

The Impact of Technological Development on the use of Technical Product Documentation.

A Multimethod-Multisource Approach to Identify Customers' Communication Behavior and the Implications on new Requirements for Virtual Support Systems.

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Abstract—Late technological developments show strong impacts on customers' communication behavior. While only years ago customers perused printed manuals in case of technical problems, they now request new ways for support. It is of crucial importance for businesses to identify these changes in communication behavior and to adopt their support offers to match customers' expectations. This paper utilizes a multimethod-multisource approach to give insights into the new importance of technical documentation as link between customer support and product marketing. After indicating the ongoing change in media consumption, creators of technical documentations as well as product users are analyzed regarding the usage scenarios of technical product documentation. Finally, major implications for businesses are built on customers' changed requirements of virtual support systems.

Keywords—technical documentation; product support; communication behavior; customer support systems; technological development

I. INTRODUCTION

Consequences of late developments in the areas of information and telecommunication systems are still taking place in various application fields. Technical communication [1] in form of different kinds of documentations and manuals plays a major role for the adoption of new products and is thereby strongly influenced by these technical developments [2]. While only years ago every newly acquired product obtaining some level of technical complexity (like the consumer electronics industry) required bulky manuals, hence product enclosures only aim to support customers by guiding them through first installation processes. Especially in the software industry these changes can conspicuously be observed. Product packaging for software like image processing applications or operating systems contained often one or two CDs as carrier medium but required thousands of sites of printed manuals resulting to boxes with several ponds of weight [3]. Thanks to digitalized content and developments in product usability, modern software products require far less printed documents or no need for printed manuals is given any more at all. In other branches like the automobile industry these potentials are not fully released yet. Still many car manufacturers deliver their vehicles with a set of diverse and impersonalized booklets and manuals,

consisting of sections referencing extras and features that are not even integrated in the specific car. So how do developments in information technology affect technical documentation and how will businesses have to react on those changes?

A. Marketing aspects of technical documentation

Technical communication includes both company-internal as well as external information regarding the product. Technical documentation is defined as the pool of information that is specifically handed to the user [4]. From a customer's point of view any kind of documentation fulfills one single need: to gather the relevant information required with as little afford as possible [5]. Thereby two main triggers for the demand of support can be spotted. First, in an early phase within the product lifecycle support to learn how to handle the product is required. Later on this changes to more problem-orientated support scenarios when product failures are to overcome. While customers therefore only notice the functional aspects of product support, businesses have to consider every touch point with its' customers from a marketing point of view as well [6]. The importance of customer support is already acknowledged in marketing literature, determining forms of product accompanying documents as instruments of marketing [4]. By the ongoing transition from classic printed documents to alternative digitalized variants companies are forced to adopt their format of customer and product support. It is of crucial importance to not only offer up-to-date products but also adequate support for existing as well as potential future customers. The structure of the paper is described in the following section.

II. RESEARCH GAP AND METHODOLOGY

The increasing importance of technical documentation for marketing purposes forces businesses to react according to their customers' changes in communication behavior. Businesses have to identify the new roles of communication technologies for customers and how they utilize these technologies. Thereby businesses gain the opportunity to adopt their marketing communication activities in an appropriate way to offer relevant information wherever and however the customer expects the information. This paper contributes to an ongoing research project regarding new marketing potentials in modern customer support by the

utilization of state-of-the-art application of information systems. The paper plays a crucial role within this research process as one key question relates to the change in users' communication behavior. Only by the identification and adaption of customers' communication behavior in support cases are businesses enabled to build adequate information systems. We therefore analyze the impact of new communication technologies to allow implications on how customers expect businesses to place their support mechanism.

To assure relevant as well as rigorous implications a mixed methods research approach was chosen. By utilizing a variety of research methods (multisource and multimethod) a higher quality on an evidence of results is given [7].

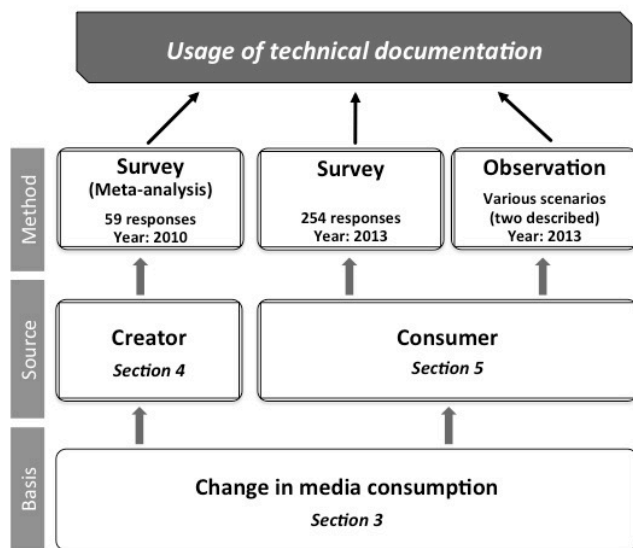


Figure 1. Research methodology

Figure 1 shows the applied research methodology. The basis for all changes in communication behavior lies in the adoption of new technologies. Section 3 focuses on these developments by a detailed analysis of relevant indicators for the last years. In section 4, insights on how the usage of technical documentation is developing from the perspective of content creators is given by applying a meta-analysis of a survey that was conducted in 2010. As the main focus of a study on customer behavior is the customer himself the fifth section focuses on statements and observations regarding the user. Results of an online survey are presented to show customer opinions as well as a research observation was performed to allow a comparison between customers' statements and their actual behavior.

III. TECHNOLOGY AS ENABLER

Developments in technology build the foundation for changes in customers' usage behavior. Therefore it is of relevance to monitor and build awareness for such developments as only by analyzing these data and indicators trends can be identified. In cases of technology monitoring it

is of high importance not only to highlight current statistics directly related to a specific topic but also to include close-by areas. This allows a more holistic view and the implication of tendencies, which may impact a specific field of interest. Some of the analyzed data shows therefore no direct relation to technical documentation, but by the holistic view on these studies implications for further developments in the concrete field can be given.

A. Customers are online and mobile

The most influential transition in the last decades was the rise of the Internet. As more and more people gather their information online or use the Internet in its many other ways, businesses are expected to be reachable in the web. While in the year 2000 less than 400 Million people were online this number increased to around 2.5 Billion in 2012 [8]. As an example in Germany more than 76% of all age groups are online in 2013 [9]. Besides the rise in online rates also the medium to get online is of importance for content providers. The worldwide traffic caused by mobile devices increased from 6,25% in the end of 2010 to more than 23% in the last quarter of 2012 [10]. Smartphones and tablet computers are becoming more and more popular for daily online routines, with leads to about 70% Germans using their smartphone to access the Internet on a daily basis [11].

B. Changes in media consumption

These developments caused by the pervasion of the Internet had tremendous impacts on various business models. Especially business models dealing with reproducible digital data had to be adopted. The music as well as the movie industry was directly affected but also the television and radio market is still changing. All forms of printed newspapers, magazines, books and of course manuals exist in some kind of duality between an online and an offline version. Depending on the target group these changes seem more or less dramatically. Results of the ARD/ZDF Longtime Study on Mass-communication [12] allow two different propositions. First, more different ways to consume media emerge, and secondly the usage behavior is highly dependent on the age.

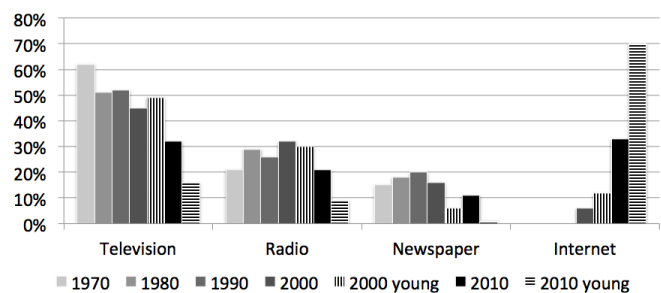


Figure 2. Change in media consumption [Q9]

Figure 2 shows results of this study. A transition of media consumption from the three classic forms of TV,

radio and newspapers to online content can be determined. More interesting is the separation in overall and young survey participants as these numbers show that younger customers are mainly reachable by online channels.

C. Social communities are still growing

Again the Longtime Study on Mass-communication [12] gives detailed insights on how people use the Internet. Besides typical leisure activities like watching videos or sharing photos also functional aspects are still relevant. In fact gathering information and gaining knowledge is the most utilized private usage scenario with Wikipedia and various forms of online communities at highest ranks. Especially social networks like Facebook play a major role for most Internet users. Regardless if a company decides to utilize such networks for marketing purposes, customers do communicate product-related issues in the public. The traditional thinking in sender and recipients becomes obsolete due to social interactivity between users. Communication Space models [13] better describe these settings where companies lose some kind of control regarding their communicated messages. Improper support may therefore directly influence potential customers on their decision as existing customers state their experienced treatments. Hence, every company-performed action may initiate a new reaction, which could get communicated to the public.

D. Merging physical and virtual world

The last significant change affecting technical documentation and product support from a technological point of view is the merging between the physical and the virtual world. Technologies start from simple Quick-Response (QR) Codes, where an image is scanned and interpreted to perform an action, to radio-frequency technologies like Near-Field-Communication (NFC). While research often focuses on the technical differences between QR-codes and the NFC technology the latter allows much wider fields of potential applications. Active two-way communication could enable display-less products to transport messages or status codes to smartphones where an output could then be displayed. Products showing error-codes where the user has to look up the meaning of the code would be simplified in many ways. In 2015, more than 250 Million smartphones integrating the NFC technology will be sold leading to more than 25% of all sell-through smartphones [14].

Augmented Reality as one of the most advanced fields of application allows a direct merging of both worlds on the device's display by adding an additional layer on top of the camera's output. Thereby the display not only shows a live picture on what the camera is filming but also identifies specified objects or schemas and shows some extra information regarding these elements. Hence, for technical documentation this merging is of high interest, as many physical products without displays require manuals in form

of virtual contents such as text or video instructions. By utilizing a bridging technology users would be able to receive context-sensitive information depending on the product version or support situation.

IV. WRITERS AS CREATORS OF TECHNICAL DOCUMENTATION

Developments and numbers in the last section are gathered by various research institutions and organizations and represent facts in technical and societal incidents. To allow feasible implications for technical documentation also opinions of experts in the area seem beneficial. A study on technical documentation by Broda [15] in 2010 analyzed survey answers of experts and technical writers. Technical writers create all forms of technical documents, for company-internal usage as well as for customer usage.

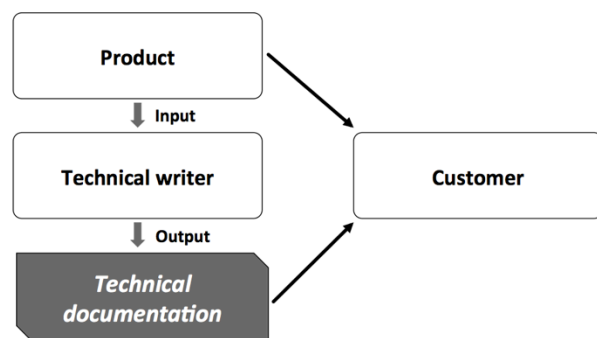


Figure 3. The role of technical writers

Figure 3 shows the important role of technical writers as they take the product as an input to produce various forms of technical documents as an output. Technical writing is therefore associated to the scientific field of translation science as writers translate product features into customer-orientated manuals. As already mentioned in the first section technical documentation is gaining importance in the field of marketing because such manuals directly transport company information to the customer. Technical writers therefore are more and more required to closely interact with marketing personnel or are even organized within the marketing department itself.

A. Results

Broda received 59 entirely filled out questionnaires. 10 out of the 59 were entitled as experts in the field of technical documentation, 49 were service providers for technical documentation. Another 13 service providers did not finish the survey and are therefore marked as incomplete. The survey took place in Germany from August to September 2010. The study focused on aspects of technical documentation in mobile environments as on smartphones or tablet computers. Overall practitioner gave more skeptic answers than experts, which leads to the assumption that current limitations also occur at the level of the creation of documentation. Typical limitations of surveys have to be

considered such as bias effects. While experts may answer in a more general context, answers from service providers directly relate to their work. Two main results can be highlighted: there are obstacles to overcome for new technologies entering the technical documentation market and the content representation is expected to depend on the usage intention.

B. Obstacles to overcome for new technologies

Participants were asked to list the three main reasons why printed standard documentation will not vanish in the next years. 40 participants voted with “legal issues” as top answer (see Figure 4). Highly restricted countries like Germany or Austria still require some kind of printed and product-accompanying form of documentation. The second most significant reason is the availability of documents. While printed manuals are in physical possession of the customer and can be attached in cases of reselling, participants worry about these aspects for digital versions.

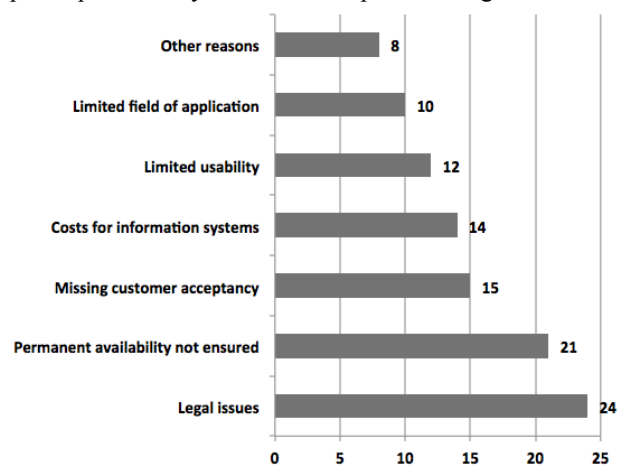


Figure 4. Obstacles to overcome for new technologies

C. Adequate application of content representation

Secondly, the study gives also insights on how content could be represented for different usage scenarios of product support. This information is especially beneficial as the participants are the most significant target group for such a complex question. Experts as well as practitioners both have knowledge on the advantages and disadvantages of these representation forms and are therefore empowered to match both entities.

Unsurprisingly of low relevance are audio representations, with the classic text and pictures at the very top as Figure 5 shows (ratings between 0 and 5). Augmented Reality is expected to be beneficial in total but especially for maintenance activities. Screen casts are an example for a very diverse form of information representation. While suitable for teaching materials there is no, match for more product-related content.

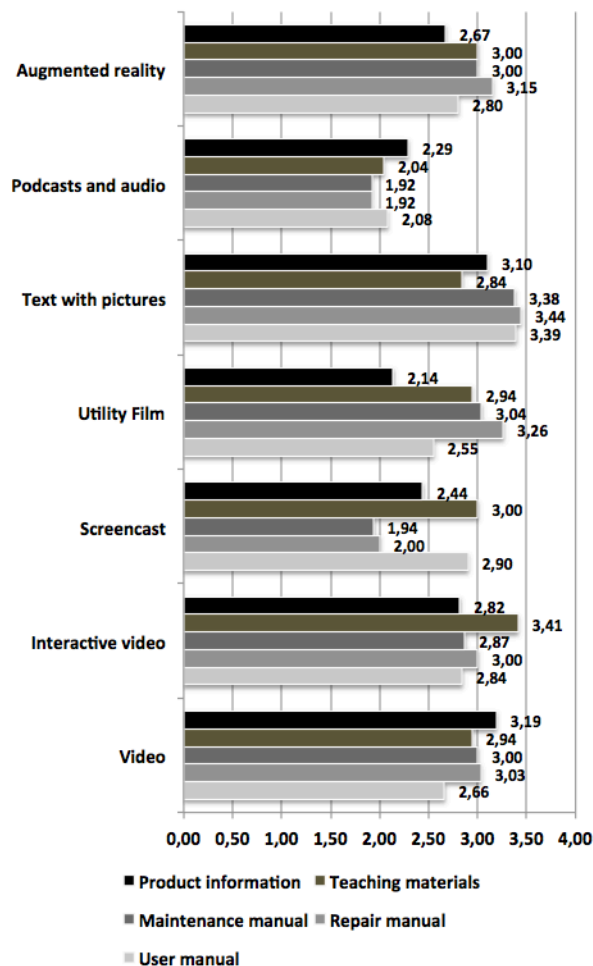


Figure 5. Forms of documentation and suggested content representation

V. USING TECHNICAL DOCUMENTATION

Even more important than content creators are opinions of actual users. Therefore, an online survey was conducted to identify current usage behaviors related to technical documentation as well as to get impressions on customers’ attitude on professional product support. Like in other social science research methods also participants of surveys intend to naturally bias their answers. To allow the forming of implications from a customer behavior analysis a multimethod approach was undertaken. Parallel to the survey a method to detect the actual behavior in form of an observation was required. Google Trends [16] as a feature of the worlds most popular search engine Google allows the comparison of different search terms. By utilizing this tool an observation on how users perform their search in problem situation was conducted. The combination of both research methods pictures a change in communication behavior.

A. Survey results

The survey took place in Austria with a total response of 254 questionnaires. Average age was 25.7 years (standard

deviation 7.64) with 71% female and 29% male participation. Results for this research paper are grouped into three categories: (1) dependence of used support method on product type, (2) online search behavior and (3) obstacles for online support systems.

1) *Dependence of used support method on product type*

Results in Figure 6 highlight that the type of product (software or non-software) strongly influences the utilization of support methods. While in the software industry help systems can easily be integrated within the product, non-software product may not facilitate such mechanism. The media format discontinuity for using online support systems on physical products plays a major role here.

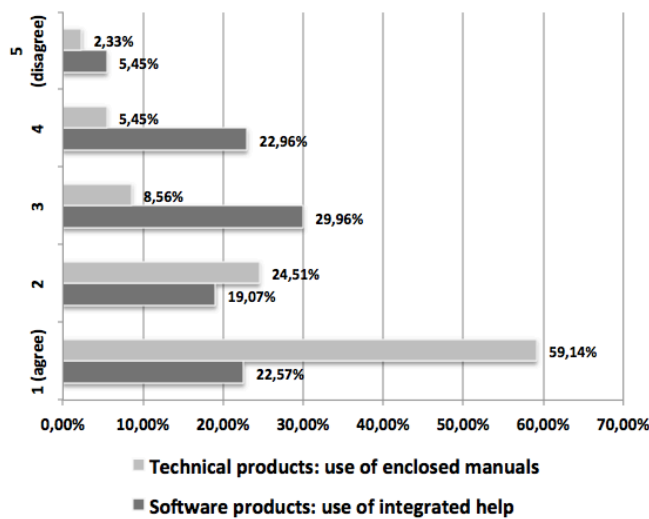


Figure 6. Use of support method is depending on product type.

2) *Online search behavior*

The second important result of the survey relates to the customers' behavior when requesting support online. While from a traditional perspective a strong relation between product and manufacturer is given in support cases, customers rely on generic search engine providers to find adequate solutions for their problems. Figure 7 shows that with more than 50% of all participants more users rather use such a search engine than to directly visit a support site provided by the manufacturer. This means a tremendous change for support service providers as search engines are operated by an algorithm and can therefore hardly be manipulated by content providers.

3) *Obstacles for online support systems*

While customers are aware of online support systems and how to search for requested information, they seem also familiar with some limitations of online platforms. For the majority the permanent availability of support is of high importance. On the one hand customers have to be connected to the Internet to use online services, on the other

hand customers rely on the availability of the support service itself.

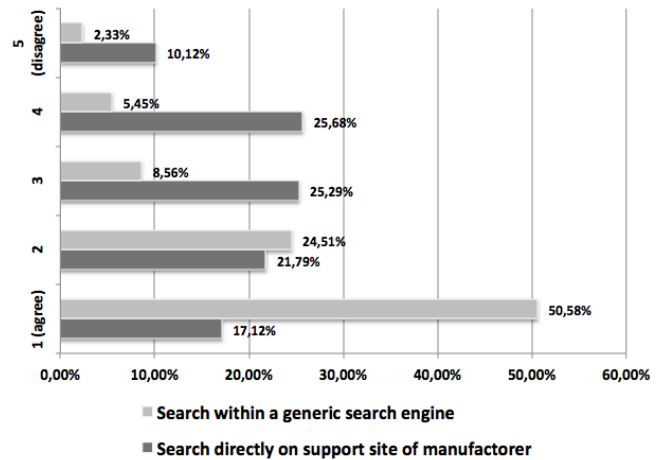


Figure 7. Search engines are used before manufacturer's support site.

Printed manuals or documents in digital form are in possession of the customer and guarantee this requirement. As Figure 8 illustrates, participants could not clarify if support platforms may entirely replace traditional manuals.

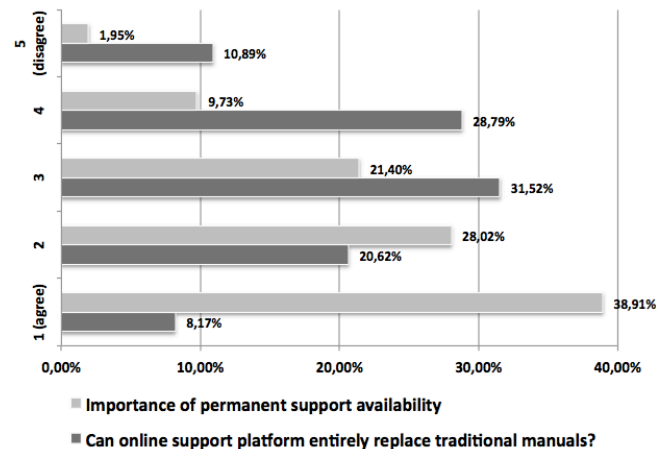


Figure 8. Availability as trigger for traditional manuals.

B. *Observations*

In a second attempt Google Trends was used to ensure rigor and relevance of the empirical survey data. While obstacles of online support can barely be acknowledged by such a method, differentiations in usage scenarios depending on product type (see point 1 in empirical results) as well as implications for general search behavior (point 2 in empirical results) are more feasible. In a first test a software-related problem was simulated to see how customers search in case of software problems. Second, a technical non-software product was chosen. Apple's Iphone 4 was the subject of interest in these queries, as the product is known for a problem with its integrated antenna affecting the phone's reception. When the problem first occurred

customer did not know that it was caused by a manufacturing error. This incident builds a perfect occasion for an observation as customers were in a typical product support situation. Both products do not include an extended amount of manuals since the software comes with an integrated system and Apple represents products of high usability. As Google Trends allows the comparison between terms in form of percentage relations only, no absolute numbers of search queries can be given.

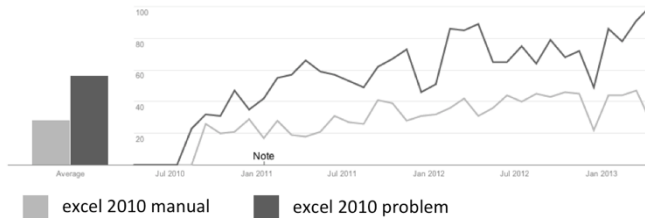


Figure 9. Context-sensitive search outnumbers the demand for manuals (geographic location: United States).

The software-test was processed by querying for a typical Microsoft Excel problem. While traditional manuals do not provide context-sensitive help, search engines are used to query for an answer directly related to a problem. Therefore, while searching for the traditional manual would indicate the need for technical documentation in the typical structure, customers intend to directly enter the question resulting into endless search query variations. As Figure 9 shows even a comparison between the search terms *manual* and *problem* demonstrates more queries for the latter. Including the variations of real appended problem situations would outnumber requests for traditional manuals.

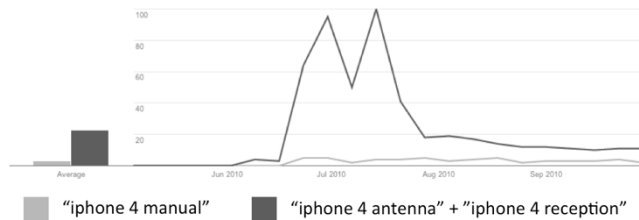


Figure 10. Search engines directly link to support content (geographic location: United States).

Figure 10 highlights an online search behavior. Again customers directly enter their problem into the generic search engine without any demand for manuals.

VI. IMPLICATIONS AND FURTHER RESEARCH

Businesses have to adopt their external communication to meet customers' demand for product support. Results show the traditional user manual devolves into online support systems where context-sensitive and location-

independent information is made available. Users directly transform their support questions into queries, which implies that businesses have to build their support offerings search-engine-optimized. Additionally the media format discontinuity is an obstacle to overcome by utilizing linking technologies between the physical and virtual world. At last the availability of support plays a major role for customers, which businesses have to ensure.

This publication is a crucial contribution to marketing as well as information systems research. Both disciplines put the customer into the center of attention. Further research will be done to identify how virtual online support systems have to be implemented to match requirements of customers as well as businesses.

REFERENCES

- [1] J. Redish, "Technical Communication and Usability: Intertwined Strands and Mutual Influences Commentary", IEEE Transactions on Professional Communication, vol. 53, no. 3, 2010, pp. 191-201.
- [2] J. Hennig and M. Tjarks-Sobhani, Usability and technical documentation, Lübeck, Schmidt-Römhild, 2007.
- [3] Amazon, http://www.amazon.com/IBM-Warp-Connect-3-0-Bonus/dp/B0023R30V4/ref=sr_1_3?ie=UTF8&qid=1373794258&sr=8-3&keywords=ibm+os%2F2+warp (last visited July 14, 2013).
- [4] D. Gebert, Instruction manuals as a marketing tool, Wiesbaden, Forkel, 1988.
- [5] B.S. Wiese, J. Sauer, and B. Rüttinger, "Consumers' use of written product information" in Ergonomics, vol. 47, no. 11, 2004, pp. 1180-1194.
- [6] M. Bruhn and G. M. Ahlers, "Customer Touch Points – Tasks and method of multi-channel communication" in Handbook Multi-Channel-Marketing, Wiesbaden, Gabler, 2007, pp. 393-425.
- [7] J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, Los Angeles, SAGE Publications, 2009.
- [8] ITU World Telecommunication, ICT Indicators, worldwide, 2000 to 2012 via Statista.
- [9] TNS Infratest, D21-Digital-Index, Germany, 2001 to 2013, via Statista.
- [10] Walker Sands, Q4 2012 Mobile Traffic Report, worldwide, Q4 2010 to Q4 2012, via Statista.
- [11] Tomorrow Focus AG, Mobile Effects 2013-1, Germany, January 2013, via Statista.
- [12] ARD/ZDF, Longtime Study Mass-communication, Germany, 1970-2012.
- [13] T. Puchleitner and M. Harnisch, "Communication Technology as Enabler for the Communication Space", in P. Kommers and P. Isaías, Proceedings of the IADIS International Conference e-Society 2012, Berlin, 2012, pp. 265-272.
- [14] Pyramid Research Global Telecom Insider, NFC-Enabled Smartphones to Account for 28% of Global Market by 2015.
- [15] S. Broda, Mobile technical documentation, Lübeck, Schmidt-Römhild, 2011.
- [16] Google, <http://www.google.com/trends/explore> (last visited August 22, 2013).