
Empowering Information Systems Users: The Role of Timely and Customizable Information for User Engagement and Selection Behavior



TECHNISCHE
UNIVERSITÄT
DARMSTADT

Am Fachbereich Rechts- und Wirtschaftswissenschaften
der Technischen Universität Darmstadt

genehmigte

Dissertation

vorgelegt von

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zur Erlangung des akademischen Grades
Doctor rerum politicarum (Dr. rer. pol.)

Erstgutachter: Prof. Dr. Alexander Benlian

Zweitgutachter: Prof. Dr. Peter Buxmann

Darmstadt 2023

Dominick Axel Kosin: *Empowering Information Systems Users: The Role of Timely and Customizable Information for User Engagement and Selection Behavior*

Darmstadt, Technische Universität Darmstadt.

Jahr der Veröffentlichung der Dissertation auf TUpriints: 2023

Tag der Einreichung: 20.10.2022

Tag der mündlichen Prüfung: 19.01.2023

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Acknowledgements

The completion of this thesis would not have been possible without the support and guidance of others. First of all, I would like to thank my supervisor **Prof. Dr. Alexander Benlian** for giving me the opportunity to earn my doctorate at his chair and for supporting me in my Ph.D. journey. I especially benefitted from the extraordinary freedom to pursue those research topics I was most fascinated by and to follow my own path how I saw fit to conduct my studies, while still always receiving swift feedback whenever I asked. Thank you very much for helping me complete my Ph.D. degree.

I also want to express my candid gratitude to my co-author and diligent coach **Dr. Martin Adam** who not only enabled me to learn the ropes of rigorous research, but who also relentlessly nurtured my growth and my success in academia. His consistently rapid and comprehensive feedback are unparalleled and have been paramount to me in completing this thesis. I sincerely thank you for all your efforts that essentially paved the way for completing this thesis.

Furthermore, I would like to thank my co-authors **Charlotte Wendt** and **Evgheni Croitor** for the multitude of inspiring discussions and countless memorable events that not only sharpened our research, but – perhaps more importantly – brought great joy and excitement into my daily work.

Finally, I would like to thank my beloved wife **Leonie Kosin** and my parents **Prof. Dr. Ruth Brack-Werner** and **Prof. Dr. Thomas Werner**. You always supported and encouraged me through all the ups and downs in my Ph.D. journey, no matter what kind of challenges I was facing. You enabled me to learn, to grow, to think, and to reflect about my choices within and well beyond my Ph.D. work – and you continue to do so. I will be forever grateful for this extraordinary care, patience and love.

Darmstadt, October 2022

Dominick Kosin

Abstract

Information systems (IS) increasingly empower their users by strengthening users' capability and autonomy to make their own decisions how to use and engage with IS. Specifically, users are empowered when they have sufficient knowledge to make rational decisions within IS and sufficient control to shape their experience with IS. In line with these pillars of empowerment, technological advancements unlock new possibilities for IS providers to empower users with access to high quality information (e.g., by providing timely updates of dynamically changing information) and with the ability to control the information stream (e.g., by implementing interfaces to customize websites). As a result, users have greater autonomy to actively shape their user experience to their liking, making them less dependent on having to identify IS that match their needs. At the same time, empowering users pays off for IS providers, as empowered users are known to form more positive attitudes and intentions to engage with the empowering IS. This thesis addresses the two aforementioned pillars of empowerment through knowledge and empowerment through control. Four studies shed light on how the increasingly prevalent practice of empowering users with *timely* and *customizable* information affects user engagement as well as users' selection behavior.

The first strand of this thesis investigates user empowerment through timely information in the context of decision support systems (DSS) that aid users in their selection of which (physical) location to visit. To avoid congestion at locations, such DSS communicate how busy each location is by displaying crowding information (CI), accompanied by timeliness cues indicating when this CI was retrieved (e.g., "updated just now" vs. "average over the last year"). Helping users avoid crowded locations becomes all the more important during periods of extraordinary pathogenic risk, such as the COVID-19 pandemic, where physical distancing is imperative for the containment of the pathogen. Against this background, the first study in this thesis investigates how CI with different levels of timeliness affects how users select between differently crowded medical practices. The results demonstrate that while the display of CI is generally useful for users to avoid crowded locations, providing particularly timely CI (i.e., updated close to real-time) leads users to select less crowded locations even more effectively. Moreover, this effect is strongest for individuals who exhibit low levels of health anxiety – an important contextual variable influencing user behavior during the COVID-19 pandemic.

The second study extends the findings of the first study by investigating a context in which hedonic motives may encourage users to seek instead of avoid crowds. Specifically, the study

examines how timely CI affects users' choice between differently crowded bars. Despite users longing for the presence of others as part of their visit experience, the results show that particularly timely CI makes users more aware of potential costs of congestion (e.g., prolonged wait times) and consequently leads users to select less crowded locations – thereby corroborating the previous findings in the utilitarian context of selecting a medical practice. Importantly, timelier CI also increases user engagement in that users express a greater intention to reuse the DSS providing the CI. This finding indicates that timely CI not only contributes to the containment of congestion, but also allows DSS providers to retain users more effectively and thereby achieve recurring impact on the reduction of crowding.

The second strand of this thesis investigates user empowerment through customizable information in the context of (banner) ads on websites. As ads oftentimes cause irritation and stifle user engagement with the website, first website providers have begun to empower users to customize how many ads they agree to have displayed. Despite website providers hoping to thereby enhance user engagement, it is unclear how users respond to the ability to customize ads they never asked for. Against this backdrop, the third study investigates how the provision of ad quantity customization (AQC) affects user engagement and which ad quantity levels users opt for. The results demonstrate that offering AQC consistently enhances user engagement in that users with access to AQC stay longer on the website and visit more sub-pages than users who cannot customize ad quantity. Counter-intuitively, a website with ads that offers AQC elicits even greater user engagement than a website that is entirely free of ads by default. In addition, the effect on user engagement is strongest for users accessing the website with a mobile (vs. stationary) device. Interestingly, users do not configure AQC to eliminate ads altogether, but instead opt for 29.0% of the default amount of ads to be displayed.

The fourth study seeks to extend the previous findings by shedding light on the underlying mechanism that drives the effect of providing AQC on user engagement. The findings suggest that offering AQC elicits perceived empowerment as a pivotal stimulant with two important outcomes: First, users pay closer attention to the website, thereby discovering more information useful to them and consequently experiencing a greater fit between the website's information and their own needs. Second, the feeling of being in control over ads, as typically immutable and irritating website elements, elicits a sense of enjoyment. Both informational fit and perceived enjoyment then lead users to engage more intensely with the website.

Overall, this thesis showcases the role and importance of IS-enabled user empowerment by providing a more comprehensive understanding of how empowering users with timely and

customizable information affects user engagement and users' selection behavior. In doing so, this thesis answers calls for research that urge scholars to not only shed light on emerging phenomena, but also to enable and empower IS users. The studies in this thesis contribute to IS research on empowerment by (1) revealing the importance of timeliness of information as a thus far under-investigated source of empowerment and by (2) uncovering ad customization as a hitherto largely neglected, yet important piece of web customization that complements our understanding of empowerment mechanisms. In addition, this thesis also offers valuable insights and actionable recommendations how DSS providers and policy makers can harness empowerment through timely CI to recurrently reduce crowding without infringing on users' freedom. Likewise, this thesis guides website providers how to leverage ads as website elements that users enjoy to customize to boost user engagement with the website as a whole.

Zusammenfassung

Informationssysteme (IS) befähigen ihre Nutzer zunehmend, indem sie die Fähigkeit und Autonomie der Nutzer stärken, ihre eigenen Entscheidungen über die Nutzung von und den Umgang mit IS zu treffen. Nutzer sind insbesondere dann befähigt, wenn sie über ausreichendes Wissen verfügen, um rationale Entscheidungen innerhalb der IS zu treffen, und wenn sie über ausreichende Kontrolle verfügen, um ihre Erfahrungen mit IS zu gestalten. Im Einklang mit diesen beiden Säulen der Befähigung eröffnen technologische Fortschritte neue Möglichkeiten, den Nutzern Zugang zu qualitativ hochwertigen Informationen zu verschaffen (z.B. durch zeitnahe Aktualisierung sich dynamisch verändernder Informationen) und ihnen die Möglichkeit zu geben, den Informationsfluss zu steuern (z. B. durch die Implementierung von Schnittstellen zur Anpassung von Webseiten). Infolgedessen verfügen die Nutzer über eine größere Autonomie, ihr Nutzererlebnis aktiv nach ihren Vorstellungen zu gestalten, so dass sie weniger darauf angewiesen sind IS ausfindig zu machen, die ihren Bedürfnissen möglichst gut entsprechen. Gleichzeitig zahlt sich die Befähigung der Nutzer für die Anbieter von IS aus, denn befähigte Nutzer zeigen eine positivere Einstellung und verstärkte Absichten, sich mit dem befähigenden IS zu beschäftigen. Die vorliegende Dissertation befasst sich mit den beiden vorgenannten Säulen der Befähigung durch Wissen und der Befähigung durch Kontrolle. Vier Studien beleuchten, wie sich die zunehmend verbreitete Praxis der Befähigung von Nutzern mit *zeitlichen* (d.h. timely) und *anpassbaren* (d.h. customizable) Informationen auf das Nutzerengagement und das Auswahlverhalten der Nutzer auswirkt.

Der erste Teil dieser Arbeit untersucht die Befähigung der Nutzer durch zeitliche Informationen im Kontext von Entscheidungsunterstützungssystemen (Decision Support Systems, DSS), die ihren Nutzern bei der Auswahl eines (physischen) Ortes helfen, den sie besuchen wollen. Um Überfüllung an den jeweiligen Orten zu vermeiden, kommunizieren solche DSS, wie voll jeder Ort ist, indem sie Informationen über die Überfüllung (Crowding Information, CI) anzeigen. Diese CI wird darüber hinaus noch begleitet von Hinweisen auf die Zeitlichkeit, die angeben, wann diese CI abgerufen wurde (z. B. „gerade aktualisiert“ im Vergleich zu „Durchschnitt des letzten Jahres“). Nutzer bei der Vermeidung von Menschenansammlungen zu unterstützen, wird in Zeiten außergewöhnlicher Krankheitsrisiken, wie z.B. der COVID-19-Pandemie, umso wichtiger, nachdem eine räumliche Distanzierung für die Eindämmung eines Krankheitserregers unerlässlich ist. Vor diesem Hintergrund wird in der ersten Studie dieser Arbeit untersucht, wie sich CI mit unterschiedlicher Zeitlichkeit darauf auswirkt, wie Nutzer

zwischen verschieden stark frequentierten Arztpraxen wählen. Die Ergebnisse zeigen, dass die Einblendung von CI für die Nutzer zwar generell nützlich ist, um überfüllte Standorte zu meiden, dass aber die Bereitstellung besonders aktueller CI (d.h. nahezu in Echtzeit aktualisiert) die Nutzer noch wirksamer dazu veranlasst, weniger überfüllte Standorte auszuwählen. Außerdem ist dieser Effekt am stärksten bei Personen, die ein geringes Maß an gesundheitlicher Besorgnis aufweisen – eine wichtige Kontextvariable, die das Nutzerverhalten während der COVID-19-Pandemie beeinflusste.

Die zweite Studie erweitert die Ergebnisse der ersten Studie, indem sie einen Kontext untersucht, in dem hedonische Motive die Nutzer anregen können, Menschenmengen zu suchen, statt sie zu vermeiden. Konkret untersucht die Studie, wie zeitliche CI die Wahl der Nutzer zwischen unterschiedlich überfüllten Bars beeinflusst. Obwohl sich die Nutzer nach der Gesellschaft anderer als Teil ihres Besuchserlebnisses sehnen, zeigen die Ergebnisse, dass eine besonders zeitliche CI den Nutzern die potenziellen Kosten der Überfüllung (z. B. längere Wartezeiten) bewusster macht und sie folglich dazu veranlasst, weniger überfüllte Orte zu wählen. Damit bestätigt diese Studie die früheren Ergebnisse im utilitaristischen Kontext der Wahl einer Arztpraxis. Ein wichtiges Ergebnis dieser Studie ist, dass zeitlichere CI auch das Nutzerengagement erhöht, insofern dass Nutzer eine größere Absicht zeigen, auf das DSS erneut zuzugreifen. Dieses Ergebnis deutet darauf hin, dass eine zeitliche CI nicht nur zur Eindämmung von Überfüllungen beiträgt, sondern es den Anbietern von DSS auch ermöglicht, die Nutzer effektiver zu binden und damit eine wiederkehrende Wirkung bei der Reduzierung von Überfüllungen zu erzielen.

Der zweite Teil dieser Dissertation befasst sich mit der Befähigung der Nutzer durch anpassbare Informationen im Zusammenhang mit (Banner-)Werbung auf Webseiten. Da Online-Werbung oft zu Irritationen führt und das Nutzerengagement auf der Website unterdrückt, haben erste Webseitenbetreiber damit begonnen den Nutzern die Möglichkeit zu geben, selbst zu bestimmen, wie viel Werbung sie anzeigen lassen wollen. Obwohl die Webseitenbetreiber hoffen, auf diese Weise das Nutzerengagement zu erhöhen, ist unklar, wie die Nutzer auf die Möglichkeit reagieren, Werbung anzupassen, die sie nie angefordert haben. Vor diesem Hintergrund wird in der dritten Studie untersucht, wie sich die Möglichkeit der Anpassung der Werbemenge (Ad Quantity Customization, AQC) auf das Nutzerengagement auswirkt und für welche Werbemengen sich die Nutzer entscheiden. Die Ergebnisse zeigen, dass das Angebot von AQC das Nutzerengagement durchweg erhöht, insofern dass Nutzer mit Zugang zu AQC länger auf der Website bleiben und mehr Unterseiten besuchen als Nutzer, die die Werbemenge

nicht anpassen können. Eine Website mit Werbung, die AQC anbietet, führt sogar zu einem höheren Nutzerengagement als eine Website, die von Haus aus vollkommen werbefrei ist. Darüber hinaus ist die Auswirkung auf das Nutzerengagement am stärksten bei Nutzern, die mit einem mobilen (im Gegensatz zu einem stationären) Gerät auf die Webseite zugreifen. Interessanterweise konfigurieren die Nutzer AQC nicht so, dass sie die Werbung ganz ausblenden, sondern entscheiden sich stattdessen dafür, 29,0 % der Standardmenge an Werbung anzeigen zu lassen.

Die vierte Studie erweitert die bisherigen Ergebnisse, indem sie den zugrundeliegenden Mechanismus beleuchtet, der die Wirksamkeit der Bereitstellung von AQC auf das Nutzerengagement bestimmt. Die Ergebnisse suggerieren, dass das Anbieten von AQC eine empfundene Befähigung als einen zentralen Stimulus mit zwei wichtigen Auswirkungen hervorruft: Zum einen widmen die Nutzer der Webseite mehr Aufmerksamkeit, entdecken dadurch mehr für sie nützliche Informationen und erleben folglich eine größere Übereinstimmung zwischen den Informationen auf der Webseite und ihren eigenen Bedürfnissen. Zweitens erzeugt das Erlebnis, die Kontrolle über Werbung als typischerweise unveränderliches und störendes Element der Webseite zu haben, ein Gefühl der Freude. Sowohl die Übereinstimmung der bereitgestellten und erwarteten Informationen, als auch das Gefühl der Freude führen dazu, dass sich die Nutzer intensiver mit der Webseite beschäftigen.

Insgesamt zeigt diese Dissertation die Rolle und Bedeutung von IS-gestützter Nutzerbefähigung auf, indem sie ein umfassenderes Verständnis dafür liefert, wie die Befähigung von Nutzern mit zeitlichen und anpassbaren Informationen das Nutzerengagement und das Auswahlverhalten der Nutzer beeinflusst. Damit folgt diese Dissertation dem wichtigen Forschungsbedarf in der IS-Disziplin, nicht nur entstehende IS-Phänomene zu beleuchten, sondern auch IS-Nutzer zu befähigen und zu ermächtigen. Die Studien in dieser Dissertation leisten einen Beitrag zur IS-Forschung zur Nutzerbefähigung, indem sie (1) die Bedeutung der Zeitlichkeit von Informationen als eine bisher unzureichend untersuchte Quelle der Nutzerbefähigung aufzeigen und indem sie (2) die Werbeanpassung als einen bisher weitgehend vernachlässigten, aber wichtigen Teil der Webseitenanpassung aufdecken, der unser Verständnis von Befähigungsmechanismen ergänzt. Darüber hinaus bietet diese Dissertation auch wertvolle Einblicke und Handlungsempfehlungen, wie DSS-Anbieter und politische Entscheidungsträger die Befähigung durch zeitliche CI nutzen können, um örtliche Überfüllung wiederkehrend zu reduzieren, ohne die Freiheit der Nutzer zu beeinträchtigen. Ebenso zeigt diese Dissertation Webseitenbetreibern auf, wie sie Werbung als Elemente der

Webseite nutzen können, die von den Nutzern mit Freude angepasst werden, um das Nutzerengagement auf der Webseite als Ganzes zu steigern.

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List of Abbreviations

AQC	Ad quantity customization
AVE	Average variance extracted
CFA	Confirmatory factor analysis
CI	Crowding information
CLUTT	Perceived ad clutter
CR	Composite reliability
df	Degrees of freedom
DSS	Decision support system
EMP	Perceived empowerment
ENJ	Perceived enjoyment
H	Hypothesis
HTMT	Heterotrait-monotrait ratio of correlations
IFTT	Informational fit-to-task
IS	Information systems
LLCI	Lower limit of confidence interval
LOR	Location recommendations
NFI	Normed fit index
PCUST	Perceived customizability
PLS	Partial least squares
RQ	Research question
SEM	Structural equation modeling
SD	Standard deviation
SE	Standard error
SRMR	Standardized root mean residual
Std. error	Standard error
STICK	Website stickiness
TML	Timeliness
ULCI	Upper limit of confidence interval

Chapter 1: Introduction

1.1 Motivation

According to Greek mythology, the god Prometheus is best known for having empowered humans with fire, thereby enabling a “Promethean leap” – a fundamental and previously inconceivable betterment of humanity and society (Morford et al. 2015). In analogy to the Greek myth, contemporary information systems (IS) are often “lauded as wielding heretofore unparalleled power that could enable Promethean leaps of varying kinds” (Conboy 2019, p. 120). Accordingly, IS research is called upon to not only explain emerging phenomena, but also to enable and particularly *empower* IS users (Conboy 2019). At the same time, an unprecedented diversity of IS features and functionalities already empowers users with remarkable capability and autonomy to make their own decisions how to use and engage with IS (e.g., Gu and Tayi 2015).

Driving this technology-enabled empowerment, the design of IS for digitized individuals strives to support users by providing high quality information (e.g., timely updates of dynamically changing information) and by inviting users to control their information stream (e.g., providing interfaces to customize websites) (Matt et al. 2019; Vodanovich et al. 2010). Both, increasing information quality and informational control, empower IS users to employ and benefit from IS in new ways: Users are now more effective in acting as autonomous agents who actively shape their own user experience, rather than being confined by limited informational quality or control (Alt et al. 2019). In that sense, empowerment in IS enables users to emancipate from old authorities (e.g., service providers dictating what and what not users shall experience) – a trend particularly important to digital natives (Vodanovich et al. 2010).

IS providers cardinaly benefit from empowering their users. This is because empowered users can use IS in ways that suit them best, thereby extracting more value from the provided IS and thus being more likely to stick to the corresponding IS (e.g., Benlian 2015; Jiang and Benbasat 2007b; Kamis et al. 2008). In addition, the mere feeling of being empowered elicits more positive attitudes and greater reuse intentions toward the empowering IS (Bright and Daugherty 2012; Spreitzer 1995). As such, striving for empowerment enables IS to more effectively appeal to their users and thus gain a competitive advantage. For users to feel empowered, two themes are particularly important (Funnell et al. 1991): First, users need to have sufficient knowledge to make rational decisions within IS. In light of technical advances in data collection, one particularly interesting way to strengthen such knowledge in users’ decision-making is to

provide markedly timely information that is continuously updated. Second, users feel empowered when they have sufficient control to shape their experience with IS. Given that users increasingly expect individualized experiences in their online interactions (Vodanovich et al. 2010), a particularly interesting application of such control is the growing ability to customize which information to view on websites. The dyad of empowerment through knowledge and empowerment through control guides the structure of this thesis.

1.2 Research Questions

The first part of this thesis focuses on empowerment through timely information as a means to enhance users' knowledge to make rational decisions. A unique and particularly relevant characteristic of IS relates to their capability to bridge digital and physical worlds by presenting information that is traditionally only accessible when being physically present (Matt et al. 2019). To that end, websites increasingly support users in their decisions which (physical) location to visit (e.g., when looking for a restaurant) by displaying crowding information (CI) that communicates to users how busy different locations are (Wang and Hu 2020). For example, Google Maps includes CI for its more than 1 billion monthly users worldwide with its “popular times” feature, designed to enable users to avoid overcrowding and avert congestion costs (e.g., impaired service quality, unwanted physical proximity) (Google 2020b). Yet, the extent to which CI enhances users' knowledge to decide where to go to (i.e., how empowered users are by CI) depends on the CI's timeliness – referring to how recently the CI was retrieved. Accordingly, CI on websites is increasingly accompanied by timeliness cues, such as “live update” (high timeliness) or “average over the last year” (low timeliness) to inform users how timely the CI was retrieved.

While previous IS literature emphasizes the necessity to investigate how to empower users with timely information, extant research focused primarily on the timeliness of static information, such as how recent a product review is (e.g., Amirpur and Benlian 2015; Chen et al. 2011; Li and Wang 2019). As such, our understanding is limited how empowering users with crowding information – which refers to a constantly changing state – affects users' perceptions and behavior. Such insights are all the more important as empowering users to successfully identify a location that matches their preferred crowding level may not only increase long-term user engagement with the website. Rather, if users with access to particularly timely crowding information are able to make more rational decisions that result in selecting less crowded locations, the overall crowding could be reduced, thereby potentially contributing to greater service experiences for the broader group of location visitors. Nevertheless, to what extent

timely crowding information influences users in their location selection may be subject to the context of the visit. Whereas users penalize crowding at locations with predominantly utilitarian objectives (e.g., medical practice), they appreciate and therefore view timely crowding information differently for locations with hedonic objectives, where the presence of crowds may contribute to the quality of the experience (e.g., bars and restaurants) (e.g., Cui and Veeraraghavan 2016; Veeraraghavan and Debo 2008). Accordingly, this thesis aims to unravel across different visit contexts the implications and potential benefits of timely crowding information as a means of empowerment through knowledge by posing the following research questions:

RQ1: How does empowering users on websites through timely crowding information affect user engagement with the empowering website?

RQ2: How do empowered users select among differently crowded locations?

Apart from providing timely information, IS providers can empower their users by giving them the possibility to customize information as a form of informational control. Particularly websites have attracted IS researchers' attention as an empowering medium that can invite users to interact with the content, choose how to navigate its offerings and determine which information to view at what time (e.g., Amichai-Hamburger et al. 2008; Füller et al. 2009; Palmer 2002). Beyond offering freedom to explore the website however users prefer, websites can offer web customization to grant their users power to exercise active control over the website's content itself (e.g., offering a modification interface in which users select a website's language or color appearance) (e.g., Benlian 2015; Jiang et al. 2010). As one of the most interesting contexts for web customization, website providers have begun to loosen their traditionally firm grip over ads (e.g., banner ads) in exchange for the prospect of higher user engagement with the website – for example in that users spend more time on the website and explore more pages. More specifically, websites increasingly offer ad quantity customization (AQC), which refers to a website feature that empowers users to customize the amount of ads displayed on a website. For example, several online news outlets, such as The Guardian (Southern 2019), Forbes (Brownsell 2016), or Newsquest (Newsquest 2021), as well as streaming portals, such as Hulu (Hulu 2021) or HBO (Metz 2021) empower their users by offering a choice feature that allows them to choose fewer or even no ads. Notoriously, YouTube appeals to its users by providing a skip feature that empowers users to considerably shorten ads (e.g., Belanche et al. 2020; Dukes et al. 2020).

Ads are a particularly interesting context to study web customization because higher amounts of ads typically stifle user engagement, causing users to abandon cluttered websites (e.g., Seyedghorban et al. 2016). As such, one could argue that the intuitive ideal for users is a website that does not display any ads at all, rather than asking its users to customize how many ads shall appear. At the same time, however, 77% of ad-blocker users explicitly wish they could filter ads rather than blocking them altogether (An 2016). Furthermore, previous web customization research demonstrated that empowering users in their interactions with IS leads to more positive attitudes and greater reuse intentions toward the empowering IS (e.g., Benlian 2015; Jiang and Benbasat 2007b; Kamis et al. 2008). Therefore, it is far from clear whether users engage more with a website when it is entirely free of ads or when the same website empowers its users to control the typically immutable amount of ads.

Creating an understanding of how AQC impacts user engagement offers a promising opportunity to extend our knowledge on web customization. Extant research on web customization thus far focused primarily on the customization of editorial content that pertains to the main purpose of the website, such as enabling users to decide in which order to examine product information (Ariely 2000), to choose which type of product to get suggested (Adomavicius et al. 2011; Xiao and Benbasat 2007; Xu et al. 2014), to customize the content of news aggregators (Benlian 2015), and to determine how to interact with virtual mock-ups of physical products (Jiang and Benbasat 2007a; Yi et al. 2015). However, customizing ads is fundamentally different from customizing editorial content, as users do not seek to be exposed to ads and therefore may even be repelled when asked to customize ads they never asked for (Cho and Cheon 2004; Tan et al. 2015). In addition, whereas previous research has taken first steps to explore why users are appealed by web customization, we have little insights on the unique underlying mechanisms that are relevant to the context of customizing ads through AQC. Lastly, to what extent web customization features, such as AQC, affect users may be subject to whether users employ mobile or stationary devices. This is because the small screen sizes of mobile devices are known to affect user behavior, particularly with respect to sizeable ads (Ghose et al. 2013). Despite repeated calls by web customization research to account for users' device type (e.g., Benlian 2015; Lee 2005; Wottrich et al. 2017), we still lack insights as to how the effects of web customization change when users access a website through their mobile device. Taken together, this thesis seeks to investigate AQC as a means of empowerment through control by posing the following research questions:

RQ3: How does empowering users on websites through AQC affect user engagement with the empowering website?

RQ4: How do empowered users select to customize ad quantity?

Both research questions address multi-faceted approaches to empower IS users through knowledge and control. Accordingly, four empirical studies were conducted: Two focused on empowering users with timely crowding information on websites (i.e., aiming at sufficient knowledge to make rational decisions within IS), while the other two investigated how to empower users with AQC on websites (i.e., aiming at having sufficient control to shape one's experience with IS). This allowed to create a much-needed understanding of two contemporary and highly impactful trends in the development of IS in general and websites in particular. The resulting studies were published in four peer-reviewed IS outlets. In the following, a theoretical background on empowerment is provided, followed by the positioning of this thesis presenting the underlying research model. Subsequently, the overall thesis structure and synopsis is presented.

1.3 Theoretical Background on Empowerment

Empowerment is not an isolated process within IS, but rather results from what IS induce in their users. Accordingly, the process of empowerment is considered as “any means strengthening a person's perception of self-determination and self-efficacy and reducing conditions contributing to feelings of powerlessness” (Füller et al. 2009, p. 74). To understand how these perceptions arise, the following subsection introduces psychological empowerment theory. Subsequently, primary outcomes of empowerment for user behavior and attitudes are discussed.

1.3.1 Psychological Empowerment Theory

According to psychological empowerment theory, the concept of psychological empowerment (hereafter referred to as perceived empowerment) describes an individual's sense of motivation that results from having the authority to fully utilize an IS in line with one's preferences (Spreitzer 1995; Thomas and Velthouse 1990). Perceived empowerment is closely linked to the general sense of agency and perceived control. However, perceived empowerment addresses particularly the sense of obtaining the possibility to meaningfully influence activities and decisions in ways that were heretofore unavailable (Alt et al. 2019; Amichai-Hamburger et al. 2008; Zimmerman 1995).

Perceived empowerment is multifaceted. For individuals to feel empowered in their pursuit of a task (e.g., making a decision), psychological empowerment theory postulates that at least one of three major cognitions needs to arise: self-determination, competence, and impact (Spreitzer 1995). Self-determination refers to an individual's perceived autonomy in executing their task. Competence reflects an individual's conviction of possessing the ability to effectively execute the task. Lastly, impact describes an individual's conviction that their actions make a difference for the outcome of their task.

Applied to the context of this thesis, both providing timely CI and offering AQC affect these three cognitions that spark perceived empowerment. Timely CI essentially enables users to obtain greater transparency on how crowded a location is at this very moment – similar to social cues communicating a choice option's popularity for a specific time point (e.g., Röthke et al. 2020; Schneider et al. 2019; Wessel et al. 2019). As such, users are more certain that the displayed CI truly reflects the current demand for each location. This entails multiple consequences. First, users are less dependent on other signals to evaluate the suitability of a certain location (e.g., reviews) and thus feel more autonomous in their decision. In other words, their *self-determination* increases. Second, the reduced uncertainty about the accuracy of the CI makes users feel more confident to make a decision – reflected in greater perceived *competence*. Third, by having greater transparency on the potential consequences of their choice (e.g., prolonged wait times), users feel they have a greater influence on the outcome following their selection. Put differently, they feel to accomplish *impact* in their selection process. As self-determination, competence, and impact increase with timelier CI, users feel greater empowerment in their task to select a location (Spreitzer 1995; Thomas and Velthouse 1990).

Offering AQC, on the other hand, allows users to customize how many ads a website may display. This means that users are invited to control ads as typically immutable elements of websites – again with important consequences for the cognitions relevant to the perception of empowerment. First, users can freely choose which ad quantity they prefer. This sense of choice boosts users' autonomy in shaping their online experience. As such, their *self-determination* is enhanced. Second, as users can adjust the ad quantity to match their personal needs, they are more confident to effectively explore the website. In that sense, users' sense of *competence* is strengthened. Third, altering the quantity of highly prevalent ads has immediate and tangible consequences for users' online experience. As such, users perceive to accomplish *impact* with their customization selection. In conclusion, AQC's propensity to enhance feelings of self-

determination, competence, and impact ultimately induce users to feel empowered when browsing the website (Spreitzer 1995; Thomas and Velthouse 1990).

Taken together, psychological empowerment theory is well suited to understand how IS can empower their users with timely and customizable information to influence selection behavior and user engagement.

1.3.2 Outcomes of Empowerment

Within the IS discipline, the Internet and its websites have drawn researchers' attention as a platform for empowering technologies that allow users to do or accomplish actions they have found difficult to do or accomplish before (Amichai-Hamburger et al. 2008; Füller et al. 2009). In this respect, website providers can empower their users by providing them high quality information and by inviting them to actively shape the website's composition (Benlian 2015). Psychological empowerment theory suggests an important consequence of IS-enabled empowerment: Users who are empowered are more active and productive than those who are not (Thomas and Tymon 1994). This sentiment is confirmed by a broad range of IS studies. For example, in the context of work, empowered users are more eager to contribute to knowledge management systems (Kang et al. 2017) and exhibit a greater tendency to make full use of customer relationship management systems (Kim and Gupta 2014). Beyond the context of work, empowered users exhibit a greater intention to disclose their location (Klumpe et al. 2020), to purchase digital products (Adam et al. 2021) and to reuse websites that empower them (e.g., Benlian 2015; Jiang and Benbasat 2007b; Kamis et al. 2008). In addition to encouraging user action, prior literature has demonstrated that empowerment leads to improved user satisfaction (Liang et al. 2006), stronger user loyalty (Pierrakos et al. 2003), enhanced personal identification of users with the brand of the empowering website (Johnson et al. 2006), and generally more positive user attitudes toward the empowering website (Kalyanaraman and Sundar 2006). On the downside, making use of empowerment (e.g., in the form of greater information or increased control) can be a task in itself and therefore depends on users' readiness and capability to muster sufficient processing resources (Ariely 2000).

1.4 Thesis Positioning

IS-enabled empowerment is considered one of the most impactful and relevant levers in the aspiration to increasingly digitize individuals in their use of IS (Matt et al. 2019). Accordingly, IS research is called to investigate new ways how to empower users (Conboy 2019). To answer

these calls, this thesis strives to showcase the role and importance of IS-enabled user empowerment by means of timely and customizable information.

Drawing on the stimuli-response (SR) model from environmental psychology (Mehrabian and Russell 1974), a research framework is constructed to delineate the focus and positioning of this thesis. The SR model posits that stimuli within an actor's environment influence and alter the actor's behavior. In the context of this thesis, the stimuli for IS users result from IS-enabled empowerment. As the first stimulus, this thesis sets out to investigate user empowerment through timely CI as an emerging technological trend bridging physical and digital worlds. As a second stimulus, this thesis uncovers the website feature of AQC as means to enhance users' control particularly in a context in which users' influence is typically severely constrained. As outcomes of both types of user empowerment, this thesis focuses user engagement and selection behavior. Revealing the effect of empowerment on user engagement is important both for users who generally enjoy engaging with IS and for IS providers that depend on engaging their users. This is because user engagement presents a vital indicator for IS' ability to attract, capture, and retain users' interest – a key success metric for many IS (e.g., Alalwan et al. 2020; Lehmann et al. 2012; Webster and Ahuja 2006). On the other hand, understanding the implications for users' selections is important as their choices impact not only the empowered users themselves, but also others that are affected by the users' selections – as in the example of convincing users to avoid visiting (over)crowded locations. Accordingly, the research model structuring this thesis is outlined in Figure 1-1.

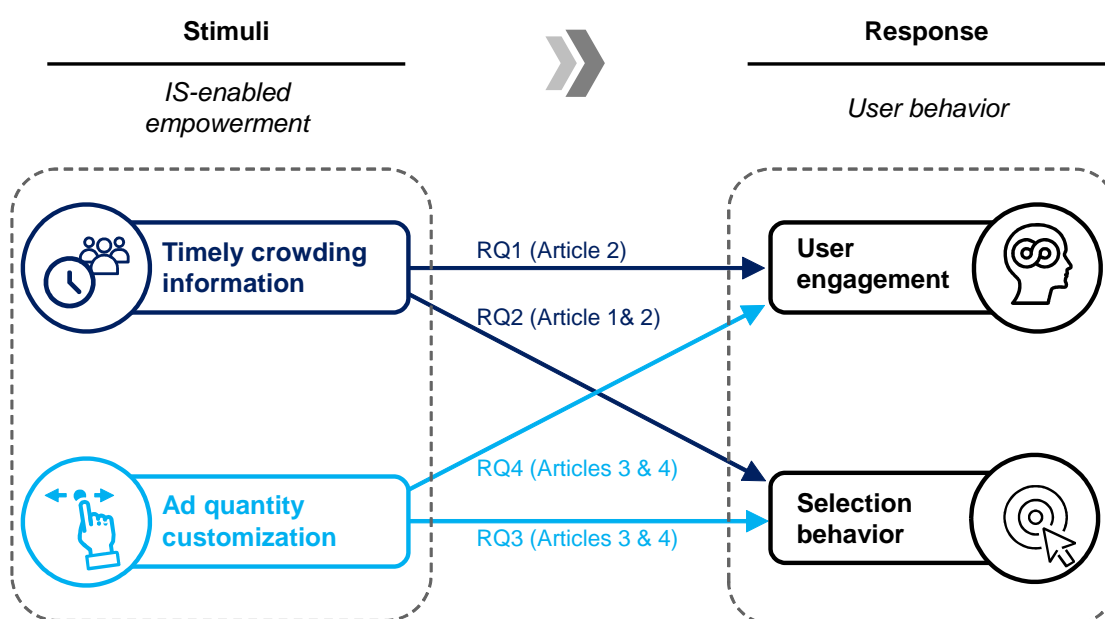


Figure 1-1: Research model

In summary, the first two articles investigate how empowering users through timely crowding information impacts users' intention to reuse the website the timely crowding information is embedded in and how it shifts their selections of differently crowded locations. The last two articles elucidate how empowering users through AQC affects their user engagement with the empowering website, as well as which ad quantity options users select.

In addressing the four corresponding research questions, I intend to contribute to IS literature centered around the IS-enabled empowerment of users. More specifically, I demonstrate how IS can leverage timeliness of information to empower their users in their decision-making and to benefit from greater user engagement. Furthermore, I shed light on how empowering users to customize a website's ad quantity can leverage typically undesirable ads to boost user engagement, while simultaneously resulting in users not cancelling out ads altogether. As such, this thesis is part of the broader umbrella of emerging research examining how users and IS providers can benefit from IS-enabled user empowerment.

1.5 Thesis Structure and Synopses

This thesis is organized into six chapters. The introductory chapter sheds light on the motivation of the thesis, introduces its research questions and informs about theoretical foundations. To address the proposed research questions, four studies were conducted and published in four articles in peer-reviewed IS outlets. The four articles are each presented in chapters 2 to 5, subject to minor deviations from the originally published version to ensure a consistent layout throughout the thesis. The concluding chapter summarizes the overarching contributions to research, presents implications for practice and offers directions for future research. Table 1-1 outlines the chapters presenting the four articles of this thesis.

In the following, each of the four articles is outlined by summarizing the main findings and contributions to this thesis' research questions. All articles use plural person pronouns (i.e., 'we'), as multiple authors were involved in their development.

Chapter 2	Timeliness of Crowding Information During Times of Pandemics
Article 1	Adam, M.; Werner, D.; Wendt, C.; Benlian, A. (2020). “Containing COVID-19 Through Physical Distancing: The Impact of Real-Time Crowding Information”, <i>European Journal of Information Systems</i> , 29(5), pp. 595-607. VHB: A
Chapter 3	Timeliness of Crowding Information in Hedonic Use Contexts
Article 2	Werner, D.; Wendt, C. (2021): “Right Here, Right Now – How The Immediacy of Information Affects Crowding“, <i>European Conference on Information Systems (ECIS)</i> , June 14-16, A Virtual AIS Conference. VHB: B
Chapter 4	Ad Quantity Customization and Its Effects on User Engagement
Article 3	Werner, D.; Croitor, E.; Röthke, K.; Manakov, V.; Adam, M.; Benlian, A. (2021): “Ad Quantity Customization and Its Effects on User Engagement – A Randomized Field Experiment”, <i>International Conference on Information Systems (ICIS)</i> , December 13-15, Austin, TX, USA. VHB: A Nominee for Best Paper Award
Chapter 5	Underlying Mechanisms of Ad Quantity Customization
Article 4	Werner, D.; Adam, M.; Benlian, A. (2022): “Empowering Users to Control Ads and Its Effects on Website Stickiness”, <i>Electronic Markets</i> , forthcoming. VHB: B

Table 1-1: Overview of the articles in this thesis

Chapter 2 – Article 1: Timeliness of Crowding Information During Times of Pandemics

The first article addresses the first research question (RQ1) that focuses on how the IS-enabled empowerment of users through timely CI affects users’ selections among differently crowded locations. The study is crucially motivated by the emergence of the COVID-19 pandemic, which mandated physical distancing as one of the most effective containment measures against the spread of the virus. The pandemic reinforced the importance of what decision support systems (DSS) had already begun to implement even before physical distancing was vital for individuals’ health: The inclusion of CI to aid users in avoiding crowded locations. Thanks to technological advancements, DSS are increasingly able to indicate the timeliness of their CI, communicating what time point the information is based on (e.g., “updated just now”). However, it is unclear whether and to what extent this type of empowerment through timely information impacts users’ selection behavior. Therefore, this first article seeks to understand how users’ selections among differently crowded locations change with timelier CI and how this effect is subject to users’ health anxiety as a critical moderator involuntarily influencing

users' location decisions during the pandemic. Based on literature on digital choice environments and construal level theory, an online experiment was conducted to examine the effect of CI on selecting differently crowded medical practices. The results show that empowering users with present (vs. absent) CI in DSS makes users more likely to select less crowded medical practices. This effect is strongest when real-time (vs. historical average) CI is employed and, surprisingly, when users' health anxiety is low (vs. high). Overall, this study provides valuable insights how IS can empower their users with information to identify and select less crowded locations. These insights are particularly relevant as they allow to contain the spread of hazardous infections by encouraging voluntary physical distancing without paternalistically restricting users' freedom of choice.

Chapter 3 – Article 2: Timeliness of Crowding Information in Hedonic Use Contexts

The second article further expands our understanding of the empowerment of users through timely CI in two ways. First, the previous study was situated in the context of pursuing a utilitarian objective (i.e., selecting a medical practice to visit). However, individuals likely evaluate crowded locations differently in hedonic use contexts, such as visiting a restaurant or bar, where the presence of crowds can actually contribute to the quality of the experience (e.g., Cui and Veeraraghavan 2016; Veeraraghavan and Debo 2008). As such, it is unclear whether empowering users with timely CI affects user behavior differently in a hedonic context than in the previously investigated utilitarian context. Second, while the implications of empowering users with timely CI for users' selection behavior continue to warrant examination, this second article additionally seeks to address the second research question (RQ2) on how empowerment through timely CI affects user engagement with the DSS in the form of reuse intentions. Accordingly, an online experiment was conducted in which 171 participants selected between differently crowded bars during times where COVID-19-related restrictions were largely absent. Similar to our findings in the utilitarian context of choosing a medical practice, we find that high (vs. low) timeliness of CI still leads users to select less crowded bars – despite the apparent hedonic appeal of the presence of crowds. Interestingly, we also find that high (vs. low) timeliness of CI increases user engagement in that users exhibit a greater intention to return to the DSS. Taken together, the first and second article provide valuable insights pertaining to the first two research questions (RQ1 and RQ2) of this thesis, focusing on the empowerment of users through timely CI.

Chapter 4 – Article 3: Ad Quantity Customization and Its Effects on User Engagement

The third article investigates the customizability of information as a facet of empowerment complementary to the provision of timely information examined in the first two articles. More specifically, this study addresses the third and fourth research question (RQ3 and RQ4) that focus on how the empowerment of users through AQC affects user engagement as well as users' selection of different ad quantities. The study builds on the growing trend of website providers starting to carefully loosen their rigid grip on ad quantity in exchange for the prospect of greater user engagement with the website (e.g., in the form of users staying longer on the website and visiting more sub-pages). This trend is particularly interesting as user engagement with the website is oftentimes stifled the more ads are displayed (Seyedghorban et al. 2016). While IS research has started to uncover benefits of empowering users to customize the website's primary editorial content (e.g., customizing which topics to receive news articles about) (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010), it is less clear how empowering users to customize ad content they never asked for may affect user engagement. Moreover, as users largely seek to avoid ads altogether, the intuitive ideal could arguably be a website that displays no ads whatsoever instead of asking its users to customize ad quantity. To address these research opportunities, this study presents a large-scale randomized field experiment comprising 17,241 visits to a news website over the course of 4.5 weeks. The findings show that users are more engaged in that they spend more time on the website and explore more pages when they can (vs. cannot) customize the quantity of ads. Intriguingly, users engage more with the website when being empowered with AQC than when browsing a website that is ad-free by default. Comparing users' selection of ad quantities, the results reveal that empowered users do not utilize AQC to set ad quantity to zero, but instead choose to have on average 29.0% of the website's ads displayed. As such, the study reveals that – contrary to common belief – users do not want to discard ads altogether. Instead, the results indicate that users accept some degree of ads, as long as they are empowered to freely select which option suits them best.

Chapter 5 – Article 4: Underlying Mechanisms of Ad Quantity Customization

The fourth article continues the investigation of the effects of empowering users through AQC. While the field experiment in article three provided rich insights on the implications of offering AQC, methodological constraints did not allow to capture *why* AQC enhances user engagement. Accordingly, this fourth article sets out to investigate the underlying mechanism driving the effect of AQC on user engagement. Drawing on literature on web customization and psychological empowerment theory, an online experiment was conducted with 395 participants

accessing a fictitious news website. The results reveal that the provision of AQC induces a perception of empowerment that is pivotal on a cognitive and affective level: Cognitively, this sense of empowerment invites careful scrutiny of the website and its contents, thereby leading users to perceive a greater informational fit with their needs. Affectively, on the other hand, the feeling of empowerment to control ads, as typically immutable and irritating website elements, elicits a strong perception of enjoyment in users. Both informational fit and perceived enjoyment then lead to enhanced user engagement. As such, this study sheds light on perceived empowerment, informational fit, and perceived enjoyment as key constructs hitherto under-investigated in web customization literature. Taken together, the third and fourth article offer comprehensive answers to the third and fourth research question (RQ3 and RQ4) on the consequences of empowering users through AQC.

Additional Articles (not included in this thesis):

In addition to the articles listed above, I contributed to the submission and publication of the following manuscripts during my time as a Ph.D. candidate. These articles, however, are not included in this thesis:

Published:

- Werner, D.; Adam, M.; Wittor, S.; Benlian, A. (2020): “Overcoming Shadow Customization by Empowering the Users: The Role of Ad Quantity Customization”, *European Conference on Information Systems*, June 15-17, A Virtual AIS Conference. **VHB: B**
- Werner, D.; Hovestadt, C.; Adam, M.; Schulze, L. (2019). “Shielding Focus Against Distractions: Designing Focus Assistants for Knowledge Workers”, *International Conference on Information Systems (ICIS)*, December 12-15, Munich, Germany. **VHB: A**
- Wendt, C.; Werner, D.; Adam, M.; Benlian, A.: “Influencing Crowding at Locations with Decision Support Systems: The Role of Information Timeliness and Location Recommendations”, *Decision Support Systems*, forthcoming. **VHB: B**
- Wendt, C.; Werner, D.; Adam, M.; Benlian, A. (2021). “To Compare Against Oneself or Others? Evaluative Standards as Design Elements to Affect Heating Energy Consumption.” *International Conference on Information Systems (ICIS)*, December 12-15, Austin, TX, USA. **VHB: A** (received Best Paper in Track Award)

- Adam, M.; Croitor, E.; Werner, D.; Benlian, A.; Wiener, M.: “Input Control and its Signaling Effects for Complementors’ Intention to Join Digital Platforms”, *Information Systems Journal*, forthcoming. **VHB: A**
- Croitor, E.; Werner, D.; Adam, M.; Benlian, A. (2021): “Opposing Effects of Input Control and Clan Control for Sellers on E-Marketplace Platforms”, *Electronic Markets*, 32, pp. 201-216. **VHB: B**
- Croitor, E.; Werner, D. (2021): “Exploring the Relationship between Perceived Input Control and Complementors’ Perceived Performance: An Empirical Study on Amazon”, *European Conference on Information Systems (ECIS)*, June 14-16, A Virtual AIS Conference. **VHB: B**
- Croitor, E.; Werner, D.; Benlian, A. (2021): “The Effects of Control Mechanisms on Complementors’ Behavioral Intentions: An Empirical Study of Reward-Based Crowdfunding Platforms”, *Hawaii International Conference on System Sciences (HICSS)*, January 5-8, A Digital Conference. **VHB: C**

Submitted for publication:

- Adam, M.; Werner, D.; Benlian, A.: “Ad Quantity Customization: Exploiting the Display of Ads to Increase User Engagement with Websites”, *Journal of Management Information Systems*, first round of review. **VHB: A**
- Wendt, C.; Werner, D.; Adam, M.; Benlian, A.: “Stimulating Sustainable Energy Consumption with Goal-Setting: An Investigation of Relative Performance and Evaluative Standards”, *Information Systems Journal*, second round of review. **VHB: A**

Chapter 2: Timeliness of Crowding Information During Times of Pandemics

Title: Containing COVID-19 Through Physical Distancing: The Impact of Real-Time Crowding Information (2020)

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Published in: European Journal on Information Systems (2020), 29(5), pp. 595-607.

Abstract

With the rise of COVID-19, decision support systems (DSS) increasingly display crowding information (CI) (e.g., how crowded a medical practice is) to encourage physical distancing when users select locations. Despite important implications for containing COVID-19, little is known about the causal effect of CI on user selection behavior and how the timeliness of CI (e.g., “updated 2 minutes ago”) as well as users’ health anxiety further influence the effect of CI. Drawing on literature on digital choice environments and construal level theory, we conducted a multi-national online experiment to investigate the effect of CI on selecting differently crowded medical practices. Our results demonstrate that present (vs. absent) CI in DSS increases the likelihood of users selecting less crowded medical practices, while the effect is strongest when employed with real-time (vs. historical average) CI and, surprisingly, when users’ health anxiety is low (vs. high). Overall, our study adds to the growing body of research on IS in the age of pandemics and provides actionable insights for DSS providers and policy makers to endow users with information to identify and select less crowded locations, thus containing COVID-19 through improved physical distancing without paternalistically restricting users’ freedom of choice.

Keywords: COVID-19, pandemic, crowding information, timeliness of information, real-time, health anxiety

2.1 Introduction

Protect yourself, protect others: Avoid going to crowded places. Why? Where people come together in crowds, it is more difficult to maintain physical distance.

— World Health Organization, *COVID-19 advice for the public*¹

As long as an effective medication and vaccine are still being developed, physical distancing² is one of the most potent means to curb the spread of COVID-19. As such, many policy makers recommend or even fiercely enforce physical distancing of their citizens through lockdowns and curfews to ensure compliance. The prevalence of enforced physical distancing reached unprecedented levels when in March 2020 almost one in every five people around the globe were placed under lockdown (Davidson 2020). In sum, physical distancing has become an unwanted but needed global practice, opposing the social nature of humans and thus – if enforced – embodying undesired paternalistic infringements of citizens’ freedom of choice.

To facilitate physical distancing without restricting citizens’ personal freedom, decision support systems (DSS) increasingly display crowding information (CI), which we define as information that indicates to what extent a location’s available capacity for visitors is occupied. For example, the website DocClocker informs patients how exposed they are to other patients at different doctors (Pennic 2020), the app Crowdless shows which supermarkets are currently crowded (BBC 2020), and the popular times feature of Google Maps displays how busy locations (e.g., restaurants and bars) are (Google 2020b) (see Figure 2-1 for an example). By employing CI, DSS make the different crowding levels at real-world locations digitally visible and thus allow users to identify differently crowded locations. If users then select less crowded locations, physical distancing increases because this selection not only reduces the likelihood of crowded locations becoming overcrowded (e.g., inhibiting users from keeping the recommended levels of physical distance at the locations) but also leads to a more equally distributed crowding level and thus to less congestion across all locations, thereby minimizing the number of possible encounters and thus potential risk of infection between all users (see D’Angelo and West (2000)). As such, DSS can potentially facilitate physical distancing by

¹ <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>

² Often referred to as “social distancing” in media. We refrain from using the term social distancing, because information and communication technology-mediated social interactions (e.g., phone, chat, video streaming) are not restrained by the COVID-19 pandemic.

displaying CI and therefore provide an important contribution to the containment of the COVID-19 pandemic.

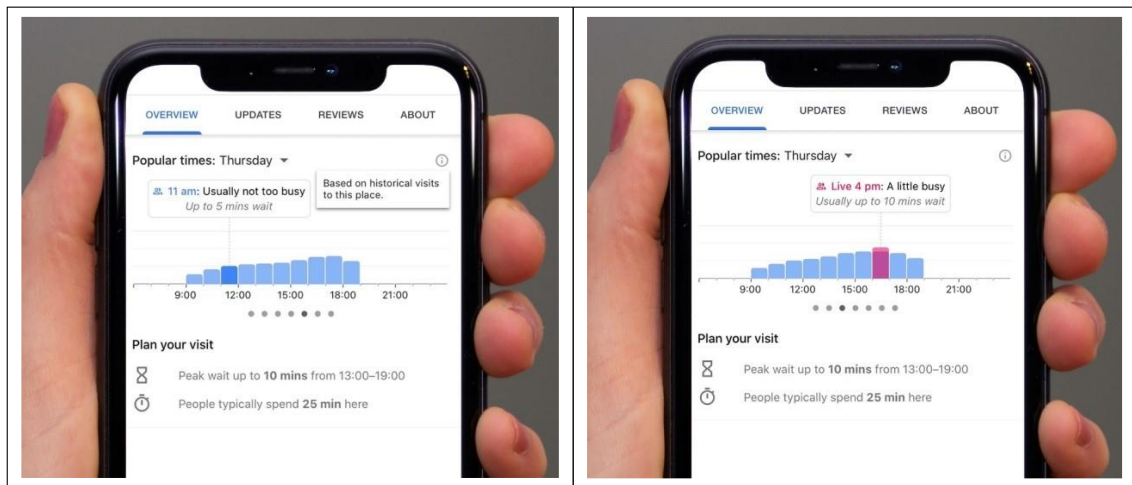


Figure 2-1: CI provided by Google Maps (Google, 2020) with usual CI based on historical visits (left) and live CI reflecting current visits (right)

Although DSS increasingly display CI to assist users in identifying and selecting less crowded options, knowledge is lacking whether and how CI indeed influences (user) selection behavior. Specifically when users are uncertain about the quality of each location, users face a dilemma when interpreting CI: Given the COVID-19 pandemic, more crowded locations entail a heightened risk of infection through increased encounters and congestion (Bayham et al. 2015), whereas less crowded locations may be perceived to exhibit poor quality, based on an apparent lack of demand for these options (e.g., Becker 1991; Bikhchandani et al. 1992; Li and Wu 2018). Previous information systems (IS) research related to CI mainly investigated how users interpret demand information, such as the number of patient recommendations for a doctor (Khurana et al. 2019; Li et al. 2019). Findings mainly indicate that individuals are attracted to highly demanded and thus often crowded locations as high demand is interpreted as a signal of high quality (Becker 1991; Chen and Davison 2019; Li and Wu 2018). For example, highly demanded doctors are believed to provide greater service quality (Khurana et al. 2019; Li et al. 2019), reflecting expertise and safety to receive competent support, which seems particularly important during the COVID-19 pandemic. Yet, this attraction to demanded and thus often crowded locations implies a serious threat in times of COVID-19: If users are attracted to crowded locations, do DSS that display CI in good faith unintentionally make users select more crowded locations and hence add fuel to the fire of spreading COVID-19? To address this concern, insights on the causal effect of displaying CI on selection behavior are urgently required and of significant practical value in view of the containment of COVID-19.

In addition to the main effect of CI on selection behavior, we also investigate two salient and COVID-19-relevant factors that potentially interact with the way CI is processed by users. First, CI is usually not displayed in isolation but accompanied by timeliness cues (e.g., “updated 2 minutes ago”), which indicate how closely the CI relates to the present point in time. For instance, Google’s popular times feature not only informs users how crowded locations are, but also whether the information reflects “live” (i.e., real-time) or “usual” (i.e., average over the past) representations (see Figure 2-1) (Google 2020b). Similarly, CI with timeliness cues can be found for locations and services particularly impacted by COVID-19, such as occupancy of real-time emergency rooms (NSW 2020) and utilization of public transport (Transit 2020). Although DSS increasingly employ timelier (up to real-time) CI (e.g., Li and Wu 2018; Qiu et al. 2018), it is unknown whether users select less crowded locations more or less often when CI becomes timelier. Indeed, previous research on time-related cues has not explicitly considered the timeliness of dynamically changing information (e.g., CI in which the crowding level notably varies over time) and instead only analyzed the effects of time cues on static information about occurrences (e.g., timestamps of when products or reviews were published) (e.g., Chen et al. 2011; Huang et al. 2018) or highly predictable events (e.g., countdowns for the limited availability of purchase options) (e.g., Amirpur and Benlian 2015; Li and Wang 2019). As such, besides the main effect of CI on selection behavior, it seems fruitful to investigate how the timeliness of CI further shapes users’ information processing and thus selection behavior.

Second, the timeliness of CI is not processed in a vacuum but is dependent on a user’s responsiveness to the timeliness cue, which is most likely shaped by a user’s health anxiety in times of COVID-19. We refer to health anxiety as a user’s “exaggerated estimates of the likelihood and severity of having an illness” (Abramowitz et al. 2007, p. 873). Health anxiety has become a common and critical theme in pandemics (Wheaton et al. 2011), as it results in unusual and partly irrational user behavior, such as generally avoiding crowded places (Lau et al. 2010; Morganstein et al. 2017), making unnecessary pre-emptive visits at doctors or avoiding doctors altogether (Wong et al. 2020) and even developing dangerous self-medications like drinking bleach (Spinney 2020). Whereas previous studies have demonstrated that higher levels of health anxiety can lead to selecting less crowded locations (Lau et al. 2010), little is known about how health anxiety interacts with the processing of differently timely CI. This insight, however, is important because health anxiety is particularly relevant in times of COVID-19 and may shape the processing of timeliness cues in an unknown direction, thus impacting the overall effectiveness of CI and hence selection behavior. As such, investigating

different levels of timeliness together with different levels of health anxiety appears to be of high theoretical and practical interest to uncover potential complementary or substitutive interaction effects.

Against this backdrop, this study first investigates whether and how the presence of CI impacts users' selections of differently crowded locations in the context of COVID-19. Second, we explore the presence of CI more deeply by investigating the effect of CI at different levels of timeliness and health anxiety. Overall, we ask the following two research questions:

RQ1: Whether and how does the presence (vs. absence) of CI influence users' selections of differently crowded locations?

RQ2: If CI is present, how does the level of timeliness of CI influence users' selections of differently crowded locations at different levels of health anxiety?

To answer our research questions, we integrate literature on digital choice environments with construal level theory and conducted an online experiment in which 343 participants from Germany and Italy selected between differently crowded medical practices. Our results demonstrate that present (vs. absent) CI increases the likelihood of users selecting less crowded medical practices, in that users are 4.6 times as likely to select less crowded options. Moreover, this effect is strongest when employed with timelier CI and when users show lower levels of health anxiety.

This study adds to the emerging body of initiatives on IS in the age of pandemics (Laato et al. 2020; Naidoo 2020) and answers the call of Ågerfalk et al. (2020) for IS studies whose results have important and immediate practical implications to contain the COVID-19 pandemic and beyond. Specifically, our insights can help DSS providers and policy makers in the design of emerging apps to achieve an immediate impact on physical distancing by endowing users with CI and making them voluntarily select less crowded locations. Consequently, the infection risk for individuals, service providers (e.g., medical practitioners) and ultimately the society as a whole is reduced without infringing on individuals' freedom of choice. Beyond these practical implications, this study also offers theoretical contributions regarding IS in times of the COVID-19 pandemic – a context that may affect users' usual processing of information and thus selection behavior. Besides introducing CI as a new DSS feature in digital choice environments and assessing its impact, we extend construal level theory by investigating timeliness as a new facet of temporal distance and by examining the joint effect of timeliness and health anxiety inducing mental construal in different ways. As such, we highlight the

importance and effects of an emerging form of information within and beyond the context of pandemics.

2.2 Theoretical Background

In this section, we first introduce CI as a DSS feature and position it in related literature on demand information in digital choice environments. Subsequently, we introduce construal level theory as a theoretical lens through which we shed light on the facets of timeliness and health anxiety.

2.2.1 Crowding Information as DSS Feature

CI as an increasingly prevalent DSS feature in digital choice environments builds upon the abundantly employed DSS feature of visualization of demand information, which signals how many users have already selected a given option (e.g., number of check-ins at a restaurant, aggregated statistics displaying product purchases) (Chen et al. 2011; Thies et al. 2016). High demand is often interpreted as a signal of high quality (e.g., Bikhchandani et al. 1992; Li and Wu 2018; Thies et al. 2016). In particular, when faced with uncertainty, users usually rely on such DSS features and use those signals to imitate previous selection behaviors, thereby selecting highly demanded options (e.g., Chen and Davison 2019; Duan et al. 2009; Walden and Browne 2009). Thus, interpreting high demand as a signal of high quality induces users to opt for more crowded locations (Becker 1991).

Since the rise of the COVID-19 pandemic, DSS providers for real-world services increasingly display DSS features in the form of CI – similar to announcing wait times in call centers (Yu et al. 2018). CI addresses the rival nature of locations with limited capacity, which entails that increasing crowding by users results in growing congestion (Casson 1982) (e.g., multiple patients competing for the attention of one medical practitioner at the same time). With increasing congestion, individuals impose rising costs on each other (Wang and Ackerman 2019; Weimer and Vining 2005), such as unwanted physical proximity to others, increased wait times and impaired service quality (Becker 1991; Villarica 2011). Particularly in times of pandemics, costs in the form of intensity and duration of exposure to others are highly relevant as they undermine physical distancing. Therefore, it is important to investigate whether and how CI alters users' selections of differently crowded locations and thus physical distancing during the COVID-19 pandemic.

2.2.2 Construal Level Theory and its Role for Timeliness and Health Anxiety

Beyond consideration of presence (vs. absence) of CI as a DSS feature, we draw on construal level theory to understand how processing of CI is affected by related timeliness of CI and a user's health anxiety. Construal level theory refers to the cognitive processing of goals (e.g., selecting a location) and related messages (e.g., CI of a location) by delineating how closer psychological distance from an event or object leads to a more concrete mental representation of it (Trope and Liberman 2010). *Psychological distance* hereby describes an individual's "subjective experience that something is close [to] or far away" (Trope and Liberman 2010, p. 440) with regard to, for instance, time (i.e., temporal distance) and likelihood (i.e., hypothetical distance) (Bar-Anan et al. 2006). For example, individuals think about an upcoming visit to a medical practice in concrete terms (e.g., how to get there), whereas general awareness of one's health is conceived in more abstract terms (e.g., why to go to medical practices).

DSS providers can affect users' construal of events and objects by accompanying CI with timeliness cues to alter users' perceived temporal distance toward the event or object (Huang et al. 2018). We refer to timeliness of CI as how closely the presented CI relates to the present point in time, reaching up to an instantaneous, real-time representation. Accordingly, higher levels of timeliness (e.g., the CI relates to "right now") represent a closer temporal distance than lower levels of timeliness (e.g., the CI relates to an average over the past) and therefore induce users to think about the respective location more concretely, compared to a more abstract construal when timeliness is low (Bar-Anan et al. 2006; Broniarczyk and Griffin 2014; Trope and Liberman 2010). Previous IS studies found that closer temporal distance derived from time-related information (e.g., timestamps of reviews, product release dates, countdown timers) changes how users respond to information, for example by evaluating recent product reviews as more helpful (Huang et al. 2018), by increasing funding of crowdfunding campaigns close to their completion date (Li and Wang 2019) and by imitating others' behaviors more strongly when products are new (Chen et al. 2011). Yet, whereas previous IS studies mainly analyzed DSS features in the form of static information, it is unclear how DSS features in the form of dynamically changing information (e.g., CI) and corresponding levels of timeliness impact selection behavior.

Aside from timeliness's influence on temporal distance, health anxiety (i.e., a user's perception of increased likelihood of having an illness) can shift a user's hypothetical distance. Accordingly, high (vs. low) health anxiety induces a closer (vs. farther) hypothetical distance toward health threats as the risk of contracting a disease is perceived as more probable to the

respective user (Trope and Liberman 2010). Previous research on hypothetical distance mainly investigated its influence on individuals' construal in isolation, without considering potential interaction effects with other dimensions of psychological distance, such as temporal distance (McDonald et al. 2015; Trope and Liberman 2010). Hence, it is unclear how health anxiety interacts with timeliness of CI and how both jointly impact the main effect of CI on selection behavior.

2.3 Hypothesis Development

In the following, we first hypothesize the effect of CI on selection behavior (H1). Subsequently, we hypothesize how the effect of CI changes with different levels of timeliness (H2) and how this influence of timeliness is subject to health anxiety (H3).

2.3.1 The Effect of CI on Selection Behavior

In digital choice environments, CI is increasingly applied as DSS feature to assist users in identifying and selecting their preferred option (e.g., location). In case CI is not provided (i.e., CI absent), crowding levels of different locations cannot be considered in the selection process and we expect users to select a location at random, all else being equal (e.g., distance to the location). Conversely, in case CI is provided (i.e., CI present), users are able to compare locations based on the trade-offs associated with the crowding level of each alternative. Specifically, the presence of many individuals at one location represents high demand and is interpreted as a signal of high quality (e.g., Bikhchandani et al. 1992; Li and Wu 2018; Thies et al. 2016), while at the same time high demand, and thus crowding, implies costs of congestion such as wait times and proximity to others (Becker 1991; Casson 1982). Although previous findings in the area of real-world services indicate a dominating influence of CI's quality signals (Becker 1991), this influence can be countervailed when CI simultaneously signals a heightened risk of infection through increased encounters (Bayham et al. 2015). Particularly under the extraordinary circumstances attributed to the COVID-19 pandemic, the costs of congestion related to CI may prevail over CI's quality signals and shift users' selection behavior toward less crowded locations to minimize exposure to individuals (Lau et al. 2010; Morganstein et al. 2017).

H1: *In times of pandemics, users are more likely to select less crowded locations when CI is present (vs. absent).*

2.3.2 The Effect of Timeliness of CI on Selection Behavior

Construal level theory posits that a construal fit occurs when the construal levels of a goal and its respective goal-related message match (Hansen and Wänke 2010; Kim et al. 2009; Lee et al. 2010). Regarding the construal level of a goal, the goal of selecting a location is often spontaneous (Parboteeah et al. 2009) and frequently refers to a highly immediate and concrete future (e.g., “I suddenly feel sick; I should see a doctor as soon as I can”), inducing a close temporal distance and thus low-level construal (Trope and Liberman 2003). On the other hand, a goal-related message can often be subject to different levels of timeliness (e.g., “updated 2 minutes ago” vs. “updated sometime in the past”) and thus different levels of temporal distance, such that the construal level of the goal-related message is not always low. Still, the two construal levels of goal and goal-related message match better when the timeliness of a goal-related message is high (vs. low) (Hansen and Wänke 2010; Semin et al. 2005).

Accordingly, we argue that high (vs. low) timeliness of CI leads to the selection of less crowded locations. Specifically, we assert that this change in selection behavior results from an increased construal fit and its evoked processing fluency, increasing the impact of the perceived cost of congestion in the user decision-making through two mechanisms: First, when timeliness of CI is high (vs. low), the increased processing fluency makes the CI more likely to be assessed as true, resulting in increased perceived validity of the CI (Hansen and Wänke 2010). As a result, when timeliness is high (vs. low), ambiguity on the cost of congestion and related optimism bias – which makes “people interpret ambiguous information or uncertain situations in a self-serving direction” (Rhee et al. 2005, p. 13) – is reduced (e.g., “this usually highly crowded location *might not* be that crowded today” vs. “this highly crowded location *is* actually crowded right now”). Consequently, more crowded locations appear to have higher costs of congestion and thus are less attractive. Second, when timeliness of CI is high (vs. low), the increased processing fluency helps in comprehending the cost implications of different crowding levels, which requires an effortful reasoning process (Cheung et al. 2014; Kahneman 2011) in contrast to the heuristically processed quality signal of demand (Sun 2013). Therefore, the increased processing fluency due to high (vs. low) timeliness of CI causes the different costs of congestion at each location to be processed better, making less crowded locations more attractive. In conclusion, when the timeliness of CI is high (vs. low), users are more likely to select less crowded locations.

H2: *Users are more likely to select less crowded locations when timeliness of CI is high (vs. low).*

2.3.3 The Moderating Role of Health Anxiety

As presented in the theoretical background, we refer to health anxiety as a user's exaggerated perception of the likelihood and severity of contracting a disease such as COVID-19, resulting in a closer hypothetical distance and a more concrete conception of the health risk associated with visiting locations (Abramowitz et al. 2007; Trope and Liberman 2010).

Building on these insights, we argue that the more health anxious a user is, the more likely will the user be to select a more crowded location in the presence of highly timely CI. When timeliness is low, processing fluency is similarly impeded for users of any level of health anxiety and consequently leads to comparable selections between users. On the other hand, when timeliness is high and thus processing fluency increased, we believe that health anxiety amplifies the in H2 mentioned deterring effect of high timeliness. This is because users with high (vs. low) levels of health anxiety give even more weight to costs of congestion when timeliness of CI is high, as they think more concretely about the infection risk (e.g., “*how* could I get infected at each location”). As such, health anxious users are deterred particularly strongly from selecting crowded locations in the presence of highly timely CI.

H3: *Health anxiety moderates the effect of timeliness of CI on location selection, such that more health anxious users are more likely to select less crowded locations when CI is timely.*

2.4 Method

To test our hypotheses, we conducted a between-subject online experiment with three conditions investigating the effect of CI and related timeliness cues on selecting differently crowded medical practices. We chose participants from Germany and Italy as the severity of the pandemic differs between the two otherwise comparable European countries³, thereby allowing us to test our findings for robustness against cultural differences and differences due to the impact and stage of the COVID-19 pandemic in the respective countries. We collected our data in the first week of June 2020, when physical distancing policies were in place to cope with the COVID-19 pandemic.

We chose to investigate the selection of medical practices for three reasons: First, COVID-19 is primarily transmitted between people during close contact, especially by coughing and

³ As of June 20th, 2020, Italy reported 58 COVID-19-related deaths per 100,000 citizens, whereas Germany reported only 11 COVID-19-related deaths per 100,000 citizens (Johns Hopkins University 2020).

sneezing (ECDC 2020; WHO 2020). As such, the risk of infection in waiting rooms of medical practices filled with potentially ill patients is significant (Shaw 2019). Second, users who plan to visit a medical practice often have an urgent need to avoid their condition from deteriorating (Wong et al. 2020) and therefore particularly value information (e.g., CI) aiding their spontaneous decision. Third, as the quality of different medical practices is hard to assess in advance, users strongly rely on information about others' behaviors to make a decision (Li and Wu 2018).

2.4.1 Experimental DSS and Manipulations

We created a fictitious website “find-your-doctor.org” for the purpose of the experiment. The website claimed to support its users with a map showing different medical practices with no further details on crowding levels in the control condition (i.e., CI absent). In the two treatment conditions, we operationalized CI with four crowding levels using manikin icons symbolizing “few” (1 manikin) to “many” (4 manikins) patients at each respective medical practice. Similarly, we operationalized timeliness of CI with a timeliness cue displaying “usual amount of patients (past 2 months)” in the case of historical average CI and “live amount of patients (updated just now)” in the case of real-time CI. See Figure 2-2 for details on all three conditions.

2.4.2 Experimental Procedure

Figure 2-3 visualizes the experimental procedure: (1) First, we explained the online experiment to the participants, ascertained anonymity and asked them to consider going to a medical practice because of an intensified back pain. As their usual medical practice was claimed to be closed, participants were asked to look for an alternative in their proximity by using our experimental website. (2) Next, participants were randomly assigned to one of the three treatment groups and were introduced to the general layout of the website including – if applicable – CI and timeliness cues. (3) Thereafter, we presented participants the map, manipulated in accordance with their condition and showing four medical practices as well as the participant's own (fictitious) location. We also pointed out that all medical practices were comparable with respect to distance, capacity, and specialization. Participants then selected the medical practice they would preferably go to. (4) To conclude, participants completed a questionnaire covering their perceptions of the selection process as well as manipulation checks and controls.

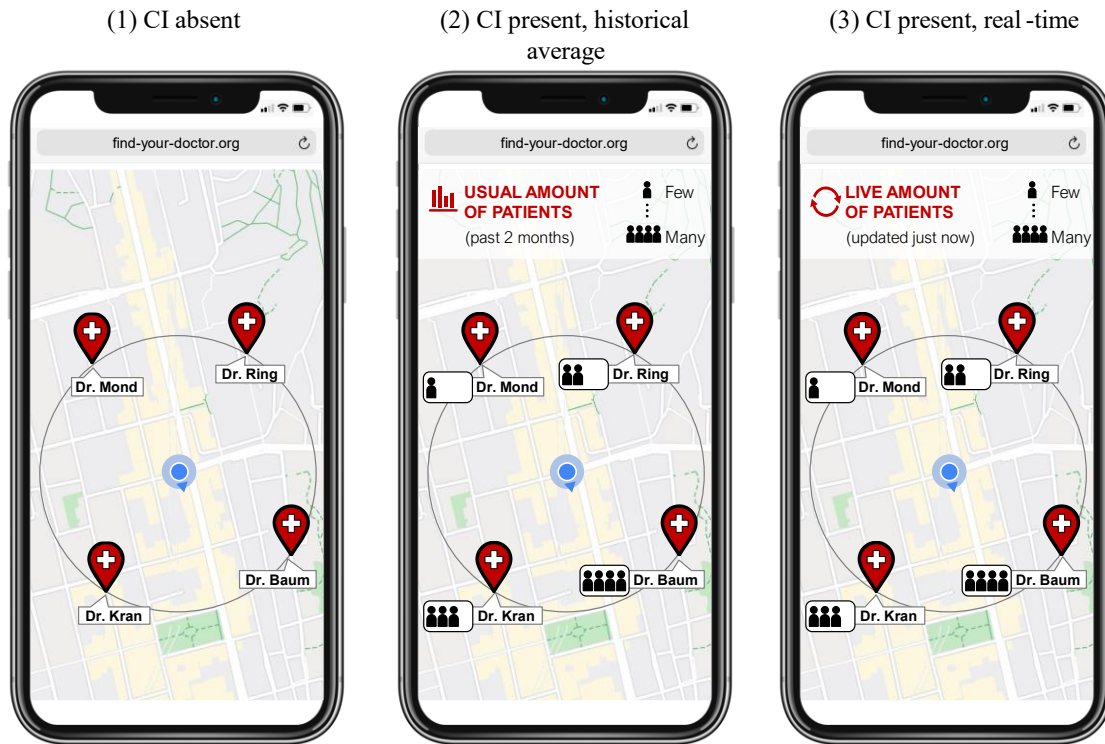


Figure 2-2: Manipulations

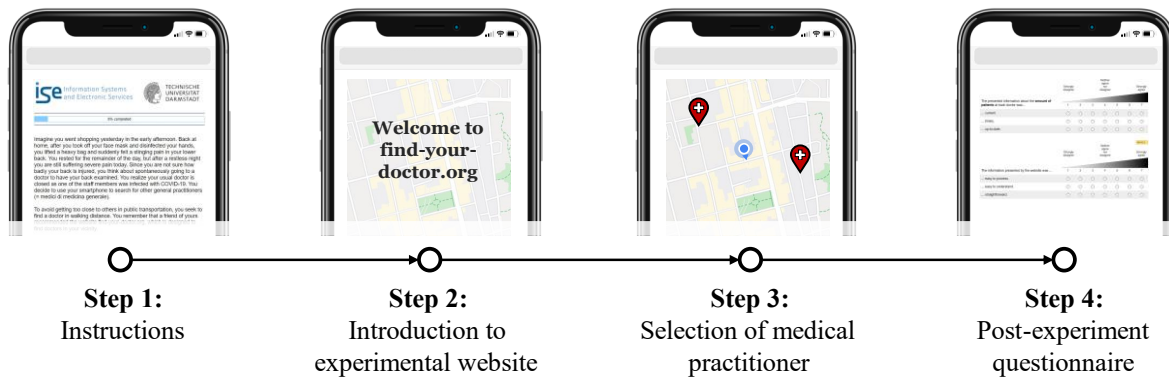


Figure 2-3: Experimental procedure

2.4.3 Measurements

We measured our dependent variable *location selection* by recording which of the four given medical practices participants selected (i.e., which crowding level they selected). As our moderating variable, we measured participants' *health anxiety* (Abramowitz et al. 2007), rated on a seven-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7). As controls we measured participants' *country* of residence (Germany vs. Italy), the *time* participants spent reading the instructions and selecting a medical practice and participants' *product involvement* (Zaichkowsky 1985) toward medical practices using three bipolar items rated on a seven-point scale. In addition, we asked for participants' *age*, given the widespread

conception that particularly older people are at higher risk for severe illness caused by COVID-19 (WHO 2020) which may impact their selection behavior beyond their overall health anxiety. Furthermore, we used seven-point Likert-type scales to measure three manipulation checks: *perceived crowding* of the most crowded location (Machleit et al. 2000), *perceived timeliness* of the CI (Lee and Strong 2003) as well as *processing fluency* (Lee and Aaker 2004). Appendix Table 2-3 lists all employed items. Besides, we included four attention checks to identify how carefully participants read each item and understood the visualizations. Lastly, we asked how realistic participants perceived the scenario.

2.5 Analysis and Results

2.5.1 Sample Description

We recruited 360 participants from the crowdsourcing platform Prolific.co which offers a particularly suitable environment for experiments in behavioral research with survey results providing reliable, high-quality data (Palan and Schitter 2017; Peer et al. 2017). We limited participation to participants with German or Italian residency as well as a high approval rating of 95% or more to ensure high data quality (Goodman and Paolacci 2017). Out of the 360 participants, 343 passed all four attention checks. Appendix Table 2-4 summarizes the descriptive statistics of our conditions.

Two one-way analyses of variance for the control variables provide evidence of comparability and balance across our three conditions, as we did not find significant differences ($p > 0.1$) in terms of participants' age, product involvement and health anxiety. Therefore, we find support for the successful randomization of assignment to the experimental conditions. We also conducted three manipulation checks: Perceived crowding was significantly higher for the two CI-present-conditions than for the CI-absent condition ($p < 0.001$) and perceived timeliness was significantly higher for the CI real-time condition than for the CI historical average condition ($p < 0.001$). As such, our experimental treatments worked as intended. Additionally, participants confirmed that they found the experiment realistic (mean=5.60; SD=1.63). Comparing the results for the two countries included in our sample (Germany and Italy), we found no significant difference ($p > 0.05$) in selection behavior, manipulation checks or age, except for Italian participants being more health anxious and exhibiting a greater product involvement toward medical practices than their German counterparts ($p < 0.001$), which likely reflects the differences in severity of the COVID-19 pandemic in the two countries.

2.5.2 Reliability and Validity

A confirmatory factor analysis provided evidence for adequate convergent and discriminant validities. For convergent validity, the values of average variance extracted (AVE) were all above the threshold of 0.50 and the loadings of all items were significant ($p < 0.01$) and above the recommended level of 0.70. For internal consistency, the values of composite reliability (CR) and Cronbach's α were all greater than the threshold of 0.70. Discriminant validity was assessed using Heterotrait-Monotrait (HTMT) analysis with all values below the recommended maximum of 0.90.

2.5.3 Hypothesis Testing

We coded our independent variables CI and timeliness of CI as binary variables (i.e., CI absent = 0, CI present = 1; historical average = 0, real-time = 1). We coded our dependent variable *location selection* as an ordinal variable with four levels (i.e., crowding level of selected location 0%, 33%, 67%, 100%). To test our hypotheses, we used ordinal logistic regression, ensuring that all required assumptions were met, including proportional odds (Lund and Lund 2020). In addition, we found good model fit through a significant improvement of the final model containing the full set of predictors compared to an intercept-only model ($p < 0.001$) and non-significant test-results of the Deviance chi-square test and the Pearson chi-square test ($p > 0.1$).

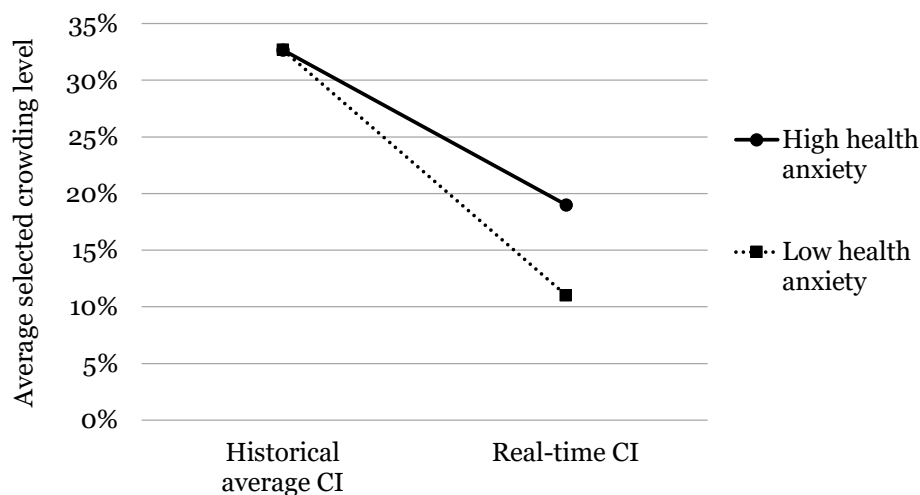
Table 2-1 provides the results of three ordinal logistic regressions on location selection. Model 1 includes all conditions and compares the effect of presence vs. absence of CI. Model 2 focuses on the CI-present conditions to analyze the main effect of timeliness of CI. Model 3 furthermore considers the moderating effect of users' health anxiety on timeliness. The regression estimates represent the predicted change in logarithmic odds of selecting a more crowded location per unit increase on the independent variable. In other words, the higher the estimate of an independent variable, the higher is the probability of selecting a more crowded location.

	Model 1		Model 2		Model 3	
Independent variables	Estimate	Std. error	Estimate	Std. error	Estimate	Std. error
CI	-1.52***	0.23	-	-	-	-
Timeliness of CI	-	-	-1.35***	0.28	-2.80**	0.88
Timeliness of CI x Health anxiety	-	-	-	-	0.40[†]	0.23
Controls						
Health anxiety	0.04	0.09	0.14	0.12	-0.03	0.16
Age	0.02	0.01	0.04*	0.02	0.04*	0.02
Country of residence	0.06	0.21	-0.23	0.27	-0.25	0.27
Product involvement	0.12	0.08	0.05	0.11	0.03	0.11
Time instructions	0.00	0.00	-0.01*	0.00	-0.01*	0.00
Time selection	0.00	0.00	0.00	0.00	0.00	0.00
Pseudo R ²						
Cox & Snell	0.14		0.15		0.16	
Nagelkerke	0.16		0.16		0.18	
McFadden	0.06		0.07		0.08	
Note: [†] p<0.1, *p<0.05, **p<0.01, ***p<0.001						

Table 2-1: Ordinal logistic regression on location selection

The results of model 1 **support H1** in that presence (vs. absence) of CI makes users 4.6 (=exp(1.52)) times as likely to select a less crowded location. Looking more closely how CI is processed at different levels of timeliness, the results of model 2 **support H2** in that higher levels of timeliness lead to selecting less crowded locations.⁴ However, contrary to H3, the results of model 3 indicate that health anxiety does not amplify the effect of high timeliness. Instead, the results suggest a significant opposite effect, in that when real-time (vs. historical average) CI is provided and health anxiety is low (i.e., one standard deviation below mean, at a level of 2.36), users are 6.4 (=exp(2.80+(-0.40)*2.36)) times as likely to select less crowded locations. In contrast, when users exhibit high health anxiety (i.e., one standard deviation above mean, at a level of 4.76), real-time (vs. historical average) CI makes users only 2.5 (=exp(2.80+(-0.40)*4.76)) times as likely to select less crowded locations. We therefore **reject H3**. See Figure 2-4 for the interaction plot.

⁴ In a separate analysis, we find that processing fluency is significantly higher for real-time rather than historical average CI (p<0.001), indicating support for our proposition of enhanced construal fit.



Note: Location with lowest crowding level = 0%, highest crowding level = 100%

Figure 2-4: Interaction plot of real-time vs. historical average CI and users' health anxiety

2.6 Discussion

Does the presence (vs. absence) of CI in DSS make users more or less likely to select less crowded locations? And, if the presence of CI makes users more likely to select less crowded locations, at what levels of timeliness and user health anxiety is CI most effective? Our study addresses these two questions and provides robust findings – across Germany and Italy – that largely support our assertion that CI displayed in DSS can facilitate physical distancing and thus help in containing the COVID-19 pandemic. We demonstrate the causal effect of CI on selection behavior, in that people are 4.6 times as likely to select less crowded places when CI is present (vs. absent). Whereas high (vs. low) timeliness amplifies the effect of CI, we surprisingly find that under high timeliness of CI, health anxiety increasingly draws users to select more crowded locations. Indeed, real-time (vs. historical average) CI makes users with high health anxiety only 2.5 times as likely to select less crowded places compared to 6.4 times when health anxiety is low. In light of this counterintuitive finding, we speculate that when faced with highly timely CI, more health anxious users may use the increased processing fluency to put greater emphasis on the quality of each location than their less health anxious peers. In other words, for a high (vs. low) health anxious user, when timeliness and thus processing fluency is high, visiting any location inherently bears an acute uncertainty and high infection risk (e.g., “no matter where I go, I run a high risk of getting infected *anyway*”), so that they select more crowded locations to comfort their health anxiety, given that the higher demand can be interpreted as a signal of high quality (e.g., Bikhchandani et al. 1992; Li and Wu 2018; Thies et al. 2016).

2.6.1 Practical Implications for Managing the COVID-19 Pandemic

By uncovering how displaying CI shapes selection behavior, our findings offer pragmatic insights and actionable implications for DSS providers and policy makers to achieve an immediate impact on containing the COVID-19 pandemic. As such, we add to the emerging body of initiatives on IS in the age of pandemics (e.g., Laato et al. 2020; Naidoo 2020; Trang et al. 2020) and answer the call of (Ågerfalk et al. 2020) for IS studies to generate urgently required impetus that can immediately support practitioners in the fight against the COVID-19 pandemic and beyond. Our contributions are summarized in Table 2-2.

First, our study highlights CI as a powerful tool for DSS providers and policy makers to facilitate physical distancing by endowing their citizens with information to identify and select less crowded places. In the past, policy makers mainly focused on whether or not it is necessary to enforce physical distancing through traditional paternalistic interventions like lockdowns and curfews as ultima ratio. Our insights now provide a more liberal, state-of-the-art solution that supports users in their physical distancing efforts without infringing on their personal freedom of choice. As such, DSS providers who display CI in general, and highly timely CI in particular, enable a self-regulating mechanism for users to unwittingly contribute to the containment of COVID-19, thus complementing and partially mitigating the necessity of paternalistic governmental interventions. Moreover, this approach not only helps to safeguard civil rights, but also allows policy makers to avert economic loss, such as from forcing service providers to (temporarily) close shops. Moreover, while this risk containment is particularly relevant to control pandemics like COVID-19, it can also serve to curb the spread of other infectious diseases (e.g., seasonal flues). As such, our findings are valuable to protect individuals within and beyond the context of pandemics.

Second, our study urges DSS providers and policy makers to consider the role of health anxiety and its effects on processing information in IS in times of COVID-19. In particular, DSS providers and policy makers can learn from our insights that timely CI is most effective in encouraging the selection of less crowded locations when users have not (yet) built high levels of health anxiety. We conjecture that this counterintuitive effect is caused by health anxiety urging users to place greater emphasis on the quality of each location, which users infer from the level of crowding. As anxiety may increase throughout the stages of a pandemic, timely CI is probably most effective at the beginning of a pandemic, when the estimates of the likelihood and severity of having an illness have not yet reached exaggerated levels, but also at later stages, such as after the first or second wave of a pandemic, when users turn back to old habits and

beliefs. Still, our results inform DSS providers and policy makers that displaying CI is better than not displaying CI and that the timelier the CI, the merrier – even if users exhibit high levels of health anxiety.

Third and last, service providers such as medical practitioners benefit from users selecting less crowded locations: Crowding levels are more equally distributed across all locations and thereby allow service providers to optimize their planning and service offering to effectively operate despite an ongoing pandemic. As such, service providers should consider to actively participate in the endowment of users through IS, for instance by sharing CI with DSS providers.

	Existing thinking / practice	Contribution of this paper
COVID-19 practical implications		
Containment strategy	Policy makers mainly focused on whether or not it is necessary to enforce physical distancing through traditional paternalistic interventions like lockdowns and curfews as ultima ratio (Our World in Data 2020).	Our insights unveil a self-regulating mechanism for users to unwittingly contribute to the containment of COVID-19, thus complementing and partially mitigating the necessity of paternalistic governmental interventions.
Collection of information	Policy makers are encouraged to develop and refine IS and technologies to collect and analyze disease status data, such as infections, recoveries and deaths (Pietz et al. 2020).	We extend the range of information required to successfully combat the pandemic by highlighting the role of CI in DSS as an implicit warning signal of infection risk.
Communication of information	Pandemic-related information must not only be collected and analyzed, but also communicated to the general public in real-time to encourage behavior compliant with policies and recommendations (Pietz et al. 2020).	We confirm the criticality of providing timely information by demonstrating the effect of displaying CI and by uncovering how real-time (vs. historical average) information elicits a more desired response.
Cognitive processing of information	Substantial resources are directed toward IS increasing the transparency of infection risk, for example by promoting disease status dashboards (Pietz et al. 2020) and by optimizing communication strategies to increase user adoption of tracing apps (Trang et al. 2020).	We build on this unprecedented level of transparency of infection risk and study its implications by investigating user selection behavior in light of differently crowded locations. Thereby, we shed light on the processing of and reaction to DSS-provided information.

Influence of health anxiety	During the COVID-19 pandemic, health anxiety has emerged as a critical factor influencing user attitudes and behavior, for example with respect to spreading information online (Laato et al. 2020) and accepting tracing apps (Trang et al. 2020).	We confirm the relevance of taking users' health anxiety into account when investigating their behavior in the context of COVID-19. Specifically, we uncover a surprising tendency of health anxious users to engage less in physical distancing when presented with real-time information, thereby emphasizing the intriguing influence of users' health anxiety in interactions with DSS on real-world location selection.
Theoretical contributions beyond COVID-19		
Contextual information	Context may alter users' usual processing of information and thus users' selection behavior (e.g., Hong et al. 2014; Thaler and Sunstein 2009; Tversky and Kahneman 1973). Previous research indicated that time-related contextual information in digital choice environments (e.g., timestamps and countdowns) affect user behavior (Amirpur and Benlian 2015; Chen et al. 2011; Li and Wang 2019).	We corroborate the importance of considering context by uncovering that temporal context shaped through timeliness cues can alter user decision-making in digital choice environments. As such, we unveil timeliness of dynamically changing information as a new facet of previously investigated time-related contextual information.
Demand information	Previous research investigating demand-related information concentrated on how the display of demand sparks users' perceptions of quality and thus draws users to select highly demanded options (e.g., Li and Wu 2018; Thies et al. 2016).	Our study is among the first to investigate CI as a new and increasingly prevalent DSS feature comparing current demand to available capacity and thus reflecting so far disregarded costs of congestion.
Construal level theory	The multitude of studies investigating construal level theory largely analyzed psychological distances in isolation and separately (see Huang et al. (2018) for an overview).	We extend our understanding of multiple psychological distances by examining the joint effect of temporal distance and hypothetical distance on user information processing and decision making.

Table 2-2: Summary of the main contributions of the current study

2.6.2 Research and Theoretical Contributions

Our study also offers theoretical contributions with a particular consideration of the context of COVID-19, whose context-specific influences may alter users' usual processing of information and thus selection behavior (e.g., Hong et al. 2014; Thaler and Sunstein 2009; Tversky and Kahneman 1973).

First, we advance our understanding of how DSS as digital choice environments influence selection behavior. Whereas previous research on digital choice environments mainly analyzed how demand-related information sparks perceptions of quality (e.g., Li and Wu 2018; Thies et al. 2016), we introduce CI as an increasingly prevalent DSS feature during COVID-19 which compares current demand to available capacity and thus additionally reflects associated costs of congestion. Furthermore, we shed light on the impact of different levels of timeliness of CI on users' processing. Specifically, higher timeliness of CI (e.g., real-time) seems to induce a more vivid perception of crowding and its related costs. Crowded locations are thus perceived as more deterring – especially in times of the COVID-19 pandemic where infection risks soar. Second, we extend construal level theory by unveiling timeliness as a new facet of previously investigated temporal cues (e.g., Amirpur and Benlian 2015; Chen et al. 2011; Li and Wang 2019) and by examining the joint effect of two dimensions of psychological distance (i.e., temporal and hypothetical distance) by further considering the effect of health anxiety during the COVID-19 pandemic. As such, our joint investigation of two dimensions extends the multitude of studies that largely analyze psychological distances in isolation and separately (see Huang et al. (2018) for an overview).

2.6.3 Limitations and Directions for Future Research

Our study to explore the role of CI is subject to limitations that offer directions for future research. First, our results are based on an online experiment conducted with participants from two European countries with largely comparable COVID-19 policies, in which users selected among differently crowded medical practices. Future research could extend the generalizability of our findings by testing our hypotheses in a field setting, potentially involving countries with different governmental approaches and cultural contexts, and by investigating further real-world locations where physical distancing is required and where interaction among visitors is considered part of the experience, such as in the case of restaurants and bars. More importantly, field data is required to assess whether the observed effects of displaying CI are strong enough to circumvent lockdowns and curfews.

Second, whilst our study focused on the main effect of CI on selection behavior under varying levels of timeliness of CI as well as users' health anxiety, we encourage future research to uncover underlying and interacting effects. Specifically, insights on the mediating role of different types of costs of congestions (e.g., wait times, infection risks), the extent to which DSS can influence users' health anxiety in the long run and potentially at different stages of the

pandemic as well as the broader role of health anxiety in user decision-making would be valuable to extend our findings.

Third, offering up to real-time CI across several locations mandates centralized data collection and automated processing, which requires substantial data infrastructure investments and approval of users or service providers to the collection. Even though these barriers have been conquered by large DSS providers like Google, most service providers are dependent on collaborating with other parties (e.g., service providers, DSS providers). As such, future research could account for these restrictions by examining efforts that are needed to fulfil the infrastructural and legal requirements when several parties are involved.

2.6.4 Conclusion

DSS have become increasingly relevant to help in containing the COVID-19 pandemic. To contribute to the emergent discussion and “war” against the invisible enemy, our study investigates whether and how displaying CI in DSS affects selections of real-world locations and thus encourages physical distancing. Specifically, by conducting an online experiment with participants from two European countries, we empirically show not only that present (vs. absent) CI causally affects the selection of less crowded locations, but also that timeliness of CI and health anxiety play an influential role in the overall effect of displaying CI. Beyond the impetus for scholars to better understand user behavior in digital environments, our study first and foremost provides insights into levers of IS that have immediate impact on containing the COVID-19 pandemic.

2.7 Appendix

Construct	Items
Health anxiety (Abramowitz et al. 2007) ($\alpha = 0.78$, CR = 0.85, AVE = 0.59)	I worry about my health. I fear of having serious illnesses. I hear about an illness and think I have it. My family / friends say I worry about my health.
Product involvement (Zaichkowsky 1985) ($\alpha = 0.90$, CR = 0.94, AVE = 0.83)	In general, going to a doctor for me ... is unimportant ... is important. doesn't matter to me ... matters to me. is nonessential ... is essential.
Perceived crowding (Machleit et al. 2000) ($\alpha = 0.92$, CR = 0.95, AVE = 0.82)	The office of Dr. Baum seemed very crowded to me. The office of Dr. Baum was very busy. There was NOT much traffic at Dr. Baum's. There were a lot of patients at Dr. Baum's.
Perceived timeliness (Lee and Strong 2003) ($\alpha = 0.83$, CR = 0.90, AVE = 0.74)	The presented information about the amount of patients at each doctor was current. ... timely. ... up-to-date.
Processing fluency (Lee and Aaker 2004) ($\alpha = 0.91$, CR = 0.94, AVE = 0.85)	The information presented by the website was easy to process. ... easy to understand. ... straightforward.
Note: "Dr. Baum" was the most crowded medical practice in the experiment.	

Table 2-3: Constructs

<div>Condition</div> <div>Variable</div>	1: CI absent (N = 114)		2: Historical average CI (N = 113)		3: Real-time CI (N = 116)	
	Mean	SD	Mean	SD	Mean	SD
Health anxiety	3.57	1.49	3.55	1.18	3.58	1.22
Age	27.47	8.43	28.04	7.49	28.43	8.55
Product involvement	5.05	1.55	5.34	1.19	5.04	1.45
Perceived crowding	3.98	0.80	6.16	0.93	6.36	0.69
Perceived timeliness	-	-	3.43	1.31	5.99	0.96
Processing fluency	5.44	1.24	5.97	1.03	6.53	0.65
Average selected crowding level ^a	50.6%		32.8%		14.9%	
Note: ^a Location with lowest crowding level = 0%, highest crowding level = 100%						

Table 2-4: Descriptive statistics

Chapter 3: Timeliness of Crowding Information in Hedonic Use Contexts

Title: Right Here, Right Now – How The Immediacy of Information Affects Crowding (2021)

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Published in: European Conference on Information System (ECIS 2021), June 14-16, A Virtual AIS Conference

Abstract

To avoid crowding at locations, decision support systems (DSS) such as Google Maps that feature crowding information (CI) and location recommendations increasingly indicate the timeliness of information (e.g., “updated just now”). Despite important implications for DSS design, little is known about how the timeliness of information influences (1) users’ selections of locations, (2) the effectiveness of present (vs. absent) location recommendations and (3) users’ reuse intentions. Drawing on construal level theory, we conducted an online experiment in which 171 participants selected between differently crowded bars. We find evidence that high (vs. low) timeliness of CI leads users to select less crowded bars – while also raising users’ reuse intentions. Yet, the effect of high (vs. low) timeliness of CI on location selection is unexpectedly cancelled out when location recommendations are displayed. Overall, we provide novel theoretical and practical insights on the role of timeliness of information for DSS.

Keywords: crowding, timeliness of information, user decision-making, construal level theory

3.1 Introduction

Crowding at locations (e.g., restaurants, shops and healthcare facilities) is a double-edged sword: While individuals may interpret high demand as a sign of high quality (e.g., Bikhchandani et al. 1992; Li and Wu 2018; Siegfried et al. 2015), crowding causes a multitude of issues, such as impaired perception of service quality (Noone and Mattila 2009), reduced willingness to pay (O’Guinn et al. 2015) and employee overload (Sun et al. 2020). Decision support systems (DSS) target crowding by providing crowding information (CI), which indicates to what extent dynamically changing demand for a location (e.g., obtaining a spot in a bar or a seat in a bus) occupies available capacity (e.g., bar size or number of bus seats) at a certain point in time (Weimer and Vining 2005). For instance, Google Maps informs over 1 billion monthly users (Google 2020a) with its “popular times” feature about the crowding at locations to reduce congestion and to increase users’ reuse intentions by helping them plan their visit (Google 2020b). Even more, several DSS build on CI to provide explicit recommendations on which locations to go to, such as using red-amber-green color schemes to deter users from crowded beaches and congested public transportation (Paton 2019; Wright 2020).

Independent of how CI is employed, CI is inherently connected to temporal cues reflecting when the CI was retrieved. Depending on available data, CI can be based on historical data or (close to) real-time information (see Figure 3-1). To inform users how timely the CI was captured, CI is increasingly accompanied with timeliness cues (e.g., “updated just now”). For example, DSS underscore when information was last updated on public transportation congestion (Transit 2020), emergency room occupancy (NSW 2020), grocery store wait lines (Lombardi 2020), restaurant visitor levels (Yang 2019) and airport security wait times (Fraport 2020). Consequently, users can consider not only the CI, but also the timeliness of the CI, when selecting a location.

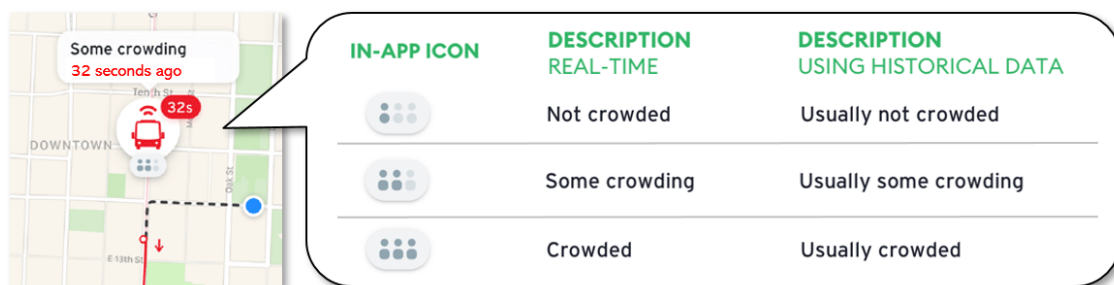


Figure 3-1: The public transportation app Transit includes different timeliness cues indicating how timely their crowding information was retrieved (Transit 2020)

IS research has repeatedly demonstrated a strong influence of such temporal cues in a variety of decision-making contexts, such as when reading product reviews (Huang et al. 2018), when contributing to crowdfunding campaigns (Li and Wang 2019) and when browsing new products online (Chen et al. 2011). In the context of crowding, preliminary IS research implies that timeliness affects how CI is interpreted, inducing users to select less crowded locations when presented timelier CI (Adam et al. 2020a). Despite researchers stressing the importance of understanding timeliness cues broadly applied by practitioners, our knowledge of the effects of timeliness is still limited in three ways: First, emerging IS research has indicated that timeliness increases users' tendencies to avoid crowded medical practices when seeking care by a physician (Adam et al. 2020a). However, it is unclear whether the implied effects of timeliness hold in contexts where crowds are traditionally viewed as an attractor, such as when individuals seek hedonic goals (e.g., pleasure, fun and excitement in restaurants and bars) instead of pursuing utilitarian goals (e.g., functional examination at a physician) (Becker 1991; Noone and Mattila 2009). Second, whereas previous research focused on how timeliness alters primarily the perception of CI (Adam et al. 2020a), little is known whether and how timeliness impacts location recommendations issued by DSS. DSS usually use social approval (i.e., to what extent others in the environment approve of a certain option) (Röthke et al. 2020; Schultz et al. 2007) based on CI to recommend selecting less crowded locations as socially approved options, given that visitors at all locations benefit from less overcrowding. Yet, if timeliness affects users' perceptions of CI and CI affects the formation of location recommendations, it is likely that timeliness affects the perceptions of location recommendations. To answer this question, we need to advance our understanding of the interaction between timeliness and location recommendations. Third and last, while it is important to look at the consequences of timeliness of CI on selection behavior, DSS-employed features are also meant to make users more likely to (re)use the DSS. As such, it is fruitful to investigate how timeliness of CI influences users' reuse intentions. It is unclear whether users value higher levels of timeliness in the form of reuse intentions or retract from DSS capturing up to real-time information, due to, for example, privacy and trust issues. Essentially, recurring impact on users' behaviors hinges on users' tendencies to keep using the DSS. Therefore, understanding how timeliness affects users' reuse intentions is critical to achieve a recurring impact on reduced crowding.

Against this backdrop, we investigate the ramifications of timeliness of CI for users' selections of differently crowded locations, both in isolation as well as in conjunction with location

recommendations. In addition, we analyze how timeliness of CI affects users' reuse intentions. As such, we investigate the following research questions:

RQ1: How do timeliness of CI and location recommendations individually influence users' selections of differently crowded locations?

RQ2: How does timeliness of CI influence the effect of location recommendations on users' selections of differently crowded locations?

RQ3: How does timeliness of CI impact users' DSS reuse intentions?

Drawing on construal level theory, we conducted a 2x2 (timeliness: low vs. high; location recommendation: absent vs. present) online experiment in which 171 participants had to select between differently crowded bars. Our results indicate that high (vs. low) timeliness of CI not only induces users to select less crowded bars, but also increases users' reuse intentions. However, the display of location recommendations unexpectedly nullifies the effect of high (vs. low) timeliness of CI.

Our research contributes to the literature on decision-making in digital environments as well as to construal level theory in three important ways: First, we advance our understanding of how timeliness of CI – individually and in conjunction with location recommendations – impacts crowding in a context with hedonic rather than utilitarian goals, where the presence of crowds enhances users' experiences (e.g., visiting a bar). Second, we contribute to knowledge on how contextual information shapes users' evaluations of DSS in the form of reuse intentions. Third and last, we extend construal level theory by examining the joint effect of timeliness of information and location recommendations based on social approval, which induce mental construal in different ways. Moreover, we reveal practical implications for DSS providers to deter users from selecting crowded locations and increase users' reuse intentions.

3.2 Theoretical Background

In this section, we first review IS literature related to CI. Subsequently, we introduce construal level theory as the theoretical basis upon which we explore the consequences of timeliness of CI and its interaction with location recommendations.

3.2.1 Crowding Information in DSS

The DSS feature of CI draws on the broadly applied concept of communicating demand by visualizing how many individuals selected a certain option, also referred to as popularity information (e.g., number of software downloads or restaurant reviews) (Chen et al. 2011; Thies

et al. 2016). Users often interpret high demand as a signal of high quality (e.g., Bikhchandani et al. 1992; Li and Wu 2018; Siegfried et al. 2015; Wessel et al. 2019). When users are uncertain about their decision, they usually rely on such signals to imitate others' behaviors and select options high in demand (e.g., Chen and Davison 2019; Duan et al. 2009; Walden and Browne 2009). Therefore, interpreting high demand of locations as a signal of high quality leads users to select more crowded locations (Becker 1991).

In contrast to mere demand information, CI takes capacity constraints into account. This is important, because simultaneous access of locations with finite capacity by multiple users results in congestion (Casson 1982) (e.g. multiple customers competing for a restaurant table at the same time). The more congested a location is, the more do individuals impose costs on each other (i.e., "costs of congestion") (Weimer and Vining 2005), including prolonged wait times, unwanted physical proximity to others and impaired service quality (Becker 1991; Noone and Mattila 2009; Villarica 2011). DSS featuring CI support their users to avoid such costs of congestion, which is central to ensure optimal consumer experience (Yu et al. 2018) and is even considered similarly important as the access to the good or service itself (Casson 1982). Whereas the effect of displaying CI has been initially investigated in the past (Adam et al. 2020a), it is fruitful to advance our understanding of how user behavior is further influenced by contextual cues (i.e., timeliness of CI and location recommendations). To understand how such cues are processed, we draw on construal level theory as a theoretical lens.

3.2.2 Construal Level Theory and Contextual Cues

Construal level theory describes the cognitive processing of a goal (e.g., selecting a location) and a related message (e.g., CI of available locations). Specifically, the theory explains how closer psychological distance from an object or event leads to a more concrete mental representation of it (Liberman and Trope 2008; Trope and Liberman 2010). *Psychological distance* hereby refers to an individual's "subjective experience that something is close [to] or far away" (Trope and Liberman 2010, p. 440) with respect to, for example, time (i.e., temporal distance) and self (i.e., social distance) (Bar-Anan et al. 2006). For instance, individuals think about meeting their closest friends on the next weekend in concrete terms (e.g., which bar to go to), while maintaining friendships is thought of in more abstract terms (e.g., how to keep in touch). Given that construal level theory links temporal and social distance related to events and messages (e.g., when information was retrieved and who it involved) to individuals' thought processes, it is particularly suited to understand how both, timeliness (i.e., temporal

distance) and location recommendations (i.e., social distance), alter users' processing of CI through contextual cues.

Timeliness cues indicate how timely the CI was retrieved and, therefore, shift users' temporal distance: Lower levels of timeliness (e.g., the CI was captured in the past) represent a farther temporal distance than higher levels of timeliness (e.g., the CI was captured right now). Previous IS research showed that users respond differently when time-related cues (e.g., countdown timers, timestamps of reviews, product release dates) reduce temporal distance, for example by intensifying funding of crowdfunding campaigns close to their countdown date (Li and Wang 2019), by assessing recent product reviews as more helpful (Huang et al. 2018), and by replicating others' behaviors more strongly in case of new products (Chen et al. 2011). Whereas these studies focused on temporal cues referring to static information, we require further investigation how timeliness referring to dynamically changing information (e.g., CI) alter users' intentions and behaviors.

Apart from temporal distance, we draw on social distance to understand how location recommendations based on social approval alter users' processing of CI and how they interact with different levels of timeliness. By recommending locations that others in the user's environment likely approve of, the presence of location recommendations induces a more interpersonally oriented form of self-awareness, thereby reducing social distance (Jacobson et al. 2011). First studies have responded to the call to simultaneously investigate multiple dimensions of psychological distance (Liberman et al. 2007) and found that when temporal and social distance are both near or both distant, individuals respond more favorably to the presented information than when these dimensions are disparate (Huang et al. 2018; Zhao and Xie 2011). Therefore, scholarly knowledge indicates that timeliness of information and location recommendations based on social approval may interact with each other.

3.3 Research Model and Hypothesis Development

We first hypothesize how selections of less crowded locations are influenced by timeliness of CI (H1) and by location recommendations (H2), before deriving how timeliness of CI and location recommendations interact (H3). Subsequently, we hypothesize how timeliness of CI affects users' reuse intentions (H4). See Figure 3-2 for our research model.

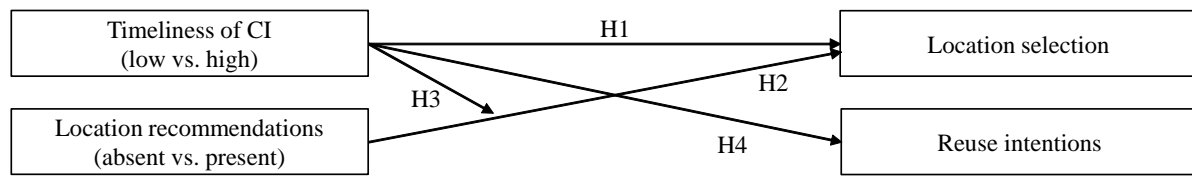


Figure 3-2: Research model

3.3.1 The Effect of Timeliness of CI on Users' Location Selections

To understand the effects of timeliness of CI on users' location selections through the lens of construal level theory, we need to think further than assessing more or less abstract levels of processing in isolation and instead focus on construal fit: According to construal level theory, construal fit occurs when the construal levels of a goal and a corresponding goal-related message match (Hansen and Wänke 2010; Kim et al. 2009; Lee et al. 2010). The goal of selecting a location often occurs spontaneously (Parboteeah et al. 2009) and refers to the near future (e.g., "I am curious which bar in my proximity I can go to right now"). The close temporal distance thus elicits a concrete, low-level construal (Trope and Liberman 2003). CI as the goal-related message on the other hand induces different temporal distances and thus construal levels depending on the timeliness of CI (e.g., "past few months" vs. "updated just now"). When timeliness of CI is high (vs. low), the low-level construal of the message (i.e., CI) and the low-level construal of the goal (i.e., selecting a location) match and construal fit occurs. In other words, for a specific goal in the near future, a concrete, low-level construal message (i.e., highly timely CI) is more fitting and thus relevant for the user than a more abstract, high-level construal message.

We argue that this construal fit induced by high (vs. low) timeliness of CI leads to the selection of less crowded locations. Specifically, construal fit fosters processing fluency (Hansen and Wänke 2010; Semin et al. 2005), which in turn increases users' awareness and perceived severity of the costs of congestion in two ways: First, the enhanced processing fluency in case of high (vs. low) timeliness of CI increases the perceived validity of the CI and thus raises the likelihood that users consider the displayed CI to be true (Hansen and Wänke 2010). Consequently, high (vs. low) timeliness of CI reduces ambiguity of the costs of congestion and impedes optimism bias, which makes "people interpret ambiguous information or uncertain situations in a self-serving direction" (Rhee et al. 2005, p. 13) (e.g., "even if this location is usually crowded, I *could* be lucky tonight" vs. "this location *is* in fact crowded tonight"). As a result, users perceive greater congestion risks and thus consider crowded locations to be less attractive. Second, the increase in processing fluency caused by high (vs. low) timeliness of CI

helps users comprehend the cost implications of different crowding intensities, which require an effortful reasoning process (Cheung et al. 2014; Kahneman 2011) compared to the heuristic processing of quality signals of high demand (Sun 2013). Therefore, when timeliness of CI is high (vs. low), users process the costs of congestion better that make crowded locations less attractive. In summary, when selecting a location in the near future, high (vs. low) timeliness of CI increases the likelihood that users select less crowded locations.

H1: *High (vs. low) timeliness of CI leads users to select less crowded locations.*

3.3.2 Location Recommendations' Effect on Users' Location Selections

To contribute to the prevention of overcrowding, DSS recommend selecting less crowded locations by employing social approval (i.e., to what extent others in the environment approve of a certain option) (Schultz et al. 2007) based on CI. The underlying rationale is that since visitors at all locations benefit from less overcrowding (Weimer and Vining 2005), a user's selection is more approved by the overall group of visitors the less crowded the selected location is.

These recommendations assist users in their uncertainty about the opposing signals of high quality and high costs of congestion of more crowded locations. Specifically, a recommendation to refrain from more crowded locations emphasizes potentially detrimental consequences of such a choice, whereas a recommendation to opt for less crowded locations emphasizes potential benefits. Taken together, location recommendations affect users' perceived valence of different levels of crowding, as long as users are actually influenced by the recommendation in the form of social approval (Köhler et al. 2011). However, as abundant empirical evidence has demonstrated the persuasive influence of recommendations based on social approval (e.g., Cialdini et al. 1990; Schultz et al. 2007; Xu et al. 2017), we expect the provision of location recommendations based on social approval to shift users' selections to less crowded locations without further hypothesizing the empirically verified mechanism of social approval. As such, we conclude:

H2: *Present (vs. absent) location recommendations lead users to select less crowded locations.*

3.3.3 The Interaction Effect on Users' Location Selections

We argue that the extent to which location recommendations influence users is subject to the timeliness of CI, as per two reasons: First, whether individuals follow a recommendation based on social approval depends on whether they perceive the assumptions underlying the

recommendation to be credible and reliable (Jeong and Kwon 2012). In the case of location recommendations that are tied to the level of crowding, we expect users to be more likely to follow the recommendation if they consider the underlying CI to be reliable. Since high timeliness increases perceived validity and reliability of CI, we expect users to adhere to location recommendations more strongly if timeliness of CI is high (vs. low).

Second, according to construal level theory, recommendations with multiple pieces of information addressing different psychological distances (e.g., timeliness and social approval) are most influential if all pieces of information are congruent in their induced construal level (Zhao and Xie 2011). When location recommendations based on social approval are present (i.e., reduced social distance), construal level matches best when timeliness of CI is high (i.e., reduced temporal distance). Consequently, the likelihood that users accept and follow location recommendations rises (Zhao and Xie 2011). This line of argument is further backed by cue consistency theory (Maheswaran and Chaiken 1991; Miyazaki et al. 2005), proposing that multiple information cues are more useful when they provide corroborating impressions than when they offer disparate conclusions. In summary, we expect high timeliness of CI to strengthen the effect of location recommendations on selecting less crowded locations:

H3: *High (vs. low) timeliness of CI enhances the effect of location recommendations on selecting less crowded locations.*

3.3.4 The Effect of Timeliness of CI on Users' Reuse Intentions

The consequences of increased processing fluency due to high (vs. low) timeliness of CI likely extend beyond users' selections. Specifically, processing fluency leads to more positive attitudes toward the origin of a message (i.e., the DSS) (Kim et al. 2009). This improvement in attitude likely allows users to concentrate on the advantages of high (vs. low) timeliness in the form of increased reliability and credibility of the CI, thereby pushing potential uncertainty or trust concerns to the back of their mind. Therefore, we assume high (vs. low) timeliness of CI to increase users' reuse intentions. This is further corroborated by previous IS research (Köhler et al. 2011) that found that users' evaluations of information systems are higher if the system design fits users' construal level of the goal they pursue. As such, we hypothesize:

H4: *High (vs. low) timeliness of CI increases users' reuse intentions.*

3.4 Method

Following previous research (Benlian et al. 2020), we tested our hypotheses by conducting a 2x2 (timeliness: low vs. high; location recommendation: absent vs. present) between-subject online experiment in which participants selected between differently crowded bars. We chose to investigate the selection of bars for two reasons: First, information on the crowding of bars is communicated by a variety of DSS providers (e.g., Google 2020b; Tanenbaum 2017; Yang 2019). Second, the hedonic nature of bars makes them a form of experience good (Becker 1991; Noone and Mattila 2009), where the quality of each selection option is difficult to assess in advance (Li and Wu 2018). As such, users base their decision on all available pieces of information, including particularly the level of crowding.

3.4.1 Experimental DSS and Manipulations

For the purpose of the experiment, we created the fictitious website “Bar-Finder.com” as a DSS that supports its users with their selections of bars. We decided to build our own website instead of using an existing one to avoid preconceived attitudes based on potential past interaction with the website (Klumpe et al. 2020). The “Bar-Finder.com” website introduced its purpose as helping users to find bars in their proximity on a map. The website presented three bars as potential selection options in equal distance to the fictitious location of the participant. For each bar, the website indicated the respective CI through three different visitor levels (i.e., low, medium, and high), operationalized by zero, one or two blue-colored manikin icons.

In addition, timeliness of CI (hereafter TML) was operationalized through a timeliness cue displaying “usual visitor level (past 12 months)” in the case of low TML and “live visitor level (updated just now)” in the case of high TML. In line with related research designs (Schultz et al. 2007), we operationalized location recommendations (hereafter LOR) through the presence or absence of hand icons. The meaning of these icons was explained by the website (see Figure 3-3): A green thumbs-up hand icon at a bar with low visitor level indicated social approval and recommended going to this bar, as selecting such a bar avoids overcrowding and therefore benefits all visitors. Conversely, a red stop hand icon indicated social disapproval and recommended to stay away from a bar with high visitor levels, as such a selection would increase the threat of overcrowding. Lastly, yellow horizontal-thumbs hand icons attached to bars with medium visitor levels indicated neither social approval nor disapproval (i.e., neutral). Also, we verified participants correctly understood the meaning of the hand icons and did not

mistake them for reviews by implementing an attention check (Schultz et al. 2007). Figure 3-4 exhibits details on the operationalization of all four conditions.

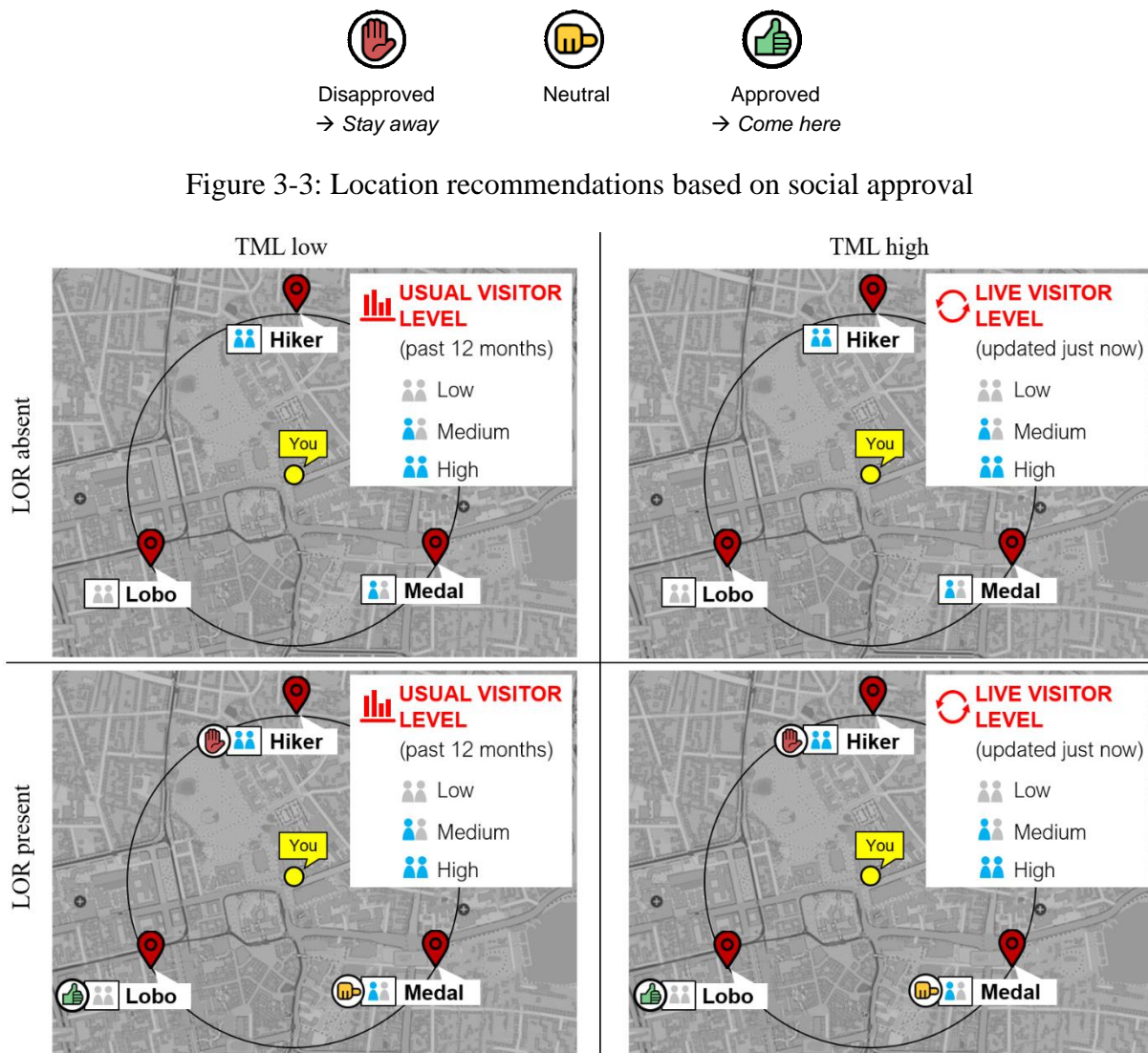


Figure 3-4: Manipulations

3.4.2 Experimental Procedure

Figure 3-5 presents the experimental procedure for the participants of all four conditions: (1) First, participants read instructions to the experiment. We introduced participants to the bar selection task by asking them to imagine that they would like to go out on a Saturday night in an unknown city with some friends (without specifying the number of friends) and that they plan to head to a bar, but do not yet know where to go. (2) Thereafter, we randomly assigned participants to one of the four conditions and informed them they hit on the website “Bar-Finder.com” in their search for decision support for their bar selection. Depending on the condition, we introduced them to the general layout of the website, explaining its timeliness

cues and, if applicable, its location recommendations. (3) Next, participants accessed the map manipulated in correspondence with the respective condition, showing three bar options and their own (fictitious) location. To minimize influence from extraneous factors, we told participants that all bars were comparable with respect to distance, drinks, prices, music, and style. Participants then indicated which of the three bars they would select to go to (closed question) and why (open question). (4) The final part covered a questionnaire about the participants' perceptions of the bar selection process, alongside manipulation checks, controls, and demographics.

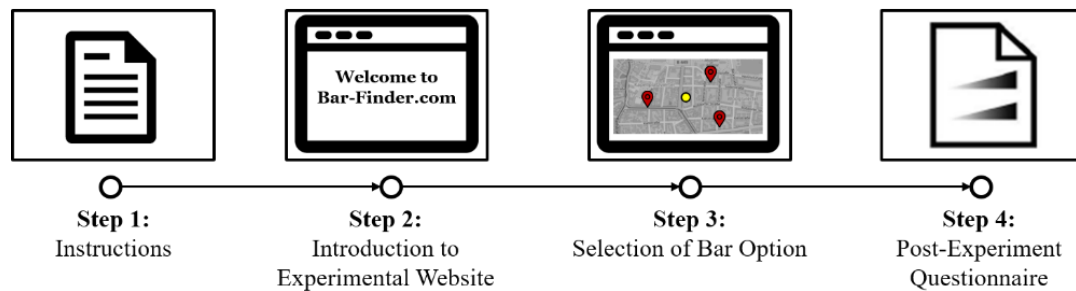


Figure 3-5: Experimental procedure

3.4.3 Measurement

We used validated scales from literature guided by the construct and item database from Larsen and Bong (2016). We measured most items on seven-point Likert scales ranging from strongly disagree (1) to strongly agree (7). We measured our first dependent variable of *location selection* by recording which of the three given bars participants selected to go to (i.e., location with low, medium or high crowding level). We captured our second dependent variable *reuse intention* with three items adapted from Venkatesh et al. (2003). In addition, we measured demographics (i.e., participants' *age* and *gender*) and two control variables that we considered most influential: We asked for participants' *product involvement* toward bars measured with three bipolar items rated on a seven-point scale (Zaichkowsky 1985), as well as what *group size* (i.e., number of people) they were thinking of when envisioning going out with their friends, as the size of the group likely influences whether they opt for more or less crowded bars. As manipulation checks, we measured participants' *perceived TML* of the provided visitor levels with 3 items adopted from (Lee and Strong 2003) as well as *perceived presence of LOR* with 4 items adopted from (Guo et al. 2011), both on a seven-point Likert scale. Table 3-1 lists all employed items. Additionally, we integrated three attention checks to notice whether participants read each item carefully and understood the meaning of the visualizations. Lastly, we asked participants about the *perceived realism* of the scenario.

Construct	Items
DSS reuse intentions (Venkatesh et al. 2003) ($\alpha = 0.98$, CR = 0.98, AVE = 0.95)	The next time I want to choose a bar I intend to use the website Bar-Finder.com. ... I predict I would use the website Bar-Finder.com. ... I plan to use the website Bar-Finder.com.
Product involvement (Zaichkowsky 1985) ($\alpha = 0.94$, CR = 0.96, AVE = 0.90)	Visiting bars for me ... is unimportant ... is important. means nothing ... means a lot. is unappealing ... is appealing.
Perceived TML (Lee and Strong 2003) ($\alpha = 0.95$, CR = 0.97, AVE = 0.91)	The presented information about the bars' visitor levels was current. ... timely. ... up-to-date.
Perceived presence of LOR (Guo et al. 2011) ($\alpha = 0.91$, CR = 0.93, AVE = 0.78)	In the current situation, my feeling was that others think that one should visit especially "Lobo". ... others believe it is wrong to visit "Hiker". ... others disapprove visiting "Hiker". ... others approve visiting particularly "Lobo".
Note: "Lobo" was the least crowded bar, "Hiker" the most crowded bar in the experiment.	

Table 3-1: Constructs

3.5 Results

3.5.1 Sample Description and Controls

We recruited 202 participants from Prolific.co, a crowdsourcing platform specifically designed for behavioral research and experiments. Scholars have demonstrated that the survey results of Prolific.co respondents exhibit high reliability and provide high-quality data (Palan and Schitter 2017; Peer et al. 2017). In addition, Prolific.co is a suitable platform to reach internet-savvy users, who are highly appropriate for our experiment setting because they are frequent users of websites. We restricted participation to U.S. participants with a high approval rating (95% or more), which is considered to be an appropriate measure to ensure high data quality (Goodman

and Paolacci 2017). Out of those 202 participants, 171 passed all three attention checks. Table 3-2 summarizes the descriptive statistics of our conditions.⁵

Variable \ Condition	1: TML low, LOR absent (N=49)		2: TML high, LOR absent (N=47)		3: TML low, LOR present (N=34)		4: TML high, LOR present (N=41)	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Gender (Female)	39 %	-	32 %	-	59 %	-	54 %	-
Reuse intention	4.00	1.72	4.85	1.64	3.81	1.92	4.42	1.78
Product involvement	3.50	1.86	3.93	1.75	3.68	1.61	3.84	1.78
Group size	3.31	1.10	3.43	1.08	3.59	1.31	3.39	1.24
Age	33.3	12.5	36.1	12.5	35.3	10.7	32.6	12.2
Perceived TML	4.39	1.33	6.43	0.68	3.82	1.52	6.57	0.70
Perceived presence of LOR	2.56	1.86	2.23	1.18	5.30	1.28	5.24	1.51
Share of participants that opted for the ...								
... less crowded location.	16.3 %		14.9 %		58.8 %		51.2 %	
... moderately crowded location.	51.0 %		74.5 %		38.2 %		46.3 %	
... highly crowded location.	32.7 %		10.6 %		2.9 %		2.4 %	

Table 3-2: Descriptive statistics

Several one-way analyses of variance for the control variables provide strong evidence of comparability and balance across our four conditions, as we did not find significant differences ($p > 0.1$) in terms of participants' product involvement, group size, age and perceived realism. Only the share of females in condition 2 (TML high, LOR absent) is modestly lower than the overall average, but the difference (12 percentage points, $p < 0.05$) is not practically significant (Bloom et al. 2013). Therefore, we find support for the successful randomization of assignment to the experimental conditions, supporting the assumption that the control variables did not confound our dependent variable. We also conducted several manipulation checks: Perceived TML was significantly higher for the TML-high-conditions 2 and 4 than for the TML-low-conditions 1 and 3 ($p < 0.001$) and perceived presence of location recommendations was significantly higher for the LOR-present-conditions 3 and 4 than for the LOR-absent-conditions

⁵ We collected all our data in February 2020, prior to COVID-19 being declared a global pandemic and before social distancing and related behavioral restrictions were a concern for participants in the United States. When asked to state the reason behind the bar they chose, none of the participants mentioned any health-related concerns.

1 and 2 ($p < 0.001$). Thus, our experimental conditions worked as intended. Lastly, our respondents found the experiment highly realistic (mean = 6.36; std. dev. = 1.00).

3.5.2 Reliability and Validity

We assessed the psychometric properties of our measurement models by examining convergent validity and discriminant validity of all constructs. We validated convergent validity for all constructs by using three criteria recommended by Fornell and Larcker (1981): First, all item loadings were significant ($p < 0.001$) and exceeded the recommended level of 0.70 (Carmines and Zeller 1979). Second, Cronbach's alpha ranged from 0.91 to 0.98 and composite reliability from 0.93 to 0.98. Thus, both measures of internal consistency were above the recommended level of 0.70 (Nunnally and Bernstein 1994). Third, the average variance extracted (AVE) of each construct ranged from 0.78 to 0.95, exceeding the relevant threshold of 0.50 (Hair Jr et al. 2016). Hence, all constructs met the specifications for convergent validity. Additionally, we tested for discriminant validity using Heterotrait-Monotrait (HTMT) analysis. The highest HTMT value of 0.34 was well below the threshold of 0.85 (Henseler et al. 2015), indicating support of discriminant validity. Lastly, the Harman one-factor extraction test yielded only 28% explained variance through a single factor, which is substantially lower than the recommended maximum value of 50% (Podsakoff et al. 2003) and therefore indicates no issues of common method bias. Hence, the constructs in our study are both theoretically and empirically distinguishable and are not substantially affected by common method bias.

3.5.3 Hypothesis Testing

We tested our hypotheses coding both TML and LOR as binary variables (i.e., TML low = 0, TML high = 1; LOR absent = 0, LOR present = 1). To test H1, H2 and H3, we conducted an ordinal logistic regression, coding *location selection* as an ordinal variable with three levels (i.e., selection of less crowded location = -1, moderately crowded location = 0, highly crowded location = 1). We ensured that all assumptions required for ordinal logistic regression were met (Lund and Lund 2020): Our dependent variable (i.e., *location selection*) was ordinal, our independent variables (i.e., TML and LOR) and our control variables were either categorical or continuous, we found no multicollinearity (variance inflation factors were below 5.00) and the data supported the assumption of parallel odds (the assumption of parallel lines was not violated with $p > 0.1$). In addition, we could confirm good model fit through a significant improvement of the final model containing the full set of predictors compared to an intercept-only model

($p < 0.001$) and non-significant test-results of the Pearson chi-square test ($p > 0.1$) and the Deviance chi-square test ($p > 0.1$) (Field 2018; Petrucci 2009).

Table 3-3 provides the results of the ordinal logistic regression and bootstrap analysis with 1,000 bootstrap samples and 95% bias-corrected and accelerated (BC) confidence intervals, testing the direct and moderating effect of TML and LOR on *location selection*. The regression estimates are interpreted as the predicted change in logarithmic odds of being in a higher category of crowding of the selected location per unit increase on the independent variable. In other words, the higher the estimate of an independent variable, the higher is the probability of selecting a more crowded location.

	Estimate	Std. Error	Boot Std. Error	BC 95% Conf. Interval	
				Lower	Upper
TML	-0.99*	0.44	0.47	-1.91	-0.16
LOR	-2.83***	0.53	0.61	-3.90	-2.03
TML x LOR	1.34*	0.66	0.72	0.03	2.79
Age	0.01	0.01	0.01	-0.01	0.04
Gender	0.02	0.33	0.37	-0.71	0.71
Product involvement	0.28**	0.10	0.11	0.07	0.57
Group size	0.32*	0.14	0.16	0.02	0.69
	Cox & Snell		Nagelkerke		McFadden
Pseudo R ²	0.28		0.33		0.17
Note: *p < 0.05, **p < 0.01, ***p < 0.001, bootstrap results are based on 1,000 bootstrap samples					

Table 3-3: Ordinal logistic regression on location selection

The results **support H1** in that higher TML leads users to select less crowded location: When TML is high compared to when it is low and LOR is absent, selecting a less crowded bar is 2.68 ($=\exp(0.99)$) times as likely as selecting a more crowded bar ($p < 0.05$). LOR causes users to select less crowded locations: When LOR is present compared to when it is absent and when TML is low, selecting a less crowded bar is 16.91 ($=\exp(2.83)$) times as likely as selecting a more crowded bar ($p < 0.001$), **thereby supporting H2**. However, contrary to our predictions, we did not find that the interaction between TML and LOR leads to selecting even less crowded locations. Instead, the data suggests a significant opposite interaction effect: When TML is high and LOR is present compared to when TML is low and/or LOR is absent, the interaction pulls towards more crowded bars by contributing a 3.82 ($=\exp(1.34)$) times higher likelihood to select a more crowded than less crowded bar ($p < 0.05$). Therefore, we **reject H3**.

To analyze the effect of TML on users' *reuse intentions*, we conducted a linear regression and bootstrap analysis with 1,000 bootstrap samples and 95% BC confidence intervals, reported in Table 3-4. Although we did not expect any influence by LOR, we added it to our set of controls. As hypothesized, we found TML to significantly increase *reuse intentions* ($\beta = 0.62$, $p < 0.05$), thus **supporting H4**. Additionally, we conducted a robustness check by adding the interaction term TML x LOR, which proved to be insignificant ($p > 0.1$), while the effect of TML still remained significant ($p < 0.1$).

	Coefficient	Std. Error	Boot Std. Error	BC 95% Confidence Interval	
				Lower	Upper
TML	0.62*	0.26	0.26	0.09	1.14
LOR	-0.25	0.26	0.26	-0.78	0.28
Age	0.02	0.01	0.01	-0.00	0.03
Gender	-0.30	0.27	0.27	-0.86	0.21
Product involvement	0.31***	0.07	0.08	0.16	0.46
Group size	0.02	0.11	0.10	-0.17	0.20
R ²	0.16				
Note: *p < 0.05, **p < 0.01, ***p < 0.001; bootstrap results are based on 1,000 bootstrap samples; TML low = 0, TML high = 1; LOR absent = 0, LOR present = 1					

Table 3-4: Linear regression on reuse intentions

3.6 Discussion

Thanks to technological advancements, CI in DSS is increasingly accompanied by timeliness cues that convey how timely the CI was captured. Despite researchers stressing the importance of timeliness cues, our knowledge is limited on (1) how timeliness of CI impacts users' location selections, (2) how it alters the effectiveness of location recommendations and (3) how it influences users' reuse intentions. Hence, we set out to study the role of timeliness of CI in the selection of locations.

We found that high (vs. low) timeliness of CI causes users to select less crowded locations. Additionally, high (vs. low) timeliness of CI increases reuse intentions, indicating users' appreciation of high timeliness of CI. Both findings were further backed by qualitative responses of participants explaining their choice by primarily referring to the presented CI and its timeliness. Surprisingly, we found that timeliness of CI does not reinforce the effect of simultaneously present location recommendations, as originally expected. On the contrary, the

participants' responses suggest a negative interaction between timeliness and location recommendations, resulting in timeliness exerting no significant effect on users' selections when location recommendations are displayed. We offer three explanations for our surprising finding: First, displaying location recommendations may decrease psychological distance to an extent where high timeliness prompts no additional effect. Previous research applying construal level theory backs this notion by positing that different dimensions of psychological distance correlate with each other, such that a change in social distance also entails a change in temporal distance (Fiedler et al. 2012). Second, location recommendations may have caused users to heed the timeliness of the CI less. Exerting social influence (e.g., through location recommendations based on social approval) induces users to respond instinctively rather than rationally (Fogg 2003), thereby bypassing the cognitive processing necessary to interpret the timeliness of the CI. Third, not all users may link level of crowding to level of social approval. Particularly for individuals who appreciate more busy locations, confusion could arise why more crowded locations – which they would consider especially attractive – are highlighted as not approved. Consequently, these individuals may experience cognitive dissonance, obstructing the processing of the timeliness of the CI. To that end, the interaction effect could potentially flip if social approval would be linked to highly crowded locations, even though such an operationalization would contradict the intention of DSS to avert overcrowding. While our explanations are based on conjecture, we nevertheless provide intriguing insights on the reduced combined effects of timeliness of CI and location recommendations.

3.6.1 Contributions

Our research provides three major contributions to decision-making in digital environments as well as to construal level theory. First, we advance our understanding of how DSS-provided timeliness cues influence user decision-making when comparing differently crowded locations. Whereas previous IS research primarily studied the consequences of temporal cues relating to static information (e.g., Amirpur and Benlian 2015; Chen et al. 2011; Li and Wang 2019), we contribute to an emerging field of research assessing timeliness as a contextual cue relating to dynamically changing information (Adam et al. 2020a). Specifically, we demonstrate how timeliness of CI unfolds in a different context with hedonic rather than utilitarian goals, where the presence of crowds is considered to contribute to a more pleasurable experience (Noone and Mattila 2009). Additionally, we reveal a counter-intuitive relationship between timeliness and location recommendations. Therefore, we uncover important insights for the DSS literature on how timeliness of CI alters users' selection behaviors.

Second, we contribute to knowledge on how contextual information shapes users' evaluations of DSS in the form of reuse intentions. For a DSS to achieve recurring impact it is critical to understand how its features affect users' intentions to keep using the DSS. However, previous research investigating temporal cues such as timeliness cues primarily focused on the consequences for users' selection behaviors, with only few exceptions considering the implications for users' judgements of the system the contextual information is embedded in (e.g., Köhler et al. 2011). By uncovering a positive relationship between timeliness of CI and users' reuse intentions, we demonstrate the consequences of timeliness beyond selection behaviors. Therefore, we advance our understanding of how users' evaluations and reuse intentions are shaped.

Third, we extend construal level theory by shedding light on the joint effect of two dimensions of psychological distance. Construal level theory is currently dominated by studies that analyze psychological distances in isolation (see Huang et al. (2018) for an overview). We advance the theoretical understanding of how the effect of temporal distance (triggered by timeliness cues) changes with the extent of social distance (triggered by location recommendations based on social approval), based on the counterintuitive negative joint effect of both dimensions of psychological distance. As such, we contribute to a more encompassing view of construal level theory.

Moreover, we provide actionable impetus for DSS providers that strive to deter users from selecting crowded locations and intend to increase their users' reuse intentions. For those DSS providers it is important to increase timeliness of CI by collecting, processing and displaying CI in (close to) real-time. In doing so, they improve their users' understanding of the situation "right here, right now" and therefore facilitate users' decision-making. DSS providers thereby also assist location managers (e.g., bar owners) who then experience more balanced demand and in consequence are likely willing to contribute to the frequent collection of CI for the DSS.

3.6.2 Limitations and Directions for Future Research

Our study to investigate the role of timeliness of CI is subject to limitations that provide opportunities for future research. First, our results are based on an online laboratory experiment with U.S. participants. To improve generalizability of our findings, we call for future research to test our hypotheses in different cultural contexts and in a field setting observing actual user behavior as well as further user experience variables such as satisfaction and decision difficulty. Furthermore, our results are based on data we collected prior to the unravelling of the COVID-19 pandemic. Yet, pandemic-related measures such as physical distancing may have altered

people's perception of the positive and negative aspects of crowded locations (e.g., higher risk of infections). Once the battle against the pandemic is won and restrictions are lifted for good, we therefore urge scholars to investigate whether the experience of undergoing a pandemic permanently changes how users react to CI and timeliness of CI, respectively.

Second, we imply that the highest possible level of timeliness reflects an instantaneous update of information. However, users may access DSS to plan events well in the future, such as organizing a birthday party. In that case, the concept of timeliness could be extended to future reference points. For example, users could be presented the expected level of crowding for the specific day they plan their birthday party on, instead of providing typical levels of crowding on the weekend. Insights on timeliness referring to future events are also interesting for construal level theory, given the unclear outcome of the conflicting temporal distances between (1) information reference point and time of consumption (specified by timeliness) and (2) time of DSS usage and time of service consumption. Moreover, other psychological distances (e.g., spatial distances) as well as potential moderators and mediators (e.g., construal fit and processing fluency) can be explored in the future to corroborate and advance our theoretical understanding.

Third, this study demonstrated the effects of timeliness with respect to CI of locations. While we thus contribute to the nascent understanding of timeliness, insights on timeliness cues applied to other types of information in potentially different contexts (e.g., rent index, performance of financial products) are needed to shape our knowledge of the different facets of timeliness.

Chapter 4: Ad Quantity Customization and Its Effects on User Engagement

Title: Ad Quantity Customization and Its Effects on User Engagement – A Randomized Field Experiment (2021)

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Published in: International Conference on Information Systems (ICIS 2021), December 13-15, Austin, TX, USA.

Abstract

A growing body of research underscores the importance of empowering online users through web customization. Yet, little research on web customization has hitherto shed light on the practice of advertisement (ad) customization and particularly ad quantity customization (AQC). To uncover the potential of AQC as a tool to foster user engagement, we conducted a large-scale randomized field experiment comprising 17,241 visits to a news website. Our findings reveal that users spend more time on the website and explore more pages when users can (vs. cannot) customize the quantity of ads. Most interestingly, users engage more with the website when given the possibility of AQC than when experiencing a website that is ad-free by default. Additionally, users respond particularly positively to AQC when using mobile (vs. stationary) devices. With our research, we contribute to literature on web customization and provide insightful guidance whether and how website providers can harness ad customization.

Keywords: customization, active control, empowerment, user engagement, advertisements, field experiment

4.1 Introduction

Web customization describes the empowerment of users to control the form or content of a website (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010). Web customization puts users in the driver seat and enables them to exert active control over their online experience, for example, by modifying website appearances (e.g., Moodle) (Singh 2019) and creating personal web pages with tailorable content (e.g., My Yahoo) (Morse 2019). By influencing users' website experience, web customization can be instrumental for website providers to foster *user engagement* (e.g., Alalwan et al. 2020; Pagani and Mirabello 2011; Webster and Ahuja 2006). User engagement refers to “being captivated by a web application, and so being motivated to use it” (Lehmann et al. 2012, p. 164). Web customization exhibits parallels to system-driven personalization in that both aim to optimize a website's offerings such that it matches closely with users' preferences and desires (Tam and Ho 2006). Nevertheless, users' increasing demands for more empowerment (Matt et al. 2019), alongside growing privacy concerns associated with the practice of behavioral targeting (Sutanto et al. 2013), underscore the importance of empowering users with active control to shape their own experience rather than degrading users to passive viewers of targeting algorithms' best guesses (e.g., Agarwal and Venkatesh 2002; Jiang and Benbasat 2007a; Jiang et al. 2010).

Web customization entails overall positive outcomes related to user engagement, such as more favorable reuse intentions and attitudes toward the website offering the customization (e.g., Ariely 2000; Jiang et al. 2010; Jiang et al. 2016). Web customization empowers users to shape their experience with a website in multiple ways, including the possibility to control advertisements (ads) as one of the most prevalent types of content on websites: As of 2018, 50% of Europe's 500 most popular websites feature banner ads to finance their business activities, with 94% of news websites displaying ads on average more than 16 times per page (Libert and Nielsen 2018). Given that users react sensitively to ad clutter (Seyedghorban et al. 2016), specifically the *quantity* of ads (e.g., the number of ads per page) is an apt customization option. Ad quantity customization (AQC) strikes a chord for many website visitors: Given that close to half of all online users resort to ad blocking (Globalwebindex 2018), the proliferation of technologies that forcefully cancel out ads is an alarming signal of users' urge for more control (Aseri et al. 2020). First practitioners respond to these demands by devolving control over ads to users and offering customization options. For example, users on YouTube are given a choice which ad to watch or can even skip ads altogether (Belanche et al. 2020). In summary,

website providers urgently require insights that help them understand the ramifications of AQC to avoid jeopardizing user engagement.

In addition to its critical relevance for practice, understanding the intricacies of AQC provides a rich opportunity for Information Systems (IS) research to expand its scholarly knowledge in two important ways: First, with few exceptions (Goh and Ping 2014), IS scholars studying web customization have directed their focus toward websites' primary editorial content (i.e., content pertaining to the main purpose of the website), such as customizing the content of news aggregators (Benlian 2015), choosing in which order to view product information (Ariely 2000) and specifying how to interact with virtual representations of physical products (Jiang and Benbasat 2007a). However, advertising content is fundamentally different from editorial content in that its processing draws less on cognitive reasoning, but rather induces ambivalent and strongly affective responses that directly impact user behavior (Belanche et al. 2020): On the one hand, users oftentimes are highly annoyed by intrusive ads triggering a perception of loss of control (Kumar et al. 2020), resulting in automatic and pronounced ad avoidance behaviors (Seyedghorban et al. 2016). Accordingly, directing attention to a website's ads – even if the intention is to empower the user – may trigger ad-related avoidance mechanisms that poison user engagement and eventually drive users away from the website. On the other hand, Nelson et al. (2009) showed that advertising content is beneficial to users by reviving users' enjoyment, which otherwise decreases when continuously consuming similar editorial content. As such, we need to expand our knowledge whether users appreciate the possibility of AQC as an enhancement to their user experience or whether AQC squashes their engagement with the website by inadvertently reminding them of the ads they are trying to ignore. Second, extant IS literature on web customization only paid limited attention to the circumstances under which users evaluate a website offering customization (e.g., which device type is used). Users likely respond differently to the possibility of AQC depending on how strongly they are irritated by the usual display of ads. On that account, AQC may be all the more important for users of mobile devices (e.g., smartphones, tablets) compared to users of stationary devices (e.g., desktops, laptops): The small screen sizes of mobile devices increase cognitive effort of browsing online, thus exacerbating users' irritation with distracting ads (e.g., Ghose et al. 2013; Gu et al. 2013; Müller et al. 2017). Although researchers have emphasized the necessity to distinguish between stationary and mobile contexts when studying web customization (e.g., Benlian 2015; Gu et al. 2013; Lee 2005), few studies have compared both device types side-by-side in one study. As such, we are lacking important insights whether and how the effects

of AQC on user engagement change when users access the website with different devices. To address these shortcomings, we seek to answer the following research question:

RQ: How does AQC influence user engagement across stationary and mobile devices?

Drawing on IS literature on web customization, we conducted a large-scale randomized field experiment comprising 17,241 visits to a news website with three variations featuring either default ads, no ads or customizable ads. Our findings reveal that users are more engaged (i.e., they spend more time on the website and explore more pages during their visit) when they can customize the amount of ads compared to when they cannot. Intriguingly, users are more engaged when having the possibility of AQC compared to not seeing any ads by default. In other words, users respond most positively when they are in control of the quantity. Lastly, we find evidence that users on mobile (vs. stationary) devices are particularly engaged when empowered with the possibility of AQC.

Our research provides two noteworthy contributions to IS literature on web customization: First, we reveal a new facet of web customization by focusing on a website's ads as the object of control. Compared to previously investigated editorial content, advertising content is unique in that it induces strong avoidance behaviors that are subject to their quantity. Based on these characteristics, we harness ads to explore AQC as a new type of web customization that is capable of transforming traditionally unwanted ads into a valuable characteristic of the website. As such, we shed light on AQC as a missing and neglected part of the puzzle to obtain a more holistic picture of how empowering users through web customization increases their engagement. Second, we contextualize our knowledge on web customization and address the repeated call for research to compare stationary to mobile contexts. By revealing how device type moderates the effect of AQC on user engagement, we are among the first to address how different contexts affect users' response to web customization. Thus, we contribute to a more nuanced understanding of how users respond to web customization across different usage contexts. Beyond these contributions to research, our research offers extensive and surprising insights for practice by informing website providers how to leverage AQC across stationary and mobile devices to transform ads from a potential threat to users' interest in a website into an asset that fosters user engagement.

4.2 Theoretical Background

4.2.1 Related Literature

Our study is mainly related to the IS literature investigating user engagement with websites (e.g., Kim et al. 2013; Palmer 2002; Zhang et al. 2019). To successfully engage users, websites individualize their offerings (e.g., editorial content and advertising content) through web personalization and web customization (Garett et al. 2016; Tam and Ho 2006). Web personalization draws on a system that gathers user information and behavioral patterns to adapt the website content based on what the system believes would match the user's interest best (e.g., recommended videos on YouTube based on the user's viewing history) (Tam and Ho 2005). To that end, users serve primarily as an object of observation and thus play a fairly passive role in how the website is individualized. In contrast, web customization affords users the possibility to exert active control over the website content through some type of modification interface (e.g., choosing the language of a website's content) (Ariely 2000; Benlian 2015). As such, users play an active part in how the website is shaped. We focus on web customization rather than web personalization because research has shown that users crave empowerment and want to control a website's content themselves rather than being watched by a system that is only capable of making an informed guess for the users (Matt et al. 2019; Sundar and Marathe 2010; Sutanto et al. 2013). Figure 4-1 contrasts web personalization with web customization and highlights this study's focus on web customization of ads.

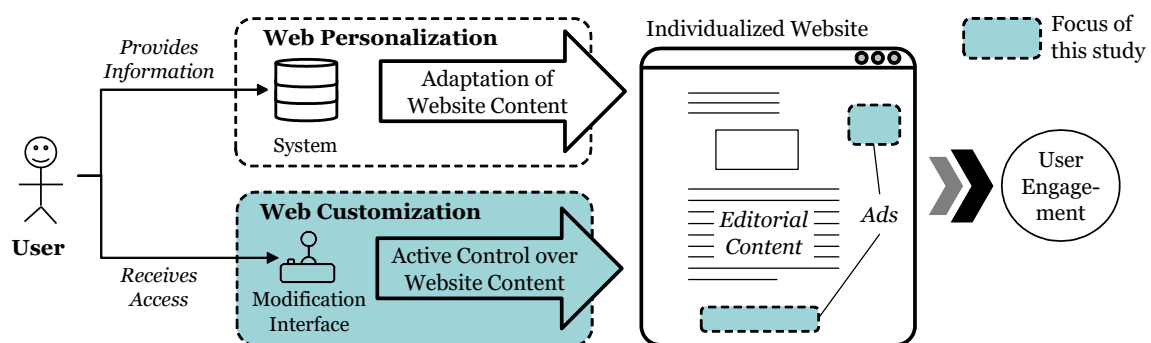


Figure 4-1: Distinction between web personalization and web customization

We provide a brief review of the IS literature on web customization in Table 4-1. Analyzing these studies, we noticed that the scope of customization focused on content that pertains to the main purpose of the website (e.g., product information on an e-commerce website). While insights on customizing such editorial content are undoubtedly of value, they cannot explain how web customization can be applied to advertising content as one of the most prevalent types

of content on websites. In contrast to editorial content that users expect and appreciate to see when accessing a website, advertising content is oftentimes perceived as an impediment to users' goals. In turn, ads commonly induce strongly affective reactions that lead to pronounced ad avoidance behaviors (Kumar et al. 2020; Seyedghorban et al. 2016). Given that these repelling effects are largely driven by ad clutter (Cho and Cheon 2004), ads offer the unique opportunity to investigate quantity as a new type of customization, complementing previous work focusing on order, content and format of information (see Table 4-1). At the same time, as ad clutter drives ad avoidance behaviors, one could argue that the intuitive ideal for users is a website that does not ask its users to customize its ad quantity, but instead never displays any ads in the first place. Yet, it is far from clear whether users' irritation with ads results from the presence of ads in general or rather is a consequence of being deprived of any control over these ads. In other words, may users even appreciate ads as an asset of a website if they are empowered to customize them? Hence, to advance our understanding of web customization, it is paramount to investigate not only how the provision vs. lack of AQC affects user engagement, but also how AQC compares to omitting ads entirely.

Moreover, as most previous studies relied on laboratory experiments or surveys, we see an opportunity to contribute by conducting a randomized field experiment with the powerful advantage of high internal validity, strong generalizability and a high level of realism at the same time (Karahanna et al. 2018). This is all the more important when studying how users react to advertising content: Ad avoidance in everyday browsing is a heuristic behavior that users may rethink and adjust in an artificial setting which focuses on ads (Seyedghorban et al. 2016). As such, insights generated in laboratory experiments may not adequately reflect users' actual behaviors and responses to ad customization.

In reviewing extant IS literature on web customization, we additionally found that studies either disregarded users' device type or narrowed their scope to exclusively mobile or exclusively stationary devices. This is puzzling, as researchers repeatedly cautioned to compare mobile and stationary devices side-by-side when investigating web customization and active control (e.g., Benlian 2015; Gu et al. 2013; Lee 2005). The technological characteristics of mobile devices, such as small screen size and restricted input facilities, make browsing websites somewhat tedious and inefficient for users (Ghose et al. 2013; Gu et al. 2013). AQC allows users to take remedial action to improve the usability of websites on mobile devices and thus may ultimately improve their user experience through a more relevant presentation format of the reviewed

information (Lee et al. 2015). Therefore, we require insights on whether and how users' device type influences their response to AQC.

Study	Customizable information	Facet of user engagement	Method	Device
Ariely (2000)	Users customized the sequence and level of detail in which product information was to appear	Decision quality	Laboratory experiment	Stationary
Jiang and Benbasat (2007b)	Users customized which features of a product should be presented to them by interacting with a digital twin	Intention to return	Laboratory experiment	Stationary
Jiang et al. (2010)	Users customized in which order and by which category to explore products to purchase	Purchase intention	Laboratory experiment	Stationary
Benlian (2015)	Users customized which topics to receive news articles about and in what color the website should appear	Website stickiness	Field experiment	Stationary & mobile, but no distinction
Xue et al. (2020)	Users customized which live product presentation and which corresponding information was to be displayed	Participation and sharing	Survey	Mobile
Mousavi et al. (2020)	Users customized how their browsing data is collected, stored, and distributed	Self-disclosure behavior	Survey	Stationary & mobile, but no distinction
This study	Users customize the quantity of ads displayed on the website	Visit duration and explored pages	Field experiment	Side-by-side comparison of stationary vs. mobile

Table 4-1: Review of IS literature on web customization

4.2.2 Theoretical Underpinning

We theorize that offering AQC may affect user engagement through (1) its ability to satisfy heterogeneous needs, (2) its propensity to encourage self-efficacy and (3) its capacity to deepen users' involvement with the website.

Web customization revolves around the notion of active control, which allows users to “maximize the fit between heterogeneous and dynamic needs for information and the information available” (Ariely 2000, p. 234). Heterogeneity thereby arises both from stable differences in individuals’ preferences (e.g., user-specific sensitivity toward ads based on varying prior experiences (Seyedghorban et al. 2016)) and dynamically changing needs for information depending on the time and context of acquiring information (e.g., accessing a website on a mobile device with a small screen). As such, AQC provides value not simply because it narrow-casts the website’s content such that it relates more closely to the user’s general interests, but rather because it enables a dynamic flexibility of the website. Following the uses and gratifications paradigm, we expect users to harness this flexibility to adapt the quantity of ads such that the resulting website fulfills their needs best and provides the greatest rewards such that they engage more strongly with the website (Bright and Daugherty 2012).

The objective of increasing the fit between users’ needs and the information available is shared by both web personalization and web customization. What sets web customization apart is that users are invited to participate in the process of individualizing the website’s content. Research has shown that this participation process causes users to consider the content they customized as reflecting their identity, which strengthens users’ perceptions of their self-efficacy (e.g., Bright and Daugherty 2012; Olsen and Pracejus 2020; Sundar and Marathe 2010). To that end, being empowered to customize the website’s ad quantity makes users feel capable, important and valued (Sundar 2008). Users likely respond to this empowerment through more positive affective responses and attitudes toward the website offering AQC, which may result in stronger user engagement (Sundar and Marathe 2010). This notion is further backed by the finding that merely making users *believe* they have customized a website’s content – without actually having allowed users to modify any element – is already sufficient to elicit more favorable interaction intentions (Bright and Daugherty 2012). As such, we expect AQC to add value above and beyond an increase in informational fit.

Once users have customized their ad quantity, we theorize they may engage more intensely with the website that results from their choices. This is because users are more involved and engaged with content that they are empowered to control (Sundar 2008). Likewise, the increased attention to content amplifies users’ experience with the website’s information, which may make users appreciate the website offering the AQC more. Supporting this line of argument, the ability to customize one’s web environment has been argued to facilitate the experience of flow and cognitive absorption, which entails a state of deep involvement with the

website providing the customization option (e.g., Ghani et al. 1991; Lee et al. 2012; Novak et al. 2000). In conclusion, extant literature indicates that AQC likely affects how users engage with a website through multiple pathways.

4.3 Methodology

To understand how users respond to AQC across stationary and mobile devices, we partnered with a news website on which we conducted a between-subjects randomized field experiment with three conditions. In the following sections we elaborate on our research setting, manipulations, experimental procedure, and data collection.

4.3.1 Research Setting

We conducted our field experiment on the website *HipHopHolic* (www.hiphopholic.de), which concentrates on news related to the German-speaking music industry. The website attracts roughly 6,000 users per week, of which approximately 91% access the website for the first time and 81% use mobile devices. Selecting a news website is ideal for our research objective for two reasons: First, news websites are among the websites that feature the highest density of ads (Englehardt and Narayanan 2016). In consequence, ads play an important role for users on news websites as they represent an integral part of users' browsing experience. Second, in contrast to transactional websites such as e-commerce platforms whose content is a mere enabler to support purchase decisions, the core offering of news websites is the content itself. For news websites to be successful, their content needs to capture and maintain users' interest (Benlian 2015; Köster et al. 2020). To that end, users' assessment of ads as part of the website's content influences users' likelihood to engage with the website (Liu and Shrum 2002).

The studied website follows a straightforward structure in that each article page features proprietary text and images, followed by ten recommendations for similar articles on the website. For the duration of our field experiment we minimized the amount of links to external content (e.g., teasers for news articles from other websites), such that users exclusively experienced the experimental website's content and were not led away from the website. See Figure 4-2 for a screenshot of an exemplary article page of the website.

We conducted two workshops with the development team of the website to increase the quality and consistency of our experimental setup. As a result of these discussions and a separate pilot test, we decided to implement the following measures: First, we employed banner ads (also known as display ads) as one of the most widely adopted online advertising formats, generally defined as "small, typically rectangular graphic image or display on a webpage that link to a

target site or product” (Sun et al. 2013, p. 50). Traditionally, the content and in some cases even the placement of these ads is controlled by an external ad server that uses behavioral targeting to deploy ads tailored to each user (Chen and Stallaert 2014). Although personalizing ads is intended to optimize the ads’ effectiveness, this practice makes it difficult to compare the ad experience across users. As such, for the duration of the experiment, we decided against the use of an ad server and instead developed a script that uniformly displayed the same ads to every user.

Second, we wanted to ensure that the content of our ads would be considered fairly neutral, yet relevant to as many users as possible. In this regard, we took into consideration that users’ needs to exercise at home have increased, given that the COVID-19 pandemic impacted physical activity for most individuals (e.g., due to closed gyms and reduced outdoor mobility) (Yang and Koenigstorfer 2020). As such, we partnered with the provider of a fitness training app that supports its users in their home exercises. This app was then advertised and linked within our banner ads.

Third, we used clickable static images without any animation, as previous research has shown that users react negatively to animated ads (Burke et al. 2005). A total of four banner ads were spread out evenly on each page, accounting for approximately 10-15% of the page’s area. As our ads were in the same format as the images of the article and directly linked to the website of the fitness app advertised, ad-blockers did not associate the banners with ad servers and consequently did not cancel out our ads. To detect activity of ad-blockers, we included a script that counted how many ads were actually displayed on users’ screens. By comparing this number to the number of ads that should have been loaded, we observed that our ads indeed were not filtered out by ad-blockers.

Lastly, even though we were confident that most ad-blockers would not interfere with our ads, we decided to develop a script to detect whether or not a user had an ad-blocker installed and active. We included a bait-ad that was not visible to the user, but that would easily be detected and suppressed by current ad-blockers. If the bait-ad was in any way inhibited on the user’s device, we recorded an ad-blocker to be present.

4.3.2 Manipulations

We designed three conditions that users visiting the website were randomly assigned to: (1) Our first control condition (hereafter website with *Default Ads*) featured the four previously mentioned ads on every page without any option of customization. This condition was designed

to closely resemble common practice on news websites. (2) Our second control condition (hereafter website with *No Ads*) contained no ads whatsoever. We designed this condition to test whether users' irritation with ads results from the presence of ads in general or rather is a consequence of being deprived of any control over these ads. (3) Lastly, our treatment condition providing AQC (hereafter website with *Customizable Ads*) allowed users to choose the quantity of ads on the website. To that end, users entering the website were presented with an AQC interface that briefly explained the possibility to adjust ad quantity, alongside three options to choose from: "regular amount of ads", "reduced amount of ads" and "no ads." The option of "regular amount of ads" entailed all four ads as in the control condition with *Default Ads*. Choosing "reduced amount of ads" cut the number of ads in half and only featured two ads on the website. Opting for "no ads" entailed the same website layout as in the control condition with *No Ads*. Based on feedback by participants evaluating the interface in a pilot test, we decided to include sketches as visual representations of what the website would look like with each customization option. Being able to see the consequences of the different options reduced users' decision effort by helping them understand which configuration suits their needs best. The visualizations were adapted to a symbolic smartphone, as the majority of users accesses the website via a mobile device. Figure 4-2 depicts the interface users were greeted with in the AQC treatment condition, translated from German to English, next to screenshots of how the ads were embedded in the website.

To examine the efficacy of our experimental conditions, we conducted a pretest with 197 participants recruited on the crowdsourcing platform Amazon Mechanical Turk (Behrend et al. 2011). Using a fictitious news website similar to the website studied in our field experiment, we introduced each participant to one out of three variations: a website with *Default Ads*, a website with *No Ads* and a website with *Customizable Ads*. We conducted several manipulation checks: Perceived ad clutter was significantly lower for *No Ads* than for *Default Ads* ($p < 0.001$), perceived customizability of ad quantity was significantly higher for *Customizable Ads* than for both *Default Ads* and *No Ads* ($p < 0.001$). In addition, we found no significant difference in perceived control over the website's ad quantity between the two control conditions *Default Ads* and *No Ads* ($p > 0.1$). Hence, we were able to confirm that our design worked as intended.

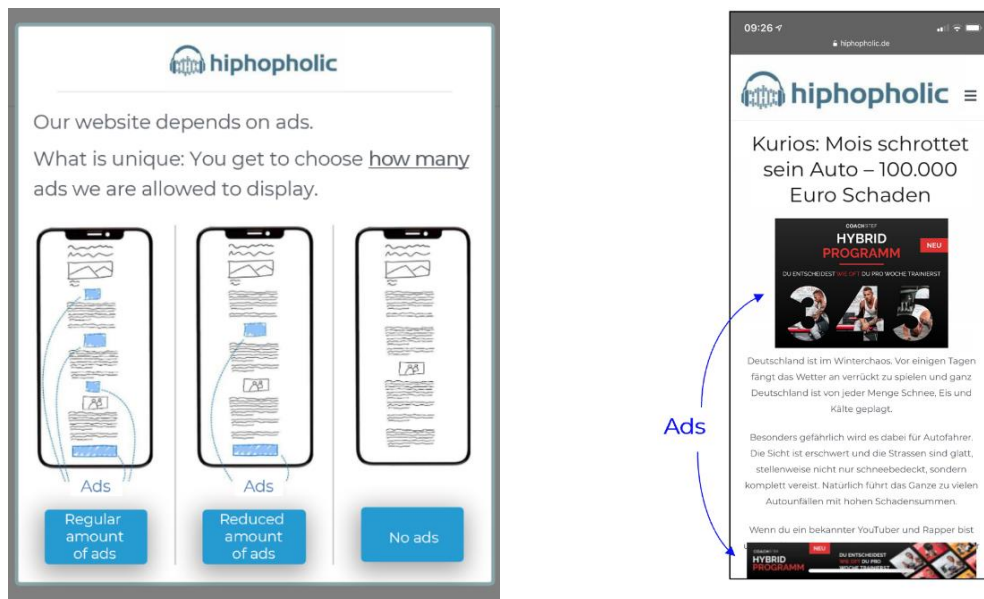


Figure 4-2: AQC interface to customize ad quantity (left) and exemplary article page displaying ads (right)

4.3.3 Experimental Procedure

We guided visitors through one of the three variations of the website as follows: (1) Immediately upon accessing the website, users were randomly assigned to one of the three simultaneously running conditions. Simultaneously, multiple scripts automatically captured information about users' devices (e.g., stationary vs. mobile). (2) Users in the treatment condition saw the AQC interface depicted in Figure 4-2. To continue to the website already visible in the background, users were asked to choose one of the three AQC options. Users in the control condition did not see any intermediate interface and instead continued directly with the next step. (3) Users explored the website and its pages at their own discretion. The amount of ads displayed on each page depended on the condition the user was assigned to and the selected ad quantity option, respectively.

4.3.4 Data Collection

The data gathered for this study spans 4.5 weeks from January 28th to March 1st 2021. We used the open source web analytics application Matomo as well as self-developed scripts to collect clickstream data of each user's visits. By analyzing session data instead of self-reported data, our results do not suffer from typical problems of recall or social desirability bias (Huang et al. 2009), thus ensuring high external validity.

We decided to measure our dependent variable *User Engagement* with two variables to increase robustness of our results: Following prior literature (Demers and Lev 2001; Köster et al. 2020),

we measured how long users stayed on the website (*Visit Duration* in seconds) and how many consecutive pages (*Unique Pages Visited* in number of pages) they explored during a visit. Both variables essentially reflect users' state of being involved, interested and retained in exploring the website – the core of user engagement (Pagani and Mirabello 2011). Engaging users is particularly important for content-focused websites such as news websites. The longer users spend on the website and the more pages they explore, the greater the website's revenue through ads, sponsored articles and subscription models (Benlian 2015).

We started measuring the *Visit Duration* only after users had full access to the website to ensure that our results for the AQC treatment condition would not be inflated by the additional time required to read and interact with the AQC interface. We furthermore collected information about users' devices, such as screen area and operating system, to distinguish between stationary and mobile devices (*Mobile Device*, 0 = stationary device, 1 = mobile device). With regard to controls, an important influencing factor to users' reactions to AQC may be users' general attitudes towards ads, which we approximated through the use of an *Ad-Blocker* (0 = absent, 1 = present) and how users landed on the website, using the variable *Organic Traffic* (0 = user accessed the website through paid channels (i.e., ads), 1 = user accessed the website through organic channels (i.e., their own search activity)). Both *Ad-Blocker* and *Organic Traffic* serve as a rough indication for users' attitudes towards ads. We furthermore recorded from which country and city users accessed the website, split into the three German-speaking countries: *DE* (0 = outside Germany, 1 = inside Germany), *AT* (0 = outside Austria, 1 = inside Austria) and *CH* (0 = outside Switzerland, 1 = inside Switzerland). We subsequently complemented the location data with the corresponding size of the *population* (million citizens of the location the website was accessed from). Lastly, for our treatment condition *Customizable Ads*, we captured how long users looked at the AQC interface before choosing an option and accessing the main part of the website (*Time in AQC Interface* in seconds).

4.4 Results

4.4.1 Sample Description and Controls

A total of 21,771 users visited the website during our field experiment. Of these, we excluded 3,229 (14.8%) visitors who bounced off the website immediately again (i.e., leaving the website without scrolling at all or engaging in any other action), for example because they accessed the website by accident. Since these visitors did not interact with the website in any way, we cannot assume they were aware of the website's content or manipulations. In addition, we could not

discern whether users were continuously engaging with the website or interrupted their exposure by switching to other tabs or apps or by even leaving their device temporarily, before returning to the still open tab with our website. In line with prior literature (e.g., Köster et al. 2020; Röthke et al. 2020), we decided to cut off the 1,301 (7.0%) users that spent more than 20 minutes on just one single article page, which exceeds the median time of 1.05 minutes by around 19 times representing a cut off at the 97.5% quantile of the distribution. Even though a robustness check including time-out users yielded consistent result patterns, we exclude these users from our further analyses to avoid biasing effects from interrupted exposure to our website. Thus, our final sample comprised 17,241 visitors for the following analyses.

Table 4-2 summarizes the descriptive statistics. Following prior literature (e.g., Bhatnagar et al. 2017; Köster et al. 2020), we focus on several session-related variables to ensure heterogeneity of our sample. According to our data, 80.8% of the visitors used a mobile device, 58.7% of the visitors used an ad-blocker, the average population size of the visitor's location was 2.37 million, 96.6% reached the website via organic search engine results or direct access, 88.2% of the visitors were located in Germany, 5.0% in Austria and 4.9% in Switzerland. As the results of several one way analyses of variance in Table 4-2 indicates, we deem the randomization of our treatment conditions successful.

Condition		<i>Custom. Ads</i>	<i>No Ads</i>	<i>Default Ads</i>	F-value	p-value
N		7,612	4,693	4,936	-	-
Mobile Device (1 = mobile device, 0 = stationary device)	M	0.81	0.81	0.81	0.18	0.84
	SD	0.40	0.39	0.39		
Ad-Blocker (1 = present, 0 = absent)	M	0.58	0.60	0.59	1.46	0.23
	SD	0.49	0.49	0.49		
Population (in 10 ⁶ inhabitants)	M	2.44	2.18	2.44	0.58	0.56
	SD	14.13	11.97	14.68		
Organic Traffic (1 = organic, 0 = paid)	M	0.97	0.97	0.96	1.47	0.23
	SD	0.03	0.03	0.03		
DE (1 = German, 0 = else)	M	0.88	0.88	0.88	0.03	0.78
	SD	0.32	0.33	0.32		
AT (1 = Austrian, 0 = else)	M	0.05	0.05	0.05	0.69	0.50
	SD	0.21	0.22	0.22		
CH (1 = Swiss, 0 = else)	M	0.05	0.05	0.05	0.42	0.66
	SD	0.21	0.22	0.21		

Table 4-2: Descriptive statistics

To address potential non-response bias (Fowler Jr 2013), we conducted several one-way analyses of variance to compare the distributional properties (e.g., mobile device, organic

traffic, and ad-blocker) of the first 25% responses to those of the last 25% responses of all visitors. The results did not indicate any statistically significant differences between these two quartiles (all $p > 0.1$), suggesting that no bias due to non-response occurred.

4.4.2 Model-Free Evidence

The results presented in Figure 4-3 indicate that providing the option of AQC⁶ leads to significantly higher (website) visit duration not only compared to when default ads are applied, but also when no ads are present at all. Likewise, visitors having access to AQC explore significantly more unique pages than visitors facing a website with *Default Ads* and even a website featuring *No Ads*.

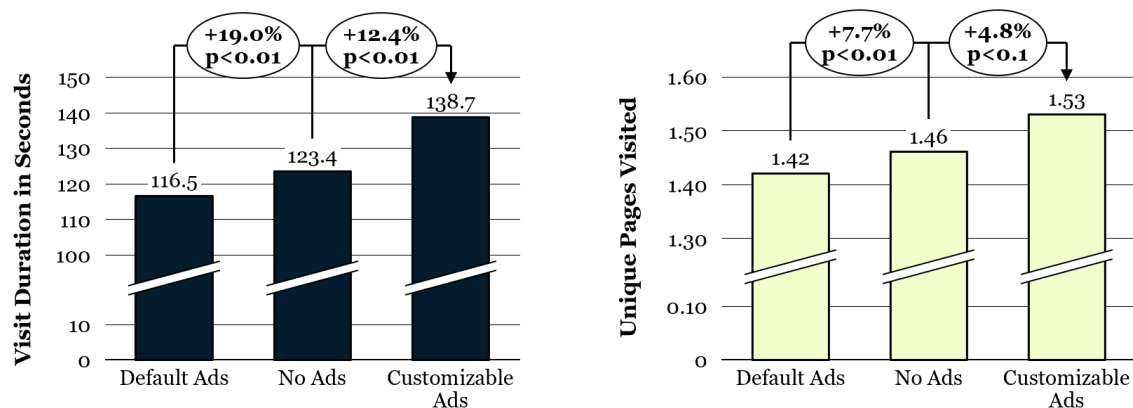


Figure 4-3: Users' visit duration on our website variants with *Default Ads*, *No Ads* and *Customizable Ads*

4.4.3 Main Effect Analyses

We conducted a linear regression on our log transformed dependent variable *Visit Duration* (see Table 4-3). Due to the positive skewness of our dependent variable, we followed extant literature (Greene 2003; Huang et al. 2019; Köster et al. 2020) and employed regression analyses with a log transformed variable. We examined the main effect of *Customizable Ads*, alongside potential effects of the control variables, on *Visit Duration*. The results of our regression analysis demonstrate a significant positive effect of *Customizable Ads* on *Visit Duration* when comparing to a website with *Default Ads* ($\beta = 0.233$; Wald statistic (1) = 103.0; $p < 0.001$) and when comparing to a website with *No Ads* ($\beta = 0.229$; Wald statistic (1) = 96.6;

⁶ Interestingly, within the group of users with customizable ads, 66% opted for “no ads”, 10% for “reduced amount of ads” and 24% for “regular amount of ads.” As such, we find that users did not configure AQC to eliminate ads altogether.

$p < 0.001$). Hence, on the website with *Customizable Ads*, users spent 19.0% more time than on the website with *Default Ads* (138.7 sec. vs. 116.5 sec.; $F = 28.08$; $p < 0.001$). Moreover, users who interacted with the website with *Customizable Ads* spent 12.4% more time than on the website with *No Ads* (138.7 sec. vs. 123.4 sec.; $F = 11.11$; $p < 0.001$). Taken together, the provision of AQC considerably impacted users' visit duration and therefore the website's success.

To assess the effect of *Customizable Ads* on our dependent variable *Unique Pages Visited*, we performed a negative binomial regression analysis (see Table 4-3), which is robust to the non-normal distribution reflected in count data such as the number of unique pages visited (Maruping et al. 2019). As with the aforementioned model, we investigated the main effect of providing *Customizable Ads*, alongside any potential effects of the controls, on *Unique Pages Visited*. The results of our regression analyses demonstrate a significant positive effect of *Customizable Ads* on *Unique Pages Visited* when comparing to a website with *Default Ads* ($\beta = 0.07$; Wald statistic (1) = 17.0; $p < 0.001$) and when comparing to a website with *No Ads* ($\beta = 0.05$; Wald statistic (1) = 6.7; $p < 0.01$). Hence, on the website with *Customizable Ads*, users visited 7.7% more pages than on the website with *Default Ads* (1.42 *Unique Pages Visited* vs. 1.53 *Unique Pages Visited*.; $F = 6.86$; $p < 0.01$). Moreover, users who interacted with the website with *Customizable Ads* visited 4.8% more pages than on the website with *No Ads* (1.46 *Unique Pages Visited* vs. 1.53 *Unique Pages Visited*; $F = 2.71$; $p < 0.1$), attesting to the greater engagement induced by AQC.

4.4.4 Interaction Effect Analysis of AQC and Mobile Device Usage

To understand how the usage of mobile devices influence the main effects on our dependent variables *Visit Duration* and *Unique Pages Visited*, we analyzed the interaction models A2 and C2 in which we included the interaction term of *Customizable Ads* and *Mobile Device* next to the variables used for the main effect models A1 and C1, using *Defaults Ads* as a baseline (see Table 4-3). These analyses unveiled a significant two-way interaction of *Customizable Ads* and *Mobile Device* ($\beta = 0.127$; Wald statistic (1) = 7.5; $p < 0.01$) on *Visit Duration*. The combination of mobile device usage and AQC results in a 20.3% increase in time spent on the website. However, Model C2 did not yield any significant interaction effect on *Unique Pages Visited*. Additionally, we analyzed the interaction model B2 and D2 with *No Ads* as the baseline and found comparable effect patterns (see Table 4-3).

To further evaluate the interaction effect, we conducted a contrast analysis. As depicted in Figure 4-4, the results highlight that when accessing the website offering *Customizable Ads*

rather than the one featuring *Default Ads*, users spent more time on the website when they used a mobile device (116.1 sec. vs. 139.7 sec.; $F = 23.59$; $p < 0.001$). Likewise, a significant difference in *Visit Duration* between the website with *Default Ads* (118.1 sec.) and the website with *Customizable Ads* (134.8 sec.; $F = 2.97$; $p > 0.1$) emerged when a stationary device was used. Moreover, when comparing *Customizable Ads* with *No Ads* as the baseline, users spent more time on the website when they used a mobile device (118.5 sec. vs. 139.7 sec.; $F = 14.43$; $p < 0.001$). In contrast, a significant difference in *Visit Duration* between the website with *No Ads* (141.2 sec.) and the website with *Customizable Ads* (134.8 sec.; $F = 0.27$; $p > 0.1$) did not emerge when a stationary device was used.

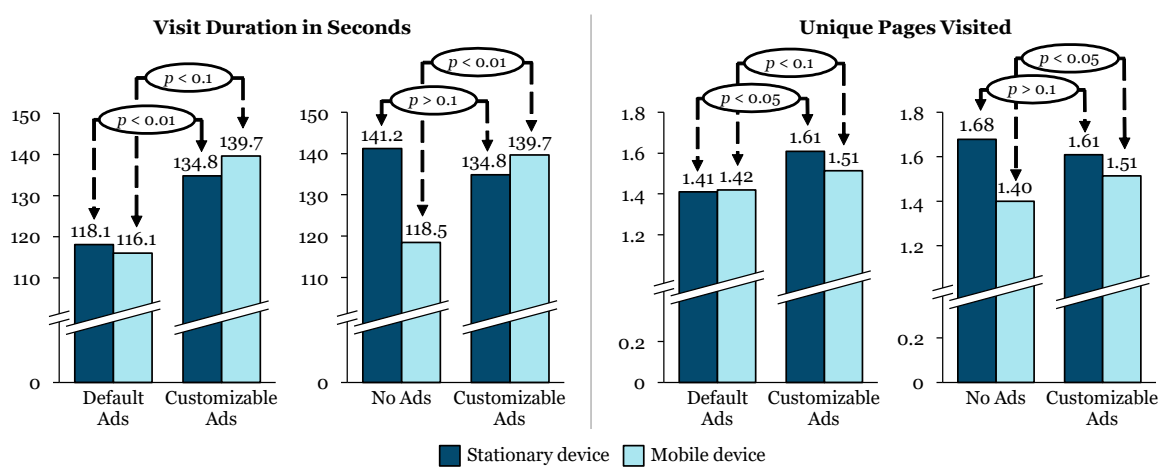


Figure 4-4: Interaction between AQC and mobile device on users' visit duration and unique pages visited

Besides the interactive effect between *Customizable Ads* and *Mobile Device* usage on *Visit Duration*, we also investigated the effect of this interaction on our dependent variable *Unique Pages Visited*. As Figure 4-4 depicts, the results indicate that when accessing the website offering *Customizable Ads* rather than the one featuring *Default Ads*, users visited more unique pages on the website when they used a mobile device (1.51 pages. vs. 1.42 pages.; $F = 3.59$; $p < 0.1$). Likewise, a significant difference in *Unique Pages Visited* between the website with *Default Ads* (1.41 pages) and the website with *Customizable Ads* (1.61 pages; $F = 4.03$; $p < 0.05$) emerged when a stationary device was used. Moreover, when accessing the website offering *Customizable Ads* rather than the one featuring *No Ads*, users visited more unique pages when they used a mobile device (1.51 pages vs. 1.40 pages; $F = 5.77$; $p < 0.05$). In contrast, a significant difference in *Unique Pages Visited* between the website with *No Ads* (1.68 pages) and the website with *Customizable Ads* (1.61 pages; $F = 0.33$; $p > 0.1$) did not emerge when a stationary device was used.

	Dependent variable: Visit Duration				Dependent variable: Unique Pages Visited			
Independent Variables	Default Ads as baseline		No Ads as baseline		Default Ads as baseline		No Ads as baseline	
	Model A1	Model A2	Model B1	Model B2	Model C1	Model C2	Model D1	Model D2
Intercept	3.900*** (0.098)	3.946*** (0.100)	3.904*** (0.098)	3.950*** (0.100)	0.589*** (0.076)	0.601*** (0.078)	0.616*** (0.076)	0.628*** (0.078)
Conditions								
Default Ads	-	-	-0.004 (0.025)	-0.004 (0.025)	-	-	-0.027 (0.020)	-0.027 (0.020)
No Ads	0.004 (0.025)	0.004 (0.025)	-	-	0.027 (0.020)	0.027 (0.020)	-	-
Custom. Ads	0.233*** (0.023)	0.132*** (0.043)	0.229*** (0.023)	0.128*** (0.043)	0.074*** (0.018)	0.049 (0.034)	0.047*** (0.018)	0.021 (0.034)
Interaction								
Custom. Ads x Mobile Device	-	0.127*** (0.046)	-	0.127*** (0.046)	-	0.033 (0.036)	-	0.033 (0.036)
Controls								
Mobile Device	0.035 (0.023)	-0.021 (0.031)	0.035 (0.023)	-0.021 (0.031)	-0.068*** (0.018)	-0.083*** (0.024)	-0.068*** (0.018)	-0.083*** (0.024)
Ad-Blocker	-0.021 (0.019)	-0.021 (0.019)	-0.021 (0.019)	-0.021 (0.019)	0.020 (0.015)	0.020 (0.015)	0.020 (0.015)	0.020 (0.015)
Organ. Traffic	-0.127** (0.052)	-0.127** (0.052)	-0.127** (0.052)	-0.127** (0.052)	-0.237*** (0.038)	-0.237*** (0.038)	-0.237*** (0.038)	-0.237*** (0.038)
Population	-0.0003 (0.0008)	-0.0003 (0.0008)	-0.0003 (0.0008)	-0.0003 (0.0008)	-0.0003 (0.0007)	-0.0003 (0.0007)	-0.0003 (0.0007)	-0.0003 (0.0006)
Time in AQC Interface	0.0052*** (0.0019)	0.0054*** (0.0019)	0.0052*** (0.0019)	0.0054*** (0.0019)	0.0023* (0.0012)	0.0024** (0.0012)	0.0023* (0.0012)	0.0024** (0.0012)
DE	0.150* (0.082)	0.147* (0.082)	0.150* (0.082)	0.147* (0.082)	0.034 (0.066)	0.033 (0.066)	0.034 (0.066)	0.033 (0.066)
AT	0.014 (0.089)	0.013* (0.089)	0.014 (0.089)	0.013 (0.088)	0.062 (0.070)	0.062 (0.070)	0.062 (0.070)	0.062 (0.070)
CH	0.059 (0.089)	0.056 (0.089)	0.059 (0.089)	0.056 (0.089)	-0.055 (0.071)	-0.055 (0.071)	-0.055 (0.071)	-0.055 (0.071)
Model Fit								
Log Likelihood	-	-	-	-	-26673	-26686	-26673	-26686
Nagelkerkes / Adjusted R^2	0.0110	0.0114	0.0110	0.0114	0.006	0.006	0.006	0.006
Omnibus Model χ^2 / F-statistic	20.15***	19.01***	20.15***	19.01***	90.94***	91.79***	90.94***	91.79***

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; $N = 17,241$; standard errors in parentheses; Population was normalized by 1 million; Time in AQC Interface was normalized in relation to its mean of 4.5 seconds

Table 4-3: Regression analysis on visit duration and unique pages visited

4.5 Discussion

A growing body of IS literature is contributing to our understanding of web customization. Yet, we still lack important insights on the relevance and consequences of web customization of ads.

In a large-scale randomized field experiment comprising 17,241 visits to a news website, we find that users spend more time on the website and explore more pages during their visit (i.e., they are more engaged) when they are allowed to customize the amount of ads. Most interestingly, we find that users engage more with the website when having the possibility of AQC than when experiencing a website that is free of ads by default. In addition, users with mobile (vs. stationary) devices engage particularly strongly when empowered with the possibility of AQC, indicating an increased value of AQC in mobile usage contexts.

4.5.1 Contributions to IS Literature and Practice

With our study on the customization of ad quantity on websites, we offer two important contributions to the IS literature on web customization: First, we uncover a new facet of web customization by employing a field experiment that specifically addresses a website's ads. Previous research focused on allowing users to customize the primary editorial content of websites (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010), thereby disregarding advertising content as one of the most prevalent types of content on websites. Advertising content is fundamentally different from editorial content in that corresponding perceptions of loss of control oftentimes elicit strong affective reactions that induce automatic avoidance behaviors (Seyedghorban et al. 2016). To address whether and how the customization of ads affects user engagement, we set out to understand the impact of empowering users with AQC in a real-world setting. In doing so, we are able to advance the boundaries of customization: Compared to editorial content which users primarily customize in terms of content and design, advertising content is unique in that its quantity is one of the main drivers of users' reactions to it (Cho and Cheon 2004). Thus, ads represent an intriguing opportunity to advance our knowledge on web customization by customizing *quantity* of information rather than content or format. Consequently, we explore advertising content as a new type of customizable information that fosters user engagement beyond shaping editorial content. Notably, we discover that web customization is capable of transforming website elements that users traditionally perceive as irritating and distracting into an asset that boosts user engagement above and beyond the intuitive ideal of simply omitting such elements. Taken together, we shed light on ad customization as a missing and neglected part of the puzzle to obtain a more holistic picture of how IS can leverage web customization to accommodate to the increasing pressure to enable individualized experiences by empowering users.

Second, we complement previous IS research on web customization by advancing our understanding of the factors influencing users' responses to AQC. Although researchers

cautioned to differentiate between stationary and mobile contexts when studying active control (Benlian 2015; Gu et al. 2013; Lee 2005), previous studies mostly investigated each context in isolation, failing to extract comparative effects that may arise from different usage patterns. By specifically taking device type into account, we uncover a moderating influence on the effect of AQC on user engagement. As users with mobile devices engage particularly strongly with the website when given the possibility of AQC, we demonstrate that web customization depends on how users access the website. Specifically, we show that a limited user interface foments users' need for and appreciation of web customization. As we underscore the importance of exploring web customization particularly in mobile usage contexts, we are among the first to address how different devices affect how users respond to web customization. This is important for IS research on web customization because it reveals thus far disregarded influences that dictate how web customization is received. As such, differentiating between mobile and stationary devices can help improve the explanatory power of general models when they are applied to specific contexts (Sun and Zhang 2006). This is in line with prior IS research that has reported significant moderating effects of context-specific factors on user engagement (e.g., Fang et al. 2005; Jang 2010; Lin 2011).

Beyond these theoretical contributions, our results offer extensive and surprising insights for website providers that strive to engage their users more strongly. While our results do confirm the common notion that displaying ads sets off users in that they engage less with the website compared to when no ads are present at all, we also uncover that users do not resist the presence of ads in general. Instead, we find that a lack of control over the ads appears to be one of the main drivers of users' reactions. Counterintuitively, integrating ads on a website while empowering users with AQC leads users to stay longer and explore more pages than renouncing ads altogether. These findings entail powerful implications for website providers in that ads are not necessarily a threat to users' interest in a website. Rather, AQC allows website providers to transform ads into an asset for users that fosters engagement with the website. Website providers may even be able to offer AQC as a value proposition to convince ad-block users to turn off their ad-blocker and allow some level of ads they feel comfortable with to support the website and its provider.

Moreover, our findings help website providers to adapt their offerings to their individual users by distinguishing between the device type used to access the website. As we find that the provision of AQC appeals particularly strongly to users with mobile devices, we uncover an opportunity for website providers to optimize their offerings by differentiating between their

user groups. These insights are valuable especially when website providers are cautious to what extent they are willing to relinquish control over ads as one of their primary revenue streams. To that end, website providers could discriminate between their users and limit AQC to their mobile user base as the target group AQC is most effective for, while maintaining control over ads for visitors with stationary devices. Taken together, our study offers website providers valuable guidance on how to leverage AQC as a new facet of web customization to strengthen their user base across different user groups.

4.5.2 Strengths, Limitations and Future Research

The present study has various strengths, including (1) the incorporation of a large-scale randomized field experiment with real consequences for a website, (2) insights from real user behaviors, (3) a side-by-side comparison of user behavior on stationary versus mobile devices, (4) the consideration of two control groups that even take a website without ads whatsoever into account, and (5) the implementation of advanced measurement techniques (e.g., non-detectability of our ads for ad-blockers). We could thus provide not only ecologically valid but most importantly highly reliable and comparable findings. Yet, like any study, our research has limitations that provide important directions for future research.

Our findings have demonstrated that AQC effectively fosters user engagement. Nevertheless, to optimize the impact of AQC, we need to advance our understanding of the mechanism driving AQC's implications. On that account, we call for future research to uncover mediating effects, for example rooted in perceived empowerment and self-efficacy. In particular, it would be fruitful to uncover the reasons behind our counterintuitive finding that users are more engaged with a website offering AQC than with a website free of any ads – for instance through a qualitative approach. Likewise, our findings can be complemented with insights on further moderating effects, such as users' motives when browsing as well as dispositional factors such as need for control. Moreover, ads can be customized in many ways beyond their quantity. As such, we invite researchers to look into possibilities how, for example, the customization of placement and content may yield fruitful avenues for further investigation.

Lastly, we want to particularly highlight that enabling users to customize ads by adjusting quantity may come at a cost for websites. Ad revenue is largely generated through the number of impressions as well as clicks on ads. Although we find that users on average did not configure AQC to eliminate ads altogether, they indeed chose less ads than what was specified as the regular amount, thereby reducing the ad impressions compared to seeing default ads. At the same time, we found no significant increase in clicks on ads when users were given the

possibility to customize ad quantity – which, however, may also be ascribed to a lack of interest in our ads as we did not personalize their content. Taken together, AQC can impact a website's ad revenue stream. In return, AQC leads to considerable boost in user engagement. Therefore, to what extent AQC provides value to a website depends on website providers' objectives. For example, IS research has found that websites that aim to expand their traffic should cut down on ads during their growth phase and only ramp up ad content at a later point in time when the website has reached a more established user base (Dewan et al. 2002). Instead of renouncing ads to attract more users, websites could leverage AQC for their growth strategies and benefit in two ways: On the one hand, the increase in user engagement induced by AQC increases the attractiveness of the website. On the other hand, websites get to display ads and generate corresponding ad revenue earlier on. While the concept of AQC thus has a strong value proposition, we encourage future research to investigate which deployment strategies allow websites to profit the most from AQC. To that end, a particularly interesting facet to investigate would be how to convince users to select higher ad amount options that satisfy users and still generate reasonable ad revenues – unlocking the best of both worlds.

Chapter 5: Underlying Mechanisms of Ad Quantity Customization

Title: Empowering Users to Control Ads and Its Effects on Website Stickiness (2022)

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Published in: Electronic Markets, forthcoming (published online: 16th August 2022)

Abstract

Website providers find it increasingly difficult to convince users to accept advertisements (ads) on their websites. In this study, we investigate ad quantity customization (AQC) as a practice to counter these challenges. AQC refers to the technological means through which website providers enable users to determine the amount of ads displayed on their websites. Drawing on psychological empowerment theory, we demonstrate in an online experiment with 395 participants that AQC can pay off: A website with AQC elicits significantly higher website stickiness than a website without AQC, even if the website without AQC contains no ads at all. We furthermore find that perceived empowerment, informational fit-to-task and perceived enjoyment mediate the effect of AQC on website stickiness. Our study thus contributes to Information Systems research on web customization and offers website providers actionable recommendations to keep their users involved, interested and retained.

Keywords: empowerment, active control, advertisements, stickiness

5.1 Introduction

Online advertisements (ads) have become an integral part of users' browsing experience on many websites (Hong et al. 2021). As of 2018, 50% of Europe's 500 most popular websites feature banner ads to finance their business activities, with 94% of news websites displaying ads on average more than 16 times per page (Libert and Nielsen 2018). From a user perspective, ads are often seen as an unsolicited distraction that can induce information overload and a perceived loss of control (Aguirre et al. 2015; Liu 2003; Rejón-Guardia and Martínez-López 2014), which causes users to engage in avoidance behaviors, such as abandoning websites (Seyedghorban et al. 2016). This poses a serious threat to the business models of many website providers whose main objective is to convince users to stick to their websites and keep returning to them (Benlian 2015; Köster et al. 2020). Additionally, a large share of users deploys ad blockers to "push back against the perverse design logic that has cannibalized the soul of the Web" (Wicker and Karlsson 2017, p. 76). With close to half of all online users resorting to ad blocking (Globalwebindex 2018), the proliferation of technologies that forcefully cancel out ads is an alarming signal of users' urge for more control (Aseri et al. 2020).

Some website providers have started to acknowledge that users demand to be in control over their web experience (Alt et al. 2019; Hartemo 2016). At the same time, recent advances in user interface technologies (e.g., overlays to collect user input) are paving the way for website providers to offer web customization (i.e., the psychological empowerment of users to control the form or content of a website) (Benlian 2015; Jiang et al. 2010). Accordingly, first website providers devolve control over ads by offering their users ad customization options. For example, users on *YouTube* can oftentimes choose how long they want to watch an ad, up to skipping the ad altogether (Belanche et al. 2020; Dukes et al. 2020). This type of customization to control specifically the *quantity* of ads (e.g., the length of a video ad or the number of banner ads) is intriguing because it targets ad clutter as one of the primary drivers of users' frustration with ads (Seyedghorban et al. 2016). Therefore, website providers face a new and exciting opportunity to approach the ever contentious handling of ads on their websites by providing ad quantity customization (AQC) to their users. Essentially, such website provider-enabled AQC may critically influence users' intention to stick to a website (i.e., their intention to return) as an indicator of users' long-term commitment to a website (Benlian 2015).

In addition to its critical relevance for practice, understanding the intricacies of AQC provides a rich opportunity for Information Systems (IS) research focusing on web customization (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010). Thus far, IS researchers investigating web

customization have narrowed their attention toward websites' primary editorial content (i.e., content related to the main purpose of the website), including customizing the content of news aggregators (Benlian 2015), choosing the order in which product information is displayed (Ariely 2000) and specifying how to interact with virtual mock-ups of real-world products (Jiang and Benbasat 2007a). Nevertheless, customizing advertising content differs fundamentally from customizing editorial content, because users never asked to see any ads in the first place. In fact, as users are oftentimes irritated and annoyed by unsolicited ads, they try to avoid such advertising content as good as they can, up to abandoning the entire website (e.g., Belanche et al. 2020; Kumar et al. 2020; Seyedghorban et al. 2016). If users seek to avoid ads, will they see the possibility to customize ad quantity through AQC as an attractive asset or an unwelcome reminder of the ads they are trying to disregard? Moreover, if users want to avoid ads, would they much rather prefer not to customize ad quantity and instead view a website that is entirely free of ads by default? This idiosyncrasy of customizing advertising content engenders the relevance to understand whether and how offering AQC can affect users' intention to stick to a website. Moreover, understanding the explanatory mechanism that drives the effects of AQC is instrumental to improve the effectiveness of web customization designs – particularly in the unique context of ads and AQC. The objective of this study is to address these opportunities for research by investigating the following research question:

RQ: How and why does website provider-enabled AQC influence users' intention to stick to a website?

To address this research question, we drew on psychological empowerment theory (Human et al. 2020; Kim and Gupta 2014; Spreitzer 1995) and conducted an online experiment with 395 participants who experienced a website with different ad customization options. Our findings demonstrate that a website with AQC, where participants are invited to customize the amount of ads, elicits greater website stickiness than a website without AQC, where participants cannot influence ad quantity. Surprisingly, a website with AQC evokes even greater website stickiness than a website that is free of any ads by default. That is, participants generally stick more to a website when they are in control of the ad quantity, even if the alternative would be a website that never features any ads in the first place. Additionally, we show that the effect of AQC on website stickiness is carried over by the mediators perceived empowerment, informational fit-to-task and perceived enjoyment.

Our research provides two important theoretical contributions: First, our study sheds light on a thus far largely disregarded prospect of web customization by allowing users to customize ads.

We thereby depart from previous research that has predominantly looked at the customization of websites' editorial content (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010). In contrast to editorial content, users typically seek to avoid ads. For this reason, insights on how users respond to being asked to customize ads they did not ask for are particularly valuable for our understanding of web customization. More specifically, we examine AQC as a web customization feature that is capable of exploiting ads as website elements that users typically dislike seeing, but enjoy to customize. As such, we bring forward the customization of ads as a hitherto largely neglected, yet significant piece of web customization to capture and retain users on websites. This is important for IS research because it showcases diverse pathways to satisfy users' need for individualized experiences. Second, we shed light on the mechanism through which AQC bolsters website stickiness. Previous research on web customization focused on the consequences of individualized content as the outcome of the customization process (e.g., Jiang and Benbasat 2007b; Xue et al. 2020), but did not account for the significance of feeling empowered as the hallmark of web customization. We demonstrate that perceived empowerment is a critical mediator that carries over the observed effects of AQC via informational fit-to-task and perceived enjoyment. As such, we not only provide a nuanced picture of the mechanisms that are unique to web customization, but also underline the importance of perceived empowerment as a hitherto under-investigated construct in IS web customization literature. This is important as it enables IS research to identify moderating factors that help to improve the design and effectiveness of web customization. Beyond our theoretical contributions to research, our study provides extensive and counterintuitive insights for practitioners by revealing how websites can leverage AQC to convert ads from a possible deterrent into a valuable resource that boosts website stickiness.

5.2 Theoretical Background

5.2.1 Web Customization

To successfully capture and retain users, websites individualize their content (e.g., editorial content and advertising content) using web personalization and web customization (Garett et al. 2016; Tam and Ho 2006). Web personalization is based on a system that collects user information alongside behavioral patterns to adjust the website's content according to the system's best guess of the user's interest (e.g., YouTube drawing on users' viewing history to suggest and recommend new videos) (Tam and Ho 2005). In this case, users are merely being observed and therefore are only passively involved in how the website is individualized.

Conversely, web customization grants users power to exercise active control over the website's content using some sort of modification interface (e.g., selecting a website's language) (Ariely 2000; Benlian 2015). In this way, users play an active role in how the website is shaped. Compared to web personalization, web customization is growing in relevance: Previous research increasingly emphasizes that users long for empowerment and demand to control website content themselves instead of being scrutinized by a system that – at best – is capable of making an informed guess (Matt et al. 2019; Sundar and Marathe 2010; Sutanto et al. 2013). For this reason, studying web customization is a current and relevant opportunity that complements and expands insights from previous web personalization literature (e.g., Ho and Bodoff 2014; Ho and Lim 2018; Johar et al. 2014).

We present a review of the IS literature investigating customization features on websites in Table 5-1. Notably, previous studies examined web customization features that focus on editorial content, which is content that relates to the primary purpose of the website. For example, extant literature investigated users' ability to customize the handling of personal data on websites (Mousavi et al. 2020), the design and content covered on aggregator websites (Benlian 2015), and the selection, order and level of detail of online product information (Ariely 2000; Jiang and Benbasat 2007a; Jiang and Benbasat 2007b; Xue et al. 2020). While insights on these customization features have made an important contribution to our understanding of web customization, their validity is restricted to the customization of sought-after editorial content. Contrary to editorial content that users expect and welcome when opening a website, advertising content is often perceived as an unsolicited impediment to users' goals. As a result, users engage in purposeful ad avoidance behaviors (e.g., scrolling away, closing the website) (e.g., Kumar et al. 2020; Seyedghorban et al. 2016). Notably, the more ads appear, the stronger users try to avoid them (Cho and Cheon 2004). For this reason, ads present a unique opportunity to study quantity as a distinct customization mechanism, thereby complementing previous research investigating content, format and order of information. Moreover, given that ads are often perceived as unsolicited distractions, the intuitive ideal for users may be a website that does not bother its users to customize the number of ads, but instead eliminates ads altogether. However, it is far from clear whether users' irritation with unsolicited ads is due to the mere existence of ads in general or rather results from being stripped of any control over these ads. Put differently, may users even welcome ads as part of a website if users have the power to customize them? Therefore, it is important to investigate not only how the presence versus

absence of AQC influences website stickiness, but also how AQC compares to eliminating ads entirely.

Study	Customization feature	Observed outcome	Mediators	
			Unspecific to web customization	Specific to web customization
Ariely (2000)	Users customized in what sequence and with which level of detail product information should be presented to them	Decision quality	—	—
Jiang and Benbasat (2007b)	Users customized which product features to be presented with by interacting with a digital twin	Intention to return	Perceived diagnosticity, shopping enjoyment	—
Jiang et al. (2010)	Users customized in which order and by which category to have products shown to them	Purchase intention	Cognitive and affective involvement	—
Benlian (2015)	Users customized which topics to receive news articles about and which color the website should presents itself in	Website stickiness	Preference fit, perceived enjoyment	—
Xue et al. (2020)	Users customized which live product presentation and which corresponding information should be displayed	Participation and sharing	Perceived usefulness, psychological distance	—
Mousavi et al. (2020)	Users customized how their browsing data is collected, stored, and distributed	Self-disclosure behavior	—	—
This study	Users customize the quantity of ads displayed on the website	Website stickiness	Informational fit-to-task, perceived enjoyment	Perceived empowerment

Table 5-1: Review of IS literature on web customization

In reviewing previous IS literature on web customization, we additionally found that first mediators (e.g., involvement, preference fit, perceived enjoyment and perceived risk) were investigated to understand *why* web customization affects outcomes such as website stickiness. In doing so, extant literature emphasizes the importance of uncovering both cognitive and

affective pathways through which web customization affects user behaviors. Nevertheless, our understanding of the underlying mechanism is still limited in that previously analyzed mediators (e.g., perceived usefulness of the website) focus merely on the outcome of the customization process – that is, individualized content that matches users’ preferences better. While insights from extant literature are therefore just as well applicable to web personalization, they are unspecific to web customization and do not account for web customization’s unique effects. Specifically, as web customization features have been characterized as a means to empower users (e.g., Füller et al. 2009; Kim and Gupta 2014), we need to understand whether and how users’ perception of being empowered influences their assessment of the website – in addition to the consequences of individualized content. Uncovering this mechanism unique and thus specific to web customization is important to inform the design and implementation of effective web customization features. As such, to contextualize and complement existing conceptualizations of the mechanisms of web customization, this study particularly includes perceived empowerment as a mediator specific to the context of web customization, while additionally taking into account informational fit-to-task and perceived enjoyment as cognitive and affective aspects critical to the individualization of websites.

5.2.2 Psychological Empowerment Theory

Psychological empowerment theory conceptualizes psychological empowerment (hereafter perceived empowerment) as an individual’s experience of motivation that occurs when the necessary authority is given to utilize the potential of a work system (Spreitzer 1995; Thomas and Velthouse 1990). While intimately related to perceived control and sense of agency, perceived empowerment focuses particularly on the experience of being granted the ability to meaningfully influence activities in ways that were previously inaccessible (Alt et al. 2019; Amichai-Hamburger et al. 2008; Zimmerman 1995). According to psychological empowerment theory, four cognitions are relevant to the perception of empowerment when performing a task: meaning, self-determination, impact and competence (Spreitzer 1995). Meaning refers to the value an individual places on the task at hand. Self-determination describes an individual’s sense of autonomy in conducting the task. Impact is an individual’s belief that their choices make a difference in the process of performing the task. Lastly, competence captures an individual’s belief of being able to effectively perform the task. In practical terms, the process of empowerment is understood as “any means strengthening a person’s perception of self-determination and self-efficacy and reducing conditions contributing to feelings of powerlessness” (Füller et al. 2009, p. 74).

In the field of IS, the Internet has attracted researchers' attention as an empowering technology that enables users to do or accomplish things they have found challenging to do or accomplish before (Amichai-Hamburger et al. 2008; Füller et al. 2009). In this context, websites can empower their users not only to receive information, but to actively participate in shaping its composition (Benlian 2015). One key aspect of psychological empowerment theory warrants attention by IS research: Empowered users are more active and productive than users who are not (Thomas and Tymon 1994). This notion is confirmed by several IS studies. For instance, in the work context, empowered users are more willing to contribute to knowledge management systems (Kang et al. 2017) and exhibit a greater propensity to utilize customer relationship management systems to the full potential (Kim and Gupta 2014). Beyond the context of work, users express a stronger intention to reuse websites that empower them (e.g., Benlian 2015; Jiang and Benbasat 2007b; Kamis et al. 2008). In addition to stimulating user action, extant literature has found that empowerment leads to enhanced user satisfaction (Liang et al. 2006), greater user loyalty (Pierrakos et al. 2003), improved personal identification of users with the brand of the empowering website (Johnson et al. 2006) and overall more positive user attitudes toward the empowering website (Kalyanaraman and Sundar 2006). On the flip side, making use of the empowerment by actively controlling information may be a task in itself and therefore requires users' willingness and capability to invest processing resources (Ariely 2000).

Given that web customization is a form of devolving control to users, psychological empowerment theory is well suited to understand how AQC on websites can empower users and how this empowerment affects users' intention to stick to a website.

5.2.3 Website Stickiness

Providing AQC may arguably impact users' assessment of the website in various ways, including users' initial impression and attitude toward the website, their intention to keep exploring the website, their intention to switch to another website, their intention to recommend the website, their willingness to pay for the website's offerings and their intention to return to the website. We choose to specifically investigate website stickiness (i.e., users' intention to return) as the key user response to AQC for three reasons. First, research on the perception of online ads indicates that the largely negative user reactions toward ads can spill over to the hosting website and specifically reduce its stickiness. In contrast to editorial content, ads make a website less attractive to users: download times increase, pages clutter up, usability is reduced and the overall content loses value (Dewan et al. 2002). Consequently, users often perceive the presence of ads to reduce the quality of their experience as well as the website as a whole

(Brajnik and Gabrielli 2010; McCoy et al. 2007) and thus show lower intentions to return to the website (Li et al. 2002). Second, website stickiness reflects users' long-term commitment to a website and their willingness to accept the website's offerings. As such, website stickiness is a key contributor to the longevity of a website's business model. Third, website stickiness is a commonly investigated outcome variable in IS research to study the effectiveness of web customization (e.g., Benlian 2015; Kamis et al. 2008; Komiak and Benbasat 2006) and appeals to the importance to investigate user onboarding and interactions (e.g., Adam et al. 2020b; R  thke et al. 2020; Schneider et al. 2019).

5.3 Research Model and Hypothesis Development

Drawing on psychological empowerment theory (Human et al. 2020; Kim and Gupta 2014; Spreitzer 1995) and web customization literature, we hypothesize that a website offering AQC to its users will elicit perceived empowerment (H1). Subsequently, we posit that users' perceived empowerment enhances users' cognitive evaluation of the website in the form of (perceived) informational fit-to-task (H2) as well as users' affective evaluation of the website in the form of perceived enjoyment (H3). We argue that both pathways affect users' intention to stick to the website (H4, H5). As a result, we hypothesize perceived empowerment, informational fit-to-task and perceived enjoyment to mediate the effect of providing AQC on website stickiness (H6, H7, H8, H9). We present our research framework in Figure 5-1.

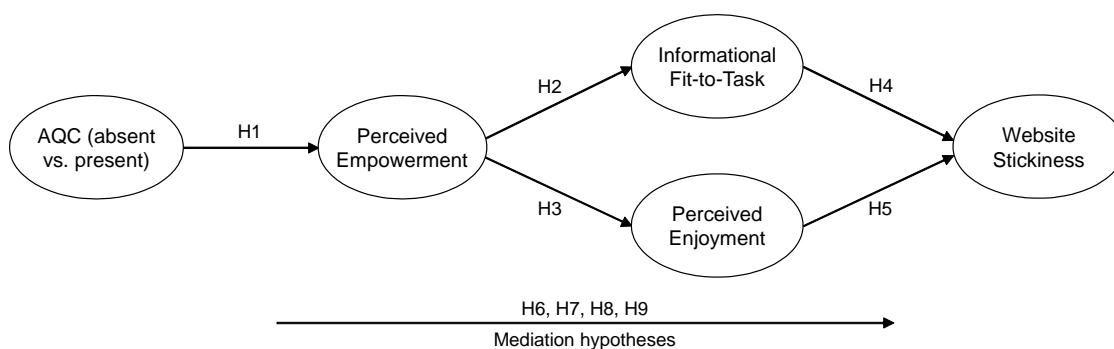


Figure 5-1: Research model

5.3.1 The Effect of AQC on Perceived Empowerment

Following psychological empowerment theory, we argue that AQC elicits perceived empowerment by giving users the impression they (1) are more self-determined and (2) accomplish a greater impact when they can customize the amount of ads compared to when they cannot. First, AQC makes users believe they are more self-determined by bestowing users the freedom to control their web experience. Specifically, users are given the ability to select

and thus control the number of ads displayed on the website. As such, they are in the driving seat to shape their web experience. This sense of choice – as the essence of customization – is well known to make users feel self-determined, with video games being the most prominent example (Kim et al. 2015; Przybylski et al. 2010). Further supporting this reasoning, IS research has demonstrated that users generally feel empowered when they have the opportunity to make technological choices (e.g., Füller et al. 2009; Junglas et al. 2019; Marathe and Sundar 2011). Second, we expect users with access to AQC to feel empowered because they believe they have an impact on their web experience. Selecting an ad quantity of the user's liking has immediate and tangible consequences that users experience when exploring the website. As such, users perceive that their choice makes an actual difference for how they get to experience the website. Realizing this impact leads users to feel empowered (Spreitzer 1995).

In conclusion, we expect AQC to enhance users' perceived empowerment. When AQC makes users feel self-determined and when AQC gives users the impression they have some impact on how their web experience unfolds, they feel empowered (Conger and Kanungo 1988; Füller et al. 2009).

H1: *A website offering AQC elicits higher perceptions of empowerment than a website without AQC.*

5.3.2 The Effect of Perceived Empowerment on Informational Fit-to-Task

An important measure to assess the quality of a website is (perceived) informational fit-to-task, which describes the extent to which information provided by the website meets users' needs to gather information and carry out transactions (Liu and Goodhue 2012; Loiacono et al. 2007; Parboteeah et al. 2009). While informational fit-to-task is closely related to the well-established construct of usefulness (of a website), we deliberately chose to investigate informational fit-to-task as it goes one step deeper and focuses specifically on the information a website provides. It is important to note that a website's information does not just refer to its editorial content. Rather, all of the website's elements contribute to users' evaluation of how the provided information meets users' needs – including potential advertising content.

We expect the feeling of empowerment induced by AQC to increase informational fit-to-task by amplifying users' attentional effort to process the website's content. The ability to influence the website by determining the quantity of virtually ubiquitous and typically immutable ads gives users the feeling to affect not just one element of the website, but rather to shape the formation of the website and its information as a whole. When users feel they are empowered

to profoundly influence the website, they see themselves as a relevant part of the source that generates the composition of the website (Kalyanaraman and Sundar 2006; Sundar et al. 2003). In that sense, users perceive the website with the customized ad quantity to relate to an aspect of themselves, which focuses greater attentional effort on all of the website's information and amplifies users' experience of the overall content and its effects (Sundar 2012). In other words, providing AQC as a form of web customization that empowers users to shape the composition of ads as a fundamental component of websites can "invite deliberate and careful scrutiny of the website, rather than just casual browsing" (Kalyanaraman and Sundar 2006, p. 115). We expect this increase in attention to occur even if users' needs for information do not include advertising content whatsoever (e.g., because the task they are pursuing requires only the website's editorial content). This is because, as long as users do not take the trouble to install an ad blocker, advertising content is an inherent part of users' web experience that involuntarily affects users' perceptions of the website's information (e.g., Hong et al. 2021; Sun et al. 2013). In fact, even when users can merely customize a website's coloring scheme (without affecting any of the content), users' already infer greater informational value of the website (Benlian 2015). As such, we expect the perception of empowerment to customize ad quantity to focus users' attention toward the website as a whole, including its editorial and potentially advertising content.

Greater attentional effort, in turn, enhances users' motivation to process the website's contents (Cacioppo 1986; Kim and Gupta 2014). When users who feel empowered by the provision of AQC are more willing and interested to explore a website, they tend to take a closer look at the available information and process it more deeply, compared to when they lack such empowerment and only skim the website's contents superficially. By examining the website's content more closely, users are more likely to discover insights that are useful to them. Therefore, the mere feeling of empowerment – largely independent of how users customize the level of ad quantity – facilitates the extraction of value of the provided content (i.e., editorial and potentially advertising content). Consequently, we expect perceived empowerment to increase informational fit-to-task.

H2: *Perceived empowerment increases informational fit-to-task of the website.*

5.3.3 The Effect of Perceived Empowerment on Perceived Enjoyment

Whereas informational fit-to-task captures users' cognitive evaluation of the website offering AQC, we propose that perceived empowerment also influences the affective evaluation of the website in the form of perceived enjoyment. Ingrained in the domain of technology acceptance

research (Van der Heijden 2004), enjoyment describes the intrinsic reward derived through the use of the website (Zhang 2013).

Extant IS literature indicates that the feeling of empowerment induced by the provision of AQC likely enhances users' perceived enjoyment with the website. Feeling in charge over the website's ad quantity strikes a nerve for a majority of users eagerly seeking to gain control over conventionally immutable ads – as evident in the proliferation of third party ad-blockers (Gritckevich et al. 2021). Despite AQC confronting users with ads they did not ask for, the perception of being empowered to regulate ad quantity likely is of substantial significance to users' perceived enjoyment. This is because the perception of empowerment reflects the awareness of a sense of control (Spreitzer 1995). Feeling in control is believed to directly enhance the enjoyability of interacting with IS, both in utilitarian contexts, such as organizational tasks (Klesel et al. 2019), as well as in hedonic contexts, such as video games (Kim et al. 2015; Przybylski et al. 2010). In fact, the perception of being empowered and able to exert control has been indicated to be one of the main reasons why users describe customizable systems as enjoyable (Bright and Daugherty 2012; Füller et al. 2009). This link between perceptions of empowerment and enjoyment is likely of particular importance in the context of ads, where users experience severe dissatisfaction with websites overwhelming them with ads (Cho and Cheon 2004; Seyedghorban et al. 2016). Therefore, we expect the belief of being empowered to control ad quantity to foment a sense of enjoyment in users. This line of reasoning is further supported by previous IS literature examining implications of empowering users: Providing task autonomy, bestowing informational control and enabling freedom of technology choice consistently fosters users' perceived enjoyment with the empowering system (e.g., Kamis et al. 2008; Kim et al. 2015; Klesel et al. 2019). Accordingly, we expect perceived empowerment – enabled by the provision of AQC – to enhance users' perceived enjoyment of the website.

H3: *Perceived empowerment increases perceived enjoyment of the website.*

5.3.4 The Effect of Informational Fit-to-Task on Website Stickiness

Informational fit-to-task likely contributes to the stickiness of a website. When the website's editorial and advertising contents meet users' information needs (e.g., because the perception of AQC-enabled empowerment amplified users' attentional effort), the website “promote[s] lingering and capture[s] user attention” (Little 2001, p. 53). The subsequent intensification of users' engagement with the website increases their satisfaction and thus attitude toward the website (Kalyanaraman and Sundar 2006; Liang et al. 2006). When users are more satisfied

with the website, they are more likely to return. Therefore, we argue that informational fit-to-task increases users' intention to stick to the website.

Extant IS research on the content customization of news aggregator websites confirms this reasoning: The improved match between users' informational needs and the website's content – resulting from users actively customizing the website – leads to increased website stickiness (Benlian 2015). Moreover, similar to informational fit-to-task, the perceived usefulness of a customizable website enhances users' intentions to stick to the website (Kamis et al. 2008). This notion is in line with research on technology acceptance that emphasizes perceived usefulness as a major influence to users' reuse intentions (Adams et al. 1992).

H4: *Informational fit-to-task of the website increases website stickiness.*

5.3.5 The Effect of Perceived Enjoyment on Website Stickiness

Parallel to informational fit-to-task, we also expect perceived enjoyment of interacting with the website to influence website stickiness. Previous research found that perceived enjoyment positively affects users' attitudes and satisfaction with a technology's interface (Jiang and Benbasat 2007b). More interestingly, as users derive pleasure from enjoyable activities, enjoyment is an important predictor of users' tendency to repeat the activity (Füller et al. 2009). Accordingly, prior studies could demonstrate that perceived enjoyment fosters online customer loyalty (Bandura 1977) and leads to greater behavioral intention to keep using a system (Füller et al. 2009; Jiang and Benbasat 2007a). Decisively, perceived enjoyment is known to increase users' propensity to return to a website (Dahan and Hauser 2002; Dholakia et al. 2004). When users enjoy interacting with a website, they are more likely to return to it. Consequently, we expect perceived enjoyment to increase website stickiness. This reasoning is supported by IS research attesting that the enjoyment resulting from web customization promotes the attractiveness of the empowering website (Benlian 2015).

H5: *Perceived enjoyment of the website increases website stickiness.*

5.3.6 The Mediating Effects of Perceived Empowerment, Informational Fit-to-Task and Perceived Enjoyment

The links between perceived empowerment, informational fit-to-task and perceived enjoyment (delineated in H1 to H5) indicate a particularly relevant role of these constructs. When an independent variable causes an intervening variable and when this intervening variable in turn causes the dependent variable, then the intervening variable can be understood as a mediator

(MacKinnon et al. 2002). Applied to our research model, we suggest that AQC affects perceived empowerment (H1) and that perceived empowerment, in turn, increases informational fit-to-task (H2) and perceived enjoyment (H3), indicating perceived empowerment as a mediator. More precisely, we argue that the hypothesized increase in informational fit-to-task is not a direct consequence of providing AQC. Rather, empowering users with AQC instills users with a sense of empowerment that in itself is instrumental in encouraging users to carefully process the website's content, making them more likely to find information relevant to them and therefore perceiving a greater informational fit-to-task. Similarly, we argue that the same sense of empowerment – triggered by the provision of AQC – is the true reason users believe they have the upper hand over ads as website elements they typically have no say in, sparking a perception of enjoyment in users. Therefore, the effects of providing AQC on both informational fit-to-task and perceived enjoyment hinge on users' perception of empowerment as a crucial *mediator*.

H6: *Perceived empowerment mediates the effect of AQC on informational fit-to-task and perceived enjoyment.*

Apart from perceived empowerment governing the effect on informational fit-to-task and perceived enjoyment, we furthermore hypothesize that informational fit-to-task and perceived enjoyment each affect website stickiness (H4, H5), thereby indicating both constructs as mediators (MacKinnon et al. 2002). Specifically, we argue that users who feel empowered are more intent to return to the empowering website not simply due to the perception of empowerment itself, but rather because this sense of empowerment incites informational fit-to-task, which satisfies users' cognitive needs, and perceived empowerment, which satisfies users' affective needs. With both cognitive and affective needs met, users are more willing to stick to the website. Thus, to what extent perceived empowerment leads users to stick to the website is highly dependent on the occurrence of both informational fit-to-task and perceived enjoyment as decisive *mediators*.

H7: *Informational fit-to-task mediates the effect of perceived empowerment on website stickiness.*

H8: *Perceived enjoyment mediates the effect of perceived empowerment on website stickiness.*

If perceived empowerment mediates the effect of providing AQC on informational fit-to-task and perceived enjoyment (H6), and if informational fit-to-task and perceived enjoyment mediate the effect of perceived empowerment on website stickiness (H7, H8), then all three

constructs of perceived empowerment, informational fit-to-task and perceived enjoyment are instrumental mediators that carry over the overall effect of AQC on website stickiness.

H9: *Perceived empowerment, informational fit-to-task and perceived enjoyment mediate the effect of AQC on website stickiness.*

5.4 Research Methodology

5.4.1 Experimental Website and Manipulation of AQC

We chose the context of online news websites to test the effects of AQC, thereby following previous scholars studying web customization (e.g., Benlian 2015; Bright and Daugherty 2012; Sundar and Marathe 2010). As for the type of ads, we chose banner ads as the most popular ad form on webpages (i.e., dedicated space displaying advertising content in the form of images and text) (Interactive Advertising Bureau 2019). To minimize confounding effects through ad content, we used the banner ad database of *Oracle Data Cloud* (Oracle 2019) and its function to randomly select banners to collect a set of ads for our experiment. For the purpose of the experiment, we created our own news website which we based on a real online news outlet to maximize realism. To determine an appropriate reference website to emulate, we set two criteria: (1) Ad quantity needed to be representative of popular news websites and (2) participants should be largely unfamiliar with the website to minimize confounding effects due to previous experience with the website. We conducted a pre-test with 60 participants from *Amazon Mechanical Turk* who rated their familiarity with and their perception of ad quantity (using the construct of ad clutter by Cho and Cheon (2004)) of five news websites randomly selected from the *Alexa* list of top 50 news websites (Alexa Internet 2019). For our benchmark of a popular news website, we included the website of *The Washington Post* as the top ten news outlet with the highest daily pageviews per visitor (Alexa Internet 2019). Comparing the participants' assessment of the five randomly selected websites, we eventually chose *The Epoch Times* as our reference website, which exhibited the lowest levels of familiarity and no significant difference in perceived ad quantity (based on ad clutter) to the website of *The Washington Post* (independent samples t-test, $t = 0.108$, $p > 0.05$).

To test our hypotheses, we conducted a between-subject online experiment with three conditions of our experimental website. The website featured a news article and varied in ad quantity and customization options: (1) The control condition website (hereafter *default website*) comprised a set of non-customizable ads. Quantity and placement of the ads was aligned with the layout of the reference website we emulated. (2) In addition to the default

website, we introduced a second control condition with no ads at all (hereafter *ad-free website*). (3) Lastly, our treatment condition website offering AQC (hereafter *AQC website*) provided an explanation of the website’s offer to choose how many of the ads on the website will be shown, alongside a continuous scale to select the preferred ad quantity setting (see Figure 5-2). The display of ads drew on the same pool of banners as the default website.

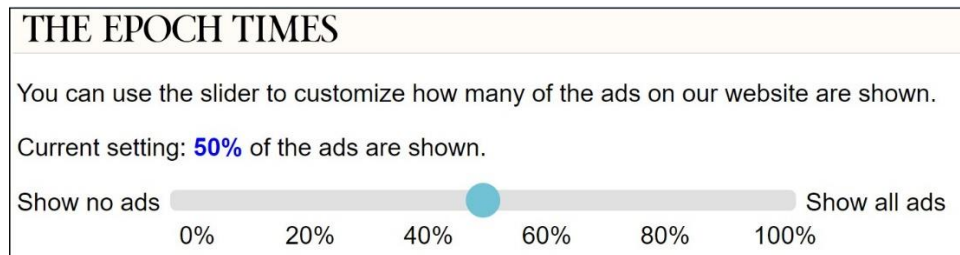


Figure 5-2: Configuration of ad quantity for the AQC website (exemplary setting of 50% ad quantity displayed)

The AQC functionality allowed participants to choose any ad quantity setting between 0% (i.e., equivalent to the ad-free website) and 100% (i.e., equivalent to the default website). The starting point for the adjustment of ad quantity was the layout of the default website. If a participant specified an ad quantity less than 100%, individual ads were randomly selected to be prevented from loading, such that the overall number of ads matched the participant’s requested specification. For example, if the participant opted to have 50% of the website’s ads shown, the website randomly selected half of the ads of the default website not to display. The random selection ensured to minimize confounding influences of ad content and placement. Hence, by selecting their preferred ad quantity, participants influenced their subsequent web experience. The resulting three variations of the experimental website are depicted in Figure 5-3.

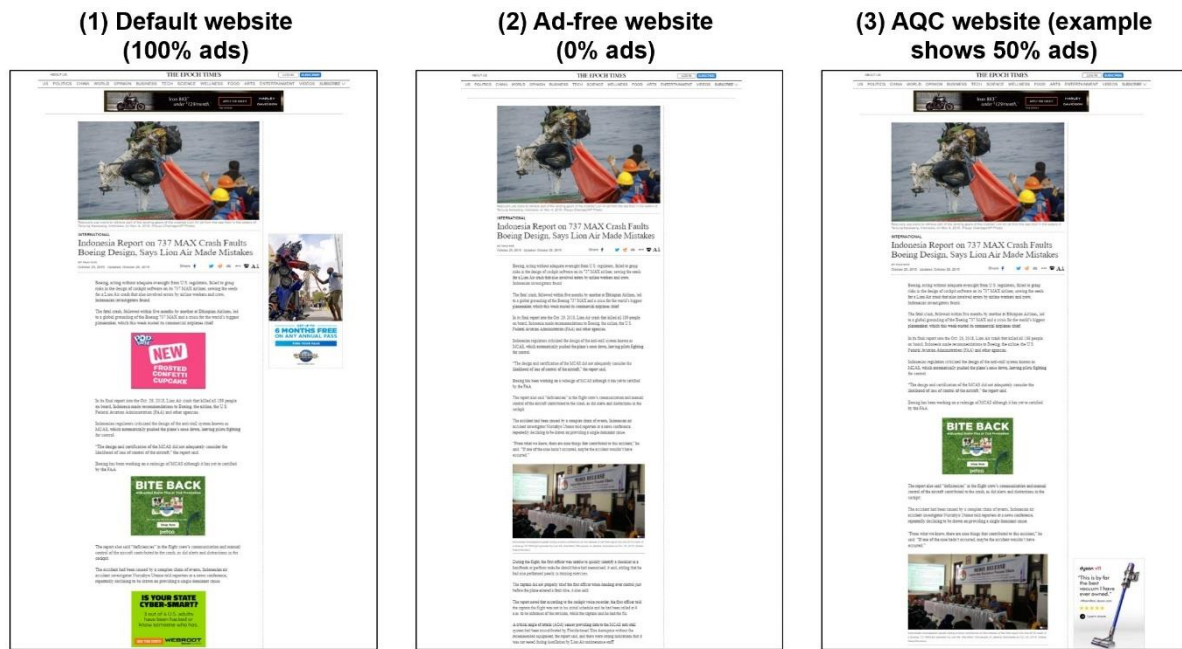
5.4.2 Experimental Procedure

The experimental procedure guiding the subjects through one of the three variations of our experimental website is presented in Figure 5-4: (1) First, participants were given instructions to the experiment in which they were asked to access our experimental website and read a news article about the background of aviation accidents involving Boeing 737 MAX – an impartial and objective topic we chose to minimize preconceived opinions. Participants were given the ostensible task to learn about what might have caused the accidents (see Appendix section “Participants Instruction”). (2) Thereafter, a cover page welcomed the participants to the website and introduced the website as a news outlet (see Appendix section “Cover Page”). (3) Next, we randomly assigned participants to one of the three conditions. Participants who were

part of the two control conditions were directly sent to the next step. Participants in the treatment condition were given instructions on the AQC feature and were asked to select their preferred setting (see Figure 5-2). (4) Subsequently, all participants experienced the main part of the website for a duration of 90 s by reading an article with varying ad quantity, subject to either each user's previously chosen ad quantity or to the control condition they were part of. Incidentally, we did not allow participants in the treatment condition to interrupt their reading of the article to go back and readjust their AQC setting for two reasons. First, we wanted to ensure that, on the one hand, participants would be aware of the AQC feature, but on the other hand, still focus on the article. Put differently, it was important to us to measure how providing AQC affects participants' experiences with the website's contents instead of observing the effects of repeatedly "playing around" with the AQC feature. Second, we wanted to avoid that some participants would access the AQC feature much more often than others (e.g., driven by a general uncertainty in making decisions). Varying exposures to our treatment would have undermined the comparability of the results across our participants in the treatment group. (5) The final part covered a questionnaire about the participants' perception of the website, alongside controls and demographics. Lastly, participants were debriefed that the AQC feature offered to them on the website was only available for the purpose of this experiment and was not publicly accessible on the reference website we emulated.

5.4.3 Measurement

We used validated scales from literature, reported in Table 5-2. We focused on *Website Stickiness* as our dependent variable measured with three items adapted from Benlian (2015). We measured our mediators *Perceived Empowerment* with two items adapted from Füller et al. (2009), *Informational Fit-to-Task* with three items adapted from Parboteeah et al. (2009) and *Perceived Enjoyment* with three items adapted from Benlian (2015). While we measured *Perceived Enjoyment* using a semantic differential with the extremes at (1) and (7), all other items were measured using 7-point Likert-type scales ranging from strongly disagree (1) to strongly agree (7). Importantly, we informed participants that the term "website" in each of our scales referred to the article page from The Epoch Times with all its elements including article content and ads.



Note: The AQC website shows an exemplary 50% ad quantity, but could range in its appearance between the two extremes of the default and the ad-free website

Figure 5-3: Excerpt of the experimental website for the two control conditions (default website, ad-free website) and the treatment condition (AQC website)

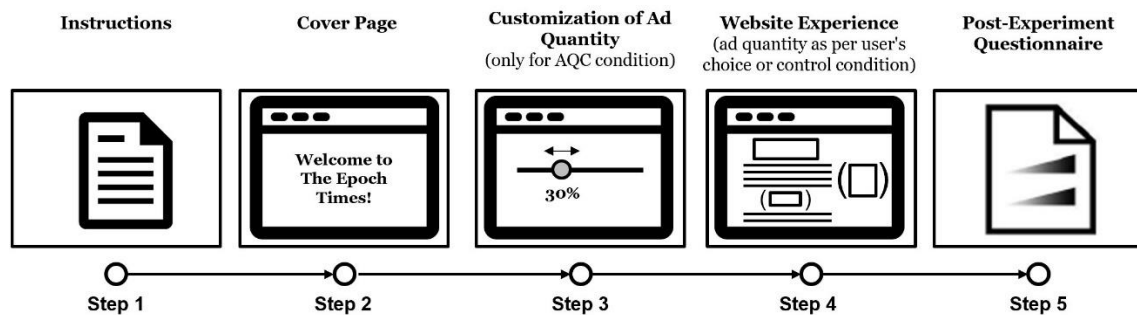


Figure 5-4: Experimental procedure

With regard to controls, we measured demographics (i.e., participants' *Age* and *Gender*) as factors identified to influence individuals' perception of control (Slagsvold and Sørensen 2008). Furthermore, to account for participants' potential preexisting attitudes toward the website of *The Epoch Times* resulting from previous visits, we asked whether participants had ever accessed the website prior to our survey (i.e., *Website Familiarity*) (Michailidou et al. 2008). Moreover, the usage of an ad blocker suppressing ads may affect how participants react to ads they are not used to anymore. As such, we asked participants if they were currently using an ad blocker on a regular basis (i.e., *Previous Ad Blocker Use*) (Wills and Zeljkovic 2011). Both *Website Familiarity* and *Previous Ad Blocker Use* were implemented as binary variables (i.e., 0 = no, 1 = yes). Lastly, to take into account effects resulting from participants' irritation

with the quantity of ads displayed, we measured *Perceived Ad Clutter* with three items adapted from Cho and Cheon (2004).

As our manipulation check, we measured *Perceived Customizability* using a self-developed 7-point Likert-type scale inspired by previous web customization research (Bright and Daugherty 2012). Additionally, we integrated two attention checks to notice whether participants read each item carefully. Lastly, we asked participants about their *Perceived Realism* of the experiment, also measured with a 7-point Likert-type scale.

Construct	Item	Loading
Website Stickiness (Benlian 2015) ($\alpha = 0.941$, CR = 0.962, AVE = 0.895)	If I needed to use a news website in the future, ...	
	... I would intend to use this website.	0.958
	... it would be highly likely that I return to this website.	0.930
	... I would predict to use this website.	0.949
Perceived Empowerment (Füller et al. 2009) ($\alpha = 0.851$, CR = 0.930, AVE = 0.870)	I had the feeling of active participation in the website layout.	0.923
	The website gave me the feeling that I am taken seriously.	0.942
Informational Fit-to-Task (Parboteeah et al. 2009) ($\alpha = 0.942$, CR = 0.934, AVE = 0.824)	The information on the website was effective for my task.	0.946
	The website adequately met my information needs for my task.	0.948
	The information on the website was pretty much what I needed for my objective.	0.944
Perceived Enjoyment (Benlian 2015) ($\alpha = 0.919$, CR = 0.875, AVE = 0.699)	Interacting with the website was ...	
	unexciting ... exciting	0.927
	unappealing ... appealing	0.934
Perceived Ad Clutter (Cho and Cheon 2004) ($\alpha = 0.929$, CR = 0.954, AVE = 0.874)	I thought the number of ads on this website was excessive.	0.970
	I thought the number of ads on this website was irritating.	0.967
	I thought this website was exclusively an ad medium.	0.864
Perceived Customizability (self-developed) ($\alpha = 0.943$, CR = 0.960, AVE = 0.856)	The website asked me whether it should show ads or not.	0.953
	The website did not present any feature to regulate the number of ads displayed. (reversed)	0.843
	I could communicate to the website whether I prefer to have ads displayed or not.	0.957
	The website offered me to control the presence of its ads.	0.942

Table 5-2: Constructs

5.5 Results

5.5.1 Sample Description and Controls

We recruited 545⁷ participants from *Amazon Mechanical Turk*, a crowdsourcing platform that has established itself as a viable platform for behavioral research and experiments (Behrend et al. 2011). Research has demonstrated that the survey results of *Amazon Mechanical Turk* respondents exhibit high reliability and provide higher-quality data than student or online convenience samples (e.g., Behrend et al. 2011; Buhrmester et al. 2016; Steelman et al. 2014). In addition, *Amazon Mechanical Turk* is a suitable platform to reach internet-savvy users, who are highly appropriate for our experiment setting because they are frequent users of websites. We restricted participation to users with a high approval rating (at least 95%), which is considered an appropriate measure to ensure high data quality (Goodman and Paolacci 2017). Out of those 545 participants, we excluded 122 participants who failed one or both of our attention checks as well as 28 participants who left the questionnaire prematurely, resulting in a final data set of 395 responses.

Table 5-3 summarizes the descriptive statistics of our conditions. Furthermore, of all participants in the AQC condition, 46% selected to have 0% ad quantity shown, 8% opted for 100% ad quantity and 46% chose an intermediate level of ad quantity. Overall, participants did not utilize AQC to shed ads altogether, but instead opted to have on average 25% of the website's ads displayed.

We verified the comparability of our participants across our experimental conditions by conducting several one-way analyses of variance. We did not find significant differences in terms of participants' *Gender*, *Age*, *Website Familiarity*, *Previous Ad Blocker Use* and *Perceived Realism* between the groups (all $p > 0.05$). Thus, the results confirm a successful randomization in the assignment of our participants to our different experimental conditions. To examine the effectiveness of our experimental conditions, we conducted several independent samples t-tests: *Perceived Ad Clutter* was significantly lower in the control condition of the ad-free website than in the control condition of the default website ($t = -14.36$, $p < 0.001$),

⁷ To reliably detect significant results and to account for our two control groups, we sought to safely exceed the minimum sample size of 102, which we estimated by conducting a power analysis using G*Power 3.1 (Faul et al. 2009) with the following parameter specifications: two groups, a moderate effect size ($f = 0.50$), an α -level of 0.05, and a desired power level of 0.80 (Cohen 1992).

Perceived Customizability was significantly higher in the treatment condition of the AQC website than for both control conditions of the ad-free website and the default website ($t = 23.06$, $p < 0.001$) and there was no significant difference in *Perceived Customizability* between the two control conditions ($t = 0.18$, $p > 0.05$). Therefore, we are confident that our experimental conditions worked as intended. Lastly, our respondents indicated that they found the experiment highly realistic (mean = 6.46; std. dev. = 0.98).

Variable	Group 1: AQC absent in default website	Group 2: AQC absent in ad-free website	Group 3: AQC present
N	122	134	139
<i>Website Stickiness</i>	3.19 (1.72)	4.47 (1.64)	4.87 (1.75)
<i>Perceived Empowerment</i>	3.20 (1.81)	4.14 (1.62)	5.04 (1.71)
<i>Informational Fit-to-Task</i>	4.92 (1.45)	5.51 (1.28)	5.71 (1.34)
<i>Perceived Enjoyment</i>	3.54 (1.52)	4.25 (1.55)	4.67 (1.63)
<i>Perceived Ad Clutter</i>	4.92 (1.64)	2.09 (1.51)	2.40 (1.80)
<i>Perceived Customizability</i>	2.08 (1.31)	2.05 (1.30)	6.10 (1.49)
<i>Average Age</i>	38.78 (12.34)	36.87 (11.22)	39.68 (12.51)
<i>Gender: female share</i>	38.53%	39.56%	48.30%
<i>Website Familiarity: share who knew the website before</i>	9.84%	11.94%	10.79%
<i>Previous Ad Blocker Use: share who are regularly using an ad blocker</i>	29.51%	42.54%	46.76%
Note: Standard deviation in parentheses			

Table 5-3: Descriptive statistics

5.5.2 Reliability and Validity

We conducted a confirmatory factor analysis (CFA) to test the instrument's convergent and discriminant validity (Levine 2005). Table 5-2 reports the employed items together with the CFA results. Our constructs exceed the recommended level of 0.70 (Nunnally and Bernstein 1994) for both measures of internal consistency (i.e., Cronbach's alpha and composite reliability). The average variance extracted (AVE) of each construct ranged from 0.699 to 0.895 and is thereby higher than the relevant threshold of 0.50 (Hair Jr et al. 2016). All items fulfilled the minimum loading requirement of 0.70 between the item and the corresponding factor. Thus, all constructs met the specifications for convergent validity. Additionally, for satisfactory discriminant validity, the square root of AVE from the constructs was greater than the variance shared between the construct and other constructs in the model (see Appendix Table 5-6) (Fornell and Larcker 1981). Furthermore, the heterotrait-monotrait ratio of correlations

(Henseler et al. 2015; Voorhees et al. 2016) exhibited values less than the threshold of 0.85 for all constructs, indicating support of discriminant validity (see Appendix Table 5-7). Lastly, the Harman one-factor extraction test resulted in 43% explained variance through a single factor, which is lower than the recommended maximum threshold of 50% (Podsakoff et al. 2003) and therefore indicates no issues of common method bias. Hence, the constructs in our study are both theoretically and empirically distinguishable and are not significantly affected by common method bias.

5.5.3 Hypothesis Testing

To test the direct and indirect effects of our research model, we analyzed our research model with structural equation modeling (SEM), following recommended practice (Urbach and Ahlemann 2010). We used Smart PLS 3.3.7 and analyzed our model with the consistent partial least squares (PLS) algorithm, which is specifically designed for hypothesis testing. While consistent PLS is largely comparable to covariance-based SEM, we chose consistent PLS primarily for its strength to identify mediating effects through the iterative introduction of new constructs and relations (Richter et al. 2016) – as is recommended, for example, for research investigating the mechanisms of technology acceptance, such as website stickiness (Dijkstra and Henseler 2015). This strength to uncover mediation mechanisms is particularly important for our study's focus on a serial mediation with three mediators (i.e., perceived empowerment, informational fit-to-task and perceived enjoyment). Moreover, the consistent PLS algorithm can offer advantages over covariance-based SEM when it is unclear whether the response data is normally distributed and when researchers seek to minimize the risk of potential misspecification of the model (Dijkstra and Henseler 2015; Richter et al. 2016).

5.5.3.1 Direct Effects

We conducted independent analyses for each of the two control conditions: We first compared the website offering AQC with the default website, and then compared the website offering AQC with the ad-free website. We hereby coded *AQC* as a binary variable (i.e., 0 = absent, 1 = present). We tested our hypotheses linking *AQC*, *Perceived Empowerment* (EMP), *Informational Fit-to-Task* (IFTT) and *Perceived Enjoyment* (ENJ) to *Website Stickiness* (STICK) in three ways: First, we verified whether all three mediators contribute to the overall model validity. To that end, we established a baseline model including only our independent variable *AQC* and our dependent variable *Website Stickiness*. We then iteratively augmented this model by including one mediator after the other (see Appendix Figure 5-7 and Figure 5-8).

As our final model comprising all mediators yielded the greatest model validity (i.e., highest R^2_{adj} for our dependent variable *Website Stickiness*) for both control groups, we find first indication for the relevance of each mediator in explaining why *AQC* affects *Website Stickiness*. Second, we analyzed each of the individual paths in our final model, in line with our proposed hypotheses (see Figure 5-5). The results of the bootstrapped PLS analyses outlined in Table 5-4 **support** our hypothesis **H1** that the provision of *AQC* positively affects users' *Perceived Empowerment* (default website as baseline: $\beta = 0.208$, $t = 3.122$, $p < 0.01$; ad-free website as baseline: $\beta = 0.286$, $t = 5.274$, $p < 0.001$). In line with H2 and H3, *Perceived Empowerment* positively affects *Informational Fit-to-Task* (default website as baseline: $\beta = 0.560$, $t = 8.545$, $p < 0.001$; ad-free website as baseline: $\beta = 0.535$, $t = 9.785$, $p < 0.001$) and *Perceived Enjoyment* (default website as baseline: $\beta = 0.683$, $t = 13.021$, $p < 0.001$; ad-free website as baseline: $\beta = 0.630$, $t = 13.770$, $p < 0.001$). As such, we find **support** for both **H2** and **H3**. Moreover, *Website Stickiness* is enhanced by both *Informational Fit-to-Task* (default website as baseline: $\beta = 0.125$, $t = 2.537$, $p < 0.01$; ad-free website as baseline: $\beta = 0.209$, $t = 3.801$, $p < 0.001$) and *Perceived Enjoyment* (default website as baseline: $\beta = 0.491$, $t = 7.257$, $p < 0.001$; ad-free website as baseline: $\beta = 0.548$, $t = 7.453$, $p < 0.001$). Therefore, our results **support H4** and **H5**. In addition, when comparing the *AQC* website against the default website, we find a remaining direct effect of *Perceived Empowerment* on *Website Stickiness* ($\beta = 0.173$, $t = 2.404$, $p < 0.05$). This indicates that, while *Informational Fit-to-Task* and *Perceived Enjoyment* qualify as complementary mediations, a third mediation path beyond our research model may exist (Zhao et al. 2010). Lastly, we performed a multigroup analysis with one group comprising those participants that experienced *Customizable Ads* and those who experienced *Default Ads* as well as a second group comprising those who experienced *Customizable Ads* and those who experienced *No Ads*. We found that none of our hypothesized paths exhibited any significant difference between the two groups with the two different control conditions. As such, we find support that the effects between *AQC*, *Perceived Empowerment*, *Informational Fit-to-Task*, *Perceived Enjoyment* and *Website Stickiness* are highly comparable for both cases of contrasting an *AQC* website to a default website and contrasting an *AQC* website to an ad-free website.

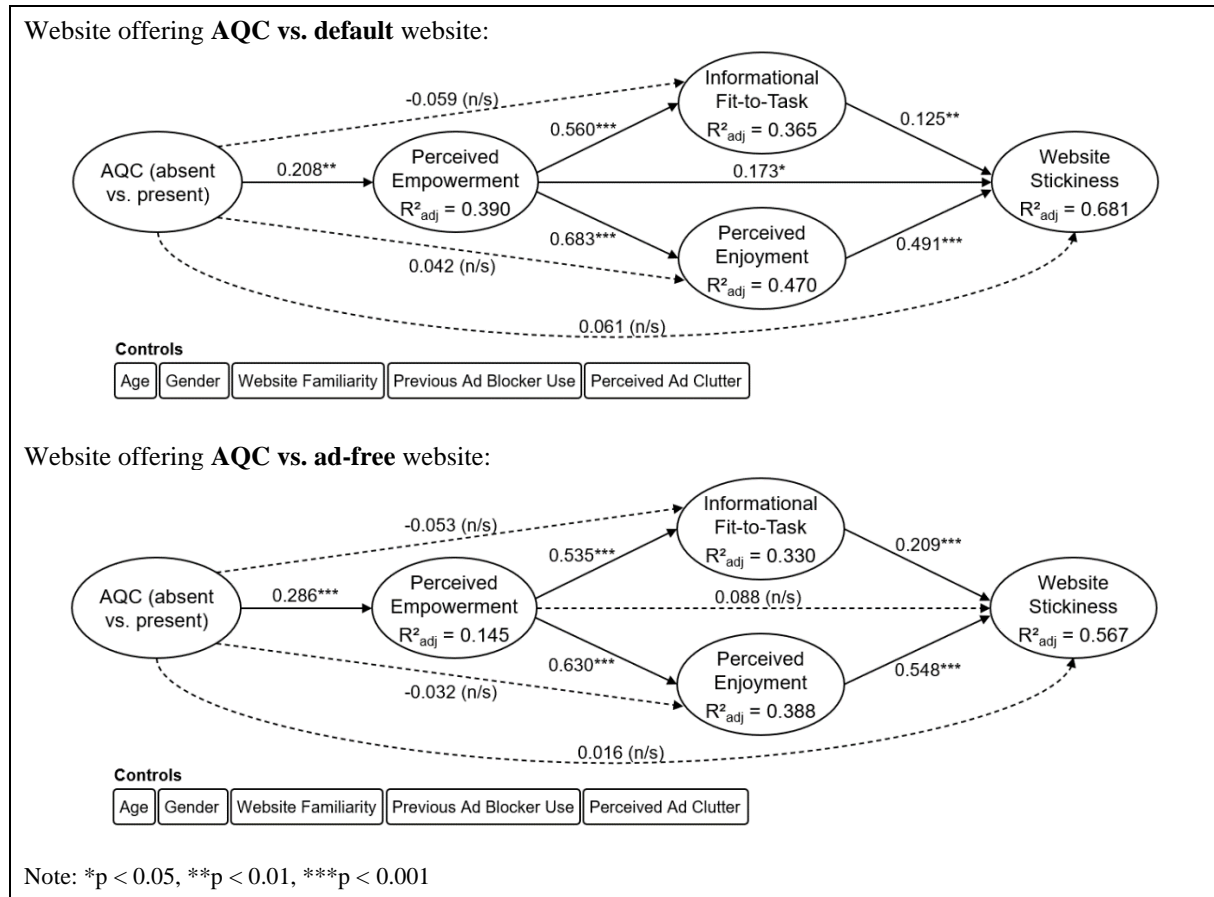


Figure 5-5: Final model results of the effects of AQC on Website Stickiness

Direct effect	Website offering AQC vs. default website		Website offering AQC vs. ad-free website	
	Mean (std. dev.)	T statistic	Mean (std. dev.)	T statistic
AQC → EMP	0.208 (0.067)	3.122**	0.286 (0.054)	5.274***
AQC → IFTT	-0.059 (0.067)	0.870	-0.053 (0.052)	1.013
AQC → ENJ	0.042 (0.06)	0.696	-0.032 (0.052)	0.623
AQC → STICK	0.061 (0.044)	1.395	0.016 (0.044)	0.356
EMP → IFTT	0.560 (0.066)	8.545***	0.535 (0.055)	9.785***
EMP → ENJ	0.683 (0.052)	13.021***	0.630 (0.046)	13.770***
EMP → STICK	0.173 (0.072)	2.404*	0.088 (0.069)	1.278
IFTT → STICK	0.125 (0.049)	2.537**	0.209 (0.055)	3.801***
ENJ → STICK	0.491 (0.068)	7.257***	0.548 (0.074)	7.453***

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Bootstrapping with 5,000 samples and a 95% confidence interval; EMP = Perceived Empowerment, IFTT = Informational Fit-to-Task, ENJ = Perceived Enjoyment, STICK = Website Stickiness

Table 5-4: Bootstrapping of all direct effects linking AQC to Website Stickiness

5.5.3.2 Indirect Effects

In addition to confirming the individual paths between our constructs, we verified whether *Perceived Empowerment*, *Informational Fit-to-Task*, and *Perceived Enjoyment* carry over the effect of AQC on *Website Stickiness* by conducting bootstrap analyses of our indirect effects.

The results in Table 5-5 paint a consistent picture for both control groups (i.e., default website and ad-free website): We find a significant indirect effect of *AQC* on *Informational Fit-to-Task* via *Perceived Empowerment* (default website as baseline: $\beta = 0.116$, $t = 2.981$, $p < 0.01$; ad-free website as baseline: $\beta = 0.153$, $t = 4.523$, $p < 0.001$) as well as of *AQC* on *Perceived Enjoyment* via *Perceived Empowerment* (default website as baseline: $\beta = 0.142$, $t = 3.223$, $p < 0.01$; ad-free website as baseline: $\beta = 0.180$, $t = 5.020$, $p < 0.001$). As the remaining direct effects of *AQC* on *Informational Fit-To-Task* and on *Perceived Enjoyment* were shown to be non-significant, we find an indirect-only mediation (formerly referred to as full mediation) of *Perceived Empowerment* (Zhao et al. 2010). We therefore find **support** for **H6**. Additionally, we find significant indirect effects of *Perceived Empowerment* on *Website Stickiness* via *Informational Fit-to-Task* (default website as baseline: $\beta = 0.070$, $t = 2.341$, $p < 0.05$; ad-free website as baseline: $\beta = 0.113$, $t = 3.370$, $p < 0.01$) and via *Perceived Enjoyment* (default website as baseline: $\beta = 0.336$, $t = 6.000$, $p < 0.001$; ad-free website as baseline: $\beta = 0.345$, $t = 6.664$, $p < 0.001$). In the case of the default website as the baseline, the remaining direct effect of *Perceived Empowerment* on *Website Stickiness* was still significant, indicating a complementary mediation in which a third, unaccounted mediator may be present – even though in the case of the ad-free website as the baseline we did not find any remaining direct effect. Accordingly, these results **support** **H7** and **H8**. Most importantly, we find significant indirect effects of our overall mediation paths via *Perceived Empowerment* and *Informational Fit-to-Task* ($AQC \rightarrow EMP \rightarrow IFTT \rightarrow STICK$, default website as baseline: $\beta = 0.014$, $t = 2.014$, $p < 0.05$; ad-free website as baseline: $\beta = 0.032$, $t = 2.782$, $p < 0.01$) and via *Perceived Empowerment* and *Perceived Enjoyment* ($AQC \rightarrow EMP \rightarrow ENJ \rightarrow STICK$, default website as baseline: $\beta = 0.070$, $t = 2.993$, $p < 0.01$; ad-free website as baseline: $\beta = 0.099$, $t = 4.285$, $p < 0.001$). We further validated these paths by conducting a bootstrap mediation analysis based on linear regression with 5,000 samples and a 95% confidence interval using PROCESS by Hayes (2018). The results in Appendix Table 5-10 demonstrate that the 95% confidence interval of both proposed mediation paths exclude zero, thereby corroborating our findings from our PLS analyses. We thus find coherent **support** for **H9**. Therefore, our results consistently support our proposed hypotheses that *AQC* induces *Perceived Empowerment*, which then fosters *Informational Fit-to-Task* and *Perceived Enjoyment* as critical concepts responsible for *Website Stickiness*. Resulting from this overall mechanism, users stick more to a website offering *AQC* than to both a website with non-customizable ads and a website that does not feature any ads at all.

Indirect effect	Website offering AQC vs. default website		Website offering AQC vs. ad-free website	
	Mean (std. dev.)	T statistic	Mean (std. dev.)	T statistic
AQC → EMP → IFTT	0.116 (0.039)	2.981 **	0.153 (0.034)	4.523 ***
AQC → EMP → ENJ	0.142 (0.044)	3.223 **	0.180 (0.036)	5.020 ***
EMP → IFTT → STICK	0.070 (0.030)	2.341 *	0.113 (0.033)	3.370 **
EMP → ENJ → STICK	0.336 (0.056)	6.000 ***	0.345 (0.052)	6.664 ***
AQC → EMP → IFTT → STICK	0.014 (0.007)	2.014 *	0.032 (0.012)	2.782 **
AQC → EMP → ENJ → STICK	0.070 (0.023)	2.993 **	0.099 (0.023)	4.285 ***
AQC → EMP → STICK	0.036 (0.020)	1.766	0.025 (0.021)	1.193
AQC → IFTT → STICK	-0.007 (0.010)	0.731	-0.011 (0.012)	0.894
AQC → ENJ → STICK	0.020 (0.029)	0.702	-0.018 (0.029)	0.621

Note: *p < 0.05, **p < 0.01, ***p < 0.001; Bootstrapping with 5,000 samples and a 95% confidence interval; EMP = Perceived Empowerment, IFTT = Informational Fit-to-Task, ENJ = Perceived Enjoyment, STICK = Website Stickiness

Table 5-5: Bootstrapping of all indirect effects linking AQC to Website Stickiness

5.6 Discussion

This study addresses how and why the possibility of AQC provided by a website affects users' intention to stick to this very website. In an online experiment with 395 participants we find that a website with customizable ads (i.e., AQC present) evokes significantly greater website stickiness than a website with default ads (i.e., AQC absent) – despite participants pursuing a task that does not require viewing any ads. This implies that users appreciate to customize ads even if those ads are supposedly irrelevant for users' objective when browsing the website. This insight underscores the powerful influence ads inevitably exert on users. We additionally compare whether participants would prefer a website without any ads (i.e., AQC absent), rather than being asked to customize ad quantity. While a website without ads unsurprisingly elicits greater website stickiness than a website with default ads, we counterintuitively find that a website with customizable ads achieves even greater website stickiness than a website without ads. Put differently, as long as users are empowered to customize ad quantity, they express a greater intention to return to a website that explicitly features ads than to a website that never had any ads in the first place. This finding is intriguing as it demonstrates that users value customization of website elements they typically want to avoid (i.e., ads) higher than the actual avoidance itself. This implies that users exhibit a firm need to exert control over unsolicited website elements that is so powerful that it even exceeds their desire of simply not being confronted with these elements at all. In line with our results, this inclination results from users' perception of empowerment, which plays a critical role in explaining the effects of the provision of AQC on website stickiness. Specifically, providing AQC imbues participants with a sense

of empowerment that we find to influence participants in two ways: On the one hand, the perception of empowerment enhances participants' cognitive evaluation of the website in the form of greater informational fit-to-task, while on the other hand, the feeling of empowerment also augments participants' affective evaluation of the website in the form of increased perceived enjoyment. Both enhanced informational fit-to-task and augmented perceived enjoyment consequently promote participants' intention to stick to the website. As such, the perception of empowerment, triggered by the provision of AQC, invigorates users to engage more intensely with the website – a vital stimulant that users lack in the supposed ideal of simply omitting ads.

5.6.1 Contributions to Research

By exploring the intricacies of empowering users to customize ad quantity on websites, we offer two noteworthy contributions to IS literature on web customization. First, our study sheds light on a thus far underexplored prospect of web customization by addressing a website's ads as content users never asked for. Extant research on web customization focused on the outcomes of allowing users to customize the primary editorial content of a website (e.g., which news topics users would receive articles for) (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010). In doing so, insights of previous literature primarily pertain to the customization of content that users are known to expect, welcome and be interested in. However, advertising content is fundamentally distinct in that users typically neither ask to see nor appreciate ads when accessing a website, oftentimes resulting in strong ad avoidance behaviors (e.g., leaving the website) (Seyedghorban et al. 2016). By asking users to customize the quantity of ads, we extend the locus of web customization research to website elements that users typically seek to refrain from. More specifically, we reveal that, despite inevitably directing users' attention toward unsolicited ads, users appreciate AQC by exhibiting a greater intention to stick to the website. This insight provides a new perspective to web customization literature, as it demonstrates that users enjoy customizing website elements that they usually perceive as irritating. Moreover, we find that, as long as users can customize ad quantity, they stick more to a website with ads than to the intuitive ideal of a website without any ads by default. As such, we demonstrate that web customization (e.g., AQC) is capable of lifting website stickiness by purposefully including and exploiting typically unwelcomed website elements (e.g., ads) as objects users enjoy to customize. This finding is particularly interesting for research on web customization, because it exposes that users value the ability to customize unwanted elements higher than simply avoiding these elements altogether. Taken together, we reveal ad

customization as a hitherto underexplored and significant piece of web customization complementing previous research. This is important also for the broader stream of research on individual IS usage because it contributes to the quest of satisfying users' need for individualized experiences.

Second, our study addresses an important gap in web customization research in terms of understanding the underlying causal mechanisms of how and why web customization impacts users' responses to a website. Despite previous studies having started to unravel the rationale of why web customization affects various user outcomes on websites (e.g., Benlian 2015; Jiang and Benbasat 2007b; Jiang et al. 2010), extant explanations focus merely on the significance of individualized content that matches users' preferences better (e.g., improved usefulness of the website). In that sense, previous literature does not account for the idiosyncrasy of web customization that sets it apart from web personalization – the empowerment of users to exert active control. By investigating not only content-oriented mediators in the form of informational fit-to-task and perceived enjoyment, but particularly users' perception of feeling empowered, we are among the first to shed light on the mechanism that is unique to web customization. More specifically, our findings imply that offering AQC increases users' intention to stick to a website because the provision of AQC imbues users with a sense of empowerment. It is this sense of empowerment that stimulates users' involvement with the website as a whole, both cognitively in the form of greater informational fit-to-task as well as affectively in the form of increased perceived enjoyment. As such, we reveal empowerment as a key element that is pivotal to the effect mechanism of web customization and that hitherto has been under-investigated in IS web customization literature. This contribution is important as it allows IS research to not only unblackbox the effect mechanisms that are specific to the phenomenon of web customization, but also to identify moderating factors through which we can improve the design and effectiveness of web customization.

5.6.2 Practical Implications

Beyond our theoretical contributions, our findings offer extensive insights for website providers that seek to attract and retain their users more effectively. On the one hand, our results indeed confirm the common belief that displaying ads provokes users in that they are less willing to stick to the website compared to when ads are omitted altogether. On the other hand, we also discover that users do not oppose ads in general. Instead, we find that users' potentially negative reactions are mainly driven by a lack of empowerment over the ads. Surprisingly, including ads on a website while simultaneously empowering users with AQC convinces users to stick more

to the website than eliminating ads altogether. These outcomes bring about influential implications for website providers in that ads are not inevitably harmful to users' evaluation of a website. Instead, when coupled with AQC, website providers can remodel ads into an asset that enhances users' web experience and thus increases their intention to stick to the website. One step further, AQC may even help website providers to persuade ad-block users to whitelist their website and accept some amount of ads they agree with to support both the website as well as its dependent provider.

While AQC is a potent mechanism to address users' attitudes toward ads, one must consider that allowing users to tamper with the amount of ads displayed may come at a price for websites. Ad revenue is primarily driven by the number of impressions and the number of clicks on ads. Although participants in our experiment did not use AQC to cancel out ads altogether, they indeed selected fewer ads than what was considered the default amount (i.e., on average 25% of the default ads). As such, the number of ad impressions was reduced compared to the default amount. Although click rates on ads may increase to some degree because users consider ads more important and relevant when they agree to receive them (Hartemo 2016), AQC may overall still impact a website's ad revenues. In return, AQC considerably boosts a website's stickiness. Hence, whether and to what extent AQC creates value for a website depends on the objectives of its provider. For example, IS research investigating websites' reliance on ads revealed that websites benefit more if they curtail the amount of ads during their growth period and delay the full display of ads to a later point in time when a reliable user base has been established (Dewan et al. 2002). We provide an alternative and perhaps more economical perspective to this finding: Instead of holding back ads to attract more users, websites could draw on AQC to fuel their growth. This not only allows to retain users more effectively through higher website stickiness, but also to feature ads and generate associated ad revenue earlier on, thereby strengthening the websites' business model during and perhaps beyond their growth phase.

Lastly, our finding that the key enabler for users' appreciation of web customization lies in perceived empowerment indicates an opportunity for websites beyond customizing the amount of ads. In essence, website providers can retain their users more by making them feel empowered. Accordingly, it is less important for users to objectively be in control, but rather to *feel* in control over their web experience. Website providers can build on this insight by designing customization interfaces that emphasize to users how this website offers a greater level of freedom and influence over the way the website can be experienced than what users

would commonly expect. As such, websites may find ways to capture users through empowerment also beyond the context of customizing ads.

5.6.3 Limitations and Directions for Future Research

This study is subject to limitations and provides several avenues for future research. To study users' responses to AQC, we conducted an online experiment in which participants were asked to customize an experimental website's quantity of ads, followed by reading a news article with as many ads as participants had opted for. This approach includes some limitations: First, to aid comparability, each participant in our AQC treatment group could only customize ad quantity when entering the experimental website, without having the option to readjust their choice at a later point in time to find a setting that suits them better. Without the possibility for participants to optimize their customization choice, our results may underestimate the effectiveness of AQC – nonetheless without affecting the resulting implications. Second, our experimental setup focused on capturing participants' evaluation based on a one-time visit of our experimental website that does not account for long term effects of interacting with the AQC feature. We can only conjecture that a one-time exposure may indeed be sufficient to induce a prolonged benefit of AQC due to the first impression effect, which suggests that individuals' first exposure to a website has a disproportionately great effect on their judgment. This effect is quite strong, as a positive first impression (e.g., based on the provision of AQC) will only start to be questioned after many subsequent interactions contradict individuals' first impression (Lim et al. 2000). Third, although we accounted for three mediating constructs, our analysis with informational fit-to-task and perceived enjoyment as mediators yielded a remaining direct effect of perceived empowerment on website stickiness – potentially indicating toward another effect mechanism caused by perceived empowerment that may offer an interesting opportunity for future research. Fourth, while participants' subjective evaluation of their intention to stick to the website is a useful indicator for the effectiveness of providing AQC, our findings could be complemented with experimental designs aimed to capture objective variables such as time spent on the website. To address these limitations and extend the findings of our online experiment, we call for future research to investigate the provision of AQC in a field setting. Specifically, it would be of interest to study how users interact with the AQC option when they can readjust their setting in the course of multiple browsing sessions and how the benefits of increased website stickiness develop over time. Furthermore, to investigate contextual influences of users' responses to AQC, future research could study the role of diverse cultural backgrounds, the impact of users' attitude toward ads, the relevance of users' motivation to access a website and

the significance of users' device types with potentially smaller screen sizes exacerbating the irritation with ads.

Moreover, this research focused on website stickiness as the core user response. While this construct is a suitable indicator of users' interest in a website, we need future research to expand our knowledge on the financial ramifications of AQC. Specifically, we require insights to what extent websites can monetize AQC, for example through a broader user base increasing the number of ad impressions, through closer attention toward ads and thus higher click-through rates and through paid subscriptions as a prerequisite to continued access to AQC. Similarly, IS researchers can draw on their experience in users' decision making to understand how and why users select a specific ad quantity option. Such knowledge may be instrumental for website providers to influence users in their decision to support the website while simultaneously benefitting from an enhanced web experience. By guiding users in their ad quantity decision, AQC could strengthen the business model not only of growing websites seeking to expand their user base, but also of mature websites interested in monetizing their traffic.

Lastly, this study concentrated on website provider-enabled customization of ad quantity. Future research could investigate whether offering users to customize the content or format of ads on websites could lead to similar levels of website stickiness and ad acceptance. On a broader note, research could expand our knowledge on web customization by studying how website provider-enabled customization competes with users' detrimental self-empowerment, such as ad-blocking. Understanding whether and how web customization can successfully address and convince users to refrain from forceful intervention can be a pivotal step for IS research to provide guidance to website providers struggling with their ad-revenue-based business models.

5.7 Conclusion

Websites featuring ads face increasing pressure to attract and retain users that are becoming progressively intolerant of ad clutter. Consequently, website providers are starting to loosen their firm grip on the ads displayed on their website by offering AQC as a website feature that empowers users to customize the website's ad quantity. In the field of web customization, several studies investigated how users customize websites' primary editorial content (i.e., content related to the main purpose of the website). However, advertising content is fundamentally distinct from editorial content in that users oftentimes perceive ads as unsolicited and irritating – raising the question whether users have any interest in customizing ads they

typically seek to avoid. As such, the purpose of this study was to uncover whether, how and why website provider-enabled AQC can influence users' intention to stick to a website.

We examined the effectiveness of providing AQC in an online experiment and analyzed the results using partial least squares. The results indicate that a website with AQC elicits higher website stickiness than a website without AQC. Counterintuitively, we find that even a website entirely free of ads is not as attractive to users than a website offering AQC, contradicting the common belief that users perceive ads as generally negative. In fact, users even appreciate the introduction of ads on websites, as long as they can customize these ads' quantity. Furthermore, our results suggest that the effect of AQC on website stickiness is primarily driven by users' sense of being empowered, which enhances both users' cognitive as well as affective evaluations of the website. These findings underline the importance of feeling empowered as a thus far neglected mechanism of web customization. The results have important theoretical implications for our understanding of web customization and provide strong practical implications for website providers seeking new ways to take advantage of their ads.

5.8 Appendix

5.8.1 Participant Instructions

Your task:

Imagine it is Saturday and you are surfing on the Internet at home. You recently developed an interest in commercial aviation and are curious to know what happened in the series of accidents involving Boeing 737 MAX aircrafts. After a quick Google search, you hit on an article from the news portal The Epoch Times. You access the website with the intention to find out what might have caused the accidents.

5.8.2 Cover Page



Figure 5-6: Cover page upon accessing the experimental website

5.8.3 Assessment of Measurement Model

	STICK	EMP	IFTT	ENJ	CLUTT	PCUST
Website Stickiness (STICK)	0.946					
Perceived Empowerment (EMP)	0.632	0.933				
Informational Fit-to-Task (IFTT)	0.543	0.547	0.946			
Perceived Enjoyment (ENJ)	0.724	0.656	0.501	0.928		
Perceived Ad Clutter (CLUTT)	-0.397	-0.390	-0.331	-0.259	0.935	
Perceived Customizability (PCUST)	0.332	0.426	0.212	0.317	-0.220	0.925

Table 5-6: Fornell-Larcker criterion demonstrating discriminant validity

(Fornell and Larcker 1981)

	STICK	EMP	IFTT	ENJ	CLUTT	PCUST
Website Stickiness (STICK)	–					
Perceived Empowerment (EMP)	0.702	–				
Informational Fit-to-Task (IFTT)	0.576	0.608	–			
Perceived Enjoyment (ENJ)	0.775	0.739	0.535	–		
Perceived Ad Clutter (CLUTT)	0.413	0.417	0.347	0.265	–	
Perceived Customizability (PCUST)	0.352	0.480	0.223	0.339	0.225	–

Table 5-7: Heterotrait-monotrait ratio of correlations demonstrating discriminant validity (Henseler et al. 2015; Voorhees et al. 2016)

5.8.4 Assessment of Structural Model

	EMP	IFTT	ENJ	STICK
AQC (absent vs. present)	0.043	0.003	0.002	0.007
Perceived Empowerment (EMP)		0.301	0.538	0.033
Informational Fit-to-Task (IFTT)				0.030
Perceived Enjoyment (ENJ)				0.389
Note: f^2 values of 0.020, 0.150, 0.350 indicate a predictor variable's low, medium, or large effect in a structural model (Cohen 1988).				

Table 5-8: Effect sizes (Cohen's f^2) of AQC website vs. default website (Cohen 1988)

	EMP	IFTT	ENJ	STICK
AQC (absent vs. present)	0.093	0.004	0.002	0.001
Perceived Empowerment (EMP)		0.364	0.555	0.009
Informational Fit-to-Task (IFTT)				0.064
Perceived Enjoyment (ENJ)				0.398
Note: f^2 values of 0.020, 0.150, 0.350 indicate a predictor variable's low, medium, or large effect in a structural model (Cohen 1988).				

Table 5-9: Effect sizes (Cohen's f^2) of AQC website vs. ad-free website (Cohen 1988)

As evident from Tables 8 and 9 the effect of AQC on perceived empowerment can be considered moderate (0.043 / 0.093), whereas perceived empowerment exerts strong effects on both informational fit-to-task (0.301 / 0.364) and perceived enjoyment (0.538 / 0.555). Lastly, the resulting effect on website stickiness is driven less by informational fit-to-task (0.030 / 0.064), but more by perceived enjoyment (0.389 / 0.398). This means that while AQC exerts a moderate impact on perceived empowerment, this shift in empowerment powerfully affects both informational fit-to-task and perceived enjoyment, whereas the latter contributes particularly strongly to enhanced website stickiness. As such, we find support that the feeling of empowerment as a stimulant for the highly influential perception of enjoyment can be considered the primary driver of the increase in website stickiness.

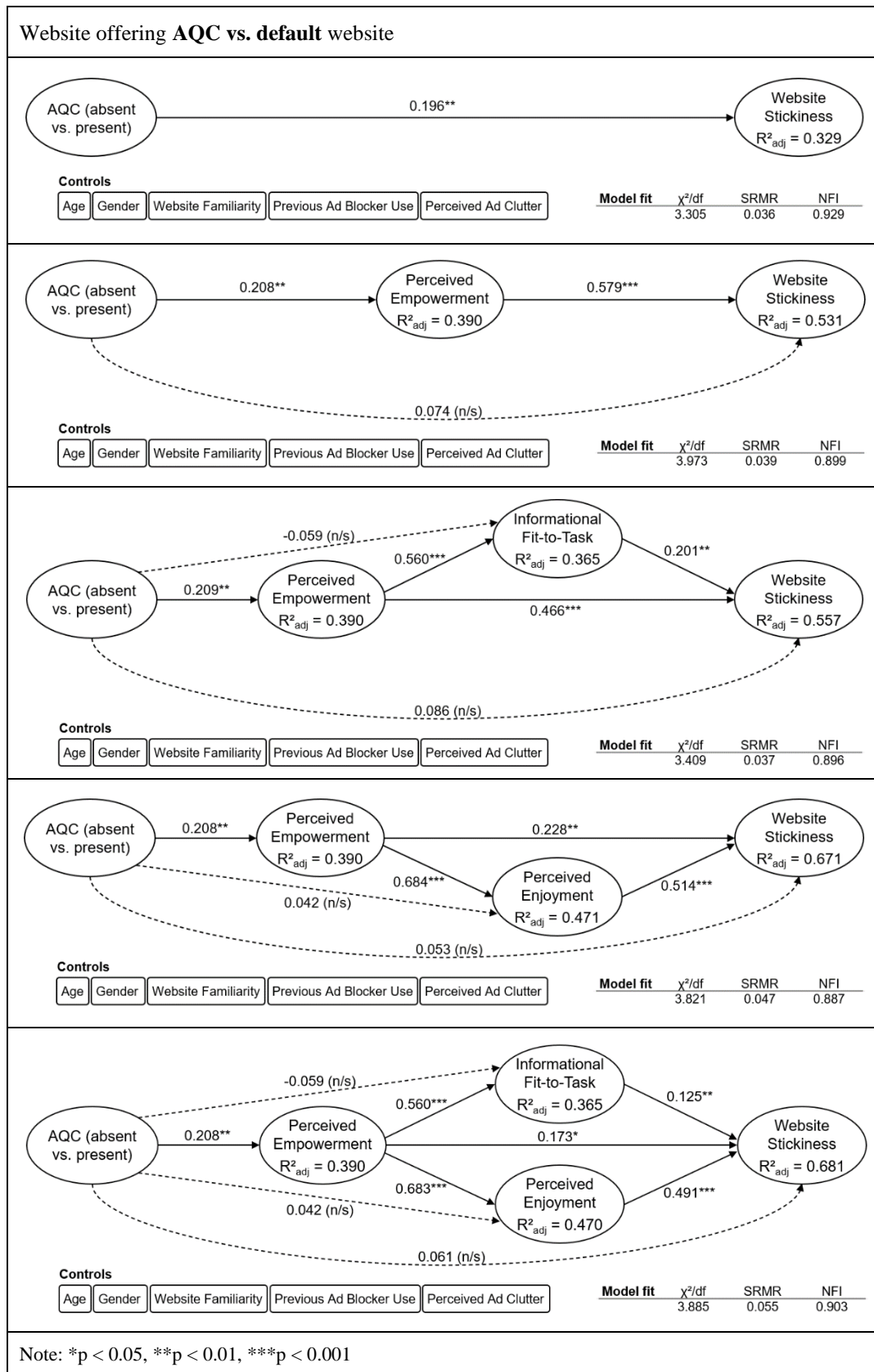


Figure 5-7: Iterative introduction of the mediators perceived empowerment, informational fit-to-task and perceived enjoyment for AQC website vs. default website

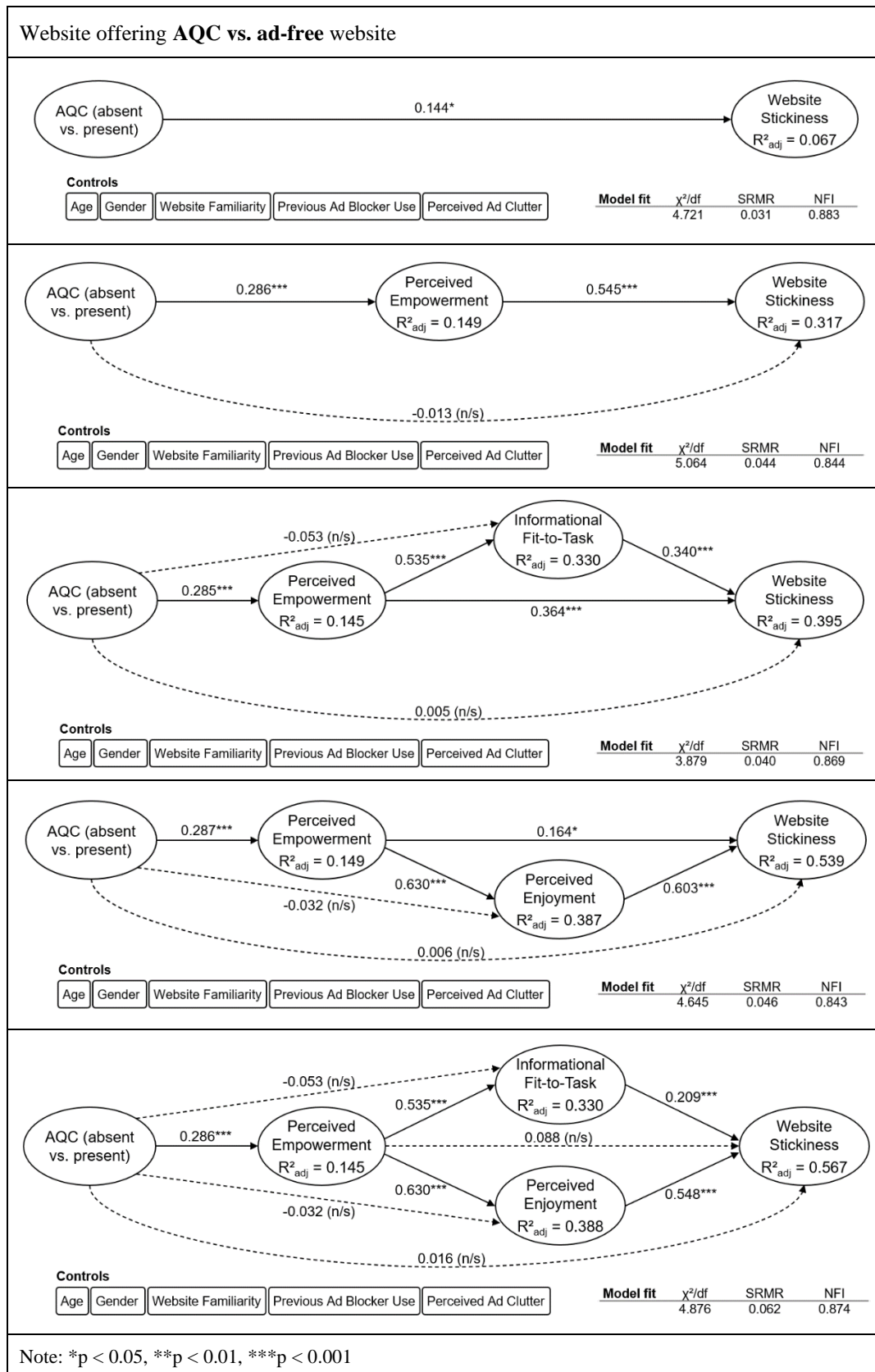


Figure 5-8: Iterative introduction of the mediators perceived empowerment, informational fit-to-task and perceived enjoyment for AQC website vs. ad-free website

Pathway of indirect effect	Website offering AQC vs. default website			Website offering AQC vs. ad-free website		
	Effect (Boot SE)	Boot LLCI	Boot ULCI	Effect (Boot SE)	Boot LLCI	Boot ULCI
AQC → EMP → IFTT	0.360 (0.118)	0.138	0.610	0.413 (0.098)	0.235	0.619
AQC → EMP → ENJ	0.506 (0.148)	0.210	0.793	0.590 (0.117)	0.363	0.822
EMP → IFTT → STICK	0.106 (0.034)	0.042	0.173	0.177 (0.040)	0.105	0.260
EMP → ENJ → STICK	0.345 (0.056)	0.238	0.455	0.370 (0.053)	0.265	0.474
AQC → EMP → IFTT → STICK	0.061 (0.031)	0.012	0.133	0.113 (0.040)	0.049	0.206
AQC → EMP → ENJ → STICK	0.248 (0.081)	0.097	0.419	0.274 (0.071)	0.145	0.427
AQC → EMP → STICK	0.147 (0.081)	0.018	0.333	0.083 (0.072)	-0.048	0.235
AQC → IFTT → STICK	-0.028 (0.039)	-0.121	0.037	-0.041 (0.043)	-0.138	0.030
AQC → ENJ → STICK	0.099 (0.112)	-0.116	0.325	-0.044 (0.095)	-0.225	0.147
Note: Bootstrapping with 5,000 samples and a 95% confidence interval using PROCESS model 81 by Hayes (2018); EMP = Perceived Empowerment, IFTT = Informational Fit-to-Task, ENJ = Perceived Enjoyment, STICK = Website Stickiness, SE = standard error, LLCI = lower limit confidence interval, ULCI = upper limit confidence interval						

Table 5-10: Bootstrapping of linear regression indirect effects of AQC on Website Stickiness using PROCESS by Hayes (2018)

Chapter 6: Contributions and Conclusion

This thesis was motivated by the aspiration for IS providers to empower their users in new ways and with powerful consequences for users' behavior (i.e., selection behavior and user engagement). In practice, ever-evolving features of IS already increasingly strengthen users' capability and autonomy to make their own decisions. However, our understanding of the consequences of IS-enabled user empowerment are still limited. In particular, investigating the practice of providing timely and customizable information – as two of the most effective means to empower users – represents a promising opportunity to expand our body of knowledge on IS-enabled user empowerment. As such, the purpose of this thesis is to showcase the role and importance of empowering users through timely and customizable information, while simultaneously providing a deeper and more comprehensive understanding of how users' behavior in the form of selection behavior and user engagement evolves. Against this backdrop, four studies have been conducted and published in renowned IS outlets. Each study contributes to answering the overarching research questions of this thesis and examining the implications of IS-enabled user empowerment in different usage contexts of IS.

6.1 Contributions to Research

This thesis was guided by four overarching research questions addressing the IS-enabled empowerment of users through timely and customizable information. In the following, the contributions of this thesis are structured along these research questions.

RQ1: How does empowering users on websites through timely crowding information affect user engagement with the empowering website?

The first strand of this thesis contributes to DSS literature by focusing on the context of selecting a (physical) location to visit, where two studies reveal how websites can empower their users in their selection decisions through timely CI. To make this empowerment salient, websites draw on temporal cues to indicate the timeliness of the information they provide. Whereas such temporal cues have been investigated in the context of decision support, prior DSS research focused primarily on the consequences for users' selection behavior among different options – for example, how temporal cues of product reviews influence users' decision which product to choose (Huang et al. 2018). With few exceptions (e.g., Köhler et al. 2011), DSS research therefore lacks an understanding of how empowering users through temporal cues affects users' judgment of the empowering IS. This thesis addresses this shortcoming and

contributes to DSS literature by demonstrating that timelier CI increases user engagement in that users show greater intentions to return to the empowering website. As such, the findings of this thesis showcase the relevance of timeliness of information beyond mere selection behavior. This is an important contribution to DSS literature seeking to understand the drivers of user engagement that strengthen a DSS' value proposition as a relevant and useful source of guidance (e.g., Hosack et al. 2012; Kamis et al. 2008; Köhler et al. 2011). More specifically, the effect on user engagement reveals that DSS design features, such as timely CI, do not only affect users in their immediate decision, but also lay the foundation for users to return to the DSS and thereby benefit recurringly from the provided decision guidance. As such, shedding light on the consequences for user engagement offers a new and insightful perspective to our body of knowledge on how DSS can leverage IS-enabled user empowerment.

RQ2: How do empowered users select among differently crowded locations?

Within the context of crowding studied in this thesis, IS providing decision support can empower their users with timely CI not only to increase user engagement. Instead, to reduce congestion and avoid related costs (e.g., impaired service quality, unwanted physical proximity), such IS may intend to guide their users to select less crowded locations. Despite timeliness' prominent appearance to users as contextual information, our understanding is limited as to whether and how timeliness of CI affects users' selection behavior. Whereas extant DSS literature started to investigate temporal cues, prior studies largely narrowed their scope to temporal cues relating to static information, such as timestamps indicating when a product was launched (e.g., Amirpur and Benlian 2015; Chen et al. 2011; Li and Wang 2019). This thesis advances DSS literature on temporal cues by addressing timeliness of CI as a type of dynamically changing information. Specifically, by revealing that greater timeliness leads users to select less crowded locations, the results demonstrate that timeliness empowers DSS users to effectively avoid crowding. This is important because it showcases new ways in which DSS can empower their users to make socially desirable selections without infringing on users' freedom of choice. Taken together, this thesis sheds light on timeliness of CI as a pivotal empowerment instrument that DSS providers can use to boost user engagement and guide selection behavior.

RQ3: How does empowering users on websites through AQC affect user engagement with the empowering website?

The second strand of this thesis contributes to web customization literature by focusing on how websites can empower their users with the possibility to customize ad quantity. In doing so, this

this thesis provides an important and hitherto missing piece to the puzzle of web customization as a means to increase user engagement. Previous IS research on web customization narrowed its scope to the customization of primary editorial content of websites pertaining to the main purpose of the website (e.g., Ariely 2000; Benlian 2015; Jiang et al. 2010). As such, extant literature disregarded ad content as one of the most prevalent types of content on websites. Customizing ad content is fundamentally distinct to customizing editorial content, since users may exhibit little to no interest in customizing ads they never asked for (e.g., Seyedghorban et al. 2016; Tan et al. 2015). By specifically investigating AQC, this thesis therefore sheds light on a thus far under-investigated, yet important type of web customization. Counter-intuitively, the results indicate that web customization has the power to reconstruct traditionally negatively associated website elements (i.e., ads) into an asset that promotes user engagement even more effectively than excluding such elements altogether. In addition, the thesis presents perceived empowerment as a pivotal mediator that stimulates users' cognitive and affective interactions with the empowering website. These insights are important as they shift the incumbent perspective on ads as website elements that supposedly stifle user engagement to website elements that – when users feel to wield power over – instead stimulate user engagement. Taken together, this thesis uncovers and explains new ways how IS research can sustain the increasing pressure to provide individualized experiences to maintain and strengthen user engagement (e.g., Alt et al. 2019; Tam and Ho 2005; Vodanovich et al. 2010).

RQ4: How do empowered users select to customize ad quantity?

Empowering users to customize and thereby incrementally adjust ad quantity unlocks a new perspective on users' preference toward ads. Previous research on online ads treated users' attitude toward ads dichotomously, investigating either how users respond to a fixed, default amount of ads (e.g., Burke et al. 2005; Goldstein et al. 2014; Tan et al. 2015) or how users employ ad-blockers as a means to eliminate ads entirely (e.g., Despotakis et al. 2021; Gritckevich et al. 2021; Todri 2020). This rigid present-absent perspective of ads is puzzling, particularly as 77% of ad-blocker users explicitly call for the possibility to filter ads rather than to suppress them entirely (An 2016). By investigating AQC with its ability to gradually regulate ad quantity, this thesis overcomes this constraint and provides a more nuanced picture of users' preferred ad quantities. More specifically, as users opted on average for roughly a quarter of the website's ads, the results demonstrate that the commonly held assumption of users' general dislike of ads cannot be supported. This insight is critical to literature on online ads as it shifts research's perspective from trying to generally minimize or even eliminate ads as alleged

hindrances to user engagement (e.g., Seyedghorban et al. 2016; Todri et al. 2020) to now leveraging customization as a tool to match users' diverse preferences for different ad quantities – while simultaneously yielding even greater user engagement. In conclusion, this thesis offers novel and important insights on AQC as an under-investigated, yet increasingly relevant manifestation of IS-enabled user empowerment.

6.2 Practical Implications

Beyond the outlined contributions to research, this thesis also offers insightful recommendations and guidelines for practitioners seeking to empower their users (e.g., website providers). Accordingly, practitioners may use the results of this thesis to understand how they can benefit from empowering their users with timely and customizable information.

The first strand of this thesis addresses policy makers and website providers seeking to mitigate crowding at highly demanded locations by providing DSS that encourage visitors to select less crowded alternatives. The results of the first study show that the display of CI empowers users to identify and select less crowded locations. Importantly, this effect is stronger the timelier the displayed CI is, which essentially improves users' understanding of the actual situation at this very moment. Therefore, practitioners should aim to update and communicate crowding levels at frequencies close to real-time to effectively guide users away from crowded locations. While these recommendations are particularly valuable in containing the spread of infectious diseases, both the first and second study confirm the efficacy of providing timely CI also when health-related concerns are low. In fact, these implications hold even when crowds are considered conducive for the experience at the location (e.g., in bars). In addition to helping users avoid congested locations, the provision of timely CI also serves location owners who stand to benefit from a more predictable and steady demand, rather than being challenged by typically volatile fluctuations in their visitor numbers.

The second strand of this thesis provides impetus for all website providers striving to engage their users more strongly, particularly when currently featuring ads or contemplating to include ads on their website. Precisely, this thesis proposes the empowerment of website users with AQC as a powerful lever to enhance user engagement. On the one hand, the results of study three and four do confirm the widespread notion that displaying immutable ads irritates users in that they engage less with the website compared to when no ads are present at all. On the other hand, however, these studies also reveal that users do not oppose the display of ads in general. Instead, the results indicate that a lack of control over ads may be one of the main

drivers of users' reactance. Surprisingly, purposefully including ads on a website while simultaneously empowering users to customize the provided ad quantity leads users to stay longer and explore more pages than eliminating ads altogether. These findings imply that ads are not necessarily a threat to users' interest in a website. Rather, website providers can empower their users through AQC to transform ads into an asset that fosters engagement with the website. Website providers may even be able to propose the advantages of AQC to persuade ad-block users to deactivate their ad-blocker and configure AQC to allow some level of ads they feel comfortable with to support the website and its provider. Moreover, the results of study three suggest that users with mobile devices engage particularly strongly with the website when being empowered with AQC. As such, this finding implies that website providers can differentiate their offerings depending on each user's device. This approach is particularly valuable when website providers are hesitant to cede control over ads as a potentially important revenue stream. Accordingly, website providers could limit access to AQC to their highly receptive mobile user base, while maintaining control for users with stationary devices. Furthermore, the results of study four emphasize the importance of perceived empowerment as the key driver of enhanced user engagement. This means that the key for website providers to more effectively retain their users lies in making users *feel* empowered – which may be somewhat decoupled from the objective devolvement of control. Accordingly, by designing interfaces that underscore users' sense of self-determination, impact, and competence, website providers may harness the perception of empowerment to capture users beyond the context of customizing ads.

Despite clear advantages for user engagement, allowing users to tamper with the amount of ads displayed may come at a price for website providers. This is because ad revenue depends on the number of impressions and clicks on ads. As users in studies three and four opted to see roughly a quarter of the default ads, website providers can expect less ad revenue when empowering their users with AQC – even though click rates on ads increase when users agree to receive them (Hartemo 2016). Whether the benefit of enhanced user engagement is worth the potential loss in ad revenue depends on the objectives of each website provider. For example, websites focusing on growth place particular emphasis on enhancing user engagement. Whereas prior IS research thus far suggests to curtail ads during growth periods (Dewan et al. 2002), this thesis provides an alternative and perhaps more economical perspective by suggesting to offer users AQC right from the start. This not only enables to attract and retain users more effectively, but also allows to benefit from ad revenues resulting

from users' ad quantity selections early on. Essentially, AQC can strengthen websites' business model during and potentially beyond growth phases.

6.3 Limitations and Future Research

Although this thesis provides valuable theoretical and practical contributions, the results should be interpreted in light of their limitations. Accordingly, three noteworthy limitations and corresponding avenues for future research are outlined next.

First, the studies incorporated in this thesis are subject to methodological limitations. Despite employing both online and field experiments, the experimental setup captured users' responses to being empowered mostly in one-time interactions. For example, users visited both the website offering timely CI and the website offering AQC only once. On the one hand, this approach is backed by the first impression effect, which suggests that users' first exposure to a website has a disproportionately great impact on their judgment and that this judgment will only be called into question after multiple interactions contradict users' first impression (Lim et al. 2000). On the other hand, only longitudinal investigations can identify with certainty whether observed effects from one-time interactions sustainably translate into long-term behaviors (e.g., Karahanna et al. 2018). Therefore, future research could investigate whether and how the empowerment of users with timely and customizable information affects users' perceptions and behaviors differently over the course of multiple interactions, for example by drawing on experience-sampling methods (e.g., Benlian 2020; Benlian 2022; Gabriel et al. 2019). Furthermore, the studies in this thesis recruited participants from Western societies (e.g., USA, Germany) to ensure comparability of results. Given that these individualistic societies place more emphasis on self-determination than collectivist societies (e.g., China, Japan) do, future research could verify the generalizability of the results of this thesis by studying different cultural backgrounds.

Second, this thesis only started to unravel influential boundary conditions and underlying mechanisms that dictate and explain the efficacy of IS-enabled user empowerment. While insights into the role of contextual variables, such as users' health anxiety or the usage of mobile compared to stationary devices, contribute to a more holistic understanding of the phenomenon of empowerment, future research can further expand our body of knowledge on additional moderating factors. For example, how users respond to being empowered may be subject to users' general need for control and their decisiveness in making decisions. Moreover, the situation-specific conditions under which users access an empowering website may play an

important role – for example whether users are hastily scanning a website for a small piece of information or whether users leisurely explore a website to see what it has to offer. Apart from such boundary conditions, future research could advance our understanding of the underlying mechanism driving users’ responses to empowerment. While the importance of users’ perceived empowerment identified in this thesis is already a first step, deeper insights into what timely and customizable information induces in users could contribute to the design of more effective empowerment features.

Third, this thesis narrowed its focus on investigating how empowering users with timely and customizable information affects specifically user engagement and selection behavior in two selected information contexts (i.e., CI and ad quantity). To broaden our understanding of IS-enabled empowerment, future research could go beyond user-specific outcomes and uncover, for instance, financial implications as well as strategies to monetize empowerment features. This is particularly important as empowerment may come at a cost, for example, when physical infrastructure for the frequent collection of CI is required or when websites’ ad revenues fluctuate with users’ choices. Investigating monetization strategies could help make empowerment features attractive even to those websites who prioritize direct financial gains over fostering user engagement. Lastly, to expand the horizon of IS-enabled user empowerment, future research has the opportunity to shed light on additional contexts in which timely and customizable information may add value, for instance in the context of crowdfunding, where user empowerment may be key to overcome information asymmetry between donors and campaign organizers (Piening et al. 2021; Wessel et al. 2022).

6.4 Conclusion

This thesis is one of the first attempts to systematically investigate the importance and ramifications of empowering IS users through timely and customizable information. The first strand of this thesis provides insights on how the provision and timeliness of CI empowers users with useful knowledge in their selection between differently crowded locations. The results demonstrate that by providing particularly timely CI (e.g., “updated just now”), users do not only heed CI more carefully and select less crowded locations, but also are more likely to keep using the IS that empowered them. This insight is important to sustainably mitigate congestion of locations without paternalistically infringing on users’ freedom. The second strand of this thesis sheds light on how the ability to customize ad quantity empowers users to attain effective control over their web experience. The results show that users empowered with AQC consistently engage more with the website (i.e., they stay longer and explore more pages) than

users who have either no control over the website's ads or – counter-intuitively – who never see any ads in the first place. This finding therefore reveals that AQC is capable of transforming ads from an irritating distraction to an asset users enjoy to customize – showcasing the profound impact empowering users can achieve. In conclusion, it is my hope that this dissertation and its findings inspire future research to further unlock the unparalleled potential of IS to empower and enable IS users to become more self-determined, competent, and effective members of society.

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