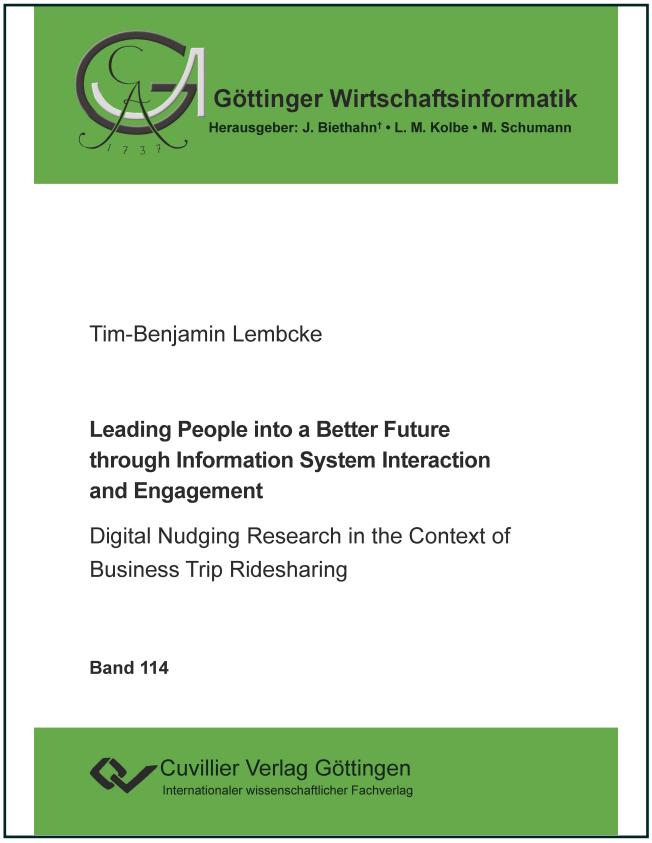
Tim-Benjamin Lembcke (Autor)

Leading People into a Better Future through Information System Interaction and Engagement

Digital Nudging Research in the Context of Business Trip Ridesharing



https://cuvillier.de/de/shop/publications/8622

I. Introduction

The introduction begins with presenting this thesis' overall motivation and relevance (Section A.I.1). The research gap and accompanying research questions form the heart of Section A.I.2, succeeded by an overview of the thesis' structure in Section A.I.3. Afterward, Section A.I.4 positions the research project and elaborates upon the research design and space. The introductory section concludes with this thesis' anticipated contribution and implications (Section A.I.5).

I.1 Motivation

We live in a world with more people than ever before, being able to become more educated, skilled, and prosperous (Altbach et al., 2010). Yet the overall economic and population growth have induced— and are accompanied— by major side effects (Gilpin, 2018). Megatrends like urbanization, automatization, new work, and globalization do not solely offer positive chances for humanity (Singh, 2012): The depreciation of natural resources and still-increasing greenhouse gas emissions are just two noteworthy considerations, with no straightforward solution being available. As a result, our world has become not only as prosperous as never before, but today's challenges have become global and more complex as well (Keohane & Victor, 2011).

Within these conflicting priorities, climate change is among the most pressing as of 2022. Since pupils and students jointly stand up to form networks like Fridays for Future, climate-related challenges have gained increased awareness in many countries around the globe. A broad consensus of research confirms that increased and human-made emissions play a significant role in global warming (Parmesan & Yohe, 2003; Thomas et al., 2004; Walther et al., 2002). Recent findings indicate that the process of change is actually even faster than assumed, alongside paradoxical effects arising: For instance, the cleaner the air in China will be, the more this cleaner air may support global warming— due to clean air's lower reflexivity compared to its polluted counterpart (Xu et al., 2018). In sum, these developments necessitate more ambitious and joint actions if humanity is to slow down and confine global warming (IEA, 2021).

Two general strategies for action are present to approach these climate challenges: climate change mitigation or adaptation (Vijaya Venkata Raman et al., 2012). While the first strategy aims to prevent potentially harmful behavior, the latter approach recognizes that certain adaptations need to be undertaken (e.g., because some potentially irreversible changes are likely to have already taken place). Adaptation measures can include any form of preparing our environment for upcoming trends like rising sea levels or stronger thunderstorms. For example, these measures include raising dikes to protect coastlines or stabilizing existing buildings in stormy regions. However, mitigation aims more at preventing causes of climate change to persist or even arise: Primarily by emitting less or no

greenhouse gases, for example, by burning fewer natural fuels in energy production or freight and individual transportation. Both strategies, mitigation and adaptation, necessitate human action—and most likely individuals to act differently from their usual modus operandi.

In light of global greenhouse gas emissions, the transport sector accounts for nearly a quarter (23%) of energy-related greenhouse gas emissions (IEA, 2018). Within the transport sector, passenger land transport represents the highest share of greenhouse gas emissions (Creutzig et al., 2015). In turn, commuting and business travel account for 40–60 percent of the total transport-related greenhouse gas emissions, rendering initiatives and research on changing or optimizing commuting a priority (Creutzig et al., 2015; H. Wang & Zeng, 2019). By 2050, according to scenarios from Creutzig et al. (2015), passenger road transport might even account for the highest share of global greenhouse gas emissions overall, given that the status quo is not significantly changed. Although long-term solutions like car and fleet electrification or green hydrogen may eventually lift the pressure of reducing transport from a climate-related perspective, challenges like congestion, traffic jams, and space utilization by streets and highways would persist if the number of cars and rides is not decreasing, but maybe even increasing.

Scientists and leading international organizations claim that humanity should act to reach scenarios like net-zero by 2050 (IEA, 2021). Governmental bodies like the European Union have acknowledged this urgency, e.g., through their European Green Deal and Fit for 55 initiative (EU, 2021b, 2021a). New technologies are necessary for a net-zero transformation of the global economy; however, humanity does not have the time to wait for these technologies to arrive. Thus, a two-sided approach is necessary: Developing new technologies and realizing short-term, readily available initiatives, measures, and actions (IEA, 2021). A pertinent and readily available short-term measure in passenger transportation is shared mobility. In particular, ridesharing is a promising approach in areas and circumstances when no substitutive means for individual vehicle mobility like public transport are readily available. With commuting and business travel accounting for 40–60% percent of the total transport-related greenhouse gas emissions (Creutzig et al., 2015), business trip ridesharing (BTRS) is a peculiar approach worthy of greater attention.

In an idealized world, every employee would engage in BTRS whenever possible. BTRS can contribute significantly to lower transport-related emissions on a larger and organizational scale. This leads to the question why most employees still travel and commute individually. Sharing rides for commuting and business trips necessitates—so the story goes—no technical support: Colleagues could use a blackboard to offer or search for rides, team leaders could suggest their employees to share rides, or HR could connect

employees sharing similar rides. However, this is quite laborious, and for BTRS's full potential to blossom, a technical support system could ease the hardship (e.g., by matching and connecting employees via a mobile app). The phenomenon at hand is interesting since it represents physical tasks to be supported (sharing rides), yet the tasks themselves serve a broader goal. This broader goal is the overall agenda of BTRS, i.e., lowering emissions. Following Benbasath (2010), a human-computer interaction to promote BTRS would be both agenda and non-agenda driven, depending on the point of view: From the employee's perspective, it could be more about sharing rides and networking with colleagues; from an organizational viewpoint, it could be about reducing climate impact and saving costs. Information systems could provide BTRS task support and serve its overall agenda.

Within Information system research (ISR), scholars have begun to examine beneficial roles of IS regarding climate change, leading to the notion of green information systems, or Green IS (Malhotra et al., 2013; Melville, 2010; vom Brocke, Loos, et al., 2013; vom Brocke & Seidel, 2012). Although IS support the shaping and offering of eco-friendlier customer goods and user service offerings, a significant contribution to readily solve climate-related challenges—both mitigation and adoption—has not materialized so far. Quite the contrary: While becoming more and more powerful and capable, IS hardware is also consuming, in sum, more energy. On a global scale, IS are insofar by no means inferior to the general economy as both cause an emittance of more greenhouse gases year after year (Morley et al., 2018; Røpke, 2012). The pure reliance on IS to solve climate change for humanity seems a bit over-optimistic: With a simple "more of the same," our current lifestyle will likely not become carbon and resource neutral soon enough. Consequently, behavioral changes and new societal, economic, and individual policies remain necessary if climate change shall be presently addressed (Shove, 2010). With climate change not only requiring governmental policy setting but changes in each individuum as well, the question arises of how necessary changes may be induced, stimulated, and reinforced (Semenza et al., 2008).

To understand why individuals behave and act in certain ways, (social) psychology and behavioral economics offer a variety of explanatory approaches and theories. For instance, the theory of planned behavior (Ajzen, 1991) explains predictors for demonstrating a specific behavior. Moreover, the self-determination theory (Deci & Ryan, 1985a, 2008) differentiates between motivational loci underlying individuals' behaviors or choices, thus ranging from amotivation over extrinsic to intrinsic motivation. If one is to change an individual's behavior, two general outcomes may occur: The individual is willing to adapt—or not. With respect to individuals' change propensity, different means can be classified on a continuum between free and coercive force (Hansen et al., 2016; Hansen & Jespersen, 2013). While coercive measures (bans, fines, or the like) qualify more

as forceful interventions to change or prevent distinct behaviors, choice-preserving means (suggestions, options, reminders, to name a few) allow individuals to override the external stimulus, form their own belief set and point of view, and freely decide and act according to their reasoning (Münscher et al., 2016; Tengland, 2012; Thaler & Sunstein, 2009).

One particular set of choice architecture techniques is nudge theory, trying "to influence choices in a way that will make choosers better off, as judged by themselves" (Thaler & Sunstein, 2009, p. 5). The specialty of nudges is that they use cognitive boundaries, biases, routines, and habits in individual and social decision-making (Hansen, 2016). If conducted in ethically sound and legitimate ways, these nudging interventions can influence people in a subtle and less cognitive demanding way, up to behavior changes being consciously unnoted by individuals. These choice-preserving mechanisms have been shown to offer a benevolent addition to existing coercive persuasion means (Thaler, 2015; Thaler & Sunstein, 2009).

So far, research in behavioral economics has widely considered nudging interventions in analog settings, like physical shopping, doing sports, or behaving more eco-consciously by sorting their garbage into the designated bins. The intervention itself merely happened through analog means, including signs, repositioning of goods, or physical highlighting. Recently, IS scholars have begun to acknowledge the importance of nudging interventions in digital (and blended) environments as well (Hummel et al., 2018; Meske & Potthoff, 2017; Mirsch et al., 2017; C. Schneider et al., 2018; Weinmann et al., 2016). In transferring the concept of analog to digital nudging, several challenges have emerged:

1. Since nudging has resided in a mere context of policy setting, with most of the underlying cognitive boundaries focused on the *analog* world, existing results may not be transferable to digital or blended environments as is (Benartzi & Lehrer, 2017).
2. In a digitalized society, digital devices such as smartphones increasingly serve as digital decision support systems. As contexts usually influence and alter specific choice architectures, influences and specificities of digital environments need to be considered (Barton & Grüne-Yanoff, 2015; Johnson et al., 2012; Münscher et al., 2016; Szaszi et al., 2018; Thaler et al., 2013).
3. With an extended discourse on ethical strings attached to analog nudging (Bovens, 2009; Clavien, 2018), prevailing analog discourses need to be revised and updated to accustom digital and blended environments as well (Meske & Potthoff, 2017; Weinmann et al., 2016).

Within the BTRS context, this thesis tries to contribute to understanding the role that Green IS can play in promoting greener and more sustainable behavior. The following

section summarizes the research gap and derives research questions to address this gap, guiding and structuring the dissertation project.

From a structural point of view, this thesis follows Goes' (2013) suggestion for more interdisciplinary research, e.g., by collaborating with scholars stemming from other domains. This shall extend the horizon of both research domains and foster methodological variety by integrating multi-disciplinary best practices. The presented research studies address this collaborative demand by collaborating with researchers from behavioral economics.

I.2 Research Gap and Research Questions

This thesis explores the context of BTRS, and it is helpful to gain an understanding of the current state of ridesharing, both in research and in practice. With ridesharing's decades-long history, this thesis does not aim to reinvent the ridesharing wheel. Instead, this work sheds further light on opportunities to proliferate ridesharing further. The background Section A.II, especially Section A.II.1, further elaborates on the research gap.

To provide a brief and concise overview of ridesharing, the first research question (RQ) of this investigates different conceptualizations of current ridesharing services:

RQ1: What are the facets of the ridesharing service landscape?

It is in the nature of research to rather analyze a focused area more in-depth than to address a broader area more generally. This thesis focuses on ridesharing for daily commuting (i.e., BTRS) and Green IS' role to foster BTRS adoption. The second step in approaching this question is to examine possible anteceding factors that might influence BTRS adoption. RQ2 poses and addresses this issue:

RQ2: Which factors can support, explain, and predict employees' BTRS adoption?

This research question comprises two different viewing angles: First, influencing factors of personal predisposition exist. Here, motivational or behavioral influences are of interest. Second, the role of technological influences, e.g., through Green IS, sparks scientific interest. While RQ2.1 touches on the first aspect of motivational or behavioral influences, RQ2.2 inquires into the bearing of Green IS to facilitate sustainable behaviors:

RQ2.1: Which anteceding factors can explain and predict employees' BTRS adoption?

Even if employees are open and willing to engage in BTRS, the matching dilemma remains a noteworthy challenge. BTRS shares this dilemma with most ridesharing forms since shared rides can only occur if supply and demand are properly matched. Green IS, conceptualized as IS that target climate change-related challenges, can be an important

part of addressing this challenge (Y. Li et al., 2020; vom Brocke, Loos, et al., 2013; Yang et al., 2020). Such Green IS can focus on the "backend" with topics like optimized matching algorithms or the "frontend" with a more human-computer interactional perspective. With plentiful research on the algorithmic side of ridesharing (e.g., di Febbraro et al., 2013; Herbawi & Weber, 2012; Masoud & Jayakrishnan, 2017), this thesis focuses on ridesharing users, and their interaction with a Green IS supporting BTRS. RQ2.2 examines potential ways how Green IS could stimulate employees' BTRS adoption:

RQ2.2: How could Green IS stimulate employees to adopt BTRS?

There are different stimulation conceptualizations conceivable: On the one end of the spectrum, employers or institutions could force employees to take part in BTRS. This might happen through measures like legislation or corporate policies. On the other end of the line are more freedom-preserving measures. These include incentive schemes or gamification as well as sub or low-conscious approaches (e.g., nudging) to facilitate employees' BTRS adoption.

This thesis zeroes in on the freedom-preserving side of the spectrum and—within this range—analyzes the concept of (digital) nudging. As introduced by Sunstein and Thaler (2009), nudging resembles a less-intrusive concept of behavior change stimulation. The role of Green IS can be the facilitation of behavior change and the support of the long-term proliferation of such changes. It is important to have a clear understanding of what nudging is, particularly in digital or digital-analog (i.e., blended) environments, to analyze the role that Green IS could play to change individuals' real-world behavior. At the start of this thesis in 2018, the concept of digital nudging had been in a state of conceptual confusion. Scholars had defined the concept so broadly and vaguely that nearly everything could resemble a digital nudge, risking the concept to become tautological. Design thinking can serve as a harbinger of the fate that can befall concepts defined too imprecisely (Badke-Schaub et al., 2010). Therefore, RQ2.2.1 is definitory by its nature:

RQ2.2.1: How can nudging in digital and blended environments be defined?

When serving as attention or action-guiding systems, Green IS provide designers and choice architects with a plethora of conscious and non-conscious intervention approaches. Nudging mounts heavily on exploiting humans' cognitive biases (Kahneman & Tversky, 1979; Tversky & Kahneman, 1974). For instance, Manoogian (2018) illustrates some 188 cognitive biases, most of which choice architects could utilize in designing digital or blended human-computer interactions. However, the subliminal or non-conscious mode of operation can be used for good or bad—in other terms, for different stakeholders' interests. This raises ethical concerns surrounding a proper and acceptable usage of

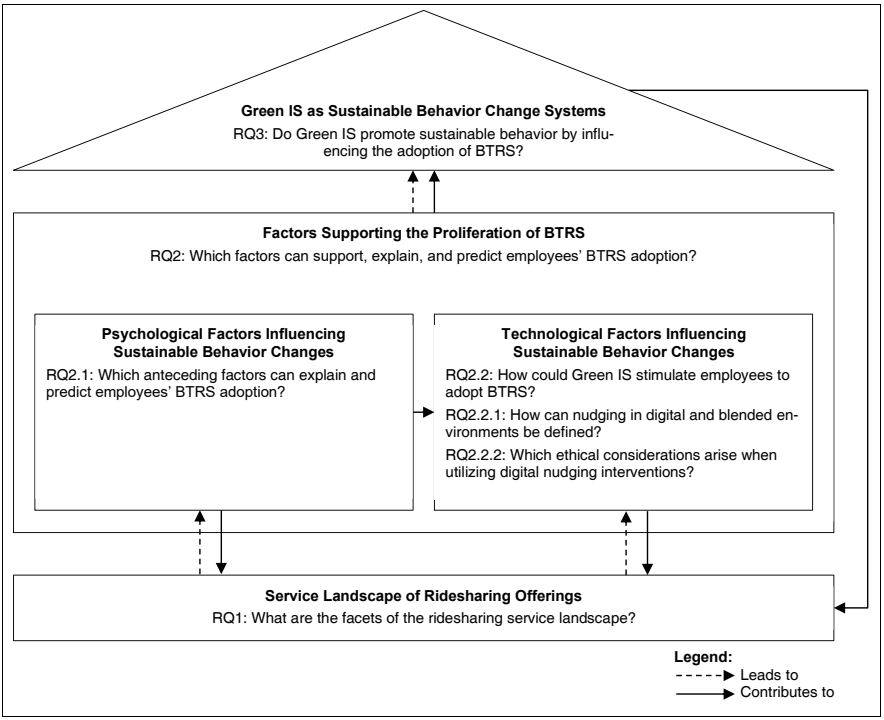


Figure 1: Research Overview

nudging interventions in digital or blended environments (Meske & Potthoff, 2017; Sunstein, 2015b). This thesis picks up this call and studies ethical considerations particularly immanent to digital nudging:

RQ2.2.2: Which ethical considerations arise when utilizing digital nudging interventions?

With a solid understanding of motivational antecedents of BTRS as well as potential digital interventions via Green IS, the question remains how a prototypical Green IS would actually influence the adoptions of BTRS. In weaving the previous research questions together, RQ3 aims to explore BTRS in a real-world case study to determine whether Green IS could support more sustainable behavior:

RQ3: Do Green IS promote sustainable behavior by influencing the adoption of BTRS?

Figure 1 illustrates the research questions and their interdependencies. That figure highlights the three-step nature of this research project and indicates that RQ2, including subquestions, and RQ3 contribute to the overall service landscape of ridesharing offerings.

I.3 Structure of the Thesis

This cumulative thesis comprises three parts: Part A lays the foundation and motivates the overall research topic (Section A.I.1), presents the overarching research questions (Section A.I.2), illustrates the thesis's high-level structure (Section A.I.3), positions the research, its design, and space (Section A.I.4) and forecasts anticipated contributions and implications (Section A.I.5). The research background introduces important considerations for the thesis (Section A.II).

The core of this thesis is Part B: This thesis consists of six research studies, addressing the three research questions. Study #1 (Section B.I.1) addresses RQ1 and examines the current service landscape of ridesharing. Based on a literature and market analysis, Study #1 supports a common understanding and definition of ridesharing services and business models. Next to this taxonomy, a cluster analysis reveals archetypical business models underlying current service offerings.

Studies #2-#5 jointly touch on RQ2, each capturing sub-research questions of RQ2 in greater detail. While Studies #2 (Section B.I.1) and #3 (Section B.II.3) investigate potential anteceding factors of BTRS adoption, the latter two present digital nudging as a way to support—among others—BTRS adoption. Study #4 (Section B.II.4) introduces the concept of digital nudging and defines this concept with a higher demarcation power than previous conceptualizations in the IS community. This is necessary to alleviate conceptual confusion or tautological definitions. Likewise, Study #4 derives the Blended Environments framework as structural guidance for research on human-computer interactions that target analog and digital-oriented behavior simultaneously. Although digital nudging can support behavior change for the better, choice architects could implement the very same intervention mechanisms for the worse. Study #5 (Section B.II.5) takes this perspective and discusses ethical dimensions that should accompany the discussion on benevolent effects and digital nudging intervention use cases.

Based on the findings regarding RQ2, Study #6 (Section B.III.6) ties these results together and applies the Blended Environment framework in a real-world setting. By investigating the adoption of a BTRS-facilitating Green IS, Study #6 demonstrates and underlines the relevance of Studies' #2-#5 suggestions.

Part C summarizes key findings (Section C.I) and synthesizes these in light of the research questions raised in Section A.I.2. Theoretical implications highlight the impact on academic research (Section C.II.1), while managerial and socioecological implications render a picture on this thesis's potential organizational and societal contribution (Section C.II.2). As with every research project, the limitations inherent in this research project open interesting and promising avenues for future research (Section C.III). This thesis

No. Section	RQ	Type: Outlet	Title	Main Contribution	Ranking[1]	Status
1 B.I.1	1	CA: International Conference on Information Systems (ICIS 2020)	Driving Future Mobility by Shared Mobility: A Taxonomy of Ridesharing Business Models	▪ Overview of the current service landscape of ridesharing ▪ Provision of a business model taxonomy and archetypical business models	A	Published
2 B.I.1	2.1	CA: International Conference on Wirtschaftsinformatik (WI 2020)	Let's Travel the World Together: Toward an Understanding of Motivational Antecedents in Business Trip Ridesharing Services	▪ Understanding intrinsic and extrinsic motivational factors anteceding BTRS adoption	C	Published
3 B.II.3	2.1	CA: Americas Conference on Information Systems (AMCIS 2019)	Where Do You Want to Go Today: Understanding the Adoption of IS-Enabled Business Trip Ridesharing Services	▪ Understanding attitudinal, social, and organizational factors anteceding BTRS adoption	D	Published
4 B.II.4	2.2.1	CA: Pacific Asia Conference on Information Systems (PACIS 2019)	Towards a Unified Understanding of Digital Nudging by Addressing its Analog Roots	▪ Proposition of a unified digital nudging definition ▪ Derivation of the Blended Environment framework	C	Published
5 B.II.5	2.2.2	JA: Journal of the Association for Information Systems (JAIS)[2]	Ethical Dimensions in Digital Nudging: Reflections on Transparency, Freedom of Choice, and Goal-Oriented Justification	▪ Deriving three key dimensions for ethical consideration of digital nudging ▪ Proposing future research directions	A	Submitted/Published
6 B.III.6	3	JA: Transportation Research Part D (TR-D 2021)	Promoting Business Trip Ridesharing with Green Information Systems: A Blended Environment Perspective	▪ Analyzing the Green IS-facilitated BTRS adoption in a real-world case ▪ Applying and confirming the Blended Environments framework	B	Published

Table 1: Overview of Studies Included in this Thesis

Notes. CA = Conference Article. JA = Journal Article. [1] = Ranking according to VHB-JOURQAL 3. [2] = Submitted to JAIS, previous version accepted and published in the Proceedings of the European Conference on Information Systems (ECIS), see Appendix B.

concludes with general remarks (Section C.IV), and the Appendix illustrates accompanying organizational and regulatory information.

To illustrate the research project, Figure 2 explicates the structure of this thesis. In addition, Table 1 links the studies with the respective research questions. It indicates the main contributions that aim to close the raised research gap and facilitate academic understanding of the research questions at hand.

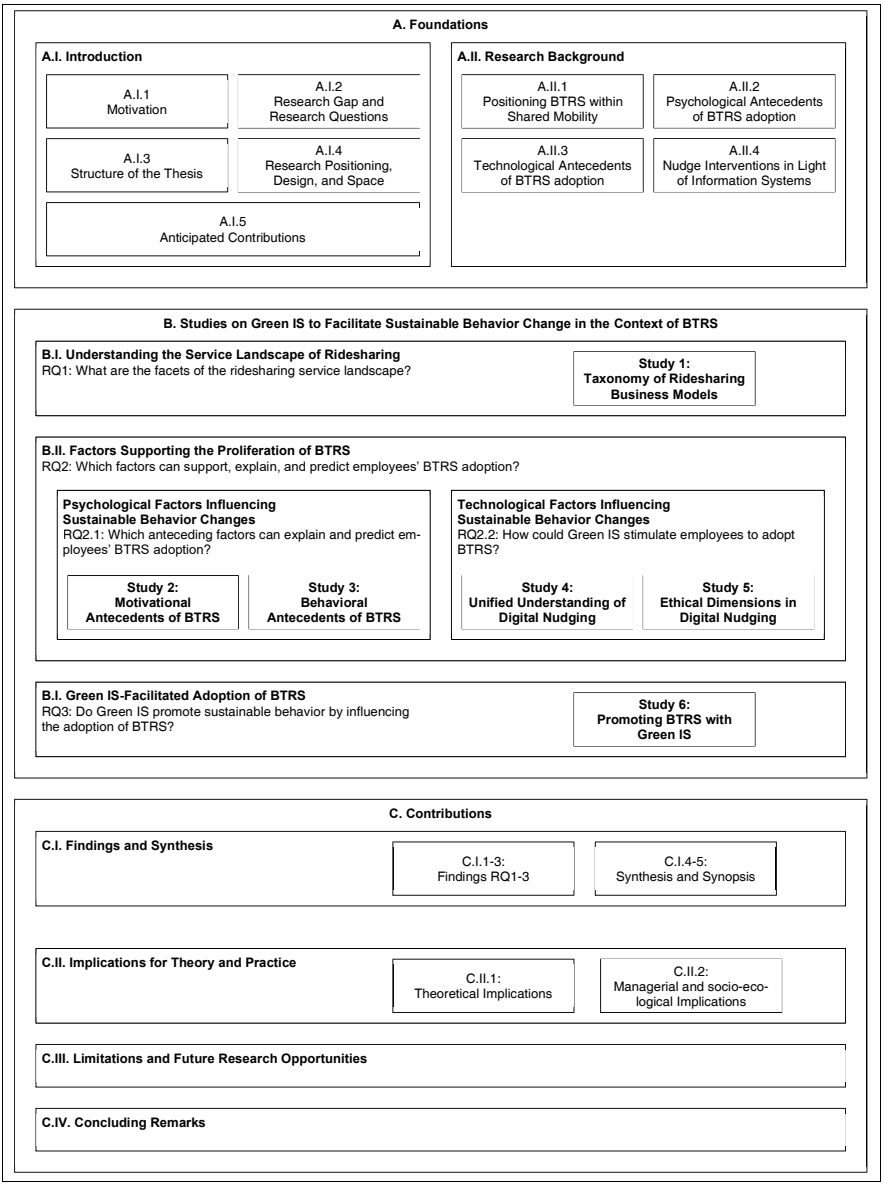


Figure 2: Structure of this Thesis