. In line with Porter's (*cf.* 1979, p. 138) framework, the overall industry profitability potential is assessed as being low. As Holger Schneider puts it, *"electronic commerce has very low margins and it is thus pretty difficult to make money in e-commerce."* Hence, economies of scale and efficient processes are essential to compete in the industry.

Due to relatively high, but *"shrinking growth rates"* (Frank Logen), there is an "army of online retailers" (Niemeier *et al.*, 2013, p. 10) made up of a vast amount of players and investor-driven businesses with increased levels of professionalism. Well-funded online businesses like Zalando in Germany kindle predatory competition since, for them, market share and brand power are more important than profitability. Consequently, a decline in the overall price level can be observed, which increases the *"risk of a price spiral and perfect competition"* (Remigiusz Smolinski).

As noted before, a high homogeneity of products and services is a characteristic of the online retailing industry. So, according to Kai Hudetz, it is *"difficult to differentiate in the eyes of customers by other means than price, trust, and product availability"*, given that the basics like usability and payment options are done properly. In addition, the industry rivalry is further amplified due to short technology lifecycles, which constantly places demands on skilled workers and already resulted in a *war for talent* (*cf.* Michaels *et al.*, 2001).

4.2 TECHNOLOGICAL TRENDS IN THE E-COMMERCE INDUSTRY

The desk research and qualitative expert interviews revealed numerous trends for the online retail industry, of which the most frequently occurring and suppositionally influential trends were selected for a closer examination by the Delphi panel. Because of the pronounced technology focus of this study, the trends of each technological driving force will be described briefly in the following. The trending technologies are highlighted in bold italics.

4.2.1 Development of New Technologies

3D printing can be a game changer for the e-commerce industry. It has *"a huge potential to disrupt because it replaces the transportation of goods for simple products and spare parts"* (Dominik Große Holtforth). Currently, fab shops and 3D printing marketplaces such as Shapeways are emerging to serve the need for unique products. According to Martin Barthel, *"warehouses and distribution centers can be organized differently and manufacturing can be done with just in time production."* Besides improved production, prototyping, and logistics, 3D printing facilitates the

democratization of product development. This fosters entrepreneurship, micro-factories, and increasing product variety (*cf.* Lipson & Kurman, 2013, p. 58). However, it still takes many hours to print objects and current 3D printers are no threat to mass production (*cf.* Hagerty, 2013).

Mobile payment systems (*e.g. Square* or *Stripe*) were established on the grounds of advanced wireless technologies like NFC and increasing energy efficiency of computer chips. Just recently, Apple introduced *Apple Pay* with lower processing fees than its competitors and has set an important milestone to the transformation of the online and offline checkout process. Martin Barthel goes one step further: *"You do not have to be a prophet to say that cash will be outdated at brick-and-mortars within ten to 15 years and replaced by mobile payment technologies."* In parallel with the development of virtual wallets, crypto-currencies like Bitcoin attract growing interest and could create new financial services and disrupt credit card providers (*cf.* Henwood, 2014).

Following an overrated hype of Second Life (*cf.* Hansen, 2009), new technologies like the *Oculus Rift* could give rebirth to the concept of ***virtual realities*** that replicate offline experiences in three-dimensional worlds. Sandro Megerle believes, *"virtual reality glasses will make it possible to test and review consultation-intensive products like furniture or automobiles also digitally"*. Furthermore he notes, consumers can *"connect with friends to shop in virtual realities and to overcome borders."* This would add a new dimension to cross-border shopping and social commerce.

4.2.2 Ubiquitous Computing and Diversity of User Interfaces

Omnipresent technologies in our everyday lives indicate the transformation of retailing through invisible and intercommunicating sensors or microprocessors (*cf.* Friedewald & Raabe, 2011, p. 55). Technologies such as biometrics, new user interfaces and the Internet of Things provide advantages for online retailing according to the interviewed experts.

Biometric technologies enable a remodeling of the checkout process, as human organs are becoming the new passports and means for identification. The main advantage of biometric identification with fingerprints, heartbeat, or iris scans is the improved security for e-commerce checkouts (*cf.* Öszi & Kovasc, 2011, p. 567). Thus, the currently perceived risks of identity theft can be mitigated because the identification is not any longer based on property (*e.g.* credit cards) but persons.

The ubiquity of technology is very conspicuous as ***smart displays and new user interfaces*** spring up like mushrooms and allow for novel shopping experiences. Nikolaus Mohr declares, *"user interfaces in everyday life will not only be context-sensitive but also user-sensitive and identify customers based on biometric technologies such as fingerprinting to offer personalized interfaces for different users."* Frank Logen supports this statement and stresses the potential combination of new interfaces with big data analyses to *"personalize public user interfaces for different customer profiles."*

Hence, so-called smart walls in stores or at public places (*e.g.* a virtual subway store in Seoul by Tesco Home Plus) offer both QR code shopping with smartphones and interactive digital customer service assistants to display product information as well as recommendations. Furthermore, new user interfaces find their way into domestic fields via modern kitchen machines or automobiles, which also sets the stage for new shopping contexts.

The ***Internet of Things*** marks a technological revolution (*cf.* Feki *et al.*, 2013, p. 24) that makes millions of objects "uniquely identifiable and linked up in an Internet-like structure" (Shang et al., 2012, p. 44). Smart things can be embedded into objects like apparel or food and communicate with each other in wireless networks via RFID tags, sensors, and actuators, *inter alia* (*cf.* Atzori *et al.*, 2010, p. 2787). The Internet of Things is already realized through RFID technologies in logistics and warehousing to optimize supply chains with leaner management of fleets and inventories (*cf.* Miorandi *et al.*, 2012, p. 1510). Especially for brick-and-mortar retailers, the Internet of Things is an enabler of the digital transformation (*cf.* Santucci & Lange, 2008, p. 13) and multiple applications are already creating a "networked shopping world" (Friedewald & Raabe, 2011, p. 58). For instance, client interactions in stores can be analyzed to provide offline retailers with the information that Internet players easily get from web tracking. Due to the merging of online and offline worlds, the Internet of Things can also play a transformative role in electronic commerce. Gabriele Riedmann de Trinidad emphasizes the importance of effective data analysis because *"everything will be based on data: The connected devices as well as the content of my fridge."* Hence, popular ideas to link the concept of smart homes with online retailing include the refrigerator and the washing machine that automatically purchase new milk or washing liquid when they are empty. Moreover, sensors and tags in objects form the infrastructure for augmented realities.

Augmented reality technologies integrate digital into physical experiences with virtual objects that supplement the world in real-time (*cf.* Azuma *et al.*, 2001, p. 34). Devices and applications, which augment the customers' reality, are blending online and offline commerce, and thus facilitate new ubiquitous shopping experiences. On the one hand, contextual product information and purchase options can be displayed when consumers focalize for instance a fashion product – or, on the other hand, a specific product like furniture can be virtually integrated into the room where it should be placed. With the help of such digital extensions of the physical world consumers can authentically experience the object before the actual purchase (*e.g.* IKEA's smartphone app *Catalog*). Therefore, the *"real world will be the shopping window due to augmented reality technologies and the Internet of Things"* (Sandro Megerle), which blur the boundaries between online and offline.

4.2.3 Pervasiveness of Technology and Merging of Online and Offline

Omnichannel retailing is a very recent concept (the oldest academic publication is from 2013) that "aims to deliver a seamless customer experience regardless of the channel" (Piotrowicz & Cuthbertson, 2014, p. 5) and thus expresses the ongoing convergence of online and offline as well as the pervasiveness of technologies. While *multichannel* retailing describes the coexistence of multiple channels such as physical stores, online shops or mobile apps, *omnichannel* retailing is its successor and breaks down the barriers between all channels (*cf.* Brynjolfsson *et al.*, 2013, p. 7). In this context Remigiusz Smolinski observes changing preferences of consumers: *"My feeling is that the customers do not care about* where *they buy but* what *they buy."* According to Piotrowicz & Cuthberson (*cf.* 2014, p. 6), the enabling technologies for omnichannel retailing are mobile commerce with social commerce apps and location-based services, big data, augmented realities, and 3D printing, amongst others. So, a huge number of technologies can be orchestrated in omnichannel retailing. As mobile devices have already been the dominating innovation in multichannel retailing, they also have a vital function in omnichannel retailing: Smartphones provide access to the other technologies such as augmented realities (see above), indoor navigation with iBeacon, or GPS-based social networks like Foursquare. The performance of omnichannel solutions is contingent on the data analysis excellence, as the omnichannel expert Frank Logen describes: *"All e-commerce data has to be collected, which is not the main challenge – a bigger challenge is to collect all data from multiple touch points including offline visits – and the biggest challenge is to analyze these huge amounts of data intelligently."* Omnichannel goes beyond technologies and Frank Logen adds: *"Omnichannel companies have to change their whole organization from technologies to marketing – the entire enterprise will be affected."* Accordingly, Brynjolfsson *et al.* (*cf.* 2013, p. 3) propose that pure online players should provide offline channels including showrooms and pickup services. In light of the high efforts to establish true omnichannel retailing, Kai Hudetz describes its *status quo* in Germany as *"an absolute exception to be in a pure cross-channel world because consumers can use smartphones only for advanced shopping applications in very rare cases and just for a couple of retailers."*

The empirical research revealed ***new mobile devices*** as another technological trend with impact on online retailing. While *"smartphones will certainly be the ultimate shopping assistant"*, according to Gabriele Riedmann de Trinidad, new mobile formats like ***wearable technologies*** (*e.g.* watches, glasses, wristbands) are waiting in the wings to be accepted by the mainstream market (Paul, 2014). Although bracelets are already widely used by fitness enthusiasts to monitor physical activity and medical conditions, the experts do not see a disruptive potential for present wearable technologies in the retail industry. However, *"wearables can extend the capabilities of personal assistants in the future when Siri might get eyes through smart glasses"*, as Remigiusz Solinski assumes.

Sandro Megerle also expects great potential for smart glasses or advanced image recognition apps like *AskZappos*, which could empower *"snapshot commerce"* in combination with augmented realities by *"taking pictures of objects that consumers see to immediately buy or bookmark them"*. An ongoing diffusion of the mobile Internet with value-adding new smartphones and innovative business applications gives rise to constantly evolving social commerce services in order to "help people connect where they buy and help people buy where they connect" (Marsden, 2010, p. 3).

4.2.4 Degree of Automation and Artificial Intelligence

With the recent advent of digital assistants on smartphones, the interviewed experts expect the appearance of ***digital personal shopping assistants***. According to Remigiusz Smolinski, *"personal assistants will not only reactively fulfill our wishes but they will proactively encourage us to do things, buy standard consumer goods autonomously, and interact with other people or their devices, respectively, to simplify our lives."* In line with this thought, Holger Schneider also predicts that *"digital personal assistants will have the authority to purchase simple consumer goods and we will go from one-click buying to no-click buying"*. Digital assistants combine many of the above-described technological trends: They operate on mobile devices, store information in the cloud, analyze big data, and augment reality. For instance, the shopping assistant app *Swirl* uses the iBeacon technology for in-store localization.

It is difficult to imagine all of the previously depicted technologies without big data and artificial intelligence, which already reached a high enough level of sophistication to analyze data impossible for humans to obtain. As online players are more and more consolidating (*cf.* Nair & Chatterjee, 2012) and multichannel strategies are rolled out, ***cross-domain and cross-channel big data analytics*** are not merely important but essential to gain competitive advantages (*cf.* Manyika *et al.*, 2011, p. 8). The demand for *"personalized recommendations based on shopping and social behavior"* (Sandro Megerle), micro-segmentation of customers, tailored touch points, and dynamic pricing can hardly be met without big data capabilities. According to Martin Barthel, *"especially the big players are massively investing in big data"* and Nikolaus Mohr forecasts the next step after descriptive and predictive analytics to be *"prescriptive analytics on an individual level to better and more precisely anticipate the buying desire in order to increase the purchase rate."*

Another current trend in respect of automation is the growing use of robots in logistics. ***Delivery by drones***, nowadays, attracts much attention because it holds the potential to disrupt the last mile of the delivery (*cf.* Banker, 2013), which *"is still like in the catalog days and the bottleneck of e-commerce"* (Kai Hudetz). Just recently, Amazon has asked for an exemption from US rules to allow drones for commercial purposes in order to launch its delivery system Prime Air that aims at delivering parcels in less than 30 minutes (*cf.* Misener, 2014, p. 1).

4.3 EXPERT ASSESSMENT OF E-COMMERCE TRENDS

Using the methods described in chapter 3, the trends from the macro and meso environment were translated into 30 statements in order to portray electronic commerce in 2025. Subsequently, 61 experts in two quantitative Delphi survey rounds judged these statements. **Table 4** lists the results obtained from the statistical analysis of both Delphi rounds ranked by the index value, which is a product of the normalized probability of occurrence's standard deviation and the normalized mean importance (*cf.* section 3.4.2). The index value thus represents the importance and level of consensus of the respective statement.

4.3.1 Importance of Trends

The experts (n=61) were asked to rate the *importance* of each statement by answering the question "*How strongly will online retailing change in general, if this statement occurs?*" on a 5-point Likert scale (1 = Not at all; 5 = Very strongly). As shown in **Table 4**, the mean importances of statements from the technological ($\bar{x}$ = 2.77) and social ($\bar{x}$ = 2.70) dimensions are notably more important than political ($\bar{x}$ = 2.52) and economic ($\bar{x}$ = 2.43) statements.

An inspection of the statistical results indicates those trends that possess the highest threat to transform the online retail landscape. Hence, the biggest impacts are associated with changes in lifestyles that imply an abandonment of shopping in supermarkets and could therefore give rise to the acceptance of electronic commerce *(statement 22)*. The second highest potential to disrupt online retailing arises from the advent of 3D printing *(statement 12)*. The following trends are also found to be important (in descending order): Big data analytics across all channels *(statement 4)*, the growth of mobile commerce *(statement 8)*, and personalization across domains *(statement 21)* as well as customized pricing in real-time *(statement 15)*. The dominance of big data-related trends (*i.e. statements 4*, *21*, and *15*) among the most important statements is striking. Following, the experts evaluated the omnichannel retailing statement with fully integrated online and offline channels *(statement 7)* also as one of the most important trends.

It is evident from the results that political and economic trends are not among the top 50% in terms of importance. The trends with the lowest impact to change online retailing are the vanishing of cash *(statement 18)*, high-speed Internet connections *(statement 26)*, availability of skilled workforce *(statement 27)*, success only possible in niches *(statement 2)*, and biometric technologies for identification means *(statement 14)*.

Table 4: *Delphi survey results ranked by index value; Δ of 2nd round statements indicates change of standard deviation of probability of occurrence between round 1 and 2; $n_{1st\ round} = 61$; $n_{2nd\ round} = 37$*

#	Statement	Driving force	Prob. of occurrence			Importance	Index Value
			Mean	*Median*	*Std.*	*Mean*	
22	In 2025, the majority of the population will no longer shop at supermarkets due to de-structured daily routines, constant time pressure, and the convenience of online shopping. *Δ =-0.04*	Dimension of changes in lifestyles (S)	3.81	4	1.13	3.16	.808
7	In ten years, more than 75% of retailers and e-commerce players manage all online and offline channels in a fully integrated way to provide a seamless shopping experience. *Δ = +0.02*	Pervasiveness of technology and merging of online and offline (T)	2.38	2	1.14	2.93	.645
5	In 2025, producers and manufacturers delivering directly to the final consumer will be the biggest competitor for online retailers. *Δ = -0.03*	Level of change in structure of retail industry (I)	2.32	2	1.11	2.92	.583
16	In 2025, more than 75% of all sold food products and apparel will contain tiny sensors (Internet of Things). *Δ = -0.01*	Ubiquitous computing and diversity of user interfaces (T)	3.22	4	1.13	2.82	.544
4	Retailers and pure players that still will not leverage the potential of big data analytics across all channels will not exist in 10 years. *Δ = -0.16*	Degree of automation & artificial intelligence (T)	3.11	3	1.02	3.02	.512
21	In ten years, cross-domain analytics will enable personalization for every user of online shops – regardless of whether the user is logged in. *Δ = -0.05*	Ubiquitous computing and diversity of user interfaces (T)	2.51	2	1.02	2.98	.486
3	In 2025, the biggest competitive advantage will be the ability to analyze and utilize all available data of consumers. *Δ = -0.02*	Level of change in structure of retail industry (I)	2.38	2	1.04	2.92	.478
12	By 2025, every tenth privately purchased product is a file for 3d printers.	Development of new technologies (T)	3.61	4	0.97	3.07	.451
13	In 10 years, more than 50% of consumers will use augmented reality technologies to shop everywhere using the real world as a showroom.	Ubiquitous computing and diversity of user interfaces (T)	2.79	3	1.00	2.92	.425
6	In 2025, more than one third of all B2C transactions are carried out online.	Shifts in customer needs and habits (S)	2.07	2	1.08	2.72	.402
1	In 2025, there will not be a monopolistic or oligopolistic online retail industry structure but multiple online retail players.	Level of change in structure of retail industry (I)	2.36	2	1.17	2.59	.389
8	In 2025, more than 75% of all B2C orders (incl. FMCG) are placed on mobile devices. *Δ = -0.21*	Pervasiveness of technology and merging of online and offline (T)	2.68	3	0.94	3.00	.374
19	In ten years, virtual 3d-worlds will have almost completely replaced present online shops.	Development of new technologies (T)	3.80	4	0.96	2.84	.327
9	In 2025, digital personal shopping assistants will have the authority to autonomously purchase preferred standard consumer goods (e.g. milk, toilet paper).	Degree of automation & artificial intelligence (T)	2.61	2	0.97	2.79	.314
15	In ten years, all prices will be customized in real-time and individually for each customer. *Δ = -0.19*	Degree of automation & artificial intelligence (T)	3.14	3	0.89	2.97	.268

Table 4 (cont.): *Delphi survey results ranked by index value; Δ of 2nd round statements indicates change of standard deviation of probability of occurrence between round 1 and 2; $n_{1st\ round} = 61$; $n_{2nd\ round} = 37$*

#	Statement	Driving force	Prob. of occurrence			Importance	Index Value
			Mean	*Median*	*Std.*	*Mean*	
25	In 2025, Asia will be the most important market for European and American retailers.	Development of global economy and trade (E)	2.59	3	0.97	2.67	.259
23	An increased environmental awareness and a culture of sharing (Share Economy) cause a significant decrease of purchasing volume ten years from now.	Shifts in customer needs and habits (S)	3.75	4	0.98	2.59	.223
17	In 2025, digital customer service assistants and new interfaces have replaced human assistants in physical stores (except luxury stores).	Ubiquitous computing and diversity of user interfaces (T)	3.51	4	1.03	2.51	.216
11	In ten years, the majority of the working population will shop at virtual billboard stores in public places such as subway or bus stations).	Shifts in customer needs and habits (S)	3.69	4	0.98	2.56	.205
24	By 2025, new scandals related to data abuse and surveillance lead to a 50/50 split of the society in users and deniers of digital technologies.	Readiness for digital technologies (S)	3.57	4	0.99	2.46	.165
28	In 2025, globally valid rules apply to all consumers and traders, so that there will be no regulatory differences between national and international transactions.	Development of global trade regulations (P)	4.07	4	0.87	2.64	.147
29	In ten years, data protection laws will be very weakened and thus enable a more intelligent and extensive data analysis.	Evolution of customer and data protection (P)	3.87	4	0.83	2.79	.133
14	In 2025, biometric technologies (e.g. fingerprints, eye scan, heartbeat) will have completely replaced traditional identification means for checkout processes – both online and offline.	Ubiquitous computing and diversity of user interfaces (T)	2.89	3	1.16	2.28	.112
20	Parcel delivery by drones will be standard by 2025 for the last mile of the supply chain.	Degree of automation & artificial intelligence (T)	3.84	4	0.93	2.38	.096
2	Despite low entry barriers, in 10 years, new e-commerce players will only be successful in niches.	Level of change in structure of retail industry (I)	2.34	2	1.22	2.21	.065
10	In 2025, digital personal assistants will proactively recommend highly relevant products based on the user's context and location.	Degree of automation & artificial intelligence (T)	1.82	2	0.76	2.87	.062
27	In 10 years, the labor market will meet the demand for digital commerce professionals and big data specialists through new training programs completely.	Availability of resources (E)	3.66	4	1.01	2.20	.028
18	In 2025, cash and credit cards as means of payment in retail stores will disappear completely due to crypto-currencies and virtual wallets.	Development of new technologies (T)	3.52	4	1.15	2.15	0
26	Mobile networks and broadband Internet connections in Europe will be on par with the fastest high-speed connections in Asia in 2025.	Political will for investments in technologies and innovation (P)	2.72	3	1.13	2.15	0
30	In 2025, political initiatives and a high level of financing have shaped Europe into the global breeding ground for digital innovation triggering a technology-friendly climate.	Amount of R&D investments (E)	3.69	4	0.72	2.43	0

4.3.2 Variance of Trends

The variance illustrates the level of disagreement and is measured by the standard deviation from the mean value of *probability of occurrence*. Asked to predict the probability of occurrence, the experts answered the question "*Will this statement occur?*" on a 5-point Likert scale (1 = Definitely; 5 = Definitely not). While the probability of occurrence-assessment helps to present the predictability of each statement, the degree of variance in the expert responses is more important to build unexpected scenarios as intended by this study.

After the first Delphi round, statements that fall into the upper half of each importance and variance were selected for a re-assessment in the second Delphi round. **Figure 5** compares the expert answers and statistical values for both rounds and reveals how the experts' group opinion (n=37) changed after being confronted with the statistical results of round 1. Generally speaking, the expert judgments of the second round were close to those of the first one. This shows the high uncertainty and dissent for the future of e-commerce among experts. Additionally, one can assume that a third round would not have further increased the consensus and this justifies the decision not to conduct a third Delphi iteration. However, the second round increased the consensus at least slightly for all statements except for statements *5* and *7*. It should be noted that the variance significantly decreased for the statements *4* (-13%), *8* (-18%), and *15* (-17%), though. Furthermore, the experts were less optimistic with regard to the probability of occurrence in round two and the proportion of *definitely* answers had reduced as plotted in **Figure 5**. This effect may be explained by the tendency of respondents to revert to the mean value in the second round.

The trend with the highest variance and thus greatest dissent is the possibility to be successful only in niches as a new entrant *(statement 2)*, followed by an industry structure without monopolies/oligopolies *(statement 1)* and biometrics as means for identification in checkout processes *(statement 14)*. Next, the vanishing of cash *(statement 18)*, fully integrated online and offline channels *(statement 7)*, sensors in food and apparel *(statement 16)*, and the development of high-speed Internet connections *(statement 26)* yield disagreement among the expert group. Moreover, the death of supermarkets due to changes in lifestyles *(statement 22)* is, again, one of the outstanding trends and disputed in respect of its occurrence.

The Delphi results also report, which trends hold a high predictability and are therefore likely to occur by 2025. Hence, digital personal shopping assistants *(statement 10)* have the greatest probability of occurrence, followed by the continuing rise of e-commerce with more than one third of all B2C transactions being conducted online *(statement 6)*. Furthermore, the experts predict that new players can only be successful in niches as markets are covered in ten years *(statement 2)*. Although all of the following statements show high variance, the forward integration of manufac-

turers and producers *(statement 5)*, the capability to analyze all customer data as the main attribute for competitive advantage *(statement 3)*, as well as true omnichannel retailing executed by 75% of all B2C retailers *(statement 7)* will probably occur, according to the expert assessments.

STATEMENT	ROUND	RESPONSES FOR PROBABILITY OF OCCURRENCE (1-5)	MEAN	STD
# 3	1	17 / 21 / 14 / 8 / 1	2.26	1.06
Competitive advantage	2	7 / 16 / 8 / 5 / 1	2.38	1.04
# 4	1	13 / 26 / 5 / 15 / 2	2.46	1.18
Big data	2	1 / 13 / 5 / 17 / 1	3.11	1.02
# 5	1	15 / 23 / 12 / 10 / 1	2.33	1.08
Forward integration	2	8 / 17 / 6 / 4 / 2	2.32	1.11
# 7	1	16 / 18 / 13 / 14	2.41	1.12
Omnichannel retailing	2	8 / 16 / 6 / 5 / 2	2.38	1.14
# 8	1	9 / 22 / 16 / 9 / 5	2.66	1.15
Mobile commerce	2	4 / 12 / 13 / 8	2.68	0.94
# 15	1	5 / 22 / 17 / 13 / 4	2.82	1.07
Customized pricing	2	11 / 11 / 14 / 1	3.14	0.89
# 16	1	8 / 16 / 15 / 19 / 3	2.89	1.14
Internet of things	2	3 / 8 / 7 / 16 / 3	3.22	1.13
# 21	1	12 / 26 / 12 / 9 / 2	2.39	1.07
Personalization	2	5 / 17 / 6 / 9	2.51	1.02
# 22	1	2 / 13 / 9 / 23 / 14	3.56	1.16
Fall of supermarket	2	1 / 6 / 3 / 16 / 11	3.81	1.13

Definitely Probably Maybe Probably not Definitely not

Figure 5: *Responses for probabilities of occurrence for trends that were presented in both survey rounds because they are both important and unpredictable ($n_{1st\ round} = 61$; $n_{2nd\ round} = 37$)*

4.4 SCENARIO MATRIX FOR FUTURE E-COMMERCE

Figure 6: *Scenario matrix for e-commerce in 2025 with characteristics for the PEST dimensions and the retailing industry (I)*

The driving forces of the statements with the highest *(statement 22)* and second highest *(statement 7)* index values are selected as the axes for the scenario matrix (see **Figure 6**). Since both key driving forces display a high level of uncertainty and therefore an imminent bipolarity, these emerging poles can be used as the axes' directions. On the high end, the key driving force *dimension of changes in lifestyles* engenders a massive transformation of society due to an adoption of technological innovations that take control of everyday life. On the low end, weak changes of lifestyles compared to today may be the contrary outcome as stagnation is extremely unlikely. The poles of the key driving force *pervasiveness of technology and merging of online and offline* are the omnipresence of connected technologies in all surrounding objects that make the distinction between offline and online irrelevant and, on the other side, a lower ubiquity of technologies than today.

As not only two driving forces shape the future, most of the remaining ones (*cf.* section 4.1) also play a role in the scenarios. While the scenarios are thus developed on the foundation of uncertain driving forces, developments with high certainty from today's point of view are *given factors* in each scenario. Hence, the growth of the global population, the demographic change in Europe, the geopolitical ascent of China, and global warming are predetermined elements.

4.5 SCENARIO 1: VORTEX OF INNOVATION

4.5.1 Narrative of Scenario 1

The inception of the Transatlantic Trade and Investment Partnership (TTIP) in 2016 initiated a ratification surge of free trade agreements between Europe and other economic areas that expedited global free trade. By 2022, the complete harmonization of global trade marked a temporary apex of the world's progressive unification with an amalgamation of global consumer tastes.

Global competition and cost pressure left retailers and producers no other choice but to replace most of human personnel by faster, cheaper, and more durable thinking machines working 24/7. However, the economy is better off than ever before due to two reasons. First, a series of political initiatives succeeded to support the transformation from a service society to the so-called *silicon society*. Second, citizens have shed technology anxiety and desire new technologies that simplify their digital lifestyles. In this accelerated world, time became the most valuable personal resource.

Ten years ago, retail managers still differentiated between online and offline. In 2025, however, every purchase involves the Internet. With any commercial transaction, the purchasing information is added to the customer's preferences profile and the items are paid through eye scans. Last year, the number of connected items such as apparel, food, and household appliances surpassed the two hundred billion mark. Now, prescriptive analyses of data allow algorithms to decide upon personalized advertisement, pricing and the individual consumption behavior. Almost invisible gadgets such as smart contact lenses and earplugs that blend in with the human body finally provide convenient and seamless augmented realities as well as the access to virtual worlds and shops. Now, there are no more barriers for shopping at any times and everywhere. Digital personal assistants in the cloud care about their human users and support or take over decision-making. Users can access their personal assistant via any device like cars, smart eyes, or holographic displays in shopping malls. While the assistants make a difference in managing time more efficiently, critics note that users are in a filter bubble and cannot perceive the complete world.

Subscription models for consumables make it superfluous to go to supermarkets and the Internet is the primary source for shopping. Reflecting on the last years, three factors are the decisive reasons for the supremacy of online shopping: First, improvements of the last mile delivery to flexible

locations and within hours. Second, the spread of digital personal shopping assistants. And third, the digital dependence and massive personalization that have created a lock-in effect for buyers. The same developments foster oligopolistic industry structures as it is more comfortable to buy everything from one trader due to network effects and better data mining.

Only very few local online retailers successfully survived the global meltdown of the retail industry. Those, which did, can only compete either in niches, or in cooperation with the market leaders. All of them have created valuable customer profiles soon enough. However, new entrepreneurial players with technological innovations are persistently entering the market. Undoubtedly, the ship for traditional retailers has sailed already ten years ago.

Key questions for retail managers in scenario 1

- Do you participate on the global market and cooperate with the major players?
- Do you provide the latest digital technologies to maximize the convenience and efficiency of your customers by linking your inventory with digital assistant systems?
- Do you exploit the potential of real-time cross-channel data harvesting to provide a personalized shopping experience, tailored offers, and higher buyer switching costs?
- Is it possible to order your products in virtual worlds and augmented realities?

4.5.2 Leading Indicators for Scenario 1

The first scenario describes a world with intensified Internet-enabled commerce. According to recent studies, 75% of South Koreans made their last apparel purchase online (*cf.* Consumer Barometer, 2014) and 82% of Chinese want to make all purchases online (*cf.* Razorfish, 2014, p. 33).

Due to the technology-intense nature of the *Vortex of Innovation*-scenario, nascent technologies allow to look towards the future. Digital personal shopping assistants that interact like humans and proactively have already been developed. For instance, *Nina* by Nuance enables natural language processing-based customer service comparable to *Siri* for commercial apps and websites (*cf.* Bohn, 2012). Furthermore, IBM's cognitive computing system *Watson* is currently tested by The North Face (*cf.* Ash, 2014). BBC Research predicts that the global market for digital assistants will grow from today's $600 million to $8 billion by 2024 (*cf.* McWilliams, 2014, p. 124).

Prototypes of invisible smart contact lenses have already been produced by Novartis in cooperation with Google (*cf.* Morse, 2014). Shopping apps for *Google Glass* are already on the market. For example, *Glashion* makes it possible for users of data glasses to buy fashion products that they see on the go (*cf.* Rao, 2013). Tesco already unveiled a prototype of its virtual store for the *Oculus Rift*, which enables realistic movements in a virtual supermarket (*cf.* Wasserman, 2014). The Chinese online retailer Yihaodian opened 1,000 augmented reality stores in 2012 that are only visible with smartphones (*cf.* Phneah, 2012). The stores are located at famous public places and directly in front of stores of Yihaodian's offline competitors.

4.6 SCENARIO 2: AVALANCHE OF TECHNOLOGY

4.6.1 Narrative of Scenario 2

The political goal from ten years ago to transform Europe to the locus of digital innovation has clearly been achieved and political initiatives to support digital technology firms. However, the society cannot keep up with the fast technology pace. Citizens express signs of technophobic behavior and are afraid to be left behind in a world controlled by computers. Countermeasures against the increasing artificial intelligence are reinforced consumer and data protection rights. Recent sanctions against the RICE alliance (Russia, India, China, and the Emirates) impair the European exports, causing negative effects on the economy and purchasing power. Consumers feel this decline through the growing replacement of jobs by machines and rising unemployment rates. As the EU pools its strengths within its borders, the harmonization of trade is effective in Europe. Ironically, technology fear has never generated technology fatigue among buyers, who still buy hyper-connected *flexphones* (smartphones with flexible displays), are always on, and are addicted to social media services. However, customers are exposed to an information overload and they fear cyber crimes, sensors, drones, and embarrassingly personalized advertising.

As individuals are unsatisfied due to the pervasiveness of technology, their resistance to change is too high to overcome. Consequently, online retailing still has not replaced shopping at physical stores. Despite assertive consolidation efforts by leading European retailers, the industry competition has reached its all-time high. In order to survive, many retailers diversified their business models and offer pre- and after-sales services such as financial services or mechanics. Due to weak changes in consumers' lifestyles demands are quite predictable and previously non-retail players like social media services have therefore entered the European retail market. Thanks to the strong technological development, all retailers utilize the possibilities to merge online and offline shopping. Since the new and more efficient generation of wearable devices never crossed the chasm to adoption by the early majority, retailers did not develop business applications for mobile gadgets other than flexphones. Offline retailers, however, have implemented more radical changes. Across all stages, in-store shopping is linked to Internet services: The information and orientation stage is assisted by smart shelves, digital recommendations, and indoor navigation; digital mirrors have revolutionized the trial stage by augmented reality technologies; the checkout stage is cash- and effortless through pay-by-phone light barriers; and drones can fly the products to personal pick-up stations or cars. Comparing the retail industry of today with the expectations and forecasts of 2015, e-commerce has not substituted traditional retailing. Instead the opposite is rather true: Multichannel retailers have benefitted from the growing fear of the technology avalanche and the handy integration of digital services by prior offline-only players.

Key questions for retail managers in scenario 2

- Do you treat your customers' data with utmost respect and do you comply with the law?
- Is it possible to buy your products for the same price at home, with flexphones on the go, and in your physical high-tech stores?
- Are all of your channels very easy to use, trustful, and open to integrate the friends of your clients?
- Can you compete on price with your business competition in all over Europe and do you provide additional services?

4.6.2 Leading Indicators for Scenario 2

In the *Avalanche of Technology*-scenario, the society suffers from a *technology avalanche* and technology fear. According to Gartner's Global Head of Research Peter Sondergaard, there are reasons for concern because he predicts that software or robots will replace every third job within the next ten years (*cf.* Miller, 2014). In terms of technology, the ubiquity of sensors, a.k.a. the Internet of Things, is not science fiction but growing around us. There are different market forecasts: IDC estimates the global market volume of the Internet of Things to be $7.1 trillion by 2020 (*cf.* Lund *et al.*, 2014) and Gartner forecasts an economic added value of $1.9 trillion with 26 billion connected objects (*cf.* Middleton *et al.*, 2013). Cisco (*cf.* 2013) predicts an even greater sensor quantity of 50 billion units. Whatever will happen: the Internet of Things market is huge and has the potential to start the next industrial revolution (*cf.* Löffler & Tschiesner, 2013, p. 1).

The second scenario also contains the vision of high-tech department stores. Already existing future store concepts indicate how most shops could look like in a few years. Burberry, for instance, seamlessly integrated digital technologies into its London flagship store to display information about RFID-tagged products on large screens and to provide the purchase history of customers to sales assistants (*cf.* Cartner-Morley, 2012). Similarly, Marks & Spencer also equipped sales associates with iPads and stores with free WiFi to allow buyers to pay directly at assistants instead of queuing up (Wood, 2012). Adidas' *Interactive Window* is a giant interactive touch-screen in the storefront that pairs with smartphones of pedestrians and thus extends opening hours (*cf.* Smith-Dubendorfer, 2013). Another technology to intersect the offline and online worlds is the digital mirror, which is used for instance by the fashion retailers Nordstrom and Uniqlo: Smart fitting rooms make it unnecessary to try different variations of a product as the mirror can transform the color and suggests complementary items as well as inventory information.

4.7 SCENARIO 3: DESERTIFICATION OF IMAGINATION

4.7.1 Narrative of Scenario 3

The Great Recession of 2008-2012 and the Eurozone crisis of 2009 were merely signs of the crises to come that have put the greatest of all fads on hold – the globalization. As a consequence of the

ongoing turmoil, populist parties have gained ground all over Europe, which widened the gap between Europe's north and south and heralded the breakdown of the EU accompanied by progressing protectionism. Since Northern and Southern Europe officially separated in 2020 over a lack of solidarity with the poor south, cross-border trading has become almost impossible. All member states of the Eurozone, accordingly, reverted to their national currencies by 2021. In comparison with the struggling world economy, Northern Europe is relatively prosperous. However, its economic growth recently stagnated and unemployment surpassed the 20% mark for the first time in all northern countries. The reasons for this primarily lie in the nationalization of economies relating to an export cut-off and a lack of access to many scarce resources. A serious matter of concern is that entrepreneurial activity is practically non-existing.

Since the European society suffers from technophobia due to a series of shocking data scandals in the late 2010s and novel technology-related diseases, people do not demand new technologies and NGOs against digital technologies meet enthusiasm. Furthermore, reactionary politicians have enforced regulations against intelligent technologies and data analysis as an act of paternalism to stop data abuse and espionage. Along with stagnating demand and lifestyles, people retain a nostalgic sentimentality for the past and seek the *good old days* with a sound economy and more leisure time. Hence, the lawmakers reacted to this need with directives to conserve the *status quo*. These actions, for instance, support brick-and-mortar retailers in order to keep the shopping streets alive and introduce national Internets as a security measure against digital terrorist attacks.

Smartphones, tablets, and notebooks have just incrementally developed and automation is rather limited. Data leaks and digital thefts via mobile payment systems resulted in a huge loss of trust for mobile commerce. So, online shoppers buy from home via web stores. E-commerce is just a tiny fragment of the whole retail market as consumers favor window-shopping. However, the level of competition in *online* retailing is still very high: First, the decreasing online sales volume weakens the overall industry attractiveness. Second, the perfect price transparency increases the power of buyers. And third, additional rivalry occurred from forward integration by suppliers and producers due to totally predictable demand and easy to supply domestic markets. As a result of years of fierce competition between online retailers, only the players with the strongest brand power and highest, if any, profits remained.

Key questions for retail managers in scenario 3

- Have you applied for government funding for offline retailers and invested in your brand?
- Did you conduct user tests for every major change to your web store before you launched it in order not to demand too much of your regular customers?
- Do you partner with your suppliers and producers before they diversify and bypass you by selling directly to consumers?

4.7.2 Leading Indicators for Scenario 3

Since the *Desertification of Imagination*-scenario roots in weak technological development and protectionism, signs have to be searched in other environmental dimensions than technology. According to Jeff Jarvis, "three forces are at work endangering the [Inter]net: control, protectionism, and technopanic" (Jarvis, 2014). His description of the "damage" done to an open Internet by the EU with actions like the motion for stricter search engine regulations (known as the *Google breakup*), Spain's link tax, and Germany's *Ancillary copyright for press publishers* is analogous to those of the third scenario. Furthermore, Iran's national Internet "restricts citizens' freedom on the Net" (Shirazi, 2014, p. 228) and indicates to what extent some non-democratic countries currently filter the digital infrastructure today.

4.8 SCENARIO 4: EARTHQUAKE OF PROSUMPTION

4.8.1 Narrative of Scenario 4

Who would have thought ten years ago that technological development almost comes to a standstill and the *sharing economy* impedes the rehabilitation of our economy? Because people's lifestyles are volatile and demands develop at rapid pace, politics is lagging behind and unable to adequately cope with the situation. As a consequence of this ongoing mess, governments are busy with quickly changing citizens' needs and completely dedicated to keep the international system working so that there is no room for maneuver left to stimulate technological development.

The economy suffers from underdevelopment due to weak policy and the impossibility to be customer-oriented in light of rapidly changing demands. In addition, before the majority of the population adopts an innovation, the demand shifts to yet another technology and the mass markets have died. In the midst of this turmoil, *prosumers* have filled the gap for innovation and invent, build, or lend currently needed goods as an act of self-empowerment and entrepreneurial alternative. Nowadays, nobody doubts the success of the sharing economy that has become the major threat to the traditionally growth-oriented economy.

Sustainability and environmental awareness due to global warming are mutual issues of concern. Furthermore, the social media revolution from 20 years ago has broken down trust barriers and hesitation to share personal things with strangers. No matter whether it is time, money, media, transportation, physical space, household items, or fashion – the young generations do not want to purchase and own things just for themselves. Their aim is to get the maximum out of the available resources and products with a limited budget. Thus, the relationship between consumers and products is significantly altered and *access* has clearly become more important than *ownership*. The downside of the peer-to-peer economy, however, is a widening chasm between digital natives

and digital immigrants. The latter are overstrained with the digital infrastructure and have taken on a blocking attitude. As a result, the digital-phobic older generation now changes their lifestyles backward-looking. Digital natives are geared up to revolutionize C2C transactions but the slow technological progress does not provide the necessary tools other than the long ago established and cheap 3D printing technique as well as augmented reality apps for smartphones.

The European Central Bank is more and more worried as dozens of unofficial currencies spread like wildfire since 2021. A number of big retailers tried to jump on the bandwagon by establishing their own currencies but failed because prosumers increasingly avoid big, full-service retailers, as their product range does not suit individual needs. The most successful retailers pursue a brick-and-click strategy with physical stores for the elderly and web shops for younger online shoppers. Pure players can only be temporarily successful in highly specialized niches but the risk of falling behind when lifestyles change is so high that merely start-ups beat the incumbents. The huge mass of prosumers is almost unreachable for online retailers because they leapfrog retailers and go directly to suppliers to save costs. In today's world, the rivalry in the retail industry is extraordinary.

Key questions for retail managers in scenario 4

- Are you aware of the rapidly shifting demand and do not overinvest in new things that can be outdated by tomorrow?
- Are you doing the best you can to improve your CSR and transparency and keep prices down for instance with re-commerce offerings to swap old for new goods?
- Do you support alternative and local currencies instead of trying to push your own currencies into the market?
- Have you established a sustainability and community-based brick-and-click strategy to serve both the younger and elder generation with separated marketing campaigns?

4.8.2 Leading Indicators for Scenario 4

The striking element of the *Earthquake of Prosumption*-scenario is the sharing economy. Collaborative consumption economy is growing and places different industries from hotels to transportation in jeopardy. By the end of 2013, more than ten million people booked overnight stays with Airbnb since its launch (*cf.* Lawler, 2013) and Navigant Research predicts the global carsharing market to reach $6.2 billion by 2020 (*cf.* Berman *et al.*, 2013, p. 43). Recently, the heavily discussed car-hailing company Uber launched its courier service *Uber Rush* in New York City to deliver parcels in less than one hour (*cf.* Ninomiya, 2014).

The fourth scenario described the effects of collaborative consumption and *prosumers.* In this case, the 3D printing technology offers the opportunity to impel the *makers revolution* (*cf.* Anderson, 2012) and to change production processes profoundly. Recently, the Royal Mail introduced a service to 3D print things in its London office (*cf.* Gibbs, 2014) and the market forecast for 3D printing is a volume of $16.2 billion by 2018 (Canalys, 2014).

5 DISCUSSION AND CONCLUSION

In chapter 5, the above-described expert assessments of e-commerce trends are discussed and interpreted. Building on the developed scenarios, a conceptualization for digital commerce in 2025 is proposed that extends previous definitions. Furthermore, this chapter provides implications to the body of existing knowledge and contributions for retail managers.

5.1 INTERPRETATION OF FUTURE E-COMMERCE TRENDS

Prior foresight studies have documented the importance of omnichannel and mobile commerce, new payment systems, 3D printing, and big data (*cf.* section 2.5.2). However, almost all of the related studies lack a quantitative assessment of the trends that were identified by desk research and expert interviews. In this study, the determined e-commerce trends were valued based on their potential to transform the online retail industry and probability of occurrence by 2025.

The results show that technological and social trends are more important than political and economic developments for the future of e-commerce. This seems reasonable in light of the technological nature of electronic commerce and its dependence on changes in society. Correspondingly, the experts attached the highest importance for e-commerce to the death of supermarkets through changes in lifestyles and the de-structuring of daily routines. The findings of this quantitative research extend those of qualitative nature by PWC (*cf.* 2012, p. 14) and DPDHL (*cf.* 2014, p. 68) as big data was rated as very important for the future retail industry. The consensus of multiple studies, including this one, regarding the value of big data reflects the great reach of the hype that currently revolves around big data, which represents a buzzword for what might be standard in the near future (*cf.* Jennings, 2014). This study found that 3D printing is the technology with the highest impact to disrupt the retail industry followed by cross-channel big data techniques. In contrast to the qualitative expert interviews, the Delphi experts were more reserved regarding the probability of occurrence of disruptive technologies in retail like virtual realities, biometrics, and 3D printing. A reason might be the composition of the Delphi panel, which is larger and presumably more conservative than a carefully selected small group of visionary experts for the interviews.

Interestingly, the highest dissent amongst the experts exists for specific trends of the industry structure. This provides evidence of the generally high uncertainty about the future of retail because the experts do not even agree regarding the basic industry setup in 2025. More specifically, the respondents fundamentally disagree whether prospective new entrants can only be successful in niches and whether the industry will express monopolistic or oligopolistic traits. This could be reasoned in the present dominance of industry giants like Amazon, which makes all efforts to become the all-in-one solution as it recently unveiled its brand Amazon Elements for household

products and thereby directly attacked producers (*cf.* Ziobro, 2014). Furthermore, the resolution of biometric technologies for identification purposes and virtual wallets also elicited strong disagreement among the Delphi panel and both statements are rated as relatively unimportant. The almost German-only expert panel might account for this rating, as the German society is noted for its adherence to cash compared to other European countries.

The study at hand revealed that the industry experts indeed expect e-commerce to have a share of at least 33% of total B2C retail but they are nevertheless divided over whether e-commerce will drive supermarkets out of the retail market. Additionally, the results indicate that digital personal shopping assistants are very likely to occur by 2025. This finding corresponds well to the expert prediction from the qualitative interviews as well as the results of Münchener Kreis (*cf.* 2009, p. 54) and is thus robust. Furthermore, the expert ratings offer retail managers an understanding for developments that are just around the corner. In this context, the assessment of an upcoming forward integration by suppliers and producers offers support to identify potential competitors because this trend is regarded as very probable. In this regard, Apple plays a pioneering role and has become US' second largest online retailer in 2013 (*cf.* Banjo, 2014).

The quantitative trend assessment by 61 industry experts expands the understanding of political, economic, social, technological, and industry-related trends in the to e-commerce landscape. Surprisingly, the ratings are more cautious than originally anticipated as the majority of experts only supports the occurrence of a very low number of trends as predicted in the statements. This might be explained by the fact that foresight researchers often tend to think in technological possibilities rather than socio-technological. Not everything that is technically possible is meaningful or demanded by consumers. The findings emphasize that shifts in society as well as reluctance to change have to be considered for trend analyses and technologies in e-commerce are "only an enabler" (Burt & Sparks, 2003, p. 283). The trend assessment also proves that the period of technological transformations is not yet overcome and continues with increased pace. The findings concerning the offline-online transition and rising pervasiveness of technologies may be generalized also to other markets than Western Europe.

5.2 CONCEPTUALIZATION OF B2C COMMERCE IN 2025

There is one common theme in every scenario: Shopping continues to change. Already today, there are multiple terms to label digital shopping processes such as e-commerce, m-commerce, t-commerce, or s-commerce and certainly other terms will come. It is difficult to make a clear delineation since e-commerce increasingly intertwines with traditional retailing through multichannel and omnichannel strategies. Therefore, a new conceptualization of B2C commerce is needed for an appropriate understanding of future commerce.

In the qualitative research part, the industry experts agree that the Internet is still the fundamental infrastructure for e-commerce but the devices and interfaces are not limited to personal computers. According to Kai Hudetz, *"a wider definition of e-commerce is important because the development on the meta-level is access from everywhere."* Correspondingly, Nikolaus Mohr reported that his consulting company no longer uses the term *e-commerce* but *digital commerce* instead since the latter is broader and, *"fits to different touch points – the technology itself is irrelevant."*

On the basis of the developed scenarios, a new conceptualization of commerce in 2025 takes possible developments into account. According to Niemeier *et al.*, the "digital revolution is transforming the role of the traditional retailer" (2013, p. 23) and consumers shop in different contexts with different devices. The effort to buy the right item at the right time further decreases, as customers do not order by themselves any more when they use smart assistants with autonomous purchasing privileges. Stores are receding into the background and the customer profiles are getting more important. Future commerce thus enables consumer-centricity with personalized offers and products. As the relationship between products and consumers changes, items are increasingly shared and individualized. Also producers offer products for collaborative consumption and not only sell their items but rent them without changing the status of ownership.

The conceptualization for B2C commerce in 2025 builds on the afore-described framework by Choi *et al.* (*cf.* 1997, p. 17; see **Figure 7**). This model is sufficient to distinguish e-commerce players from traditional retailers, which has been the pressing question when the model was developed. Today, this is no longer open to question. As the lines between digital and physical are blurring, this categorization is no more meaningful. In order to update the framework by Choi *et al.* (*cf.* 1997, p. 17), the three existing dimensions – products, processes, and agents – persist but their bipolar characteristics are reinterpreted. Thus, the critical question for each dimension is identified to arrive at new poles for the axes. In 1997, the question was: *Is the dimension physical or digital?* Unlike then, there is not anymore a single question for *all* dimensions but one question for *each* dimension. The questions for B2C commerce in 2025 are:

- **Products & services:** *Do producers and retailers sell products only to individuals or do they offer products for shared consumption?*
- **Processes:** *Are the sales processes between the buyer and seller manual or automated?*
- **Agents:** *Are the sales agents standardized for everyone or individualized to unique clients?*

As depicted in **Figure 7**, the conceptualization of B2C commerce in 2025 is more complex than Choi's *et al.* e-commerce model, which reflects the multifaceted industry. The main difference between the old and new framework is the perspective of categorization: The role of the retailer is no longer paramount but the *shopping experience* is. A single player can therefore create multiple

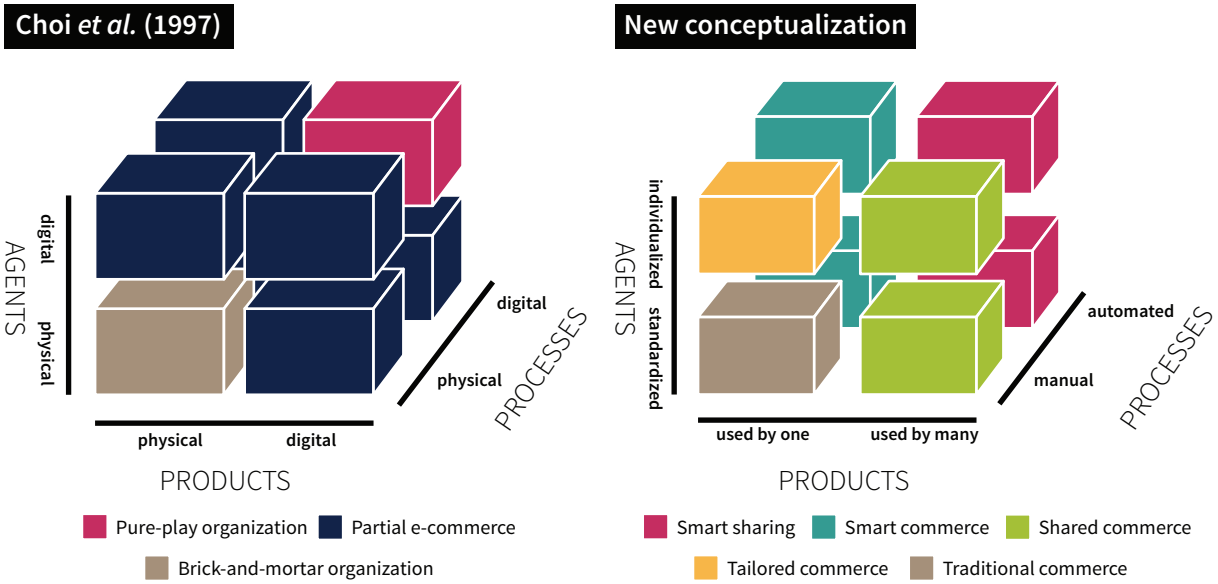

Figure 7: *Conceptualization of B2C commerce in 2025 compared to Choi et al. (1997, p. 17) (own depiction)*

shopping experiences at the same time. From a customer perspective it is not important *where* she buys but that her needs are fulfilled. Furthermore, the concept is device-independent as the future devices are unknown and digital technologies likely are a part of every dimension.

Future commerce differentiates between five shopping experiences. First, *traditional commerce*, for instance in conventional supermarkets or standardized web shops, describes online and offline shopping, as it is known today. Second, *tailored commerce* distinguishes itself from traditional commerce through individualized sales agents. For example, apps on mobile devices or smart walls in stores that personalize offers to users based on their profiles fall into this category. Third, *shared commerce* covers all commercial activities between producers or retailers and final customers that do not transfer the possession of the good to consumers. For example, car sharing between automobile manufacturers and clients or retailers that offer to rent instead to buy fill this shopping context. The sales agent in *shared commerce* contexts can be either standardized or individualized because it is more important that the consumers do not own the products or services. Fourth, *smart commerce* is defined as automated purchases by devices with autonomous purchasing rights. The smart fridge or autonomous personal shopping assistants are assigned to this category as well as subscription models for regular food delivery. The distinction between individualized and standardized agents is not important for this shopping experience because technologies bypass customers so no perceptible interaction between agents and clients exist. This holds also true for the fifth category *smart sharing*. Like in the *smart commerce* context, machines autonomously buy things but decide whether products ought to be purchased only for temporary use. For instance, *smart sharing* is possible for resource-oriented digital personal shopping assistants

that know the calendar entries of their users and may decide to hire a car to get to the next appointment or to borrow tools in order to support the mounting of the recently acquired wardrobe.

While the above-posed definition of e-commerce by Constantinides (*cf.* 2006, p. 425; *cf.* section 2.1.1) delineates electronic commerce as a *replacement* of traditional commerce, the conceptualization of B2C commerce in 2025, however, *integrates* traditional and electronic commerce. Hence, the division into different channels loses its significance as priorities are given to the shopping context and experience.

5.3 IMPLICATIONS

5.3.1 Contributions to Theory and Future Research

As this study is the first to combine the Delphi and scenario techniques in the field of electronic commerce, it extends the retail literature with valuable insights about the potential future and a straightforward methodological approach. Evidence from the empirical research verifies that the retail transformation continues. In future, the Delphi survey should be replicated with an international sample or in other markets than Western Europe to evaluate this study's findings. Furthermore, the sample size for the expert interviews could be subjected to an extension in order to substantiate the identified e-commerce trends. Since third parties have not yet discussed the scenarios, a peer review workshop or interviews with industry experts could serve as a member check to adopt suggestions for improvement. Additionally, quantitative techniques could be utilized to assess the cross-impact of the scenarios among each other. But, it is not advised to calculate which of the scenarios is most probable to occur, as this would contradict the true purpose of scenarios.

Moreover, the thesis provides a theoretical conceptualization of B2C commerce in 2025. In future, the usefulness of the new conceptualization should be tested in theory and practice. Further work should provide more insights into the five different shopping experiences with concrete examples and signposts for the future. Future foresight and forecast studies in the context of retailing should take care of the commerce conceptualization as a basis for predictions. It is advised that prospective retail studies about its future broaden their view on the industry and involve stakeholders from all shopping contexts into the foresight process.

5.3.2 Managerial Implications

As each scenario would call for different implications, five practical recommendations for action are proposed on the basis of the scenario and trend analysis. These implications should avoid to be overrun by new paradigms and give support for decision-makers.

Start to rehearse the future by using the scenarios

Scenarios support to transform "things we *don't know* we don't know" into "things we *know* we don't know" (Schoemaker, 1995, p. 38; emphasis added) and are thus a tool to build a shared vision of the future. The scenarios ought to build consensus and overcome resistance to change as well as collective ignorance. Although this foresight study will not prevent managers from being surprised as unanticipated situations cannot be fully avoided (*cf.* Postma & Liebl, 2005, p. 167), the current business model should be checked against the scenarios in internal discussions and workshops. Hence, the scenarios should be integrated in corporate planning processes.

Monitor changes in your local and macro environment

The driving forces in the meso and macro environment have to be kept under surveillance in order to watch for discontinuities and potentially disruptive actions by non-traditional competitors or technologies. As the environment constantly changes, retailers should build their business around those factors that are constant and do not change like demand for low prices and fast deliveries. Resources should be allocated more long term-oriented with an advanced foresightedness. The trend assessment results point out that retailers specifically should focus on technological and socio-environmental changes.

Transform your retail business into a technology business

Due to its technological nature, digital commerce relies on the development of technology and price competition forcing retailers to automate processes. It is therefore essential, to establish a new mental model: Be a technology company rather than a retail company. It may be that those technologies will have the biggest impact that we cannot think of today. This is advantageous for companies that currently lack behind and can leapfrog others with next generation technologies.

Establish customer-centricity as your core value

The future requires retailers to be highly responsive to customers' needs with personalized marketing, pro-active services as well as a 360-degree view of what buyers are doing and demanding. It is crucial to leverage intelligent data collection and analysis to create meaningful customer profiles. Future-oriented retailers prepare their present value proposition for a changing society.

Serve multiple shopping experiences

The boundaries for retailers are disappearing, new substitutes are entering the markets, and customers are indifferent about the point of sale location. Hence, managers have to fulfill multiple shopping experiences at the same time rather than adhere to different channels and silo thinking.

BIBLIOGRAPHY

2b Ahead (2014). *Trendstudie: Die Zukunft des stationären Handels*. Trend report by 2b Ahead Think Thank, Leipzig. Retrieved from: http://2bahead.com/fileadmin/content/janszky/pdf/Trendstudie_Die_Zukunft_des_stationaeren_Handels_klein.pdf

Aichholzer, G. (2002). Das ExpertInnen Delphi: methodische Grundlagen und Anwendungsfeld Technology Foresight. In: A. Bogner, B. Littig, W. Lenz (Eds.), *Das Experteninterview – Theorie, Methode, Anwendung* (pp. 133-154). Wiesbaden: Springer.

Amabile, T. M. (1998). How to kill creativity. *Harvard Business Review*, 76(5), 76-87.

Anderson, J. V. (1993). Mind mapping: A tool for creative thinking. *Business Horizons*, 36(1), 41-46.

Anderson, C. (2012). *Makers – The New Industrial Revolution.* New York: Crown.

Andreessen, M., & Bina, E. (2010). NCSA mosaic: A global hypermedia system. *Internet Research*, 20(4), 472-487.

Arcade, J., Godet, F., Meunier, F., & Roubelat, F. (1999). *Structural Analysis with the MICMAC method & Actors' Strategy with MACTOR method*. Millenium Project Futures Research Methodology Report. Retrieved from: http://www.lampsacus.com/documents/MICMACMETHOD.pdf

Ash, H. (2014, May 21). *The North Face And IBM Team Up*. Retrieved from: www.retailsolutionsonline.com/doc/the-north-face-and-ibm-team-up-0001

Asthana, P. (1995). Jumping the technology S-curve. *IEEE Spectrum*, 32(6), 49-54.

Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. *Computer Networks*, 54(15), 2787-2805.

Azuma, R., Baillot, Y., Behringer, R., Feiner, S., Julier, S., & MacIntyre, B. (2001). Recent advances in augmented reality. *IEEE Computer Graphics and Applications*, 21(6), 34-47.

Banjo, S. (2014, May 6). *Apple jumps to second place in online retail*. The Wall Street Journal Online. Retrieved from: http://blogs.wsj.com/corporate-intelligence/2014/05/06/apple-jumps-in-rankings-now-second-largest-online-seller/

Banker, S. (2013, December 19). *Amazon And Drones - Here Is Why It Will Work.* Forbes Online. Retrieved from: http://www.forbes.com/sites/stevebanker/2013/12/19/amazon-drones-here-is-why-it-will-work/

Baquero, A., & Taylor, R.N. (2012). Computational commerce: A vision for the future. In: C. Huemer & P. Lops, P. (Eds.), *E-Commerce and Web Technologies*(pp. 124-136). Berlin: Springer.

Beretta, R. (1996). A critical view of the Delphi technique. *Nurse Researcher*, 3(4), 79–89.

Berg, B.L. (2001). *Qualitative Research Methods for the Social Sciences* (4th ed.). Needham Heights: Allyn & Bacon.

Berg, J. E., Nelson, F. D., & Rietz, T. A. (2008). Prediction market accuracy in the long run. *International Journal of Forecasting*, 24(2), 283-298.

Berners-Lee, T., Cailliau, R., Luotonen, A., Nielsen, H. F., & Secret, A. (1994). World-wide web. *Communications of the ACM*, 37(8), 76-82.

Bezos, J. (2014, April 10) *Amazon Letter to Shareholders*. Retrieved from: http://phx.corporate-ir.net/phoenix.zhtml?c=97664&p=irol-reportsannual

Bijl, R. (1992). Delphi in a future scenario study on mental health and mental health care. *Futures*, 24(3), 232-250.

Bishop, P., Hines, A., & Collins, T. (2007). The current state of scenario development: An overview of techniques. *Foresight*, 9(1), 5-25.

Bohn, D. (2012, August 6). *Nuance's 'Nina' to add Siri-like features to customer service apps on iOS and Android*. The Verge Online. Retrieved from: www.theverge.com/2012/8/6/3222431/nuance-nina-siri-customer-service-apps

Börjeson, L., Höjer, M., Dreborg, K., Ekvall, T., & Finnveden, G. (2006). Scenario types and techniques: Towards a user's guide. *Futures*, 38(7), 723-739.

Bradfield, R., Wright, G., Burt, G., Cairns, G., & Van Der Heijden, K. (2005). The origins and evolution of scenario techniques in long range business planning. *Futures*, 37(8), 795-812.

Brown, C. A. (2007). The opt-in/opt-out feature in a multi-stage delphi method study. *International Journal of Social Research Methodology*, 10(2), 135-144.

Brynjolfsson, E., Hu, Y. J., & Rahman, M. S. (2013). Competing in the age of omnichannel retailing. *MIT Sloan Management Review*, 54(4), 1-7.

Budd, L., & Clear, F. (2003). The business environment for e-commerce. In: P. Jackson, L. Harris L. & P.M. Eckersley (Eds.), *e-Business Fundamentals* (pp. 13-42). London: Routledge.

Bunn, D.W., & Salo, A.A. (1993). Forecasting with scenarios. *European Journal of Operational Research*, 68(3), 291-303.

Burt, S., & Sparks, L. (2003). E-commerce and the retail process: A review. *Journal of Retailing and Consumer Services*, 10(5), 275-286.

Canalys (2014, March 31). *3D printing market to grow to US$16.2 billion in 2018*. Retrieved from. www.canalys.com/newsroom/3d-printing-market-grow-us162-billion-2018

Carpenter, G. (2013). *Power shift: The rise of the consumer-focused enterprise in the digital age*. Retrieved from: https://www.kellogg.northwestern.edu/faculty/academics/~/media/Files/general/2013/Rise-of-the-Consumer-Focused-Enterprise.ashx

Cartner-Morley, J. (2012, September 12). *Burberry designs flagship London shop to resemble its website*. The Guadian Online. Retrieved from: www.theguardian.com/fashion/2012/sep/12/burberry-london-shop-website

Cavalli-Sforza, V., & Ortolano, L. (1984). Delphi forecasts of land use, transportation interactions, *Journal of Transportation Engineering*. 110(3), 324-339.

Chaffey, D. (2009). *E-Business and E-Commere Management* (4th ed.). Essex: Prentice Hall.

Chermack, T.J. (2006). Assessing the quality of scenarios in scenario planning. *Futures Research Quarterly*, 22(4), 23-35.

Chermack, T.J., Lynham, S.A. Ruona, & W.E.A. (2001). A review of scenario planning literature. *Futures Res*. Q. 17(2), 7-31.

Choi, S.Y., Whinston, A., & Stahl, D. (1997). *Economics of Electronic Commerce*. New Jersey: Pearson.

Chui, M., Manyika, J., Bughin, J., Brown, B., Roberts, R., Danielson, J., & Gupta, S. (2013). *Ten IT-enabled business trends for the decade ahead - Updated research*. McKinsey Global Institute Report.

Christensen, C. M. (1992). Exploring the Limits of the Technology S-curve Part 1: Component Technologies. *Production and Operations Management*, 1(4), 334–357.

Cisco (2013, July 29). *Connections Counter: The Internet of Everything in Motion*. Retrieved from: www.newsroom.cisco.com/feature-content?type=webcontent&articleId=1208342

Constantinides, E. (2006). The Marketing Mix Revisited: Towards the 21st Century Marketing. *Journal of Marketing Management*, 22(3), 407-438.

Constantinides, E., Lorenzo Romero, C., & Gómez Boria, M. A. (2008). Social Media: A New Frontier for Retailers? *European Retail Research*, 22(1), 1-28.

Consumer Barometer Survey (2014). *The smart shopper*. Retrieved from: https://www.consumerbarometer.com/en/insights/

Cuhls, K. (2003). From forecasting to foresight processes – new participative foresight activities in Germany. *Journal of Forecasting*, 22(2), 93-111.

Czaplicka-Kolarz, K., Stańczyk, K., & Kapusta, K. (2009). Technology foresight for a vision of energy sector development in poland till 2030. delphi survey as an element of technology foresighting. *Technological Forecasting and Social Change*, 76(3), 327-338.

Dalkey, N., & Helmer, O. (1963). An experimental application of the Delphi Method to the use of Experts. *Management Science*, 9(3), 458-467.

Day, J., & Bobeva, M. (2005). A generic toolkit for the successful management of Delphi studies. *Electronic Journal of Business Research Methods*, 3(2), 103-116.

Delbecq, A.L., Van de Ven, A.H., & Gustafson D.H. (1975). *Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes*. Glenview: Scott, Foresman and Company.

Demos, T., & Jarzemsky, M. (2014). *Alibaba's IPO Priced at $68 a Share*. The Wall Street Journal Online. Retrieved from: http://online.wsj.com/articles/alibabas-ipo-priced-at-68-a-share-1411075675

Dennis, C.E., Fenech, T., & Merrilee, B. (2004). *E-Retailing*. Abingdon: Routledge.

Deutsche Post (2009). *Delivering Tomorrow: Customer needs in 2020 and beyond – A global Delphi study*. Retrieved from: http://www.dpdhl.com/content/dam/logistik_populaer/trends/delphi-studie_english.pdf

Deutsche Post (2012). *Delivering Tomorrow: Logistics 2050 – A scenario study*. Retrieved from: http://www.dhl-usa.com/content/dam/Local_Images/g0/aboutus/SpecialInterest/Logistics2050/szenario_study_logistics_2050.pdf

Deutsche Post DHL (2014). *Global E-Tailing 2025*. Retrieved from: http://www.dpdhl.com/content/dam/global_etailing_2025/pdf/dpdhl-study-global-e-tailing-2025.pdf

Dürand, D., Menn, A., & Voss, O. (2014). Neuverteilung der Welt. *WirtschaftsWoche*, 20, 60-68.

eBay (2014). *Zukunft des Handels* (The Future of Retail). Retrieved from: http://www.zukunftdeshandels.de/

Einav, L., Levin, J., Popov, I., & Sundaresan, N. (2014). Growth, adoption, and use of mobile E-commerce. *American Economic Review*, 104(5), 489-494.

eMarketer (2013a, June 27). *B2C Ecommerce Climbs Worldwide, as Emerging Markets Drive Sales Higher*. Retrieved from: http://www.emarketer.com/Article/B2C-Ecommerce-Climbs-Worldwide-Emerging-Markets-Drive-Sales-Higher/1010004

eMarketer (2013b, Februar 5). *Ecommerce Sales Topped $1 Trillion for First Time in 2012.* Retrieved from: http://www.emarketer.com/Article/Ecommerce-Sales-Topped-1-Trillion-First-Time-2012/1009649

EPO (2014, March 5). *European patent filings raw data as excel sheets*. Retrieved from: http://www.epo.org/about-us/annual-reports-statistics/statistics/filings.html

European Business Summit (2014). *Accelerating Europe's Comeback—Digital Opportunities for Competitiveness and Growth.* Accenture Report. Retrieved from: http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Report-Accelerating-Europes-Comeback-Digital-Opportunities-Competitiveness-Growth.pdf

Eurostat (2014). *Income distribution statistics*. European Commission Statistics. Retrieved from: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Income_distribution_statistics

Fahey, L., & Narayanan, V.K. (1986). *Macroenvironmental Analysis for Strategic Management*. St. Paul, Minnesota: West Publishing.

Feki, M.A., Kawsar, F., Boussard, M., & Trappeniers, L. (2013). The Internet of Things: The Next Technological Revolution. *Computer*, 46(2), 24-25.

Fitzpatrick, A. (2014, January 8). *Macy's Laying Off 2,500 Employees, Shutting Five Stores*. Time Online. Retrieved from: http://time.com/422/macys-layoffs/

Forrester (2013, March 13). *US Online Retail Forecast, 2012 To 2017*. Forrester Online. Retrieved from: http://www.forrester.com/US+Online+Retail+Forecast+2012+To+2017/fulltext/-/E-RES93281

Foster, R.N. (1986). *Innovation: The Attacker's Advantage*. New York: Summit.

Frey, C.B., & Osborne, M.A. (2013). *The Future Of Employment: How Susceptible Are Jobs To Computerisation?* Oxford University Programme on the Impacts of Future Technology.

Gabor, D. (1964). Inventing the Future. New York: Alfred A. Knopf.

Gartner (2014), August 11. *Hype Cycle for Emerging Technologies 2014*. Retrieved from: http://www.gartner.com/newsroom/id/2819918

Garud, R., & Nayyar, R. (1994). Transformative Capacity: Continual structuring by intertemporal technology transfer. *Strategic Management Journal*, 15(1), 365-385.

Gibbs, S. (2014, December 9). *Royal Mail launches 3D-printing service*. The Guardian Online. Retrieved from: www.theguardian.com/technology/2014/dec/09/royal-mail-launches-3d-printing-service

Gibson, W, (1990). *Cyberpunk* (Video documentary, quotation in part 3, time code: 12:20). Retrieved from: http://www.youtube.com/watch?v=xxTuEGEl9EQ

Gilbert, A. (2004, August 11). *E-commerce turns 10*. Retrieved from: http://news.cnet.com/E-commerce-turns-10/2100-1023_3-5304683.html

Ginter, P.M., & Duncan, J.W. (1990). Macroenvironmental analysis for strategic management. *Long Range Planning*, 23(6), 91-100.

Godet, M. (1986). Introduction to la prospective: Seven key ideas and one scenario. *Futures*, 18(2), 134-157.

Godet, M. (2000). The art of scenarios and strategic planning: Tools and pitfalls. *Technological Forecasting and Social Change*, 65(1), 3-22.

Godet, M., & Roubelat, F. (1996). Creating the future: The use and misuse of scenarios. *Long Range Planning*, 29(2), 164-171.

Goodman, C.M. (1987). The Delphi Technique: a critique. *Journal of Advanced Nursing*, 12, 729-734.

Graefe, A., Luckner, S., & Weinhardt, C. (2010). Prediction markets for foresight. *Futures*, 42(4), 394-404.

Grisham, T. (2008). The Delphi technique: a method for testing complex and multifaceted topics. *International Journal of Managing Projects in Business*, 2(1), 112-130.

Gupta, U.G., & Clarke, R.E. (1996). Theory and applications of the Delphi technique: A bibliography (1975-1994). *Technological Forecasting and Social Change*, 53(2), 185-211.

Haag, S., Cummings, M., & McCubbery, D.D. (2004). *Management Information Systems for the Information Age* (4th ed.). New York: McGraw-Hill/Irwin.

Haderlein, A. (2012). *Die digitale Zukunft des stationären Handels*. München: mi-wirtschaftsbuch.

Hagerty, J.R. (2013, November 1). *5 Reasons Not to Go Gaga Over 3D Printing*. The Wall Street Journal Online. Retrieved from: http://blogs.wsj.com/corporate-intelligence/2013/11/01/five-reasons-not-to-go-completely-gaga-over-3d-printing/

Hansen, L. (2009, November 20). *What happened to Second Life?* BBC News Magazine. Retrieved from: http://news.bbc.co.uk/2/hi/8367957.stm

Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the delphi survey technique. *Journal of Advanced Nursing*, 32(4), 1008-1015.

Heinecke, A., & Schwager, M. (1995). *Die Szenario-Technik als Instrument der strategischen Planung*, Braunschweig: University Press.

Heinemann, G., & Gaiser, C. (2014). *Social Local Mobile: The Future of Location-based Services*. Berlin: Springer.

Henwood, D. (2014). The bitcoin fantasy are digital currencies the future of money. *Nation*, 298(20), 12-17.

Hickmann, K.E.B. (1994). *SSL 0.2 Protocol Specification*. Retrieved from: https://web.archive.org/web/20130530054017/http://www.mozilla.org/projects/security/pki/nss/ssl/draft02.html

Hill, K.Q., & Fowles, J. (1975). The methodological worth of the Delphi forecasting technique. *Technological forecasting and social change*, 7(1), 179-192.

Hitt, M.A., Keats, B.W., & DeMarie, S.M. (1998). Navigating in the new competitive landscape: Building strategic flexibility and competitive advantage in the 21st century. *Academy of Management Executive*, 12(4), 22-42.

House, R., Rousseau, D.M., & Thomas-Hunt, M. (1995). The Meso Paradigm: A framework for the integration of micro and macro organizational behavior. *Research in Organizational Behavior*, 17(1), 71-114.

IFH (2014). *Handelsszenario 2020: Zwischen Online und Offline, Discount und Mehrwert*. Retrieved from: http://shop.ifhkoeln.de/de/Themen/Handel-Allgemein/Handelsszenario-2020-Jahrgang-2014

Inayatullah, S. (2002). Reductionism or layered complexity? The futures of futures studies. *Futures*, 34(3-4), 295-302.

Jackson, P., Harris L., & Eckersley, P.M. (2003.). *E-Business Fundamentals*, London: Routledge.

Jacobson, R.E. (1981). *Access rights to the electronic marketplace*. Sacramento: Assembly Office of Research.

Jarvis, J. (2014, November 26). *Eurotechnopanic*. Die Zeit Online. Retrieved from: www.zeit.de/kultur/2014-11/jeff-jarvis-eurotechnopanic-google-germany-english-edition

Jelassi, T., & Enders, A. (2008). *Strategies for E-Business: Creating Value through Electronic and Mobile Commerce – Concepts and Cases* (2nd ed.). Essex: Pearson.

Jennings, R. (2014, September 19). *Big Data Overhyped? "No," Say Actual Scientists*. Forbes. Retrieved from: www.forbes.com/sites/netapp/2014/08/19/big-data-gartner-hype-cycle-otoh/

Jopson, B. (2013, December 27). *US bricks-and-mortar retailers seek online success*. Financial Times Online. Retrieved from: http://www.ft.com/intl/cms/s/0/6773a16c-69dc-11e3-aba3-00144feabdc0.html

Kalakota R., & Whinston, A.B. (1997). *Electronic Commerce: A Manager's Guide*. Reading: Addison-Wesley.

Kalemli-Ozcan, S., Papaioannou, E., & Peydró, J. (2010). What lies beneath the euro's effect on financial integration? Currency risk, legal harmonization, or trade? *Journal of International Economics*, 81(1), 75-88.

Kalyanam, K., & McIntyre, S. (2002). The E-marketing mix: A contribution of the E-tailing wars. *Journal of the Academy of Marketing Science*, 30(4), 487-499.

Kilgour, M., & Koslow, S. (2009). Why and how do creative thinking techniques work? Trading off originality and appropriateness to make more creative advertising. *Journal of the Academy of Marketing Science*, 37(3), 298-309.

Komiya, F., Kusuzaki, T., Soga, S., Ohtani, K., Tsushima, I., & Hiramatsu, A. (1998). Preliminary evaluation of business to business electronic commerce by using qualitative simulation and scenario generation. *Proceedings of the IEEE International Conference on Systems, Man and Cybernetics,* 4763-4768.

Kostoff, R.N., & Schaller, R.R. (2001). Science and technology roadmaps. *IEEE Transactions on Engineering Management*, 48(2), 132-143.

Kotler, P., & Keller, K.L. (2012). *Marketing Management* (14th ed.). New Jersey: Pearson.

Kreibich, R., Oertel, B., & Wölk, M. (2011). Futures Studies and Future-oriented Technology Analysis - Principles, Methodology and Research Questions, *1st Berlin Symposium on Internet and Society*, Institute for Futures Studies and Technology Assessment, Berlin.

Kuchler, H. (2013, June 4). *UK high streets to lose 5,000 shops in next five years*. Financial Times Online. Retrieved from: http://www.ft.com/cms/s/0/eced567c-cc65-11e2-bb22-00144feab7de.html

Kumar, N., & Ruan, R. (2006). On manufacturers complementing the traditional retail channel with a direct online channel. *Quantitative Marketing and Economics*, 4(3), 289-323.

Köhler, G. (1992). Methodik und Problematik einer mehrstufigen Expertenbefragung. In: J.H.P. Hoffmeyer-Zlotnik (Ed.), *Analyse verbaler Daten : über den Umgang mit qualitativen Daten* (pp. 318-332). Opladen: Westdeutscher Verlag.

Landau, S. (2013). Making sense from Snowden: What's significant in the NSA surveillance revelations. *IEEE Security and Privacy*, 11(4), 54-63.

Landeta, J. (2006). Current validity of the Delphi method in social sciences. *Technological Forecasting and Social Change*, 73(5), 467-482.

Landeta, J., Barrutia, J., & Lertxundi, A. (2011). Hybrid Delphi: A methodology to facilitate contribution from experts in professional contexts. *Technological Forecasting and Social Change*, 78(9), 1629-1641.

Laudon, K.C., & Traver, C.G. (2004). *E-Commerce: Business, Technology, Society*. New Jersey: Pearson.

Lawler, R. (2013, December 19). *Airbnb Tops 10 Million Guest Stays Since Launch, Now Has 550,000 Properties Listed Worldwide*. TechCrunch Online. Retrieved from: www.techcrunch.com/2013/12/19/airbnb-10m/

Levy, M., Weitz, B., & Grewal, D. (2013). *Retail Management* (9th ed.). New York: McGraw-Hill.

Lin, K.-J. (2008). E-Commerce Technology – Back to a Prominent Future. *IEEE Internet Computing*, 12(1), 60-65.

Linstone, H.A. (1978). The Delphi technique. In: R.B. Fowles (Ed.), *Handbook of Futures Research* (pp. 271-300). Westport: Greenwood.

Linstone, H.A., & Turoff, M. (1975). *The Delphi Method: Techniques and Applications.* Reading: Addison-Wesley.

Linstone, H.A., & Turoff, M. (2011). Delphi: A brief look backward and forward. *Technological Forecasting and Social Change*, 78(9), 1712-1719.

Lipson, H., & Kurman, M. (2013). *Fabricated – the new world of 3D printing*. Indianapolis: Wiley.

Löffler, M., & Tschiesner, A. (2013). *The internet of things and the future of manufacturing.* McKinsey Business Technology Office Report.

Lohr, S. (2014, April 24). *Amazon's Revenue Grew 23 Percent in First Quarter, Nearing $20 Billion*. The New York Times Online. Retrieved from: http://www.nytimes.com/2014/04/25/technology/amazon-quarterly-earnings.html

Loo, R. (2002). The delphi method: A powerful tool for strategic management. *Policing*, 25(4), 762-769.

Lund, D., MacGillivray, C., Turner, V., & Morales, M. (2014). *Worldwide and Regional Internet of Things (IoT) 2014–2020 Forecast: A Virtuous Circle of Proven Value and Demand*. IDC Market Analysis. Retrieved from: http://www.idc.com/getdoc.jsp?containerId=248451

Maamar, Z. (2003). Commerce, E-commerce, and M-commerce: What comes next? *Communications of the ACM*, 46(12), 251-257.

Manski, C. F. (2006). Interpreting the predictions of prediction markets. *Economics Letters*, 91(3), 425-429.

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Bisson, P., Roxburgh, C., & Hung Byers, A. (2011). *Big data: The next frontier for innovation, competition, and productivity.* McKinsey Global Institute Report.

Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., & Marrs, A. (2013). *Disruptive technologies: Advances that will transform life, business, and the global economy.* McKinsey Global Institute Report.

Manzoor, A. (2010). *E-Commerce – An Introduction*. Saarbrücken: Lambert.

Marsden, P. (2010). *Social Commerce: Monetizing Social Media*. Retrieved from: http://digitalinnovationtoday.com/documents/Syzygy_2010.pdf

Martelli, A. (2001). Scenario Building And Scenario Planning: State Of The Art And Prospects Of Evolution. *Futures Research Quarterly*. Retrieved from: http://www.antoniomartelli.com/html/articoli/scen_building.asp

Martin, B.R. (1995). Foresight in science and technology. *Technology Analysis & Strategic Management*, 7(2), 139-168.

Martin, B.R. (2010). The origins of the concept of 'foresight' in science and technology: An insider's perspective. *Technological Forecasting and Social Change*, 77(9), 1438-1447.

Masini, E.B., & Vasquez, J.M. (2000). Scenarios as seen from a human and social perspective. *Technological Forecasting and Social Change*, 65(1), 49-66.

Mazur, Z., & Mazur, H. (2009). Security of Internet Transactions – Results of a Survey. In: E. Tkacz & A. Kapczynski (Eds.), *Internet – Technical Development and Applications* (pp. 253-260). Berlin: Springer.

McWilliams, A. (2014). *IAS094A Smart machines: technologies and global markets*. BBC research market forecasting. Retrieved from: http://www.bccresearch.com/report/download/report/IAS094A

Mesman, G.R., Kuo, D.Z., Carroll, J.L., & Ward, W.L. (2013). The impact of technology dependence on children and their families. *Journal of Pediatric Health Care*, 27(6), 451-459.

Meuser, M., & Nagel, U. (1991). ExpertInneninterviews - vielfach erprobt, wenig bedacht : ein Beitrag zur qualitativen Methodendiskussion. In: G. Detlef , & K. Kraimer (Eds.), *Qualitativ-empirische Sozialforschung : Konzepte, Methoden, Analysen* (pp. 441-471). Opladen: Westdeutscher Verlag.

Michaels, E., Handfield-Jones, H., & Axelrod, B. (2001). *The war for talent*. Boston: Harvard Business Press.

Middleton, P., Kjeldsen, P., & Tully, J. (2013). *Forecast: The Internet of Things, Worldwide*. Gartner Industry Report. Retrieved from: https://www.gartner.com/doc/2625419/forecast-internet-things-worldwide-

Mietzner, D., & Reger, G. (2005). Advantages and disadvantages of scenario approaches for strategic foresight. *International Journal Technology Intelligence and Planning*, 2(1), 220-239.

Miles, I. (2010). The development of technology foresight: A review. *Technological Forecasting and Social Change*, 77(9), 1448-1456.

Miller, M.J. (2014, October 7). *Software, Robots to Replace a Third of Jobs by 2025*. Retrieved from: www.forwardthinking.pcmag.com/none/328178-software-robots-to-replace-a-third-of-jobs-by-2025

Millet, S.M. (2003). The future of scenarios: challenges and opportunities. *Strategy & Leadership*, 31(2), 16-24.

Milliken, F.J. (1987). Three types of perceived uncertainty about the environment: state, effect, and response uncertainty. *Academy of Management Review*, 12(1), 133–143.

Miorandi, D., Sicari, S., De Pellegrini, F., & Chlamtac, I. (2012). Internet of things: Vision, applications and research challenges. *Ad Hoc Networks*, 10(7), 1497-1516.

Misener, P. (2014, July 9). *Amazon Petition for Exemption*. Letter to the FAA. Retrieved from: www.amazon.com/b?node=8037720011

Moore, G. (1998). Cramming More Components onto Integrated Circuits. *Proceedings of the IEEE*, 86(1), 82-85.

Morse, A. (2014, July 15). *Novartis and Google to Work on Smart Contact Lenses.* The Wall Street Journal Online. Retrieved from: www.wsj.com/articles/novatis-google-to-work-on-smart-contact-lenses-1405417127

Mullen, P.M. (2003). Delphi: Myths and reality. *Journal of Health Organization and Management*, 17(1), 37-52.

Munier, F., & Rondé, P. (2001). The role of knowledge codification in the emergence of consensus under uncertainty: Empirical analysis and policy implications. *Research Policy*, 30(9), 1537-1551.

Murphy, M.K., Black, N., Lamping, D.L., McKee, C.M., Sanderson, C.F.B., Askham, J., & Marteau, T. (1998). Consensus development methods and their use in clinical guideline development. *Health Technology Assessment,* 2(3), 1-88.

Muskat, M., Blackman, D., & Muskat, B. (2012). Mixed Methods: Combining Expert Interviews, Cross-Impact Analysis and Scenario Development, *The Electronic Journal of Business Research* Methods, 10(1), 9-21.

Müller, A.W., & Müller-Stewens, G. (2009). *Strategic Foresight: Trend- und Zukunftsforschung in Unternehmen – Instrumente, Prozesse, Fallstudien.* Stuttgart: Schäffer-Poeschel.

Münchener Kreis (2009). *Prospects and Opportunities of Information and Communication Technologies (ICT) and Media : International Delhpi Study 2030*. Retrieved from: http://www.zukunft-ikt.de/wp-content/uploads/2_Prospects_and_Opportunities_of_ICT_and_Media.pdf

Nair, R., & Chatterjee, P. (2012, February 21). *India's e-commerce industry braces for consolidation as stronger online retailers gobble up minnows*. India Times Online. Retrieved from: http://articles.economictimes.indiatimes.com/2012-02-21/news/31083025

Ngai, E.W.T., & Gunasekaran, A. (2007). A review for mobile commerce research and applications. *Decision Support Systems*, 43(1), 3-15.

Ngai, E.W.T., & Wat, F.K.T. (2002). A literature review and classification of electronic commerce research. *Information and Management*, 39(5), 415-429.

Niemeier, S., Zocchi, A., & Catena, M. (2013). *Reshaping Retail: Why Technology is Transforming the Industry and How to Win in the New Consumer Driven World*. Chichester: Wiley.

Ninomiya, K. (2014, April 7). *A reliable ride for your deliveries*. Uber blog. Retrieved from: http://blog.uber.com/RUSH

Nowack, M., Endrikat, J., & Guenther, E. (2011). Review of Delphi-based scenario studies: Quality and design considerations. *Technological Forecasting and Social Change*, 78(9), 1603-1615.

Numberger, S., & Rennhak, C. (2005). The Future of B2C E-Commerce. *Electronic Markets*, 15(3), 269-282.

Okoli, C., & Pawlowski, S.D. (2004). The Delphi method as a research tool: An example, design considerations and applications. Information and Management, 42(1), 15-29.

Oliver, S. (1997). A model for the future of electronic commerce, *Information Management & Computer Security,* 5(5), 166-169.

O'Reilly, T. (2005, September 30). *What is Web 2.0*. Retrieved from: http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html

Öszi, A., & Kovacs, T. (2011). Theory of the biometric-based technology in the field of e-commerce. *12th IEEE symposium on computational intelligence and informatics*, 567-571.

Parenté, F.J., & Anderson-Parenté, J.K. (1987). Delphi inquiry systems. In: G. Wright & P. Ayton (Eds.), *Judgmental forecasting* (pp. 129-156). Chichester: Wiley.

Patel, N. (2003). E-Commerce technology. In: P. Jackson, L. Harris & P.M. Eckersley (Eds.), *e-Business Fundamentals* (pp. 43-64). London: Routledge.

Paul, I.C. (2014, November 12). *Wearable Devices of the Future: What to Expect by 2015*. Retrieved from: https://www.gazelle.com/thehorn/2014/11/12/wearable-devices-of-the-future-what-to-expect-by-2015/

Pavlou, P.A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, 7(3), 101-134.

Peng, G.C.A., & Nunes, M.B. (2007). Using PEST Analysis as a Tool for Refining and Focusing Contexts for Information Systems Research. In: *6th European Conference on Research Methodology for Business and Management Studies* (pp. 229-236). Lisbon.

Perry, C. (1998). A structured approach for presenting research theses. *Australasian Marketing Journal,* 6(1), 63-86.

Pillkahn, U. (2008). *Using Trends and Scenarios as Tools for Strategy Development*. Erlangen: Publicis.

Phaal, R., Farrukh, J.C.P., & Probert, D.R. (2004). Technology roadmapping - A planning framework for evolution and revolution. *Technological Forecasting and Social Change*, 71(1-2), 5-26.

Phneah, E. (2012, October 16). *Yihaodian plans 1,000 augmented reality virtual supermarkets*. Retrieved from: www.zdnet.com/article/yihaodian-plans-1000-augmented-reality-virtual-supermarkets/

Piotrowicz, W., & Cuthbertson, R. (2014). Introduction to the special issue information technology in retail: Toward omnichannel retailing. *International Journal of Electronic Commerce*, 18(4), 5-16.

Porter, M.E. (1979). How Competitive Forces Shape Strategy. *Harvard Business Review*, 57(2), 137-145.

Porter, M.E. (2008). The five competitive forces that shape strategy. *Harvard Business Review Must Reads*, 86(1), 23-41.

Porter, A.L., Ashton, W.B., Clar, G., Coates, J.F., Cuhls, K., Cunningham, S.W., & Thissen, W. (2004). Technology futures analysis: Toward integration of the field and new methods. *Technological Forecasting and Social Change*, 71(3), 287-303.

Postma, T.J.B.M., & Liebl, F. (2005). How to improve scenario analysis as a strategic management tool? *Technological Forecasting and Social Change*, 72(2), 161-173.

Postma, T.J.B.M., Alers, J.C., Terpstra, S., & Zuurbier, A. (2007). Medical technology decisions in the netherlands: How to solve the dilemma of technology foresight versus market research? *Technological Forecasting and Social Change*, 74(9), 1823-1833.

PWC (2012). *Retailing 2020: winning in a polarized world*. Retrieved from: http://www.pwc.com/en_US/us/retail-consumer/publications/assets/pwc-retailing-2020.pdf

Rao, L. (2013, September 8). *Use Google Glass And New App Glashion To Buy Fashion Items You Spot On The Go*. Techcrunch Online. Retrieved from: www.techcrunch.com/2013/09/08/use-google-glass-and-new-app-glashion-to-buy-fashion-items-you-spot-on-the-go/

Razorfish (2014). *Digital dopamine*: *2015 global digital marketing report*. Retrieved from: http://www.razorfish.com/binaries/content/assets/ideas/digitaldopaminereport2015.pdf

Rikkonen, P., & Tapio, P. (2009). Future prospects of alternative agro-based bioenergy use in Finland-constructing scenarios with quantitative and qualitative Delphi data. *Technological Forecasting and Social Change*, 76(7), 978-990.

Ringland, G. (1998). Scenario Planning: Managing for the Future. Chichester: Wiley.

Rinne, M. (2004). Technology roadmaps: Infrastructure for innovation. *Technological Forecasting and Social Change*, 71(1-2), 67-80.

Ritzer, G., & Jurgenson, N. (2010). Production, consumption, prosumption: The nature of capitalism in the age of the digital 'prosumer'. *Journal of Consumer Culture*, 10(1), 13-36.

Rockefeller (2010). *Scenario for the Future of Technology and International Development*. Retrieved from: http://www.rockefellerfoundation.org/uploads/files/bba493f7-cc97-4da3-add6-3deb007cc719.pdf

Rohrbeck, R., & Gemünden, H.G. (2011). Corporate foresight: Its three roles in enhancing the innovation capacity of a firm. *Technological Forecasting and Social Change,* 78(2), 231-243.

Rowe, G., & Wright, G. (1999). The Delphi technique as a forecasting tool: Issues and analysis. *International Journal of Forecasting*, 15(4), 353-375.

Rowe, G., & Wright, G. (2011). The Delphi technique: Past, present, and future prospects - introduction to the special issue. *Technological Forecasting and Social Change*, 78(9), 1487-1490.

Saffo, P. (2007). Six rules for effective forecasting. *Harvard Business Review*, 85(7-8), 122-131.

Salo, A.A. (2001). Incentives in technology foresight. *International Journal of Technology Management*, 21(7), 694-710.

Saunders, M., Lewis, P., & Thronhill, A. (2009). *Research methods for business students* (5th ed.). Essex: Pearson.

Schaars, S.P. (1987). How to develop and use scenario. *Long Range Planning*, 20(1), 105-114.

Schilling, M.A., & Esmundo, M. (2009). Technology S-curves in renewable energy alternatives: Analysis and implications for industry and government. *Energy Policy*, 37(5), 1767-1781.

Schneider, G. (2008). *Electronic Commerce* (8th ed.). Boston: Course Technology.

Schoemaker, P.J.H. (1995). Scenario Planning: A Tool for Strategic Thinking. *Sloan Management Review*, 36(2), 25-40.

Schwartz, P. (1991). *The Art of the Long View: Planning for the Future in an Uncertain World.* New York: Doubleday.

Shang, X., Zhang, R., & Chen, Y. (2012). Internet of things (IoT) service: Architecture and its application in e-commerce. *Journal of Electronic Commerce in Organizations*, 10(3), 44-55.

Shim J.K., Qureshi, A.A., Siegel, J.G., & Siegel, R.M. (2000). *The International Handbook of Electronic Commerce*. Chicago: Fitzroy Dearborn.

Shirazi, F. (2014). Interrogating Iran's restricted public cloud: An actor network theory perspective. *Telematics and Informatics*, 31(2), 228-236.

Smith-Dubendorfer, J. (2013, July 1). *A vision turned into reality: The future of window shopping scoops prestigious Cannes Lion Award.* Adidas Blog. Retrieved from: www.blog.adidas-group.com/2013/07/a-vision-turned-into-reality-the-future-of-window-shopping-scoops-prestigious-cannes-lion-award/

Steinert, M. (2009). A dissensus based online Delphi approach: An explorative research tool. *Technological Forecasting and Social Change*, 76(3), 291-300.

Strauss, A.L. (1987). *Qualitative Analysis for Social Scientists*. New York: Cambridge University Press.

Su, H., Lee, P., & Yuan, B.J.C. (2010). Foresight on Taiwan nanotechnology industry in 2020. *Foresight*, 12(5), 58-79.

Sundararajan, A. (2013, January 3). From Zipcar to the Sharing Economy. *Harvard Business Review*. Retrieved from: https://hbr.org/2013/01/from-zipcar-to-the-sharing-eco/

Tian, Z., Zhang, Z., & Guan, X. (2013). A new evolution mechanism model for B2B e-commerce network. *Journal of Electronic Commerce in Organizations*, 11(2), 12-22.

Toffler, A. (1980). *The Third Wave*. New York: Bantam.

Traynier, K. (2013, March 4). *5 omni-channel retail examples*. Retrieved from: http://www.smartinsights.com/online-brand-strategy/multichannel-strategies/omnichannel-examples

Turban, E., King, D., McKay, J., Marshall, P., Lee, J., & Viehland, D. (2008). *Electronic Commerce 2008: A Managerial Perspective* (5th ed.). New Jersey: Prentice Hall.

Turban, E., Lee, J., King, D., & Turban, D. (2010). *Electronic Commerce 2010: A Managerial Perspective* (6th ed.). New Jersey: Pearson.

Turoff, M. (1970). The design of a policy Delphi. *Technological Forecasting and Social Change*, 2(2), 149-171.

Unilever & Tesco (2007). *Retail futures: scenario for the future of UK retail and sustainable development*. Retrieved from: https://www.forumforthefuture.org/sites/default/files/project/downloads/retailfutures2022-report.pdf

von der Gracht, H.A., & Darkow, I. (2010). Scenarios for the logistics services industry: A Delphi-based analysis for 2025. *International Journal of Production Economics*, 127(1), 46-59.

van Der Meulen, B., De Wilt, J., & Rutten, H. (2003). Developing futures for agriculture in the netherlands: A systematic exploration of the strategic value of foresight. *Journal of Forecasting*, 22(2), 219-233.

van Notten, P.W.F., Rotmans, J., van Asselt, M.B.A., & Rothman, D.S. (2003). An updated scenario typology. *Futures*, 35(5), 423-443.

Vecchiato, R., & Roveda, C. (2010). Strategic foresight in corporate organizations: Handling the effect and response uncertainty of technology and social drivers of change. *Technological Forecasting and Social Change*, 77(9), 1527-1539.

Villacorta, P.J., Masegosa, A.D., Castellanos, D., Novoa, P., & Pelta, D.A. (2011). Sensitivity analysis in the scenario method: A multi-objective approach. *International Conference on Intelligent Systems Design and Applications*, 867-872.

Volman, M. (2005). A variety of roles for a new type of teacher. educational technology and the teaching profession. *Teaching and Teacher Education*, 21(1), 15-31.

von Hippel, E., Franke, N., & Prügl, R. (2006). Efficient identification of leading-edge expertise: Screening vs. pyramiding. *Portland International Conference on Management of Engineering and Technology*, 884-897.

von Reibnitz, U.H. (1988). *Scenario Techniques.* Hamburg: McGraw-Hill.

Walker, A.M., & Selfe, J. (1996). The Delphi method: a useful tool for the allied health researcher. *British Journal of Therapy and Rehabilitation*, 3(12), 677-680.

Walsh, P.R. (2005). Dealing with the uncertainties of environmental change by adding scenario planning to the strategy reformulation equation. *Management Decision*, 43(1), 113-122.

Wang, M., & Lan, W. (2007). Combined forecast process: Combining scenario analysis with the technological substitution model. *Technological Forecasting and Social Change*, 74(3), 357-378.

Wang, C., & Zhang, P. (2012). The evolution of social commerce: The people, management, technology, and information dimensions. *Communications of the Association for Information Systems*, 31(1), 105-127.

Wasserman, T. (2014, March 21). *Let Oculus Rift Take You to the Supermarket*. Mashable Online. Retrieved from: www.mashable.com/2014/03/21/oculus-tesco/

Whiting, L.S. (2008). Semi-structured interviews – Guidance for novice researchers. *Nursing Standard*, 22(1), 35-40.

Wigand, R.T. (1997). Electronic Commerce: Definition, Theory, and Context. *Information Society*, 13(1), 1-16.

Wills, G. (1972). *Technological Forecasting*, Harmondsworth: Penguin.

Wilson, I. (1998). Mental maps of the future: An intuitive logics approach to scenarios. In: L. Fahey & R.M. Randall, *Learning from the future* (pp. 81-108). New York: Wiley.

Wolfers, J., & Zitzewitz, E. (2004). Prediction markets. *Journal of Economic Perspectives*, 18(2), 107-126.

Wong, P. (2003). Global and national factors affecting e-commerce diffusion in Singapore. *Information Society*, 19(1), 19-32.

Wood, Z. (2012, September 2). *Marks and Spencer gambles on bringing internet age to the shop floor.* The Guardian Online. Retrieved from: www.theguardian.com/business/2012/sep/02/marks-and-spencer-multichannel-shopping

Zentes, J., & Rittinger, S. (2009). Retailing in Germany: Current landscape and future trends. *European Retail Research*, 23(1), 153-182.

Zillien, N., & Marr, M. (2013). The digital divide in Europe. In: W. Ragnedda & G.M. Muschert: *The digital divide – The Internet and social inequality in international perspective* (pp. 55-66). New York: Routledge.

Ziobro, P. (2014, December 4). *Amazon Tries on the Diaper Business*. The Wall Street Journal Online. Retrieved from: http://online.wsj.com/articles/amazon-tries-on-the-diaper-business-1417732223

APPENDIX

Appendix 1: DELPHI SURVEY STATEMENTS

E-commerce industry in 2025

1. In 2025, there will not be a monopolistic or oligopolistic online retail industry structure but multiple online retail players.
2. Despite low entry barriers, in 10 years, new e-commerce players will only be successful in niches.
3. In 2025, the biggest competitive advantage will be the ability to analyze and utilize all available data of consumers. *[1st and 2nd round]*
4. Retailers and pure players that still will not leverage the potential of big data analytics across all channels will not exist in 10 years. *[1st and 2nd round]*
5. In 2025, producers and manufacturers delivering directly to the final consumer will be the biggest competitor for online retailers. *[1st and 2nd round]*
6. In 2025, more than one third of all B2C transactions are carried out online.
7. In ten years, more than 75% of retailers and e-commerce players manage all online and offline channels in a fully integrated way to provide a seamless shopping experience. *[1st and 2nd round]*
8. In 2025, more than 75% of all B2C orders (incl. FMCG) are placed on mobile devices. *[1st and 2nd round]*

E-Commerce Technologies in 2025

9. In 2025, digital personal shopping assistants will have the authority to autonomously purchase preferred standard consumer goods (e.g. milk, toilet paper).
10. In 2025, digital personal assistants will proactively recommend highly relevant products based on the user's context and location.
11. In ten years, the majority of the working population will shop at virtual billboard stores in public places such as subway or bus stations).
12. By 2025, every tenth privately purchased product is a file for 3D printers.
13. In 10 years, more than 50% of consumers will use augmented reality technologies to shop everywhere using the real world as a showroom.
14. In 2025, biometric technologies (e.g. fingerprints, eye scan, heartbeat) will have completely replaced traditional identification means for checkout processes – both online and offline.
15. In ten years, all prices will be customized in real-time and individually for each customer. *[1st and 2nd round]*
16. In 2025, more than 75% of all sold food products and apparel will contain tiny sensors (Internet of Things). *[1st and 2nd round]*

17. In 2025, digital customer service assistants and new interfaces have replaced human assistants in physical stores (except luxury stores).
18. In 2025, cash and credit cards as means of payment in retail stores will disappear completely due to crypto-currencies and virtual wallets (e.g. Bitcoins or Apple Pay).
19. In ten years, virtual 3D-worlds will have almost completely replaced present online shops.
20. Parcel delivery by drones will be standard by 2025 for the last mile of the supply chain.
21. In ten years, cross-domain analytics enable personalization for every user of online shops – regardless of whether the user is logged in. *[1st and 2nd round]*

Socio-cultural Development in 2025

22. In 2025, the majority of the population will no longer shop at supermarkets due to de-structured daily routines, constant time pressure, and the convenience of online shopping. *[1st and 2nd round]*
23. An increased environmental awareness and a culture of sharing (Sharing Economy) cause a significant decrease of purchasing volume ten years from now.
24. By 2025, new scandals related to data abuse and surveillance lead to a 50/50 split of the society in users and deniers of digital technologies.

Economic Development in 2025

25. In 2025, Asia will be the most important market for European and American retailers.
26. Mobile networks and broadband Internet connections in Europe will be on par with the fastest high-speed connections in Asia in 2025.
27. In 10 years, the labor market will meet the demand for digital commerce professionals and Big Data specialists through new training programs completely.

Political Development in 2025

28. In 2025, globally valid rules apply to all consumers and traders, so that there will be no regulatory differences between national and international transactions.
29. In ten years, data protection laws will be very weakened and thus enable a more intelligent and extensive data analysis.
30. In 2025, political initiatives and a high level of financing have shaped Europe into the global breeding ground for digital innovation triggering a technology-friendly climate.

Are you missing key trends in the 30 statements? Please tell us your personal forecast for digital commerce in 2025 *(optional)*.

Appendix 2: INTERVIEW GUIDE FOR EXPERT INTERVIEWS

Warm-up

1. What is your personal **definition** of e-commerce?

Part 1: Current trends and drivers

2. What are the current **political and regulatory** trends affecting the development of e-commerce?
3. Which current **economic** factors affect the development of e-commerce?
4. What today's **socio-cultural/societal** trends have an impact on the development of e-commerce?
5. What major **technological** developments do you currently see on the e-commerce market?
6. What are the drivers for the **high rivalry among competitors** in the e-commerce industry?

Part 2: Disruptive technologies in the future

7. How could the expansion of mobile Internet with so-called **wearable technologies** (bracelets, data glasses) and the **Internet of Things** (sensors in objects) have changed shopping in 2025?
8. How could **Big Data** (analysis of large amounts of data) have influenced e-commerce in 2025?
9. What influence could **3D printing** take on e-commerce in 2025?
10. Finally, what is **your vision** for shopping in 2025? Please feel free to be creative and you do not have to be bound by current obstacles.

Appendix 3: DELPHI PANEL

Name	Institution	Position
Achim Himmelreich	Mücke, Sturm & Company	Partner
Aleš Drábek	Metro AG	Director Global E-Marketing & E-Commerce
Andreas Haderlein	Sales Design	Consultant
Andy Altmeyer	A Eins	CEO
Bastian Siebers	plus.de	CEO
Benedikt Berlemann	McKinsey	Consultant
Bertold Raschkowski	future-commerce.de	Consultant
Boris Achterberg	IFH Institute for Retail Research	Director ECC
Carsten Schmitz	Lidl Schwarz	CEO
Dr. Carsten Föhlisch	Trusted Shops	Director Law
Dr. Daniel Schneider	Zalando	Head of Onsite Customer Journey
Dr. Julia Heigl	Conrad Electronic	Head of Multichannel Marketing
Dr. Kai Hudetz	IFH Institute for Retail Research	CEO
Dr. Lars Finger	Otto Group	Director E-Commerce
Dr. Remigiusz Smolinski	Otto Group	Head of Innovation Management
Dr. Ronald Wiltscheck	channelpartner.de	Journalist
Gabriele Riedmann de Trinidad	Metro AG	Group Director Business Innovation
Henning Mielkau	Otto Group	Project Manager E-Commerce Innovation Management
Henryk Lippert	Solution 360	CEO
Ingmar Böckmann	bevh E-Commerce Association	Referent for E-Commerce, IT security, & logistics
Ingo Janssen	netz98 new media	CEO
Jan Kristof Arndt	trendInnovation	CEO
Jens H. Plath	eBay Inc.	Head of Partner Business Development
Joachim Graf	iBusiness	Publisher, Foresight Researcher
Jörg Glinka	etailer Solutions	CEO
Jörg Schille	eBay Inc.	Director PayPal
Joubin Rahimi	Bluetrade	CEO
Jürgen Petersen	hmmh	Head of Branch Hamburg
Kai-Thomas Krause	CouchCommerce	COO
Kathrin Haug	dgroup	CEO
Katja Felke	The Kase	Head of E-Commerce
Lars Schickner	intershop	Director Innovation Lab

Name	Institution	Position
Manuel Jahn	GfK	Head of Consulting
Marcus Anton	Contrinet	CEO
Martin Barthel	eBay Inc.	Senior Director Verticals & eBay Kleinanzeigen
Martin Groß-Albenhausen	BVH Services	CEO
Max Celko	maxcelko.com	Trend Researcher
Nicolas Speeck	CBR	CEO
Olaf Kolbrück	etailment.de	Journalist
Patric Hoffmann	Bertelsmann - arvato	Vice President Sales & Operations
Prof. Dr. Axel Küpper	Technical University Berlin	Chair for Service-centric Networking (Telekom Innovation Labs)
Prof. Dr. Dirk Morschett	University of Fribourg	Chair for International Management
Prof. Dr. Dominik Große Holtforth	Fresenius University	Chair for Online Marketing & E-Commerce
Prof. Dr. Georg Rainer Hofmann	University of Applied Sciences Aschaffenburg	Chair for Data Processing & Management
Prof. Dr. Gerrit Heinemann	University of Applied Sciences Niederrhein	Chair for Management & Retail
Prof. Dr. Holger Schneider	University of Applied Sciences Wedel	Chair for E-Commerce
Prof. Dr. Joachim Zentes	University of Saarland	Chair for Retail & International Marketing
Prof. Dr. Jochen Strähle	Reutlingen University	Chair for International Fashion Management
Prof. Dr. Nikolaus Mohr	Mücke, Sturm & Company	Managing Partner
Quynh Christian Ha-Ngoc	Otto Group - Baur Versand	Head of E-Commerce
Ronny Höhn	Bergfreunde	CEO
Sandro Megerle	TrendONE	Trend Analyst
Sascha Berens	EHI Retail Institute	Project Leader Research IT & E-Commerce
Sebastian Wohlrapp	dmc commerce consultants	Managing Partner
Simone Henneberger	Henneberger-Consulting	Consultant
Stephan Meixner	neuhandeln.de	Journalist
Stephan Seils	Otto Group	Team Leader E-Commerce, Business Development, & Innovation
Thierry Knecht	Bechtle E-Commerce Holding	Vice President International Business Development
Ulrich Eggert	Eggert Consulting	Consultant
Wolfgang Lux	Lux Unternehmensberatung	Consultant

Appendix 4: RESULTS OF CODING OF QUALITATIVE EXPERT INTERVIEWS

	Dr. Kai Hudetz	Prof. Dr. Nikolaus Mohr	Prof. Dr. Dominik Große Holtforth
Political	• regulated shop opening times • strict data privacy regulations	• regulated shop opening times • strict data privacy regulations	• restrained e-commerce by policy • rights of labor unions
Economic	• saturated European retail market • trade unions fight against low wages in logistics	• pure players are valued higher compared to traditional retailers	• exploitation of employees • globalization of economy • returns are waste of resources
Social	• high relation of young population in emerging countries • shifting consumer demands (convenience, time-efficiency, CSR, transparency)	• digital communication • shifting consumer demands (transparency) • social shopping	• always on • changes in mobility • urbanization
Technological	• augmented reality technologies (e.g. Google Glass) • mobile commerce • mobile technologies • multichannel retailing • wearables	• big data • interactive price labels • location-based services (e.g. Beacon) • mobile technologies merge online and offline • social media • web shop systems	• development of software industry • web shop systems
New Entrants	• difficult to differentiate • low entry barriers • multi- and omnichannel retailing of previously offline players • not many niches left for new entrants		• global dimension of competition • low entry barriers • utilization of differentiation strategy
Buyer Power	• price transparency	• price transparency	
Supplier Power			• trustworthiness of suppliers is crucial for consumers
Substitutes	• consolidation of players		• biggest retailers are also logistic companies
Industry Rivalry	• brick-and-mortars with more means to differentiate than e-commerce players • different profitability objectives among competitors due to investors • efficiency matters • high level of professionalism • huge amount of players • low margins • only a few players can be successful in each segment	• economies of scale • huge amount of players • low margins • share of e-commerce of total retail is growing	• dynamic environment • economies of scale • extension of market share by big players • predatory competition • price not longer the best attribute to differentiate • products are very homogeneous
Political 2025	• new data privacy standards • regulations against monopolies • regulators may hinder innovation	• new data privacy standards • regulators may hinder innovation	• data privacy issues with smart glasses
Economic 2025	• investors will not invest in e-commerce start-ups because niches are filled		• economies of scale will not work for individualization
Social 2025	• demand for offline zones • empowered consumers • lower barriers for technological acceptance • persistent need for data security	• empowered consumers • shifting consumer demands • trust as enabler for future technologies	• diminishing role of social relationships • lower barriers for technological acceptance • shifting consumer demands
Technological 2025	• advanced last mile delivery • augmented reality technologies • diversity of user interfaces • increased connectivity of devices • smart wallets • value-adding features for existing technologies	• augmented reality technologies • delivery with drones • diversity of user interfaces • increased connectivity of devices • prescriptive analytics (big data) • recommendations based on habits • smart home • smart wallet	• 3D printing • hologram technologies • individualized touch points • mobile commerce • smart apparel • virtual fitting technologies
General Outlook for 2025	• Amazon will be dominating player • increased convenience through better logistics • omnichannel retailing • personalization • self-checkout • transparency	• 3D printing stores • big data is next big thing • context- and user-sensitive shopping • inflation of user interfaces • personalization • same day delivery • shopping possible at any places and at all times • transformation of stationary retailers	• changing value chains • consolidation of players • monopoly in retailing will not exist • omnichannel retailing • retailers with specialization will have advantage at individualizing services • service-oriented retailing • technologies recede into background

Appendix 4 (cont.): *Results of coding of qualitative expert interviews*

	Prof. Dr. Holger Schneider	Gabriele Riedmann de Trinidad	Dr. Remigiusz Smolinksi
Political	• harmonization of European cross-border trading • new payment process (SEPA) • remote purchase law • strict data privacy regulations	• hindering regulatory environment for e-commerce innovations • strict data privacy regulations	• consumer protection laws • harmonization of European cross-border trading
Economic	• different markets have different prices (arbitrage) • new currencies (Bitcoins)	• gap in purchasing power of consumers	• decreasing interest rates • globalization of economy • rising purchasing power of consumers
Social	• demand for privacy protection • digital natives, silver surfers & golden agers • social shopping • trust as lever to success • willingness to provide personal data for cash benefit	• deceleration • sharing economy • shifting consumer demands (convenience, time-efficiency)	• awareness for price-performance • cross-border purchasing • demographic change • fear of data misuse • globalization of tastes
Technological	• biometrics • disappearing boundaries between stationary and mobile devices • Internet of things & smart home • location- and context-aware technologies • outdated IT systems of traditional retailers • smart wallet (e.g. Apple Pay) • wearables	• location-based services (e.g. Beacon) • new interfaces and checkout processes for mobile commerce • smartphone apps	• big data • increased connectivity of devices • predictive analytics online and in stores • reactive digital assistants (e.g. Siri)
New Entrants	• market share more important than ROI for some pure players • most markets are already covered • multi- and omnichannel retailing of previously offline players		• access to capital is available • innovations in e-business easy to copy • low entry barriers
Buyer Power		• price transparency	• customer protection laws • low switching costs • price transparency
Supplier Power			• suppliers can be technological gatekeepers and limit access to customers
Substitutes	• new revenue streams needed for owners of rights of digital/intangible goods	• services sold by retailers	
Industry Rivalry	• economies of scale • low margins • methods applied to gain market share that are neither sustainable nor profitable • players with much investor capital can lower the overall price level • share of e-commerce of total retail is growing	• price not longer the best attribute to differentiate	• commoditization of retail industry by Internet • comparability leads to zero profits • differentiation through brand equity, additional services, or operational excellence • economies of scale & efficiency • risk of a price spiral and perfect competition
Political 2025	• new data privacy standards • new laws for digital currencies • regulations for global trading		
Economic 2025	• changes in purchasing power • different markets need different prices (arbitrage)	• pure players will cooperate with brick-and-mortar retailers to get physical real estate	• changing cityscapes • data are used as barrier for imitation
Social 2025	• acceptance of data collection	• sharing economy	• desire for individualization • shifting consumer demands
Technological 2025	• 3D printing • big data • digital personal shopping assistants • increased connectivity of devices • offline analytics • recommendations based on habits • smart wallet • smart walls in stores	• 3D printing • digital personal shopping assistants • increased connectivity of devices • recommendations based on habits	• big data • digital personal shopping assistants • in-session predictive analytics • location-based technologies
General Outlook for 2025	• automated purchasing of daily consumer goods • cross-channel product recommendations • logistic companies use 3D printers • omnichannel retailing • personalization	• automatically generated shopping lists • brick-and-mortar personnel will use tablets • more services offered by stationary retailers • omnichannel retailing • re-commerce • self-checkout	• channels shift in favor of online channels • increasing share of electronic and m-commerce relative to retail volume • personalization

Appendix 4 (cont.): *Results of coding of qualitative expert interviews*

	Martin Barthel	Frank Logen	Sandro Megerle
Political	• development of high-speed Internet • harmonization of European cross-border trading	• harmonization of European cross-border trading • political instability outside of Europe • strict data privacy regulations	• consumer protection laws • harmonization of European cross-border trading • politics lagging behind • strict data privacy regulations
Economic	• globalization of economy • rising incomes in emerging countries	• lack of skilled workers • logistic centers in low wage countries • political crises affect trading volume	• consolidation of players
Social	• digital communication • parallelism between global and local commerce • rising expectations on e-commerce • shifting consumer demands (trust, CSR) • social shopping	• digital communication • digital natives • fear of data misuse among elder generation • shifting consumer demands (transparency, time-efficiency, quality)	• demand for individualization • demographic change • fear of data misuse • silver surfers • visual-oriented culture (e.g. Instagram)
Technological	• big data • Internet of things • mobile technologies merge online and offline • technology-driven improvement of logistics	• big data • biometrics • diversity of user interfaces • Internet of things • wearables	• big data • mobile commerce
New Entrants	• access to capital is available	• global dimension of competition • multi- and omnichannel retailing of previously offline players	• global dimension of competition • market share more important than ROI for some pure players
Buyer Power		• consumers want to shop outside business hours of physical stores • low switching costs • price transparency	• low switching costs • price transparency
Supplier Power			
Substitutes			• virtual worlds can substitute physical stores
Industry Rivalry	• rapid pace of technological innovations • lack of skilled workers	• existence of dominating players • high level of professionalism • lack of skilled workers • shrinking growth rates	• predatory competition
Political 2025			• growing intellectual property claims • political will to support digital innovation
Economic 2025	• monopoly in retailing will not exist	• data are important resource	• data are important resource
Social 2025	• low acceptance of wearable devices	• acceptance of data collection • changed lifestyles • digital divide • empowered consumers • initiatives like Greenpeace against big data analytics • new service-oriented jobs	• acceptance of data collection • always on • demand for offline zones • empowered consumers • persistent need for data security • shifting consumer demands
Technological 2025	• 3D printing • digital assistants in physical stores • diversity of user interfaces • human shop assistants replaced by technologies • Internet of things • neuro technologies • smart wallet	• diversity of user interfaces • increased connectivity of devices • pervasiveness of technologies • recommendations based on habits • smart apparel • smart homes • smart wallet	• 3D printing • augmented reality technologies • biometrics • increased connectivity of devices • increased network coverage • individualized pricing • location-based technologies • smart wallet • virtual realities
General Outlook for 2025	• biggest changes will be in offline world • cash will be replaced by mobile payment technologies • just-in-time production • omnichannel retailing • personalization • physical stores as flagship stores with very limited amount of products on stock • shopping in metro stations • shopping possible at any places and at all times	• big data management as decisive factor • brands will be less important • omnichannel retailing • personalization • self-checkout • shopping possible at any places and at all times	• algorithm-based shopping • flagship stores in virtual worlds • mobile devices as remote control for physical stores • omnichannel retailing • personalization • predictive intelligence • products connect with customers, not vice versa • real world as shopping window • snapshot commerce

Appendix 5: DRIVING FORCES IN MACRO AND MESO ENVIRONMENT

	Political	Economic	Social	Technological	Retail Industry
First round of abstraction of driving forces	1. Development of global trade regulations 2. Development of customer protection laws 3. Data protection 4. Political will for investments in technologies and innovation 5. Growth of state unions	6. Development of global economy 7. Dynamics of world trade 8. Level of productivity 9. Amount of R&D investments 10. Availability of physical resources 11. Existence of skilled workers	12. Readiness of customers for digital technologies 13. Dimension of changes in lifestyles 14. Shifts in customer needs and requirements 15. Dynamics of consumer habits 16. Problems resulting from digitization and demographic change	17. Development of new technologies and value-adding features for existing technologies 18. Presence of ubiquitous computing and level of connectivity 19. Diversity of user interfaces 20. Pervasiveness of technology 21. Merging of online and offline worlds through technologies 22. Degree of automation and artificial intelligence 23. Scope of Big Data analytics	24. Level of forward and backward integration 25. New attributes for competitive advantage 26. Innovativeness of new business models 27. Level of buyer empowerment
Second round of abstraction	1. Development of global trade regulations 2. Evolution of customer and data protection 3. Political will for investments in technologies and innovation	4. Development of global economy and trade 5. Amount of R&D investments 6. Availability of resources	7. Readiness for digital technologies 8. Dimension of changes in lifestyles 9. Shifts in customer needs and habits	10. Development of new technologies 11. Ubiquitous computing and diversity of user interfaces 12. Pervasiveness of technology and merging of online and offline 13. Degree of automation and artificial intelligence	14. Level of change in structure of online retail industry

APPENDIX 6: CALCULATION OF INDEX VALUE

Statement	σ Prob. of Occ. (A)	$\bar{x}$ Import. (B)	Normalized σ Prob. of Occ. (A')	Normalized $\bar{x}$ Import. (B')	Index Value (A' x B')
22	1.126	3.164	.808	1	.808
7	1.139	2.934	.833	.774	.645
5	1.107	2.918	.769	.758	.583
16	1.134	2.820	.822	.661	.544
4	1.022	3.016	.599	.855	.512
21	1.017	2.984	.591	.823	.486
3	1.037	2.918	.630	.758	.478
12	.971	3.066	.499	.903	.451
13	1.002	2.918	.560	.758	.425
6	1.078	2.721	.712	.565	.402
1	1.170	2.590	.893	.435	.389
8	.944	3.000	.446	.839	.374
19	.963	2.836	.483	.677	.327
9	.971	2.787	.499	.629	.314
15	.887	2.967	.332	.806	.268
25	.973	2.672	.502	.516	.259
23	.977	2.590	.512	.435	.223
17	1.027	2.508	.610	.355	.216
11	.975	2.557	.508	.403	.205
24	.991	2.459	.539	.306	.165
28	0.873	2.639	.305	.484	.147
29	0.826	2.787	.211	.629	.133
14	1.156	2.279	.867	.129	.112
20	.934	2.377	.426	.226	.096
2	1.223	2.213	1	.065	.065
10	.764	2.869	.088	.710	.062
27	1.015	2.197	.586	.048	.028
18	1.149	2.148	.853	0	0
26	1.127	2.148	.810	0	0
30	.720	2.426	0	.274	0