

Analysis of Smartphone Applications for the Improvement of the Ecological Attitude

Masterarbeit

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versität Hannover

vorgelegt von

Name: Schmidtke



Vorname: Kerstin



Prüfer: Prof. Dr. rer. nat. Michael H. Breitner

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1. Introduction

1.1 Motivation and Relevance of the Topic

Over the last several years, research on green information systems (IS) for environmental sustainability has received significant attentiveness in the IS community.¹ The earth ecosystem is subject to severe pollutions, which are mainly caused by human actions, more precisely by anthropogenic emissions of greenhouse gases (GHG) such as those induced by households, means of transportation, consumption and nutrition.² Researchers and scientist are now assuming that the negative impact on the environment poses a serious threat to the basis of civilization.³

Already, more than half a century ago the American geologist Roger Revelle described the immense extent of human intervention in the earth system as “human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future.”⁴ In this context, the prevailing challenge of the 21st century is the climate change and thus to mitigate global warming.⁵ Such global warming has disastrous impacts on human and natural systems. The latest report from the Intergovernmental Panel on Climate Change (IPCC) depicted these observed changes in the climate system as follows: “warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.”⁶

Since sustainable behavior often lacks relevant information about its environmental impacts, scientists are request to contribute to solving problem. Therefore, green information systems have been identified as an important driver to reduce the negative impact on the environment and to stimulate the society towards more ecological sustainability as well as to contribute to the improvement of the ecological attitude.⁷ CO₂ emissions can be reduced at any place in the world, however the benefits of reduced global warming will accrue to everyone. To save the earth the public awareness for environmental sustainability needs to increase and the ecological attitude of each individual behavior be meant to improve. Global warming can only be limited if the climate footprint of each person decrease drastically.⁸ Nevertheless, the society

¹ cf. Elliot, S. (2011), p. 197-236; Hilpert, H. et al. (2013); Ijab, M. T. et al. (2012); Malhotra, A. et al. (2013), p.1265-1274; Melville, N.P. (2010), p. 1-21, Watson, R.T. et al. (2010), p. 23-38

² cf. IPCC (2015); National Academy of Sciences (2005)

³ cf. World Commission on Environment and Development (1987)

⁴ cf. Revelle, R. (1957), New York Times

⁵ cf. Aoun et al. (2011); vom Brocke, J. et al. (2013); United Nations (2012); Aoun et al. (2011); Watson, R.T. et al. (2010), p. 23-38; UNFCCC (1992): Article 2

⁶ cf. IPCC (2015), p. 2

⁷ cf. Elliot, S. (2011)

⁸ cf. UNFCCC (1992)

is aware of the necessity to reduce GHG emissions but a large part of the society is unclear which activities or devices release how much GHGs. Therefore, humans need a transparent representation of their own CO₂ emissions.⁹ Hence, the importance of the topic green IS has recently been highlighted in several places.¹⁰ According to Watson et al. (2012), there is a need to “develop information systems that provide individuals with accurate, meaningful, and actionable information about the environmental impact of personal decisions.”¹¹ Due to this, IS should contribute to the design and implementation of sustainable processes and thus explore how IS have to be developed and designed in order to influence human actions with the aim of increasing environmental sustainability.¹²

In times of the digitalization, a smartphone is omnipresent in today’s everyday-life¹³ and hardly any other means of communications is so important in the lives of many people through their any-time and any-place availability.¹⁴ Exactly for this reason, smartphone applications (abbreviation: apps) have the potential to improve the ecological attitude of people due to their connectivity, mobility and smartness.¹⁵ They can offer new ways to raise awareness and empower people to become more sustainable in regard to climate change.

1.2 Objective of the Research Topic

The aim of the present thesis is to investigate how IS – especially smartphone apps – have to be developed to influence human actions and improve the ecological attitude of users. In this context, the question arises which aspects or criteria have a positive influence on the acceptance and use of smartphone apps. Furthermore, green IS can make a valuable contribution to the improvement of the ecological footprint through design-oriented research as well as behavioral research. Hence, this thesis will investigate the influence of system characteristics on the success of smartphone applications. For this purpose, different models from the IS research are considered in order to better understand the usage behavior and the corresponding user preferences of smartphone applications. In addition, this thesis also identifies and modifies appropriate theoretical explanatory approaches from the behavioral research and creates an evaluation model for smartphone applications. Already published and sophisticated smartphone applications will be analyzed within this evaluation model to find out which system characteristics lead to a successful smartphone application.

⁹ cf. WWF-Study (2009), p. 3

¹⁰ cf. vom Brocke, J. et al. (2013); Loos, P. et al. (2011); Pernici, B. et al. (2012)

¹¹ cf. Watson, R. T. et al. (2010), p. 30

¹² cf. Melville, N. P. (2010)

¹³ cf. Theoharidou, M. et al. (2012), p. 443

¹⁴ cf. BITKOM (2014)

¹⁵ cf. Fogg, B. & Eckles, D. (2007)

The present work is intended to help to close this research gap as well as to formulate concrete recommendations for the development and use of smartphone applications in the field of green information systems.

1.3 Structural Approach

After an introduction to the highly up-to-date topic in *chapter 1*, and according to the objectives of this work, the further course of this thesis is divided into a theoretical as well as an empirical part. Therefore, a theoretical foundation of this work is set up in *chapter 2*. First, an in-depth presentation of the topic of climate change is given. Afterwards it will be illustrated by means of diverse activities such as heating, driving, eating, recycling etc. how much GHG emissions are released by people and to reach an understanding of the importance of this subject (part 2.1 – 2.3).

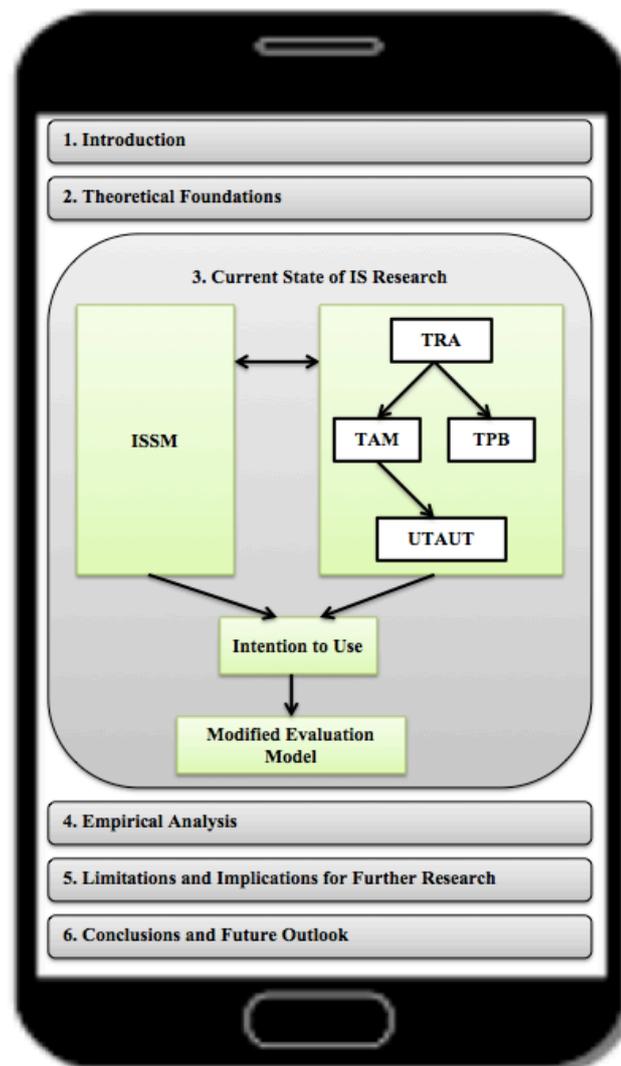


Figure 1: Graphical Overview of the Structural Approach
Source: own illustration

Subsequently, a detailed description of the terms smartphone and smartphone applications is made in order to highlight the significance of smartphones and applications in this day and age and also differentiate them clearly from other mobile devices. Furthermore, a presentation of already existing studies will be presented that deal with smartphone applications and their impact on the ecological sustainability (2.4).

In *chapter 3* the current state of research is depicted by presenting theoretical foundations and basic concepts of IS research. Therefore, approaches to the influence of system properties on the use and user satisfaction are presented. The basis for this is the IS Success Model, which illustrates the influence of system characteristics in context with the individual intention to use information systems and thus the actual system use (3.1). Complementary to this, section 3.2 describes the behavior-oriented acceptance models and the individual motivation to use information systems. In the following section, the suitability of the presented models will be investigated and an explicit research question is derived (3.3). Based on the research question an analysis-oriented model adaption and concretization takes place in which the insights from all sections are summarized and merged into a final framework for the evaluation and analysis of smartphone applications to improve the ecological attitude of users (3.4).

Afterwards, *chapter 4* illustrates the empirical part of the present work. For this purpose, a presentation of the selected smartphone applications takes place (4.1) as well as for which kind of reason these applications have been elected. Afterwards the selected research methods are presented as well as the evaluation scheme for the analysis of the applications is introduced (4.2). Subsequently, the results of the analysis are presented in part 4.3 and extensively discussed on part 4.4. Moreover, *chapter 5* contains limitations from which implications for research and practice are derived. In the concluding *chapter 6* a summary of the work is given.

6. Conclusion and Further Outlook

Since sustainable behavior often lacks relevant information about its environmental effects, the role of smartphone applications that provide individuals with meaningful, accurate information about their environmental impact, has received considerable attention. The focus of the present thesis was based on the research question, which system characteristics are decisive in order to improve the ecological attitude of users. Based on this research gap, an introduction to the topic was presented and the most important theoretical foundations were explained because people need to increase their awareness about the topic of climate change. Due to the novelty of the investigation context, it was not possible to revert on existing scientific research models. Rather, general research models were presented from different areas of the IS research and were merged into a single framework to analyze smartphone applications.

Based on the simplicity and traceability of the ISSM, this model has developed into a dominant evaluation framework²⁸¹ and has therefore been chosen as the basic for measuring the success of a smartphone application by the influence of system characteristics. In addition, the objective was to create a model that is also suitable for explaining the individual usage behavior of smartphone applications. For this purpose, an evaluation catalog for smartphone apps has been developed, which is mainly based on the success dimensions of the ISSM and includes the most important factors of the TAM-related approaches. Thus, the individual intention to use can be investigated in detail in regard to the influence of specific system characteristics. It is particularly important to know the underlying motivations to use a pro-environmental app as well as the appropriated functional needs of the users. On this basis, already developed apps were extensively analyzed and it was examined which of the selected system characteristics are decisive for the improvement of the ecological attitude of the users.

The results of the study show that both the system and the information quality play a decisive role for the further utilization of the potential for a longer period of use. In particular, the presentation of the information plays an important role, as an appealing design of the app as well as a suitable color selection and the division of textual and pictorial content form the basis for the enjoyment of an app. In addition to the functional aspects of an app, intrinsic motivation is the most important factor. In order to permanently pay attention to an app, this must be equipped with many important gamification elements, such as reward systems. People want to be challenged with the use of apps and grow in their tasks. Furthermore, some aspects such as multimedia features or the communicability, which includes the information dissemination via social media channels, plays an important role. In the digital age, people and especially the younger generation want to communicate everything about the social media

²⁸¹ cf. Urbach, N. et al. (2009), p. 316

channels, as well as the successful completion of challenges within an app. Besides, the comparison of the achieved goals leads to a competition that further encourages the users to use an app. As a clear result, it turns out that users show a particular interest to an app if they do not only have to perform or complete a game within this app, but also receive rewards in form of value vouchers. Above all, the app “Changers” offers an enormous potential due to its system characteristics to improve the ecological attitude of the users. Nowadays, people are connected to their smartphones at any time and anywhere and spend every free minute on their smartphones. As a result, a smartphone is one of the best links to draw people’s attention to personal decisions in the course of climate change and thus encouraging them to adopt sustainable behavior.

However, it should be noted that all sustainability apps often address only one or a few areas in everyday life, such as reducing CO₂ emissions in transport, household or in the field of nutrition. A smartphone application that is designed to help people in their daily lives to improve their ecological attitude may, however, not only cover one area, given the important issue of climate change. In order to actively tackle climate change, greenhouse gases must be reduced in all areas. Therefore, it would be particularly interesting and important to develop an app or information system that encourages people to be sustainable in their everyday lives. Innovative would be a smartphone app, which could also be combined via a special SmartWatch and could record all the user's activities such as the daily shower time via a touch sensor. If a previously defined shower time is exceeded, the user will be informed via a reminder message on the SmartWatch and also the released CO₂ emissions are additionally displayed. With an integrated barcode scanner on the watch, food labels could also be scanned. According to the founder and managing director of RESET "scanner applications in particular could make a significant contribution to sustainable everyday life and conscious consumption. From our point of view, this is the greatest potential"²⁸² In the end, research on green IS for environmental sustainability will become even more important and it can be assumed that enormous progress will be made in this area over the next few years.

“Business as usual is dead – green growth is the answer to both our climate and economic problems”²⁸³

²⁸² cf. Quote by Uta Muehleis, founder and managing director of RESET

²⁸³ cf. Quote by Andreas Fogh Rasmussen