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Novel AR solutions in media

Customer perception of augmented reality in media applications – possibilities for new service innovations

Aino Mensonen | Christian Persson | Terje Stafseng | Ravi Vatrapu | Örn Kaldalons

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Uusia AR-ratkaisuja media-alalle. Käyttäjien suhtautuminen lisätyn todellisuuden palveluihin – uusien palveluinnovaatioiden mahdollisuudet. **Aino Mensonen, Christian Persson, Terje Stafseng, Ravi Vatrapu & Örn Kaldalons.** Espoo 2013. VTT Technology 126. 62 p. + app. 10 p.

Abstract

A project titled 'Customer Perception of Augmented Reality (AR) in Media Applications – Possibilities for New Service Innovations' was carried out, with participants from all of the Nordic countries. The project addressed the fact that the magazine and newspaper business is set to change dramatically as printed products encounter two specific challenges: a) increasing competition from other media and b) changes in media-consumption habits caused by growth in the use of smartphones and tablets, such as instant access and digital delivery. The changing market environment for print-media products also opens new opportunities for using technologies such as AR to create innovative applications and hence add business value. To investigate the opportunities for service development within this area, we conducted a study of the state of the art to review the theoretical concepts relevant for better understanding of the macro-level societal trends and business potential of augmented reality for print products. Selected cases of augmented reality for print products were then presented.

The next phase of the project consisted of a Nordic empirical study of user perceptions of AR applications. Focus-group interviews were used to collect participants' statements about the use of AR technology. These statements were then ranked by means of the Q-sort method. Factor-analysis methods were applied with the objective of understanding the similarities among participants' answers. The results indicated that AR was seen as useful, beneficial, attractive, interesting, and fascinating and as possessing the 'wow' factor. Some considered AR's usage time-consuming, while others deemed it time-saving. Another finding is that standards seem to be lacking both for the user interface and on the business-handling side. Participants saw AR as offering great possibility for innovation. People would like to try the applications, and they would indeed find time for using them. Expectations set for AR applications are high.

Stemming from the interview and Q-sort, an innovation workshop was organized for the 19 industrial and academic partners of the project. The brain storming session aimed at producing new innovative service concept ideas of AR in printed media. Thirty four different ideas were generated in the workshop. The industrial partners were encouraged to select one idea for further development and produce a pilot. The pilots as well as the development process and experiences where presented as a part of the end seminar.

Keywords augmented reality, users, new services, media

Uusia AR-ratkaisuja media-alalle
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Aino Mensonen, Christian Persson, Terje Stafseng, Ravi Vatrapu & Örn Kaldalons.
Espoo 2013. VTT Technology 126 . 62 s. + liitt. 10 s.

Tiivistelmä

Projekti “Customer Perception of Augmented Reality (AR) in Media Applications – Possibilities for New Service Innovations” tehtiin pohjoismaisessa yhteistyössä. Aikakaus- ja sanomalehtibisnes on murroksessa. Painetun median haasteina ovat a) koveneva kilpailu muiden medioiden kanssa ja b) kuluttajien muuttuvat tavat kuluttaa mediaa. Muuttuva markkinaympäristö mahdollistaa teknologian, kuten AR:n, hyödyntämisen, kun luodaan uudenlaisia tuotteita ja palveluita, jotka lisäävät tuotteen arvoa niin käyttäjän kuin liiketoiminnan näkökulmasta. Selvittääksemme palvelukehityksen mahdollisuudet teimme SoA-katsauksen, johon keräsimme painetun median AR-sovellusalueet.

Seuraavassa vaiheessa teimme kaikki Pohjoismaat kattavan kuluttajatutkimuksen, jossa kartoitimme kuluttajien suhtautumista lisätyn todellisuuden palveluihin. Kuluttajatutkimuksessa kerättiin focus-ryhmähaastatteluin väittämiä, joita testattiin q-sort-menetelmällä. Tuloksista kävi ilmi, että AR nähdään hyödyllisenä, kiehtovana, kiinnostavana ja se saa aikaan WOW-efektin käyttäjässä. Jotkut näkivät AR:n säästävän aikaa, toiset vievän sitä. Standardien puute nousi esiin keskusteluissa. AR:llä on kuluttajien mielestä paljon mahdollisuuksia innovaation saralla. Kuluttajat haluavat kokeilla AR-sovelluksia, ja he olisivat valmiita käyttämään siihen aikaa. Odotukset kuluttajien suunnalta ovat korkealla.

Kuluttajatutkimuksen tuloksiin pohjautuen järjestimme työpajan, johon osallistui 19 yritys- ja tutkimusedustajaa. Työpajassa ideoitiin palvelukonsepteja. Yhteensä 34 ideaa kirjattiin ja näistä yrityksiä kannustettiin viemään omaa yritystä kiinnostavaa ideaa eteenpäin pilotointivaiheessa. Pilotoinnin tulokset ja siitä kertyneet kokemukset esiteltiin osana projektin loppuseminaaria.

Avainsanat augmented reality, users, new services, media

Preface

The research project “Customer Perception of Augmented Reality (AR) in Media Applications – Possibilities for New Service Innovations” has been carried out by VTT Technical Research Centre of Finland, Stockholm University, Denmark’s Copenhagen Business School, Norway’s Høgskolen i Gjøvik, and ICEPRO (Iceland Trade Procedures and e-Commerce). The project is funded by Nordic Innovation.

The following companies and other organisations participated in the project and funded their part of the work effort: Aller Media (Finland), Grafiska Företagens Förbund (Sweden), Hvíta Húsið (Iceland), *Jyllands-posten* (Denmark), Nordic eMarketing (Iceland), *Reader’s Digest* (Finland), and *Sunnmørsposten* (Norway). The project has been governed by a steering committee, with the following members: Gisli Bryjólfsson (Hvíta Húsið), Steffen Damborg (*Jyllands-posten*), Martin Elofsson (Grafiska Företagens Förbund), Kristján Már Hauksson (Nordic eMarketing), Kristina Hännikäinen (Aller Media), Jan Ove Steffensen (*Sunnmørsposten*), and Ilkka Virtanen (*Reader’s Digest*), The researchers are indebted to the participating companies and organisations and to the members of the steering committee for their contribution and support.

Thanks are extended also to Pär Dahsltedt (Ineko), for his comments and participation in the project, especially in the carrying out and presentation of the AR pilot work.

Contents

1. Introduction

Augmented reality (AR) is a digital extension of our real world. Whereas virtual reality replaces the real world with a simulated one, augmentation conventionally takes place in real time and in semantic context with environmental elements. With the aid of advanced AR technology (e.g., adding of computer vision and object recognition), the information about the real world surrounding the user becomes interactive and digitally manipulable.

The usefulness of AR in the media is largely uncharted – there is great potential for innovation. Users' media habits are rapidly changing on account of increased Internet usage, ready access to Web services, and extensive use of tablet computers and smartphones.

Users have up-to-date information at their fingertips via AR or search engines, and user data can be stored in a cloud database without the need for worries about such mundane things as backups. Both user data and externally produced services can be accessed 24/7 from a wireless device.

New technology such as AR is starting to affect consumers' purchasing habits. The services available are offered via smartphones, which are easily carried wherever one goes. Nonetheless, very little is known about people's perceptions of AR and how widely the new technology is accepted.

Augmented reality is integrated into the application programs, or 'apps', on the smart device – i.e., a tablet computer or smartphone. There are many designs of smart devices, with various operating systems and programming environments. Each AR function of a smart device is provided as its own app, created either by the manufacturer of the goods offered or by the presenter of the environment being depicted by the smart device.

To capitalise on the potential for future innovations in the AR field, one must study how users perceive AR, in order to determine the direction future development should take. By giving users a quick introduction or a demonstration of AR and presenting them with a questionnaire in which they choose the degree of importance of various statements, the researcher can collect their preferences and basic views on the possibilities of AR.

2. Augmented reality for print products: A study of the state of the art

2.1 Definition, scope, and sources

Augmented reality is a 'live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data', according to Wikipedia[1].

Augmented-reality technologies typically superimpose virtual objects on real-world displays. Those who develop AR applications seek to 'create the sensation that virtual objects are present in the real world' by combining 'virtual reality (VR) elements with the real world' (Cawood et al., 2008, p. 12).

The scope of this part of the report is provision of a brief survey of the state of the art of application of AR to print magazines. Accordingly, this report includes neither a survey of the basic research into AR technologies nor one of non-print-related applications of AR.

This report was compiled from information contained in sources such as academic publications, including books, journals, and conference papers; technical reports such as prior reviews of the state of the art of AR and print media; and resources on the Web, such as Wikipedia, 'blogs', and discussion fora.

2.2 Augmented reality and print products: A theoretical review

Augmented reality offers new possibilities for the design of interactive print products, as the technology allows for creative linkages between the physical and digital worlds. The business potential of AR applications for print products is found at the juncture of two transformational developments in technology, business, and society. Widespread adoption of Internet use resulted in vertical integration of organisational channel capacities such as production, distribution, transaction, and com-

[1] http://en.wikipedia.org/wiki/index.html?curid=85631

munication and in a simultaneous horizontal integration of organisational communications such as advertising, public relations, and promotion work (Li & Leckenby, 2007). Social-media channels that emerged from the recent participatory trend in Internet use, facilitated by developments in social computing, created new opportunities for interaction and innovation within and across the various stakeholder groups in both the public and the private sector. This had led to what Vatrapu (forthcoming) terms a concomitant convergence of technologies, terminals, touchpoints, and services.

With AR applications, print products become able to explore and exploit the business opportunities resulting from the above-mentioned concomitant convergence. As an e-media report (Lindqvist et al., 2008) points out, technological convergence and terminal convergence together lead to service convergence. The evolution of touchscreen smartphones with high-speed mobile broadband, wireless Internet access, and mobile apps is a good example showcasing the concomitant convergence of technologies, terminals, and services. This is further evidenced by the slogan 'There's an app for that' with regard to erstwhile standalone services often offered on unique and distinct terminals. Four concomitant convergences in particular are relevant for the purposes of this paper:

- Design: Local, social, and mobile elements
- Media: Owned, paid, and earned
- Interactions: 'My place', 'your place', and 'our place'
- Scorecards: People, planet, and profit.

2.2.1 Design: Local, social, and mobile elements

The coming together of social navigation and recommendation, local business discovery, and mobile applications and services has been hailed under the term 'SoLoMo'[2], a portmanteau of 'social', 'local', and 'mobile'. This concomitant convergence refers to the deployment of mobile applications for purposes of intertwining the users' online social world with the local physical contexts and services of organisations. Augmented-reality applications for print products operating in this design space can offer value-added services that are personalised and hyper-local.

2.2.2 Media: Owned, paid, and earned

With respect to the marketing communications from the organisation and the customer conversations about the organisation, one can now distinguish three parts of the media world: owned media, paid media, and earned media. Owned media are those media properties owned and controlled by the organisation itself (e.g., its Web site), while 'paid media' refers to the purchasing of advertisements and

[2] http://mashable.com/2011/06/23/paid-earned-owned-media/

promotional materials for media channels (e.g., television commercials, search-engine marketing in the form of Google AdWords, and Facebook advertisements). Earned media coverage in traditional and new media channels that is not directly paid for. AR applications for print products have the potential to bridge these disparate media worlds.

2.2.3 Interactions: My Place, your place, and our place

Just as with media, a tripartite distinction can be made with respect to the Customer-Organization interactions. From an organizational point of view, My Place refers to the customer interactions located on discussion forums owned and controlled by the organization (e.g. customer support forums). Your Place refers to the customers' interactions with the organizations' goods and services at their own personal interactional sites (e.g. Facebook wall of a customer). Our Place refers to interactional spaces that engender a sense of community and co-ownership between the organizations and its consumers (e.g. a Facebook page of a brand community). AR applications for print products can facilitate novel types of online communities that include not only social engagement but also playful experiences.

2.2.4 Scorecards: People, Planet, and Profit

With the emergence of Balanced Scorecards (Kaplan & Norton, 1992) as strategic management systems, the debate on Corporate Social Responsibility (Friedman, 2007; Harrison & Freeman, 1999), and the current social media revolution, social responsibility, environmental sustainability, and economic profitability become critical dimensions of measurement and evaluation for both organizations and its stakeholders. As such the new generation of business scorecards needs to compass metrics and key performance indicators across these three critical organizational dimensions. AR applications for print products can empower the consumers to make real-time decisions in what is increasingly a complex consumer decision-making environment.

Situated within the context of concomitant convergence of design, media, interactions, and scorecards, AR applications facilitate the inclusion of print products in the emerging "Internet of Things" that seeks to seamlessly integrate real-world physical objects and the online digital worlds. One business potential of AR applications is to create innovative socio-technical interactions for the different stakeholders of print products. Particularly, AR applications for print products can create new socio-technical affordances for subscribers and users. Socio-technical affordances are "action-taking possibilities and meaning-making opportunities in a socio-technical system relative to actor competencies and system capabilities" (Vatrapu, 2010, p. 111). AR applications for print products can be used to create a mixed-reality environment of physical print and digital objects that are open to multiple meanings and actions. From a marketing perspective, AR applications for print products expand the scope of the traditional marketing mix of the 4P's (Product,

Price, Place, and Promotion) to the 8P's associated with digital marketing that adds physical evidence, process, people, and partnerships to the 4P's model (Chaffey et al., 2009).

The next section presents a survey of selected AR applications for print products. Many of the current AR applications for print products marketing communications oriented. Effective AR applications for print products can create a "compression of the hierarchy of effects" (that is, the traditional cascade of cognition, affect, and behaviour can be compressed in space and time with internet advertising) (Haugtvedt et al., 2005; Schumann & Thorson, 2007) and transform customers' interactions with print products from "exchange events" to "exchange relationships" (Bagozzi, 1975; Grönroos, 1991; Kotler & Levy, 1969).

2.3 Augmented Reality applications for print products: Selected examples

AR Media's white paper[3] formulates several AR application scenarios for publishers:

- Augmented advertising
- Augmented informative content
- Geo-located augmented content
- Augmented special inserts
- Augmented-reality inserts
- Collectibles.

This section of the paper presents descriptions of selected AR applications for print products.

2.3.1 *Esquire* (USA)[4]

The magazine *Esquire* created a marker-based webcam-activated AR special issue in December 2009. The AR features were included on the cover, and bonus content was provided by selected pages. To interact with the AR content, readers had to have access to the physical magazine, download a special software application and install it on their desktop computer (PC or Mac), and have a webcam connected. Readers could then point the webcam at the AR-enhanced print pages and, through the custom software application, receive the digital content. The AR features included interactions with a 3D version of Robert Downey, Jr. for the film *Sherlock Holmes*. Figure 1 presents the default screen at start-up of the custom application. Figure 2, an image frame captured from *Esquire*'s promotional video, shows a reader interacting with the AR features.

[3] http://mashable.com/2011/06/23/paid-earned-owned-media/

[4] http://mashable.com/2011/06/23/paid-earned-owned-media/

Figure 1. An example of the AR application interaction.

Figure 2. The start screen of *Esquire*'s AR application.

Several human–computer interaction (HCI) and technical issues arise in connection with the first generation of AR applications for print products. These HCI and technical issues are perhaps best illustrated by *Esquire*'s help page for the custom software application (shown in Figure 3).

Figure 3. Potential HCI and technical issues as pointed out by the help page of *Esquire*'s AR application.

2.3.2 *Süddeutsche Zeitung* (Germany)[5]

Partnering with the AR technology company Metaio, *Süddeutsche Zeitung* enriched the entirety of their issue 33 with multimedia content. Readers interacted with the print magazine through the Junaio 2.0 iOS app and *Süddeutsche Zeitung*'s iTunes magazine channel on their Apple iPhones. This was marketed as 'The world's first mobile Augmented Reality Special Magazine Edition'. As of 10 October 2012, the associated YouTube video had racked up 115,815 views, with 119 likes and 10 dislikes. The AR features included:

- Revealing the face of the German anchorwoman seen in a print image in which her face was covered by a hand (shown in Figure 4)
- Displaying text captions to accompany print images of the Eurovision contest winner, whose song was titled 'Don't Say a Word' (see Figure 5)
- Giving an example of cause-related journalism, displaying the 'worst fears' of some local farmers about the environmental impact of the upcoming Winter Olympics sporting events (see Figure 6)
- Providing 3D digital object display for a 2D print illustration (Figure 7)
- Giving the user an AR-enhanced crossword puzzle (see Figure 8).

[5] http://www.youtube.com/watch?v=LRceOYbrVzc

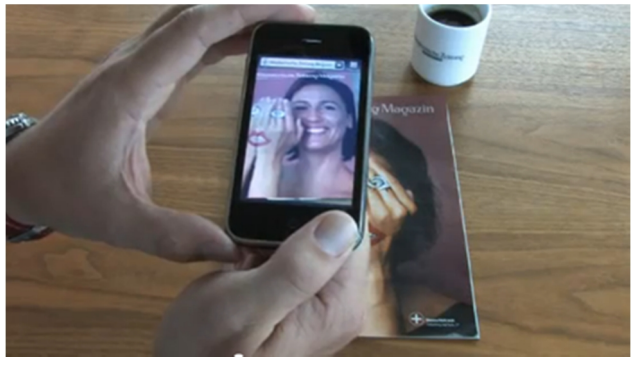

Figure 4. AR cover page of *Süddeutsche Zeitung*.

Figure 5. AR-enhanced text captions for print images.

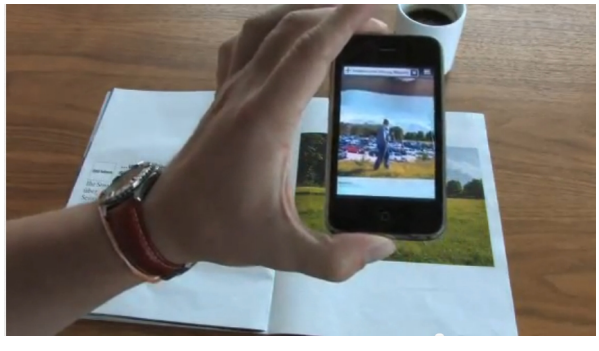

Figure 6. AR use in a cause-related photojournalism essay.

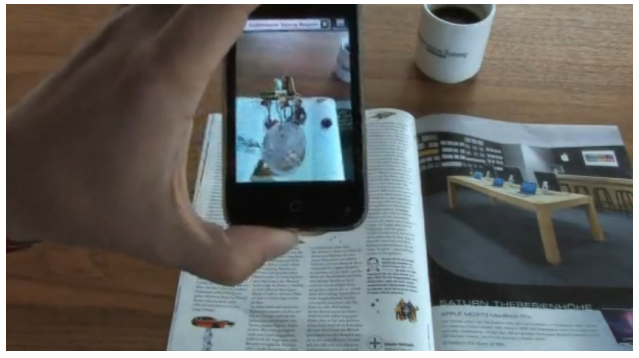

Figure 7. AR 3D digital object display accompanying a 2D print illustration.

Figure 8. An AR-enhanced crossword puzzle.

2.3.3 The *Metro Herald* (Ireland)[6]

Between 19 and 30 September, 2011, Ireland's *Metro Herald* published a series of five editions with augmented-reality integration. The newspaper implemented the mobile AR technology of Blippar. The five AR editions were marketed as the 'World's first fully augmented AR newspaper'. The AR features included:

- Video content for print advertisements (see Figure 9)
- Crossword puzzles
- Polls
- Promotional contests (as shown in Figure 10).

[6] http://blog.blippar.com/print-press/metro-herald-team-with-blippar-to-create-worlds-first-augmented-reality-newspaper/

Figure 9. AR video content to accompany printed advertisements.

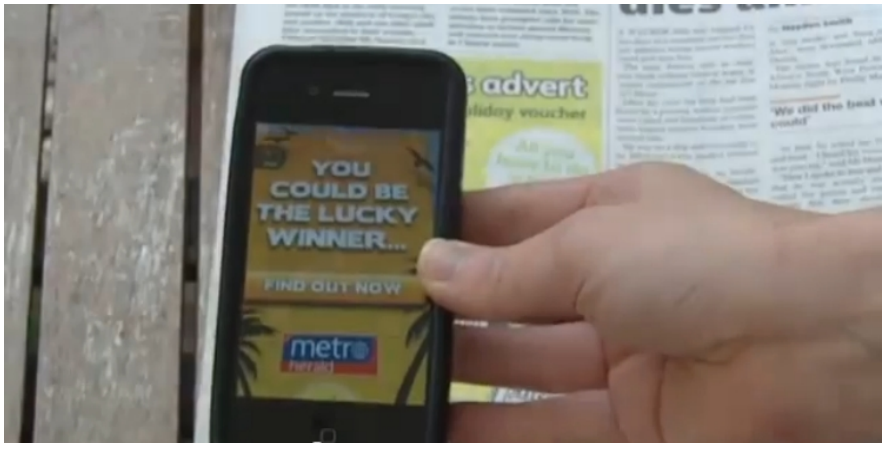

Figure 10. An AR promotional contest.

2.3.4 *Metro* (Sweden)[7]

Based on the PointCloud Browser product from Swedish company 13th Lab, *Metro* newspapers' implementation of AR allowed readers to use a smartphone's camera for online interaction with the contents of the physical newspaper. *Metro*'s AR implementation was innovative in enhancing print articles with social-media features and interactive polls, not just in its manner of provision of video and audio content to complement and/or supplement the print articles. These are some of the noteworthy AR features included:

[7] http://www.arcticstartup.com/2012/03/15/pointcloud-13th-labs

- Integration with Facebook pages, allowing 'like's, comments, and sharing (see Figure 11)
- Interactive polls (see Figure 12)
- Video stories to supplement the print news story and images (Figure 13)
- Interactive Art Gallery (Figure 14)
- Current Weather Information (Figure 15)
- Bonus Music Content (Figure 16).

Figure 11. AR Integration with Facebook.

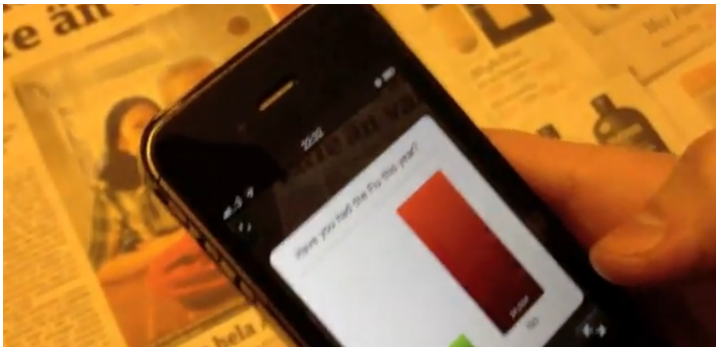

Figure 12. AR Interactive Polls.

Figure 13. AR Video supplement to a print-medium news article.

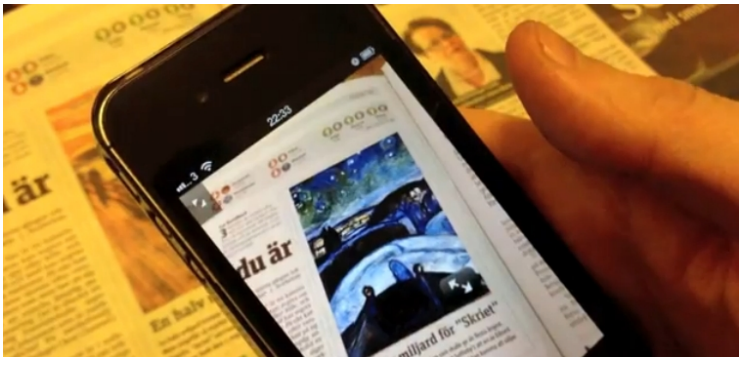

Figure 14. An AR interactive art gallery.

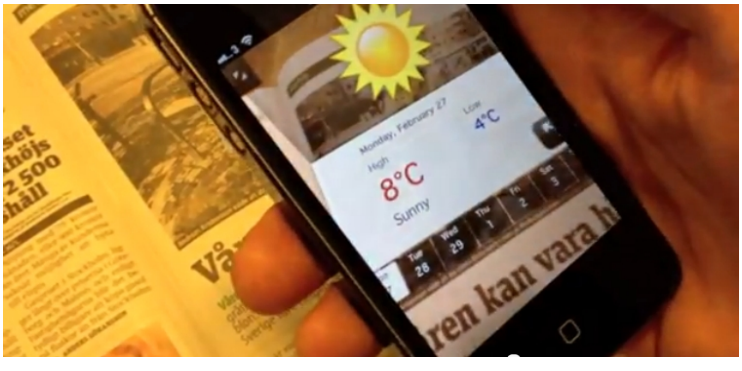

Figure 15. AR weather-on-demand content for a story on an event.

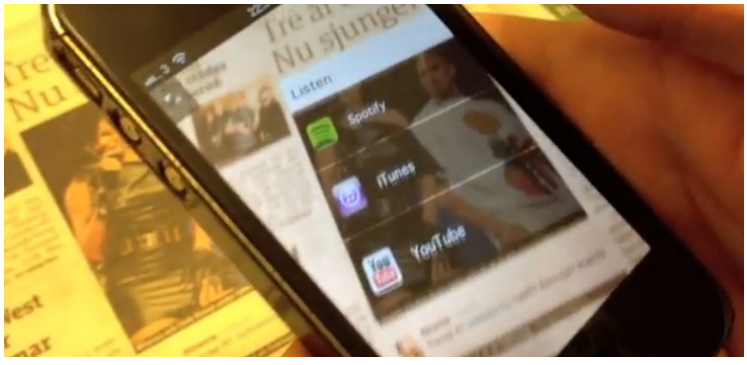

Figure 16. AR bonus audio content.

2.3.5 *United Daily News* (Taiwan)[8]

The AR visual browser Aurasma was used to launch an augmented national daily newspaper in Taiwan for provision of interactive pictures, editorials, and advertisements. Readers used the bespoke mobile app Vmagic and pointed their smartphone cameras at static images to interact with digital objects online. Media group *United Daily News* marketed their AR implementation as the 'World's First Augmented Reality National Newspaper'. An example of the AR functionality was a video testimonial connected with a print advertisement (shown in Figure 17).

Figure 17. AR video testimonial accompanying a printed advertisement.

[8] http://printmediacentr.com/2011/11/worlds-first-augmented-reality-national-newspaper/

2.3.6 *Asahi Shimbun* (Japan)[9]

Japanese newspaper *Asahi Shimbun* collaborated with the advertising agency Hakuhodo to create an AR application allowing readers to point their smartphone cameras at printed advertisements and thus interact with digital video content. Figure 18, from the official press release, depicts the interaction sequence.

Figure 18. Usage scenario for interaction with AR printed advertisements.

2.3.7 The *Philadelphia Inquirer* (USA)[10]

In a case similar to that of the United Daily News implementation in Taiwan, the AR visual browser Aurasma allowed users to interact with digital content connected to print articles, via a bespoke app. The innovation in this implementation, by the *Philadelphia Enquirer*, was that the user's smartphone was not required to be in camera mode for the AR functionality to become active (Figure 19). The AR features were branded and marketed as 'auras' – another term for augmented reality features.

[9] http://blog.japantimes.co.jp/japan-pulse/augmented-reality-taking-it-to-another-level/

[10] http://www.newsandtech.com/news/article_8e22d7cc-9adc-11e1-82d4-001a4bcf887a.html

Figure 19. AR digital content for print articles without the need for the smartphone camera to be active.

2.3.8 *Time Out* (New Zealand)[11]

Time Out, the weekly entertainment magazine of the *New Zealand Herald*, created a custom app through which readers could interact with online digital content for print products. Figure 20 presents screenshots from that app.

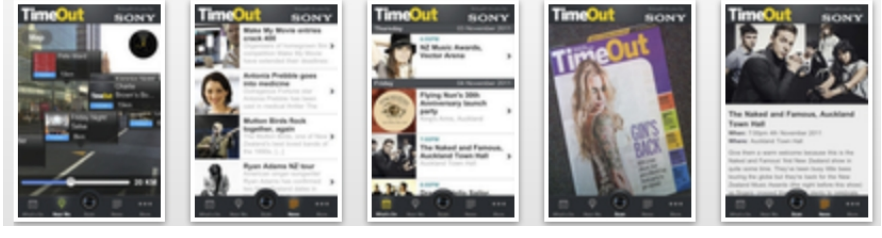

Figure 20. Screenshots from a custom mobile app for AR for a print magazine.

2.3.9 *Between Page and Screen* (USA)[12]

The 44-size book *Between Page and Screen* was created to combine the physical format of a printed book with Adobe Flash, telling a virtual love story via a webcam

[11] http://www.junaio.com/publish/success-stories/timeout/

[12] http://www.sigliopress.com/books/bps.htm

(Figures 21 and 22). The publisher's relevant online-catalogue Web page provides the following product description:

> *Coupling the physicality of the printed page with the electric liquidity of the computer screen, Between Page and Screen chronicles a love affair between the characters P and S while taking the reader into a wondrous, augmented reality.*
>
> *The book has no words, only inscrutable black and white geometric patterns that – when seen by a computer webcam –conjure the written word. Reflected on screen, the reader sees himself with open book in hand, language springing alive and shape-shifting with each turn of the page.*
>
> *The story unfolds through a playful and cryptic exchange of letters between P and S as they struggle to define their turbulent relationship. Rich with innuendo, anagrams, etymological and sonic affinities between words, Between Page and Screen takes an almost ecstatic pleasure in language and the act of reading.*
>
> *Merging concrete poetry with conceptual art, 'technotext' with epistolary romance, and the tradition of the artist's book with the digital future, Between Page and Screen expands the possibilities of what a book can be.*
>
> *Writer and book artist Amaranth Borsuk and (her husband) developer Brad Bouse, have created a magical space for the reader to discover what lives in the 'in-between.'*

An interesting aspect of this AR implementation is that the product as an 'art-work' was accepted and demonstrated in multiple exhibitions. The product-catalogue Web page for the book features a quote from Johanna Druckker, identified as an artist and critic, stating that 'this might be one of the first poetic works to constitute itself across the distributed network of inter-medial relations, and its spare elegance and mute beauty speak volumes about the shape of texts to come'.

Figure 21. Mode of interaction with an AR book that has no text.

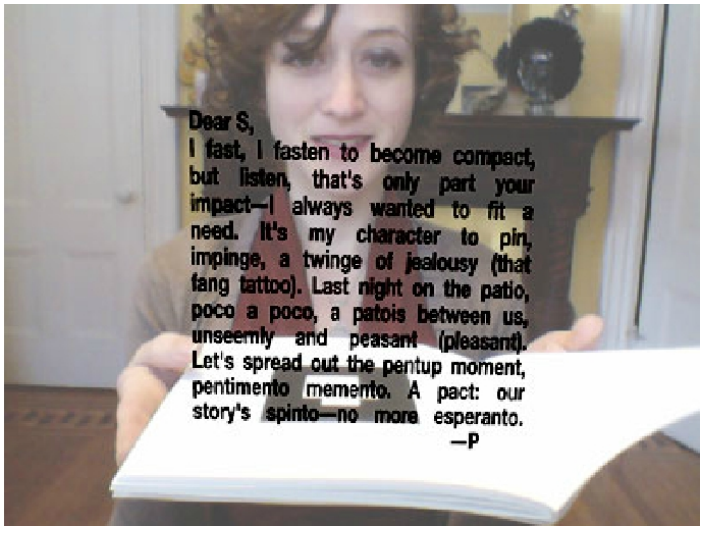

Figure 22. AR text in the book.

2.3.10 IKEA's AR catalogue[13]

IKEA has created iOS and Android apps for its catalogue, which has 211 million copies in circulation, to enable readers to view a series of videos by pointing a smartphone camera at the print-catalogue items. The AR catalogue is expected to be released later in 2013. According to Andreas Dahlqvist, Global Deputy Chief Creative Officer of McCann, the creative agency responsible for the catalogue, the following are among the AR features to come:

- An 'X-ray' feature that allows readers to look inside furniture's compartments (see Figure 23)
- 3D product models
- Product videos
- digital 'how-to' guides.

Figure 23. The proposed 'X-ray' feature for the AR IKEA print catalogue.

2.3.11 *O Estado de São Paulo* (Brazil)[14]

The Brazilian newspaper *O Estado de São Paulo* has featured regular AR content since 2009. The magazine also created an Open Source AR-development toolkit called EZFlar[15] (see Figure 24).

[13] http://www.wired.com/gadgetlab/2012/07/ikeas-augmented-reality-catalog-lets-you-peek-inside-the-malm/

[14] http://www.estadao.com.br/especiais/120-anos-da-torre-eiffel,52836.htm

[15] http://www.ezflar.com/home/show_about

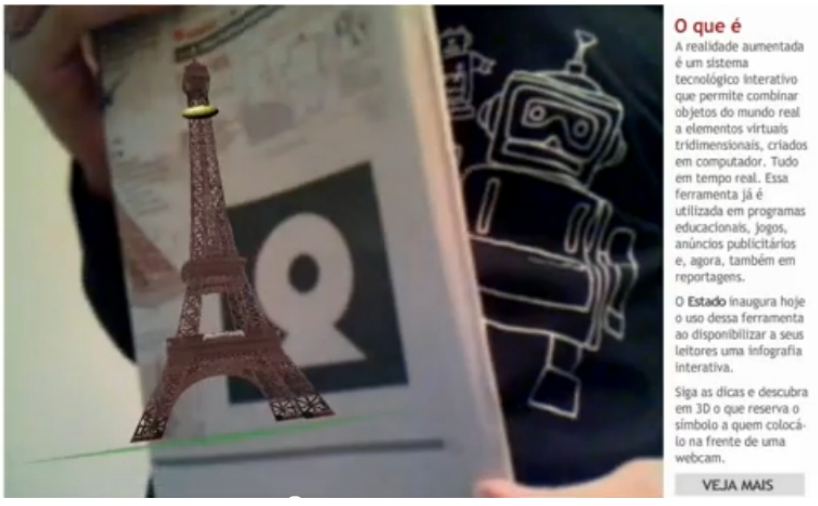

Figure 24. An example of AR from *O Estado de São Paulo*.

2.3.12 *Katso* and *TVSeiska* (Finland)[16]

In collaboration with VTT, the Finnish magazines *Katso* and *TVSeiska* used AR in advertising a new animated children's series called *Dibitassut* in April 2010 (see Figure 25).

[16] http://www.vtt.fi/news/2010/03252010.jsp

Figure 25. AR animated children's series in Finland's *Katso* and *TVSeiska*.

2.3.13 The *Dibitassut* augmented-reality book (Finland)[17]

For the television programme *Dibitassut* ('Dibidogs' in English) there is software made by VTT that users can download and install on their own computers. Users can see augmented animations by means of a webcam (see Figure 26).

[17] http://www.youtube.com/watch?v=aR-g9RbYUYs

Figure 26. The Dibidogs augmented-reality book in use.

2.3.14 The 'magic book'

The conception and implementation of augmented-reality books have evolved slowly in tandem with developments in AR technologies, but widespread consumer adoption and use is not yet a reality. According to Siltanen (2012):

> *The idea of an augmented reality book, 'the magic book' is at least ten years old […]. However, it took a while before the technology was robust enough for mass markets.* Aliens & UFOs[18] *was probably the first published book with AR content. In 2010, publishers released several AR books, e.g.* Dinosaurs Alive![19], Fairyland Magic[20], Dibitassut[21] *[and* Magic of Christmas by Santa[22] *and the trend continues.*

[18] http://www.amazon.com/Aliens-UFOs-Christopher-Evans/dp/1847321380

[19] http://www.amazon.co.uk/Dinosaurs-Alive-Augmented-Reality-Book/dp/1847325785

[20] http://www.amazon.co.uk/Fairyland-Magic-Augmented-Reality-Book/dp/1847325793/ref=sr_1_1?s=books&ie=UTF8&qid=1350309380&sr=1-1

[21] http://www.vtt.fi/news/2010/03252010.jsp

[22] http://www.whsmith.co.uk/Products/The-Magic-of-Christmas-by-Santa+Mixed-media-product+9781847325846

2.4 Conclusion

As a recent survey of mobile augmented-reality applications (Olsson & Salo, 2011) shows, the current environment for AR is still rife with technological challenges, implementation problems, and consumer-acceptance issues. That said, AR applications for print products have the potential to create value for diverse stakeholder groups. The interactive print platforms that are now commercially available, such as Layar[23] and Crossfy[24], when coupled with the work of AR application vendors, engender new opportunities for print magazines. Flash- and HTML5 based AR technologies eliminate the need for downloading of software applications, simplify the content-creation process, and can support AR interactions with multicoloured key characters. These developments bode well for the future of AR applications in the print-media industry.

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[23] http://www.wired.com/beyond_the_beyond/2012/06/augmented-reality-layar-reveals-their-print-strategy/

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3. User responses to AR in the Nordic countries

This part of the report presents the results related to user responses to AR applications. The goal of the study was to increase our knowledge of how users and advertisers perceive AR, with the study being aimed at providing the market with detailed information on possible user profiles while drawing conclusions as to how these profiles could be utilised in future AR media applications.

The study was divided into two phases, one involving focus-group interviews and the other using a quantitative survey based on Q-sort methodology. Both phases were carried out in Finland, Iceland, Norway, and Sweden. Denmark took part only in the second phase of the study.

3.1 Methodology

3.1.1 Focus-group interviews

Focus groups are used as a method of collecting qualitative data. They are frequently utilised in marketing and media research (Flick, 2006). According to Morgan (1988), focus groups are used for obtaining information on a new field, to generate hypotheses based on participants' knowledge, for developing interviews and questionnaires, and to gain interpretations of earlier studies.

The interviews with the focus groups were used to generate statements about the use of AR technology. These statements were then tested via Q sorting.

The focus-group interviews were conducted similarly in all four relevant Nordic countries. All of the respondents filled in a questionnaire with questions on the use of mobile, computer, and social networks to 'break the ice'. Then, brief videos of augmented-reality applications were shown to the participants. After watching the videos, the participants were asked to take five minutes to write down their first impressions of AR. The videos can be found at the following locations:

- http://www.youtube.com/watch?v=agwFbTwg9HA
- http://www.youtube.com/watch?v=PGu0N3eL2D0
- http://www.youtube.com/watch?v=AjDjsmr0G14.

The participants were brand-owners, publishers, and various actors in the media value chain. Table 1 describes the companies in more detail.

Table 1. Participants in the focus-group interviews.

Company description	Country
Publisher	Finland, Sweden, Norway
Printer	Sweden
Advertising	Iceland, Norway
Brand owner in brewery	Finland
Brand owner in cosmetics	Finland
Brand owner in dairy products	Iceland

3.1.2 The Q-sort method

Q sorting is a way of studying people's opinions. The methodology includes collection of people's views on a list of statements and subsequent analysis of the answers. A list of statements is presented to each participant in the study, and the subject is requested to indicate how much he or she agrees with each statement. However, the responses become more precise through the use of many, related statements; for example, they may agree or disagree very strongly with one statement on a particular topic but be neutral on several others. The approach has the additional benefit of avoiding answers that do not indicate much: if people were requested to give a score between 1 and 5 for each statement, they might give a score of 3 to every statement; however, in Q methodology this is not possible, because the participant must also order the statements by how much they agree or disagree.

The additional constraints, involving the way of ranking statements (agree/disagree), are a key element of Q sorting: it is a way of sorting the statements such that in some cases two or more statements can be in the same line. After the answers to the statements have been received, the Q method proceeds with analysis of the data. The analysis is conducted by means of factor analysis in which the objective is to analyse similarities (correlation) between people's answers and thereby end up with a small number of general patterns of responding that could explain all the answers sufficiently well. In a sense, the method is about the people more than the statements. Their underlying answering patterns are the factors here, and the hope is that the answers of each participant can be found to be mainly associated with one or otherwise very few underlying answering patterns. These underlying patterns of responses would correspond to groups of people within which similar opinions are evident and between which opinions differ.

The statements for the Q-sort analysis in this study were chosen on the basis of the focus-group interviews. In addition, 24 statements from a previous study, by Claire Gauzente and colleagues (2011), were tested.

3.2 Results

The focus-group interviews were carried out in Finland, Iceland, Norway, and Sweden (Table 2). The statements for Q-sort testing were chosen on the basis of the transcripts of the focus-group interviews, and 25 statements representing the user attitudes in the Nordic countries were employed in the Q-sorting process. The Q-sort statements were tested also in Denmark. In addition to statements gathered from Nordic focus-group interviews, those used in the ongoing Gauzente study were tested among respondents.

Table 2. Summary of participation.

Country	No. of participants in the focus groups	No. of subjects filling in the Q-sort form, with 25/24 statements
Finland	**17**	**26/26**
Denmark	**-**	**4/4**
Iceland	**16**	**13/14**
Norway	**12**	**7/7**
Sweden	**12**	**7/8**

3.2.1 Finland

The focus-group interviews were carried out in three groups of brand-owners, with 17 members in all. These brand-owners were Lumene (a company in the cosmetics business), Sinebrychoff (a brewery), and Aller Media and Valitut Palat (publishers). The Q-sort material was sent to the attendees for completion. In addition, nine other people at their companies received it. In all, 26 people filled in the Q-sort form.

There were many discussions about the benefit of using AR applications and the motivation to use such an application. It was stressed that the application should be easy to access and easy to use. A universal code-reader would be appreciated. Also, the user has to gain some benefit from using the AR application – content is king. The benefit might be information on a very complex issue that could well be hard to explain in words alone. The application could also be simply for leisure – such as a game.

The importance of applications' attractiveness was mentioned many times. The users would use the applications in short spans of time when they do not have

anything else to do. This is in line with findings from ongoing Next Media studies in Finland (Next Media, 2012).

In specific terms, AR was expected to facilitate Web shopping and perhaps enhance the experience via senses other than the visual, incorporating odour or tactile properties in the future. Virtual shops for clothing purchases were desired. The focus groups saw men and adolescents as the main target groups. Also, 'Could AR help with day-to-day grocery shopping?' was asked in the focus groups.

The target areas in which interviewees would expect to see augmented-reality applications in the near future are:

1. Web shopping (especially involving clothes)
2. Showcasing of homes and other objects in the building trade
3. Interior design
4. Assembly
5. Guides to knitting, preparing food, etc.
6. Learning applications, in which engaging all of the senses would enhance the effectiveness of learning process (in academic-style lessons or demonstration of how to drive leftward)
7. Enhanced experience in conference calls
8. Hairdresser's operations (e.g., for choosing of a hairstyle)
9. Trying out cosmetics (such as lipstick) and seeking friends' opinion
10. Demonstration of how to use cosmetics – replacing the in-store cosmetics consultant
11. Storytelling, providing information on the brand, origin, and materials
12. Tourist guides.

The costs of using an application were seen as an obstacle. Earlier studies too have found that if the user doesn't know the costs, this becomes an obstacle (Lindqvist et al., 2009). Time was mentioned as another obstacle: interviewees felt that it would be time-consuming to use AR applications. The more the user needs to do to access the content, the greater the obstacle to use of the application will be.

Users' trust in a product should increase when AR is involved. As one participant put it, 'I'd trust a product more if I got more information through the AR application as compared to just a picture in a catalogue."

The statements out of Finnish focus groups were:

- I would be interested in using AR applications, if I didn't have to download more than one application.
- In the future, AR will help people to see something concretely even in its planning stage (for example, in interior design).

- AR would be helpful in assembly and installation applications.
- AR would be too expensive for me to use.
- There is nothing special in AR.
- Stringing small payments together is an easy way to accept the total cost.
- Everything must happen in real time. A mobile phone isn't fast enough for AR applications.
- I don't have time for using AR applications.
- An AR application must involve all the senses before I would use it for purchasing on the Web.

3.2.2 Iceland

The Icelandic focus-group interviews were conducted with three groups. The first group came from the marketing company Nordic eMarketing and consisted of six individuals, as did the second group, drawn from dairy company Mjólkursamsalan. The third group, from the IT company Nýherji, consisted of four individuals. In total, 16 individuals (13 men and three women) took part in the group interviews.

All participants received the Q-sort material for completion a month later. Inevitably, their interest had dwindled somewhat, resulting in slow response.

The use of AR to increase the amount of information available about a product is important. This could open up new channels of communication between consumer and manufacturer. However, only those who are familiar with their phones and use them a great deal will be able to use AR in any significant manner. In a small country such as Iceland, this means that marketing efforts are not going to reach very many people if conducted through AR.

From a technical standpoint the main issue was the apparent lack of a standard way to present AR in a marketing context, increasing development cost for companies and making it harder for users to access the information. Also expressed were concerns about the cost of the data connectivity involved in fetching AR overlays over the web. Apart from those issues the response was very positive, especially in one of the groups where the possibility of wearable displays came up.

As for the longevity of the technology, some work would have to be done for AR not to be a gimmick that fades away. Integration directly into the store, in the style of the Lego demo would help integrate the AR experience into shopping habits.

Use cases were widely discussed, with various ideas as to where this would develop next. Among them were use in traveling, both as a navigation aid, information, and possibly a way to look into the past of old buildings via overlaid photographs. Also mentioned were education, self-service repair, and a broad range of – slightly different – applications within stores.

The target areas would be these:

- Tourism and travel agencies

- Travel and guided tours
- Online shopping
- Games
- Office applications
- Car rental
- Museums
- Exhibitions
- Schools and education
- Navigation
- Automotive self-service repair
- Entertainment/theme parks.

3.2.3 Norway

The focus-group interviews in Norway were conducted with two groups. The first of these consisted of seven persons from a Web communication bureau and an advertising company. They shared the same locale and worked together, with the same portfolio of customers. Group 2 consisted of five members of the marketing department of local newspaper *Oppland Arbeiderblad*.

In both groups, emphasis was placed on the benefit of using AR applications in marketing. The success of a marketing campaign is measured in terms of either increased sales or profile development and brand-building. If the customer is to return and buy another advertisement, that customer needs to reach a certain level of satisfaction. One example of a customer for whom this approach might be useful for brand-building might be a shopping centre, with the individual shops there also being in need of increased sales.

The groups focused also on the idea that, to maintain interest, an AR application must supply added value for the user. The Virtual Fitting Room application emphasises how its AR gives this kind of value. The technology could be used likewise in video displays when one is shopping for frames for spectacles.

Today, the user who wishes to use AR must download a separate application for each and every service, brand, or company. The two focus groups did not reach agreement on whether this was too complicated or was acceptable. It was stated that services based on HTML5 would be much more user-friendly, making it possible to do everything in a browser. This eliminates the need to manage multiple downloads. The other group found downloading of these to be acceptable.

Newspapers already struggle to resolve the issue of digital codes in advertisements. Less than 10% of their income comes from sales of Web advertisement. At issue seem to be both scepticism about starting to explore new technologies before one is in full control of the established ones and a need to find new solutions. It would be beneficial for newspapers to expand their announcement portfolio as AR technology becomes more common. So far, generating an AR application is assumed to be quite expensive. Therefore, the brand-holders targeted tend to be involved in sales of expensive items.

The interviewees pointed out the following target areas for AR applications

- Web shopping
- Physical shopping centres
- Interior decoration and design
- Entertainment
- Adventure
- Tourism
- Storytelling, associated with brand-building
- Hair, make-up, and clothing products
- Museums
- Estate agents' services
- Manuals.

The local newspaper also seemed to be facing the challenge of customers choosing a traditional way of advertising. Many customers still consider it safer to buy a campaign in the print edition than to try other digital media. Today, the sales department must spend more time convincing the customer to buy digital advertisements.

Another statement made was that the combination of AR and social media would strengthen the effect. If one reads an advertisement in a newspaper, there's no way to know whether any of your friends may have read it. In contrast, you could be alerted that a certain number of your friends have downloaded and used the equivalent AR application. It is clear that the social part of the advertisement is important.

Both groups agreed that the future will see AR technology create a number of possibilities for advertisement. There is no doubt that the best ideas are yet to come. For now, the high cost of developing AR seems to be the restriction on utilisation of the technology. The creation of 3D models is considered to be the most expensive part. One can probably conclude that developing AR applications will be standardised in another way than seen today. Adoption of a far less expensive alternative to using Quick Response Codes (QR codes) to merge printed information with digital content seems to have been supported by both groups.

The following statements were produced by the Norwegian focus groups:

- The mental space between print media and the mobile world is too great. You see a printed advertisement in the print media, find your mobile, start (perhaps even download) an app, and localise the code in the magazine or on the wall. This is not a natural way of using the mobile phone or tablet.
- HTML5 technology is going to make things a lot easier. It should prove better to use this than to install apps. Then everything can be done from the browser.
- AR offers great possibilities for innovation; we have not seen the best ideas yet.
- The sensors are the technical limitation of the mobile phone; its accelerometer, GPS functions, etc. are not accurate enough.

- When the sensors don't work well enough, you could be standing at the target location while being told that you still are 10 metres from it.
- It is going to be interesting when the scan of a QR code brings you directly to a Web site with the functionality.
- Things are better with more generic applications, such as Layar. You can program layers into an application made by others. This simplifies development.
- Some articles are not commonly sold in Web shops because the consumer needs to try them on. If one could 'try on' an article with AR, this could increase sale of such articles.
- AR can visualise things you cannot see. If a contractor is building a block of flats, AR is a way of showing the customer how the space is going to look. That is useful.
- The combination of AR and social media would strengthen the effect. You will not know which of your friends reads an advertisement in a newspaper, but you could be alerted that 40 of your friends have used the AR application. The social part of the advert will be important.
- The threshold for using AR is too high: you have to find the application, then install it. Only after that are you able to use it. You must have strong motivation to do this.
- By using AR, we have created a new and interesting way of telling stories. To tell stories with AR, one stimulates multiple senses.
- An interesting way of using AR is to apply QR codes on the floor in a shopping centre. When the customer scans this code, a person pops up to describe today's offerings.
- In the early stages, it is enough for an AR application to be entertaining. After a while, it must also be useful if it is to maintain interest.
- When combining the real world, the digital world (AR), and the social world, one will make an enormous impact.

3.2.4 Sweden

Two focus-group interviews were carried out in Sweden. One group consisted of people from the printing industry and the other group of publishers with magazine and newspaper products.

The first group was quite sceptic about the AR applications. They perceived as problematic. If AR functionality were to be integrated into mobile hardware (e.g., successful apps such as Aurasma Lite or Blippar's offering), a revolution would occur for AR applications.

Augmented reality was found to be difficult to use; AR technology needs to be simpler to use both when creators are developing AR content and when users access AR applications. A greater connection speed in accessing AR applications is another prerequisite for a breakthrough.

Augmented reality could draw extra attention to the printed product, in a sort of hype effect; AR could imply a shift in focus from printed product toward digital services: 'When you start to use the smartphone to access AR, there is a risk that you remain with the phone and don't return to the magazine.' The following conclusions were obtained from the printing-production focus group:

- A breakthrough for AR is not going to occur until creators start to use AR, and this won't happen on a larger scale before a common standard for AR applications is established. The functionality has to be integrated into the hardware.
- There was consensus on the impression that AR is not a great opportunity for printed media. The lack of standardisation is one problem. But it might be possible to give impetus to hype based on AR and thus establish greater attention. However, putting in place useful solutions that lead to permanent businesses is a more complex task.
- AR is generating relatively little added value when compared to what QR technology creates.

The second focus group was oriented more specifically toward AR. Augmented reality was seen as a fascinating technology that certainly will give added value to print media and provide potential for interaction. It may increase users' interest in magazines, although it demands more user involvement than an ordinary printed product does. Augmented reality provides a possibility for advertisers to increase the effects of their adverts, and it was seen as an interesting opportunity for the publisher to introduce the reader to supplemental services.

There is a risk that AR apps in magazines will cause a focus shift and that the readers keeps using the mobile phone rather than returning to the magazine after using the app. Also, ease of use was seen as important.

On the basis of the focus-group interviews, the following items were extracted and proposed for the Nordic statements for the Q-sort work:

- How important is interactivity? 'It is important because it is always necessary to listen to the readers. Another question is how to implement interactivity – it must focus on business goals, since interactivity can be very expensive to handle (it is time-consuming and hence expensive). AR can fully replace QR.'
- There is need for a common standard for AR applications before a breakthrough can occur for AR.
- AR is not a problem-solver for print media but may increase consumer interest in magazines.

- If AR is going to be successful, the time for an AR app to show up on the mobile phone must be decreased.
- There is a risk that AR apps in a magazine will cause a focus shift and that the reader stays with the mobile phone after using the apps and doesn't return to the printed magazine.
- AR needs to give added value to the readers of print media if it is to be interesting for the publisher.
- AR gives print media the potential for interactivity, which is a clear benefit.

3.3 The statements for Q-sort analysis

The focus-group interviews were used in addition to comparison between user nationalities for plucking out suitable statements for Q-sort analysis. In all, 25 statements were chosen to represent the attitudes of Nordic users. These were:

1. Using AR with a webcam is too complicated. With a phone, it's OK.
2. I don't understand how it works; it's too complicated. I don't want to try it.
3. AR is not surprising. I've seen things like this before.
4. I wouldn't have time to use AR.
5. The threshold for using AR is too high; you have to find the application, then install, it. Only after that are you able to use it. You must have strong motivation to do this.
6. There is a risk that AR apps in a magazine will cause a focus shift and that the reader stays with the mobile phone after using the apps and doesn't return to the printed magazine.
7. AR needs to give added value to the readers of print media if it is to be interesting for the publisher.
8. AR gives print media the potential for interactivity, which is a clear benefit.
9. AR will be popular in the near future.
10. I want to use AR to familiarise myself with products that I am not already familiar with.
11. Seeing an object through AR… it's good in a store when you can neither see the object nor open the box.
12. One would use AR more if the applications were accessible via screens in stores.
13. It's playful and funny.
14. One needs to be able to touch the product.

15. In the future, AR will help consumers see something concretely even in its planning stage (for example, in interior design).
16. AR would be helpful in assembly and installation applications.
17. AR offers great possibilities for innovation; we have not seen the best ideas yet.
18. Seeing a product through AR is not enough to make me buy it.
19. Some articles are not commonly sold in Web shops because the consumer needs to try them on. If one could 'try on' an article with AR, this could increase sales of such articles.
20. Combining AR and social media would strengthen the effect of an advertisement.
21. I like the way AR can be used to tell stories: it makes me interested because it stimulates a variety of senses.
22. AR is not a problem-solver for print media but may increase consumer interest in magazines.
23. An AR application must involve all the senses before I would use it for purchasing on the Web.
24. Everyone is able to use AR.
25. AR is too expensive for me.

In addition to statements gathered from Nordic focus-group interviews, the statements used in the ongoing study by Gauzente et al. (2011) were tested among the respondents. Accordingly, the respondents filled in two forms: one for Nordic statements and another for the statements employed in the Gauzente study. The statements in the Gauzente study were the following:

1. Using AR with webcam is too complicated. With a phone, it's ok.
2. I don't understand how it works, it's too complicated. I don't want to try.
3. AR is not surprising. I've already seen things like this before.
4. The wow-effect will not last long.
5. It doesn't make sense, it's absolutely useless.
6. It's better to go into stores than to live behind your screen and try things with AR.
7. I would use AR only as an exception, if I hadn't a second to spare to go into a store.
8. It is not interesting in order to see real objects, but to visualize how some situations could evolve (our physical appearance, a location, an illness…)

9. It's good only to draw attention.
10. It's not for me, but for people who already know this technology very well.
11. Seeing an object through AR, it's good in store when you can neither see the object nor open the box.
12. Seeing products through AR saves time. It's quicker than searching for the products in a store and trying them on.
13. It's playful and funny.
14. One needs to be able to touch the product.
15. When pre-visualizing a product through AR at home, one lacks the pleasure of going into a store as well as the advice of the salesperson.
16. Using AR to visualize a product is stupid; because one cannot be sure it will look like this in reality.
17. AR is interesting for people who order on the Internet.
18. Seeing a product through AR is not enough to make me buy it.
19. It's good because it allows you to have pictures of yourself with the product you can share on the Internet.
20. It's interesting mainly to discover a product one did not know at all.
21. It's interesting because you can see yourself with the product on scale.
22. AR is good only when it actively involves us in the demonstration and the trying of the product.
23. AR can be good to first see a product and then go into a store: it prepares the act of buying.
24. It's not necessary, I don't really need it.

3.3.1 The Q-sort analysis of the Nordic statements

Data were downloaded on 9.11.2012 at 9:30am. The dataset covers 57 people, in total. Their IDs were the following:

- FI (26 persons), IDs 1–26 (blue)
- SE (7 persons), IDs 27–33 (yellow)
- NO (7 persons), IDs 34–40 (white)
- DK (4 persons), IDs 41–44 (red)
- IS (13 persons), IDs 45–57 (orange).

Factor loadings for the entire corpus of data are presented in Appendix A, in Table A1. Five factors were used in the analysis, and five countries were involved. Four groups were found (marked in green in Table A1). Table A2, also in Appendix A,

presents the Q-sort scores of the statements for each group, from 1 (disagree) to 9 (agree).

The first group was the largest, with 32 people taking part. There were representatives from each country. They agreed with these statements:

- AR offers great possibilities for innovation; we have not seen the best ideas yet.
- In the future, AR will help consumers see something concretely even in its planning stage (for example, in interior design).
- It's playful and funny.

They disagreed with these statements:

- I don't understand how it works; it's too complicated. I don't want to try it.
- I wouldn't have time to use AR.
- Using AR with a webcam is too complicated. With a phone, it's OK.

Hence they showed quite positive attitudes. They would like to try AR applications and indicated that they would find time for using such applications. They didn't find the applications too complicated to use, and they saw possibilities for innovation both for business purposes and for pleasure. The subjects expressed high expectations of the future of AR applications.

The second group was composed of 11 people, mainly from Finland (two were from Iceland). They agreed with the following statements:

- Seeing an object through AR… it's good in a store when you can neither see the object nor open the box.
- In the future, AR will help consumers see something concretely even in its planning stage (for example, in interior design).
- AR will be popular in the near future.

They disagreed with these statements:

- Everyone is able to use AR.
- AR is too expensive for me.
- An AR application must involve all the senses before I would use it for purchasing on the Web.

They found AR applications useful and believed in these applications' future. They didn't find it important to involve all of the human senses in future applications. They indicated that not everyone is able to use AR applications but that it is not the costs that will be an obstacle.

The third group consisted of eight subjects, from Finland, Sweden, and Iceland. They agreed with the following statements:

- The threshold for using AR is too high; you have to find the application, then install it. Only after that are you able to use it. You must have strong motivation to do this.
- In the future, AR will help consumers see something concretely even in its planning stage (for example, in interior design).
- AR offers great possibilities for innovation; we have not seen the best ideas yet.

They disagreed with the following statements:

- Everyone is able to use AR.
- I don't understand how it works; it's too complicated. I don't want to try it.
- An AR application must involve all the senses before I would use it for purchasing on the Web.

These subjects were quite like the second group, but they underscored that they would like to try AR applications. They also saw the threshold for using AR application as high, though they still believed in the possibilities for innovation.

The fourth group consisted of six participants, hailing from Finland, Norway, and Denmark. They agreed with these statements:

- Combining AR and social media would strengthen the effect of an advertisement.
- AR offers great possibilities for innovation; we have not seen the best ideas yet.
- AR will be popular in the near future.

They disagreed with these statements:

- AR is too expensive for me.
- AR is not surprising. I've seen things like this before.
- I want to use AR to familiarise myself with products that I am not already familiar with.

They didn't find costs to be an obstacle and considered AR something they had not seen before. The participants saw possibilities for innovation and greater popularity in the near future. This group saw the AR applications as strengthening the effect of an advertisement.

With the Q sorting, costs did not emerge as a perceived obstacle; this was in contrast to the findings from the focus-group discussions.

3.3.2 The Q-sort analysis of 24 statements

The dataset encompasses 59 people in total. Their IDs are the following:

- FI (26 persons), IDs 1–26 (blue)

- SE (8 persons), IDs 27–34 (yellow)
- NO (7 persons), IDs 35–41 (white)
- DK (4 persons), IDs 42–45 (red)
- IS (14 persons), IDs 46–59 (orange).

Factor loadings for all of the data are presented in Appendix B, in Table B1. Five factors were used in the analysis, with five countries involved. Four groups were found; these are marked in green in Table B1. Table B2, also in Appendix B, presents the factor scores of each group (1 = disagree … 7 = agree).

The first group was the largest, consisting of 40 respondents. All respondents from Norway were placed in this group. This group of people agreed with the following statements:

- It's interesting because you can see yourself with the product on scale.
- AR can be good to first see a product and then go into a store: it prepares the act of buying.

They disagreed with these statements:

- It doesn't make sense, it's absolutely useless.
- I don't understand how it works, it's too complicated. I don't want to try.

Hence, the majority of respondents had a highly positive view of AR applications and saw them as very interesting.

The second group consisted of five respondents. They agreed with the following statements:

- AR is interesting for people who order on the Internet.
- When pre-visualizing a product through AR at home, one lacks the pleasure of going into a store as well as the advice of the salesperson.

They disagreed with these statements:

- Seeing products through AR saves time. It's quicker than searching for the products in a store and trying them on.
- It doesn't make sense, it's absolutely useless.

The third group consisted of six Finnish respondents. They agreed with the following statements:

- AR is interesting for people who order on the Internet.
- It's playful and funny.

They disagreed with these statements:

- It's good because it allows you to have pictures of yourself with the product you can share on the Internet.
- It's good only to draw attention.

Clearly, they consider there to be possibilities for AR applications in the field of Web shopping. For them, AR is not only for grabbing people's attention.

The fourth group was made up of eight respondents, from all of the countries involved except Norway. They agreed with these statements:

- Using AR with webcam is too complicated. With a phone, it's ok.
- It's good only to draw attention.

They disagreed with the following items:

- It doesn't make sense, it's absolutely useless.
- I don't understand how it works, it's too complicated. I don't want to try.

Their attitude toward AR applications was quite positive: they found them useful and indicated that they would like to try them. However, this group found the applications to be only for drawing attention.

3.4 Conclusions and discussion

The results indicate that AR was seen as useful, beneficial, attractive, interesting, fascinating, and offering the 'wow' factor. Some thought that AR usage was time-consuming, while others deemed it time-saving. Also, the findings indicated that standards apparently are lacking both for user interfaces and on the business-handling side.

The felt need for a universal reader for AR codes implemented at hardware level is appreciated. Costs from several perspectives were seen as an obstacle by the focus-group participants in all countries. The development costs were considered to be high, which could affect the future of AR. At the same time, however, the Q-sort results showed that the costs were not viewed as an obstacle. Those in the focus groups had second thoughts about the costs, but when they filled in the Q-sort form, costs were seen as a minor issue. Ease of use and the AR applications' speed of use were found to be important factors: the applications must be easy to use and fast enough. The mobility aspect was important, and it was felt that applications and content should be designed primarily with mobile use in mind – i.e., for small screens.

The Q-sort results also showed that AR is seen as offering great potential for innovation. People would like to try the applications and would also find time for using them after that. The expectations placed on AR applications are clearly high.

Some of the focus groups were quite innovative and their ideas somewhat whimsical – an example being one in which enhancement of other senses could be involved. Odour and tactile properties were mentioned in that context.

Augmented reality was seen as valuable for the advertising industry. There was, however, some fear of a shift in focus, of AR taking over, or that the user would stay on his or her mobile instead of continuing to read the printed material. Augmented reality was considered to reduce the gap between advertisements in newspapers and advertisements on television or the Web. This is because AR

activates several of the user's senses. For success in use of the AR technology, a business model for digital advertisement needs to be developed. As for the future, the technology should be exploited in a manner exploiting the possibilities within a browser instead of development of a number of standalone applications.

A summary of the results is included as Table A1, found in Appendix A.

3.5 References

Flick, U. (2006). An Introduction to Qualitative Research. London: SAGE.

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4. The innovation workshop

4.1 Introduction

Harnessing augmented reality in media is not a straightforward matter. You can carry a smartphone wherever you go but may not find AR friendly and easy to use.

Before the innovation workshop, an extensive user study of AR in the Nordic region revealed both enthusiasm and fear of AR. It was considered playful and funny yet also complicated and expensive. Augmented reality is popular and was seen as useful for solving problems, yet it was regarded as unfamiliar and time-consuming at the same time.

To tackle these widely opposing views, the group arranged an innovation workshop, which was held in Reykjavik, Iceland, in November 2012. One goal was to provide publishers with fresh ideas for service development. Five countries were represented in the project: Finland, Sweden, Denmark, Norway, and Iceland. In total, 19 people attended, from five research partners and nine industrial partners (Table 3).

Table 3. Participants in innovation workshop.

Research partners	Industrial partners
VTT Technical Resarch Centre of Finland	ASTE Helsinki, Finland
CBS Copenhagen Business School	Aller Media, Finland
HiG Høgskolen i Gjøvik	Grafiska Företagens Forbund, Sweden
Stockholm Universitet	Ineko, Sweden
ICEPRO Iceland Trade Procedures and e-Commerce	Jyllandsposten, Denmark
	Sunnmørsposten, Norway
	Nordic eMarketing, Iceland
	Hvíta Húsið, Iceland
	Stokkur, Iceland
	GS1, Iceland

4.2 Methodology

The innovation workshop built upon the results of the focus-group interviews in the user study, in which each country had proposed several target areas. Before the workshop, the decision was taken to tackle the eight most commonplace target areas, as categories for ideation:

1) Guides and manuals
2) Games
3) Online shopping
4) Building and interior design
5) Learning
6) Tourism
7) Brand awareness
8) New ideas.

4.2.1 The approach

The participants were divided into six groups, each tackling selected themes. A summary from the user study was provided, consisting of the following elements:

1) The statements from the Q sorting
2) Ideas from the focus-group interviews.

Osterwalder's et al. (2009) *Business Model Generation* and the business model canvas were utilised in the workshop.

Armed with the above statements and ideas, the groups went on to tackle the eight categories. After the initial brainstorming, each country's representatives decided to deal with two categories:

NO: New ideas + games
SE: Online shopping + building
FI: Learning + guides and manuals
IS: Brand awareness + tourism
DK: Technologies and theory.

4.3 Results

4.3.1 Summary: List of service innovations

Category	Innovation
Guides and manuals	IKEA assembly manual LEGO assembly manual Shopping catalogue for groceries Do-it-yourself guides

Games	Puzzles Treasure hunts Tasks and contest based on content Advertisements as a gateway Casual games Augmented board games Augmented-reality pets
Online shopping	A food recipe A 'phone' fitting room in a store A virtual fitting room Products placed virtually in their intended places
Building and interior design	AR windows Exterior materials for a house 3D simulation of interior design 3D simulation of a building 3D simulation of lighting inside or outside the house Garden instructions with the aid of AR Speaker placement Presentation of structures hidden behind a wall Capture of AR pictures of a car
Learning	An augmented-reality printed textbook
Tourism	Augmented travel information Additional information An augmented tourist guide Tourist-guide micro-payments
Brand awareness	AR with a social aspect
New ideas	An augmented newspaper Augmented books Visualisation for learning Visualising of natural phenomena

4.3.2 Detailed categorisation

Guides and manuals

Assembly: IKEA

- Visualisation of the ongoing process and the final product
- Interactive help on demand
- Gamification + social sharing.

Assembly: LEGO

- Brand awareness and product knowledge
- Visualisation of the ongoing process and the final product

- Interactive help on demand
- Gamification + social sharing.

Shopping catalogue / printed advertisement: Grocery store

Brand awareness and product knowledge

- Visualisation of the shopping floor and product locations
- Curated shopping basket: a 'recipe of the day' etc.
- Interactive help on demand
- Gamification + social sharing.

'How-to' guides: Cars and crafts

- Product knowledge
- Visual instructions
- Gamification + social sharing.

Themes of the research questions:

- Product videos vs. interactive product models
- Recorded videos vs. live models
- What, if any, additional benefits video offers.

Games

Puzzle games (crosswords, sudoku, etc.)

- AR hints when one gets stuck
- Possibly multi-player games via AR / social media
- Where's Wally?

Gamification ideas

- Treasure hunts (scanning the ads and collecting points / hidden treasures)
- Tasks and contests based on content
- Persistent events – the advert as a gateway to an ongoing (online) event
- Casual games (e.g., from advertising posters), as something entertaining to do while one waits for the metro train.

Augmented board games

- Possibly virtually augmented Risk, Monopoly, etc.

Social media: Sharing your score

Possibly an augmented-reality pet (Tamagotchi-like, for example)

- Possibly exercising one's virtual pet by taking it for a walk.

Online shopping

Food recipes

- Taking a picture of various ingredients in a store and obtaining suggestions on recipes that use these.

A 'phone' fitting room in a store

- Use of AR as a tool for 'virtually' trying on the clothes in the shop and hence avoiding the queue for the fitting room.

A virtual fitting room

- Trying on clothes and spectacles with the aid of AR.

Products being placed virtually in their intended places

- Products purchased online that, with the aid of AR, can be virtually placed in the home for checking of how well they suit it.

Building and interior design

AR windows

- Instead of windows, a screen that presents interesting views.

Exterior materials for a house

- Illustration of how various exterior materials might influence the impression inside one's house.

3D animation of interior design

- Use of AR as a tool to simulate various objects – such as furniture or paintings – in one's home
- Possibly also use in combination with a 360° visualisation of a room.

3D simulation of a building

- With the aid of AR, the opportunity to view the home in a 3D app.

3D simulated lighting with the aid of AR

- Simulation of various lighting effects – with different positioning, colour, etc. – in the home with the aid of AR.

Simulation of sun directions with AR as part of a house-building project

- Visualisation of different directions of sun before a house-building project begins.

Garden instructions incorporating AR

- Viewing of various simulations of garden arrangements.

Speaker placement

- An AR-based guide for placing speakers in a room so as achieve optimal sound and also show how different speakers can fit in the room.

Presentation of structures that are hidden behind a wall

- Presentation of 'behind-the-wall' drawings of electrical cabling and the plumbing network in a house with the aid of AR.

Capture of AR pictures of a car

- AR as a tool to design customisations for a car on the basis of a picture taken of it in the street.

Learning

An augmented-reality printed textbook

- Print + digital offerings
- Exercises
- Quizzes
- Discussions
- A social layer
- Gamification.

Augmented-reality printed books

- Books for special groups of users
  - Users with learning disabilities
  - Children
  - Non-native users of the language
- Driving manuals
  - Interactive books on theory
  - Guides on how to drive in country X
- Pop-up books
  - Interactive books.

Tourism

Augmented travel information

Navigation through location-based techniques that allow, for example, an augmented historical overlay for a site or a building, where examples in this field include:

- Visualising a building and seeing what it looked like 100 years ago
- Visualising a site and seeing the building that was there 500 years ago

- Visualising a historical site (in this case, Þingvellir) and seeing the parliament of 1,000 years ago in session
- Visualising an architectural site in its original state and colours (in the example case, the Acropolis) etc.
- Allowing the user to adjust the number of years of going back in time.

The technique is based on the phone's ability to determine the direction in which it is pointing and, since it has a GPS-based locator, to locate the object in question. The distance between viewer and object may vary. Good use could be made of co-ordinates.

Additional information

- Connection to Wikipedia for further information
- Reading out the text for the user's convenience – in his or her own language
- Connection to Google for translation of signs and billboards.

An augmented tourist guide

- Seeing a painter at work or watching Einstein explain his theories (from old still photos or video material)
- Viewing X-rays of paintings and buildings
- Viewing the floor plan of the building in which one is standing, for better orientation.

Tourist-guide micro-payments

- Convenient payment for individual tours and activities
- A day planner.

Brand awareness

Use of shape recognition (a Coke bottle or barcode) to identify a product

AR with a social aspect

Consumers' loyalty to a brand, achieved by allowing them to vote for or comment on a given product (the user downloads an app from the store, sees the product, and visualises the voting, and others customers comment)

- Involving consumers by allowing them to vote on a new design or a logo
- Visualising an identified product in a shop and voting to indicate how much you like it
- Visualising testimonials for a product on a package and seeing the latest comments.

New ideas

An augmented newspaper

- Linking of documentary videos to news
- Linking in of audio/video of events
- Audio/video advertisements.

Augmented books

- 'Author comments' similar to a film director's comments on DVDs
- Ornithology books with sound/video.

Visualisation for learning

- Visualisations of anatomy, history, science, etc.

Visualisation of natural phenomena

- Viewing of a satellite image of a hurricane in print form and visualisation of how it evolves.

4.4 Conclusion

The innovation workshop highlighted areas in which further work could contribute to advanced use of augmented reality. Upon the conclusion of the initial brainstorming, the groups gathered and the industrial partners weighed the possibility of undertaking a pilot in which the ideas from the various categories could be subjected to testing.

Those from each country agreed to prepare piloting for one or more of the resulting categories. The next chapter, 'Experiences from the pilot work', provides further information on this matter.

4.5 References

Osterwalder, A., Pigneur, Y., & Smith, A. (2009). Business model generation (self-published). http://www.consulteam.be/media/5985/businessmodelgenerationpreview.pdf.

5. Experiences from the pilot work

The idea behind the Customer Perception of Augmented Reality (AR) in Media Applications – New Service Innovations project was to provide the publishers with fresh ideas for service development and to examine the possibilities for reshaping the magazines and newspapers advertising toolbox with the aid of AR applications. Hence, one of the project's objectives was to develop AR pilot applications.

Six media companies, representing the various Nordic countries, developed AR application pilots. The participants were Ineko (Sweden), *Reader's Digest* (Finland), Aller Media (Finland), Hvíta Húsið (Iceland), *Jyllands-Posten* (Denmark), and *Sunnmørsposten* (Norway).

For most of the participating media companies, the aim was to develop an app to increase the value of the media products for the customers. The piloting was also intended also to increase knowledge of how AR can be part of the companies' future business models.

For Ineko, which is a print-shop company, the goal was to investigate how AR can deliver added dimensions to the printed products. The company was interested also in looking at the opportunities to develop AR applications without making huge investments, through the aid of low-cost equipment such as mobile-phone cameras. Ineko used the platform from Aurasma, an AR technology development company that offers production tools for AR applications.

The *Reader's Digest* team developed an app for a marketing campaign for their advertising customers. The aim was to create an application that would be new, innovative, and therefore attractive. The Trusted Brands survey is one of the main tools of the *Reader's Digest*s advertising sales department and they wanted to highlight the top companies in that survey by offering them a new mobile application. They also hoped to give the winners the possibility of becoming forerunners and differentiating themselves from competitors. To this end, VTT developed the app for *Reader's Digest*, and the magazine then arranged a road show to demonstrate the new application and its potential to the advertising customers.

Finland's Aller Media has already built various AR applications and this project was a logical continuation of their existing portfolio. Their focus was finding out how users could benefit from AR, instead of focusing on developing a functional AR app. The benefits of AR were investigated by interviewing customers, judging their reactions to a specific conceptual AR model.

In a joint project with Visiolink, *Jyllands-Posten* developed a software plug-in for the existing native iOS app; this was called 'Jyllands-Posten E-avis'. The app offered additional material for readers and hence created added value for the printed product through AR. The company also wanted to gather knowledge of how to integrate AR into their existing production systems and how to make the AR initiative as easy as possible for their readers to work with and, hence, adopt.

Hvíta Húsið gathered knowledge on development of new and innovative consumer services for tourism. The idea stemmed from the capability a smartphone offers to point the lens at an object and display it with an overlay of other information – showing, for example, a scene or a monument as it looked 100 or even 1,000 years ago. This idea of employing overlays had previously been implemented in printed books aimed at providing tourist information on well-known places such as Rome. For presentation of the idea in the project discussed here, several historical photos were obtained from the Icelandic National Gallery, which holds archives containing old photographs of interesting places, and combine these with contemporary photos from the same spot. This provided satisfactory input for presentation of the idea. An experienced AR programmer concluded that a programming project for turning this idea into reality was feasible but would require both time and resources not available in the short timeframe of the AR project.

Sunnmørsposten co-operated with their customer Ålesund Bil to develop an app for advertising. The focus was on the production workflow, and the objective was to obtain knowledge of how much effort is needed to produce an AR app for advertisement use.

5.1 Results

5.1.1 The production workflow

Technology is a limiting factor for both producers and users of AR content, because of the 'lock-in' effect imposed by the production software; that is, one finds it necessary to use the same tools over time (as they are not interchangeable) if one wishes to ensure continued access to the AR content and also to maintain an efficient production system. Having access to enough bandwidth is critical for the access to AR functionality, and the current situation involving three, quite distinct, main operating systems in the mobile-phone market (Android, iOS, and Windows Phone 8) adds cost to the AR production processes, because a different set of development steps is needed for supporting each platform.

An important factor for the development and implementation of the AR apps was how they could be integrated with the current media production and distribution systems. This is important both from a production efficiency perspective and from the usability perspective.

In collaboration with Visiolink, *Jyllands-Posten* used a software plug-in to the existing native iOS app Jyllands-Posten E-avis in order to provide a cost-effective and user-friendly solution.

At *Sunnmørsposten*, the workflow – e.g., the capture of video content and its storage on the media server – was manageable within the normal deadlines, and, after some experimenting with various resolutions and video formats, the result is of satisfactory quality. The publishing of the AR content involved two steps: The first of these was production of a printed advertisement without any signs of the presence of AR. The next day, the advert was published again, this time with the information needed for the public to use the AR functionality. On the same day, *Sunnmørsposten* published an article about AR technology, its usage, and the AR project. The results were positive overall and the management team on the advertising customer's side too were very satisfied with the result.

5.1.2 Production costs and effectiveness of the AR apps

The costs to produce the pilots differed from one media company to the next, as they had different objectives for their work. Generally, the pilot project shows that it is possible to produce AR content without very large investments in production facilities. A good example of this is found in the Ineko pilots, wherein young students produced useful content with the aid of smartphones. Ineko carried out several pilot projects, with quite easy-to-use mechanisms that were appreciated by the customers. Two typical cases are Region Dalarna and the Falu Fria gymnasium. It is possible to produce AR apps even with amateur video, but the result depends greatly on the quality of the content. The above-mentioned pilots show that one can create interesting content wherein print media and digital media are combined into attractive products.

When the *Jyllands-Posten* AR app was launched for readers, its effect was tested. The first test results showed that during the test period there was a doubling of the usage of their important E-paper App. Usage peaked on 9 June, at 3,782 user sessions, as compared to fewer than 2,000 on a normal day. This indicates that an AR application of this nature is an effective way to raise attention.

The main cost items in the *Jyllands-Posten* project were:

- Design
- Integration of the AR software with the existing app
- Creation of back-end functionality for uploading the images that trigger the AR layers on top of the various editions of the newspaper
- Testing
- Submission.

The core software solution was the least expensive contributor to the total development cost.

Aller Media, who conducted interviews with potential AR users, received divergent responses. The respondents' opinion about this specific pilot app was that it provides no information that would not be accessible with other means, and there were doubts as to whether the technology would work properly, along with worries about information overload.

In summary, *Jyllands-posten*, *Reader's Digest*, *Sunnmørsposten*, and *Ineko* had a positive view of the effectiveness of the AR apps, while *Aller Media* remained more sceptical and *Hvíta Húsið* thought the idea was feasible but would require both time and resources not available in this limited project.

5.2 Conclusions

Reader's Digest found the piloting process very useful. The *Reader's Digest* team learned a great deal about new digital applications. They managed to create a new advertising sales product that has already opened doors for them among their existing customers along with potential future customers. Also, the fact that *Reader's Digest* is collaborating with VTT is viewed as an enhancement to the company's image and advances it to being a leading player in the market. Where follow-up projects are concerned, it is important to make software updates to the current AR pilot application in order to avoid a situation wherein the application needs to be rebuilt from the start.

Ineko found it difficult to draw a long-term conclusion about the efficiency of AR itself, but the clients involved in the pilot project were excited to be at the forefront of developments. In essence, Aurasma is an easy-to-use platform that offers many opportunities for creation of advanced 'auras' without requiring programming knowledge.

Aller Media concluded that it was a good idea not to focus on technical implementation as the first step and that they should instead ask the users about their responses first. They gained good insights into how they could use AR in their future product development. In the development of a commercial service, one must consider whether the benefits provided by AR are substantial enough, because the perceived benefits of the augmented reality in this experiment were not remarkable in comparison to other solutions.

Hvíta Húsið concluded that creation of the AR app is feasible, provided that companies in tourism and related industries (air carriers, car-rental dealers, hotels, etc.) are prepared to have a stake in the project.

Jyllands-Posten, who launched their pilot as a service for their newspaper customers, concluded that further research, experiments, and measurements are required before valid conclusions can be drawn.

They found that the following key findings emerged from the project:

- Investment in AR technology is not expensive
- The readers of print media are ready for AR
- Journalists are ready for AR
- Advertisers are not as ready for AR
- It should be kept simple but continuous.

Sunnmørsposten will continue the work with Ålesund Bil and other interested customers. They will also commence a preliminary project for organising the workflow for production that mixes traditional paper content and AR content.

6. Discussion

The findings from the various phases of the project support the claim that augmented-reality technology provides opportunities for print-media innovation. The report on the state of the art reviewed the theoretical concepts relevant for better understanding the business potential of augmented reality for print products and then presented a review of selected exemplary cases of augmented-reality implementation in the print-media industry. The examples presented show the use of augmented reality for augmented advertising, augmented informative content, geo-located augmented content, augmented special inserts, and collectibles.

As a recent survey of mobile augmented-reality applications (Olsson & Salo, 2011; see Section 2.5 References) shows, the field today remains rife with technological challenges, implementation problems, and consumer-acceptance issues. That said, AR applications for print products have potential to create value for the various stakeholder groups in all their diversity. The interactive print platforms that are now commercially available, such as Layar[25] and Crossfy[26], together with the work of AR application vendors, bring new opportunities for print magazines. Flash- and HTML5-based AR technologies remove the need to download the software applications, simplify the process of content creation, and can support AR interactions with multicoloured key characters. These circumstances show promise for the future of AR applications in the print-media industry.

The results from the empirical study of users' perception of AR indicate that, on the positive side, AR was perceived as being useful, beneficial, attractive, interesting, and fascinating, and as possessing the 'wow' factor. On the negative side, users perceived AR usage to be time-consuming, expensive, and a potential distraction from the print-media product. There is a clear need for standardisation of AR technology from a technical perspective, which can be seen with respect to SDKs, APIs, and universal AR-readers, and from a business perspective, in relation to design choices, advertisement types, and consumer value propositions.

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[25] http://www.wired.com/beyond_the_beyond/2012/06/augmented-reality-layar-reveals-their-print-strategy/.

[26] http://crossfy.com/.

The innovation workshop with the industry partners and researchers in academia generated 34 AR ideas, ranging from guides and manuals to games, shopping applications, design, uses in learning, and visualisation. There is consistency between the use of AR as documented by the study of the state of the art and the user-perception study in terms of categories of use and innovation of business processes and for print products. For future projects, adopting a participatory design method such as a 'future workshop' (Kensing & Madsen, 1991)[27] could be useful.

Results from the pilot projects undertaken by industry partners show not only the realisation of the value propositions in terms of enhanced digital user experience, personalised content, and effective targeting of advertisements but also the challenges of working with a somewhat immature technological infrastructure and a complex business ecosystem.

Empirical studies of the pilot AR applications were beyond the scope of this project but could have provided validation of the consumer acceptance and an understanding of the consumer experience with the service innovations implemented.

[27] Kensing, F. & Madsen, K.H. (1991). Generating visions: Future workshops and metaphorical design. In: Design at Work: Cooperative Design of Computer Systems. Pp. 155–168.

7. Conclusions and recommendations

The main goal of the project was to illuminate and clarify the customers' perception of AR technology in a magazine and newspaper context and to use the information as input to service development. From the focus-group interviews and Q-sort formulae, it has been possible to gather qualitative information that formed the basis for the creative workshop. The project brought forth more than 20 new ideas from the workshop, whose participants included both partners in academia and industry partners. The industry partners developed these ideas into pilots that were presented at the project's final seminar, on AR applications. The pilots have contributed to establishment of a dialogue between the publishers / marketing companies and the brand-owners. All partners who have been able to publish their pilot in collaboration with a customer seem to have established curiosity and interest in continuing to work with AR. The project thus has provided examples of how traditional print media can be transformed into interactive products. The process of producing pilots has shown that both systems with dedicated programming, and generic systems such as Layar could create the foundation for a sustainable workflow. All but one of the companies felt comfortable with the results.

The industry partners seemed to find inspiration in the project: they were inspired by ideas from the workshop, established a focus on AR within the company, found that the project provided useful background information, or used the ideas as a way to 'get a foot in the door' for opening a dialogue with the print-field companies.

As an avenue for further work, one could look more thoroughly into obtaining information from the users, to gauge their opinion of the pilot work carried out in the project. This could be done by means of interviews, through gaze recognition, and/or with the use of EEG studies.

The business side of AR has not been touched upon in the project described here. It is, of course, important to undertake further work on development of the AR ecosystem, addressing how to add value for the customer and at the same time make more money through AR technology.

Appendix A: Factor loadings for the Nordic statements

Table A1. Factor loadings for the Nordic statements.

	Factor loading				
Person	1	2	3	4	5
1	0.40795X	0.07958	0.05719	0.27234	0.21980
5	0.84586X	0.42140	0.03331	-0.02429	0.08222
10	0.57843X	0.45146	0.05332	-0.01131	0.10601
11	0.67633X	0.30425	0.01384	-0.12721	0.35621
17	0.75038X	0.46630	0.08077	0.14820	0.07593
18	0.64337X	0.41221	0.06439	0.07807	0.28562
19	0.83108X	0.23078	0.06621	0.26596	-0.00529
20	0.60132X	0.29827	0.02515	-0.06895	0.19431
13	0.61659	0.56173	0.07156	0.07657	0.30901
15	0.59457	0.37803	0.09471	0.42545	0.26141
27	0.50150X	0.09717	-0.04394	-0.17828	-0.10757
30	0.63191X	0.19288	0.09194	0.39695	0.03036
31	0.75918X	0.19896	0.00980	-0.00446	0.20262
32	0.71078X	0.10152	0.05652	0.23101	0.36303
35	0.72934X	0.06617	0.03436	0.21617	0.01395
36	0.78537X	-0.07242	0.00856	0.30207	-0.17178
37	0.76386X	0.07090	0.02507	0.18244	0.06409
40	0.71285X	0.24270	0.06858	0.20270	0.38019
38	0.58511	0.16543	0.07404	0.32660	0.51602
42	0.71540X	0.12684	0.01652	0.11253	-0.07819
43	0.64262X	0.03977	0.06641	0.31741	0.40181
44	0.66138X	0.35382	0.07054	0.16373	-0.03675
45	0.69607X	0.32534	-0.00317	-0.17284	0.16231
46	0.63453X	0.23150	0.04995	0.13921	-0.05915
47	0.62087X	0.30813	0.04963	0.04650	0.33951
49	0.83772X	-0.03597	-0.05589	0.06617	0.01967
50	0.73810X	-0.10580	-0.05761	0.00658	0.20920
51	0.75329X	0.12289	-0.02304	-0.09786	0.35801
53	0.44222X	0.30839	0.03821	-0.00704	0.29026
54	0.86078X	-0.07782	-0.13146	-0.11491	0.17836

55	0.82409X	0.06355	0.03381	0.19990	0.32018
57	0.48848X	-0.27383	-0.02407	0.08466	0.35144
3	0.43619	0.72564X	0.04227	-0.08259	0.30604
4	0.30180	0.53566X	0.03496	0.36990	0.19241
7	0.17062	0.62540X	0.01741	0.38773	-0.13511
8	0.09211	0.54624X	-0.02279	0.03375	0.41558
9	0.15574	0.73742X	0.02093	-0.12037	-0.17658
21	-0.03368	0.51426X	-0.04341	0.32484	0.05100
23	0.22724	0.64229X	0.00022	0.32016	0.22929
25	0.21151	0.72796X	-0.00395	0.29756	0.11698
22	0.33101	0.41258	0.07556	0.39690	-0.18901
48	0.11439	0.45167X	-0.00189	0.25175	0.23678
52	-0.01885	0.32971	-0.00205	0.12591	0.04014
2	-0.20003	0.36087	-0.12390	0.57188X	0.10345
14	0.34272	0.16631	0.08045	0.58232X	0.00649
24	0.22355	0.12729	0.07443	0.51196X	-0.28301
26	0.31876	0.43170	0.03448	0.43974	0.34124
28	-0.21949	0.14383	-0.06954	0.62419X	-0.01600
29	0.27236	-0.06472	0.05600	0.39594X	0.11394
33	0.07392	0.23596	-0.03810	0.56843X	0.49861
56	-0.02896	0.10949	-0.00265	0.47068X	0.13414
6	0.26098	0.24670	0.02275	0.01976	0.40609X
12	0.07576	0.13227	-0.02060	-0.11266	0.72811X
16	0.15072	0.25158	0.01291	0.25779	0.39844X
34	0.20863	0.33340	-0.00463	0.45769	0.55149
39	0.45021	0.28446	0.06464	0.39411	0.46457
41	0.02053	-0.05584	-0.00433	0.04233	0.35082

Table A2. Factor scores for each group, 25 Nordic statements.

		Factor score/group			
No.	Statement	1	2	4	5
1	Using AR with webcam is too complicated. With a phone, it's ok.	2	5	5	6
2	I don't understand how it works, it's too complicated. I don't want to try.	1	3	2	3
3	AR is not surprising. I've already seen things like this before.	4	4	5	2
4	I wouldn't have time to use AR.	2	6	4	5
5	The threshold for using AR is too high; you have to find it, then install it, and after that you are able use the application. You must have a strong motivation to do this.	3	7	9	7
6	There is a risk that AR apps in a magazine will cause a focus shift and that the reader stays in the mobile phone after using the apps and doesn't come back to printed magazine.	4	4	7	4
7	AR needs to give added value to the readers of print media to be interesting for the publisher.	5	5	6	5
8	AR gives print media the potential of interactivity which is a clear benefit.	7	4	6	7
9	AR will be popular in the near future.	6	8	3	8
10	I want to use AR to familiarize myself with products that I am not already familiar with.	6	5	4	2
11	Seeing an object through AR, it's good in store when you can neither see the object nor open the box.	6	9	5	4
12	One would use AR more, if the applications were accessible through screens inside stores.	5	7	3	7
13	It's playful and funny.	8	6	6	4
14	One needs to be able to touch the product.	4	3	7	5
15	In the future AR would help consumer to see something concrete already in its planning stage (for example in interior design).	8	8	8	5
16	AR would be helpful in assembly and installation application areas.	5	6	6	5
17	AR is a great possibility for innovation; we have not seen the best ideas yet.	9	7	8	8
18	Seeing a product through AR is not enough to make me buy it.	4	3	7	6
19	Some articles are not commonly sold in web shops because consumer needs to try them on. If one could "try on" an article with AR, this could increase sale of those articles.	6	4	5	4
20	The combination of AR and social media would strengthen the effect of an ad.	7	6	4	9

21	I like the way AR can be used to tell stories: it makes me interested because it stimulates a variety of senses.	7	5	4	6
22	AR is not a problem solver for print media but may increase consumers' interests towards magazines	5	5	5	3
23	AR application must involve all senses before I would use it for purchasing on the web.	3	2	2	6
24	Everyone is able to use AR.	5	1	1	3
25	AR is too expensive for me.	3	2	3	1

Appendix B: Factor loadings for the 24 statements

Table B1. Factor loadings for 24 statements.

	Factor loading				
Person	1	2	3	4	5
2	0.69037X	-0.12389	0.19608	-0.02984	0.17091
4	0.76451X	-0.07609	0.25622	-0.00220	0.21818
7	0.83223X	0.08558	0.05461	-0.04758	-0.07174
9	0.70770X	0.14563	0.19014	0.05171	0.15678
10	0.62713X	-0.03387	0.33850	0.03067	0.22701
11	0.88339X	0.12725	0.11438	0.01742	0.19806
14	0.64577X	0.04078	0.03553	-0.01644	0.06641
17	0.64773X	0.02293	0.10939	0.01805	0.29404
18	0.62254X	-0.03449	0.43792	0.03765	-0.03654
19	0.73738X	0.16391	0.11922	0.02547	0.06303
20	0.62836X	0.09941	0.37978	0.07294	0.27627
22	0.62739X	0.08133	0.53369	0.07269	0.24894
25	0.67688X	0.14657	0.54820	0.09403	0.07050
30	0.55569X	-0.19700	0.00900	-0.07835	0.38685
31	0.76624X	-0.04318	0.14517	-0.00777	0.28409
33	0.42576X	0.08677	0.15521	0.04539	0.21743
35	0.70685X	0.17595	0.02420	0.03936	0.36088
36	0.68870X	0.20598	0.15099	0.03758	0.00287
37	0.80848X	0.24490	-0.00641	0.03081	0.33184
38	0.73548X	-0.01956	-0.00557	-0.03948	0.23629
39	0.82613X	0.30577	0.19753	0.07877	0.23480
40	0.81937X	0.21668	0.28896	0.08897	0.29121
41	0.78539X	0.19114	0.06991	0.04903	0.37475
43	0.71174X	0.33957	0.05117	0.02702	0.06688
44	0.71763X	0.03632	0.33174	0.05156	0.23165
45	0.57992X	-0.19021	0.29025	-0.03764	0.21460
46	0.75940X	0.07918	-0.02524	-0.07116	-0.08530
47	0.62141X	-0.09323	0.31352	0.00600	0.30024

48	0.68619X	0.34527	0.25639	0.10352	0.37076
50	0.79159X	0.29255	0.15389	0.03394	-0.03170
51	0.63825X	-0.09687	0.20534	-0.00653	0.48005
53	0.81650X	0.14255	-0.00612	0.01799	0.39654
55	0.81255X	0.25906	0.20058	0.07910	0.28275
56	0.76931X	0.00665	0.07486	-0.00724	0.27854
58	0.59116X	0.18475	-0.18645	-0.02811	0.22712
59	0.77226X	0.27635	0.22602	0.09167	0.34045
5	0.45673	-0.05359	0.10649	0.00498	0.44231
6	0.46482	0.38393	0.19711	0.08136	0.22770
27	0.56625	-0.11344	0.37112	-0.00609	0.44727
54	0.55731	0.49672	0.17490	0.08291	0.30261
3	0.22206	0.51742X	0.46180	0.05104	0.02194
34	-0.03140	0.51615X	-0.06143	-0.00391	0.09967
52	-0.04748	0.73834X	0.30415	-0.05413	0.06658
57	0.14722	0.50061X	-0.04182	-0.00057	-0.00044
1	0.43952	0.45148	0.33088	0.05782	-0.23557
8	0.49784	-0.21747	0.62585X	-0.04244	0.11780
21	0.01269	0.06313	0.63001X	-0.00620	0.03261
24	-0.03208	0.03841	0.71913X	-0.08130	0.25767
26	0.29942	0.30041	0.59394X	0.05816	0.25908
13	0.44780	0.21435	0.47769	0.08608	0.11953
16	0.27370	0.26674	0.35255	0.06917	0.33175
15	0.30565	-0.27118	0.21776	-0.10237	0.59201X
23	0.32006	-0.11576	0.15378	-0.02461	0.62020X
29	-0.28542	0.28626	0.16884	-0.03539	0.66762X
32	0.28308	0.07259	0.18564	0.04088	0.45156X
49	0.10232	0.16440	0.12243	0.03141	0.70115X
12	0.23296	0.10218	-0.35211	-0.02537	0.43165
28	0.20050	0.15821	0.10619	0.05023	0.39315
42	0.16716	0.32939	-0.14027	0.03822	0.39926

Table B2. Factor scores for each group, 24 statements.

		Factor score/group			
No.	Statement	1	2	3	5
1	Using AR with webcam is too complicated. With a phone, it's ok.	4	2	5	7
2	I don't understand how it works, it's too complicated. I don't want to try.	1	3	3	1
3	AR is not surprising. I've already seen things like this before.	3	2	5	4
4	The wow-effect will not last long.	4	5	6	4
5	It doesn't make sense, it's absolutely useless.	1	1	2	1
6	It's better to go into stores than to live behind your screen and try things with AR.	4	6	4	5
7	I would use AR only as an exception, if I hadn't a second to spare to go into a store.	3	3	5	5
8	It is not interesting in order to see real objects, but to visualize how some situations could evolve (our physical appearance, a location, an illness…)	3	5	6	6
9	It's good only to draw attention.	3	4	1	7
10	It's not for me, but for people who already know this technology very well.	2	4	4	4
11	Seeing an object through AR, it's good in store when you can neither see the object nor open the box.	6	5	6	4
12	Seeing products through AR saves time. It's quicker than searching for the products in a store and trying them on.	5	1	4	5
13	It's playful and funny.	6	4	7	6
14	One needs to be able to touch the product.	4	6	4	2
15	When pre-visualizing a product through AR at home, one lacks the pleasure of going into a store as well as the advice of the salesperson.	4	7	2	2
16	Using AR to visualize a product is stupid; because one cannot be sure it will look like this in reality.	2	4	3	3
17	AR is interesting for people who order on the Internet.	6	7	7	6
18	Seeing a product through AR is not enough to make me buy it.	4	4	3	3
19	It's good because it allows you to have pictures of yourself with the product you can share on the Internet.	5	3	1	5
20	It's interesting mainly to discover a product one did not know at all.	5	5	3	4
21	It's interesting because you can see yourself with the product on scale.	7	3	5	3

22	AR is good only when it actively involves us in the demonstration and the trying of the product.	5	2	2	2
23	AR can be good to first see a product and then go into a store: it prepares the act of buying.	7	6	4	4
24	It‘s not necessary, I don‘t really need it.	2	4	4	3

Appendix C: Summary of the focus-group work

Table C1. Summary of the focus-group work in the Nordic countries.

Summary of AR focus-group conclusions	FI	SE	IS	NO
Discussion of *benefits* and *motivation*	FI			
Ease of access and ease of use	FI			
Encompassing of *complex* information as well as *leisure*	FI	SE	IS	
Application attractiveness, interest, the *'wow' factor*, and *fascination*	FI	SE	IS	NO
Future enhancement of other senses, incl. *odour* or *tactile* properties	FI			
Target group: men or adolescents	FI			
Price as an obstacle, *expense*, and being a *time-consuming approach*	FI	SE		NO
Increased trust in the product because there is more *information*	FI		IS	NO
The desire to *download* an application only *once*	FI			
Benefits for printed media as vital		SE		NO
Inclusion of a *virtual* concept in the definition		SE		
Comparison of AR and QR: AR as inferior or fully replacing *QR*		SE		NO
2D modelling in addition to 3D modelling		SE		
AR as about *picture* analysis and picture recognition		SE		
Absence of a *standard* for AR apps	FI	SE	IS	NO
AR applications being *integrated* into the phone *hardware*(!)	FI	SE		
The need for AR technology to be *simpler* to use	FI	SE		
AR's *hype* effect – the possibility of it being a short-lived gimmick		SE	IS	
Not being a major solution to current problems in *print media*		SE		NO
The implication of a possible *focus shift* from print to mobile phones		SE		
Complicated handling of apps		SE		NO
Value to consumers	FI	SE	IS	NO
Interactivity as a clear benefit		SE		NO
The need for more *involvement* than *printed* matter demands		SE		NO
The possibility of AR being a natural *extension* of *printing*		SE		NO
Increased effects of *adverts*	FI	SE		NO
A *new channel* of consumer–manufacturer *communication*			IS	

Something suitable only for *experienced* smartphone-users			IS	
High *connectivity* costs			IS	
Future *development* – use cases and various ideas			IS	NO
Easier gathering of *information*			IS	
Increased *IT integration*			IS	
That smartphone always being *close at hand* anyway			IS	
The *virtual–real mix* as something that looks good but is a bit *unrealistic*			IS	
High *development* costs		SE	IS	NO
Benefits to both buyer and seller	FI	SE	IS	NO
Saved time and increased consumer comfort			IS	
Ease of *locating* the product			IS	
Reduction in the number of trips to the store			IS	NO
Children, teens, and savvy males as *target* groups			IS	
Increased *consumer connection* to the brand			IS	NO
Need for ***understanding*** of technology				NO
Use of ***multiple senses***	FI			NO
An impact through combination of the real, digital, and social world				NO
Visualisation of what cannot be seen	FI			NO
Pull communication and their possibilities				NO
Creation of ***need for a new business model***				NO

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Title	**Novel AR solutions in media** **Customer perception of augmented reality in media applications – possibilities for new service innovations**
Author(s)	Aino Mensonen, Christian Persson, Terje Stafseng, Ravi Vatrapu & Örn Kaldalons
Abstract	A project titled 'Customer Perception of Augmented Reality (AR) in Media Applications – Possibilities for New Service Innovations' was carried out, with participants from all of the Nordic countries. The project addressed the fact that the magazine and newspaper business is set to change dramatically as printed products encounter two specific challenges: a) increasing competition from other media and b) changes in media-consumption habits caused by growth in the use of smartphones and tablets, such as instant access and digital delivery. The changing market environment for print-media products also opens new opportunities for using technologies such as AR to create innovative applications and hence add business value. To investigate the opportunities for service development within this area, we conducted a study of the state of the art to review the theoretical concepts relevant for better understanding of the macro-level societal trends and business potential of augmented reality for print products. Selected cases of augmented reality for print products were then presented. The next phase of the project consisted of a Nordic empirical study of user perceptions of AR applications. Focus-group interviews were used to collect participants' statements about the use of AR technology. These statements were then ranked by means of the Q-sort method. Factor-analysis methods were applied with the objective of understanding the similarities among participants' answers. The results indicated that AR was seen as useful, beneficial, attractive, interesting, and fascinating and as possessing the 'wow' factor. Some considered AR's usage time-consuming, while others deemed it time-saving. Another finding is that standards seems to be lacking both for the user interface and on the business-handling side. Participants saw AR as offering great possibility for innovation. People would like to try the applications, and they would indeed find time for using them. Expectations set for AR applications are high. Stemming from the interview and Q-sort, an innovation workshop was organized for the 19 industrial and academic partners of the project. The brain storming session aimed at producing new innovative service concept ideas of AR in printed media. Thirty four different ideas were generated in the workshop. The industrial partners were encouraged to select one idea for further development and produce a pilot. The pilots as well as the development process and experiences where presented as a part of the end seminar.
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Nimeke	**Uusia AR-ratkaisuja media-alalle** **Käyttäjien suhtautuminen lisätyn todellisuuden palveluihin – uusien palveluinnovaatioiden mahdollisuudet**
Tekijä(t)	Aino Mensonen, Christian Persson, Terje Stafseng, Ravi Vatrapu & Örn Kaldalons
Tiivistelmä	Projekti “Customer Perception of Augmented Reality (AR) in Media Applications – Possibilities for New Service Innovations” tehtiin pohjoismaisessa yhteistyössä. Aikakaus- ja sanomalehtibisnes on murroksessa. Painetun median haasteina ovat a) koveneva kilpailu muiden medioiden kanssa ja b) kuluttajien muuttuvat tavat tavat kuluttaa mediaa. Muuttuva markkinaympäristö mahdollistaa teknologian, kuten AR:n, hyödyntämisen, kun luodaan uudenlaisia tuotteita ja palveluita, jotka lisäävät tuotteen arvoa niin käyttäjän kuin liiketoiminnan näkökulmasta. Selvittääksemme palvelukehityksen mahdollisuudet teimme SoA-katsauksen, johon keräsimme painetun median AR sovellusalueet. Seuraavassa vaiheessa teimme kaikki Pohjoismaat kattavan kuluttajatutkimuksen, jossa kartoitimme kuluttajien suhtautumista lisätyn todellisuuden palveluihin. Kuluttajatutkimuksessa kerättiin focus-ryhmähaastatteluin väittämiä, joita testattiin q-sort-menetelmällä. Tuloksista kävi ilmi, että AR nähdään hyödyllisenä, kiehtovana, kiinnostavana ja se saa aikaan WOW-efektin käyttäjässä. Jotkut näkivät AR:n säästävän aikaa, toiset vievän sitä. Standardien puute nousi esiin keskusteluissa. AR:llä on kuluttajien mielestä paljon mahdollisuuksia innovaation saralla. Kuluttajat haluavat kokeilla AR-sovelluksia, ja he olisivat valmiita käyttämään siihen aikaa. Odotukset kuluttajien suunnalta ovat korkealla. Kuluttajatutkimuksen tuloksiin pohjautuen järjestimme työpajan, johon osallistui 19 yritys- ja tutkimusedustajaa. Työpajassa ideoitiin palvelukonsepteja. Yhteensä 34 ideaa kirjattiin ja näistä yrityksiä kannustettiin viemään omaa yritystä kiinnostavaa ideaa eteenpäin pilotointivaiheessa. Pilotoinnin tulokset ja siitä kertyneet kokemukset esiteltiin osana projektin loppuseminaaria.
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Avainsanat	Augmented reality, users, new services, media
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Novel AR solutions in media

Customer perception of augmented reality in media applications – possibilities for new service innovations

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