JYU DISSERTATIONS 381

Ville Salonen

Personalized Marketing at the Right Time

Toward Motivation-Based Temporal Dynamics in Web Personalization

JYVÄSKYLÄ UNIVERSITY
SCHOOL OF BUSINESS
AND ECONOMICS

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ABSTRACT

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Web personalization is an essential tool for marketers to market personalized offerings. To be accurate and valuable to the user and subsequently the focal firm, web personalization must be situation-aware and timely. However, current web personalization approaches are ill-adapted to react to the shifting nature of user preferences, which results in the degradation of personalization's effectiveness. This dissertation suggests that applying a motivation-based approach may mitigate this dilemma.

More specifically, this dissertation contributes to the literature by providing theoretical insights on and empirical validation of advances to increase the understanding of motivation in the context of web personalization. Thus, it builds the case for motivation-based temporal dynamics in web personalization by identifying advanced contextualization (based on refined psychological models) and timing as central research focus points through a systematic literature review (Article 1). Next, this research provides a conceptual framework (based on the Fundamental Motives Framework) for motivation-based temporal dynamics in web personalization (Article 2). Finally, via experimental settings, the remaining article empirically investigates the applicability of the chosen fundamental motives in predicting business-relevant metrics in online channels.

The results suggest that a motivation-based approach to temporal dynamics may be a novel and beneficial complementary approach to traditional web personalization approaches. Concurrently, this dissertation finds that (chronic) fundamental motives can be successfully applied to predict business-relevant metrics in online channels.

The results of the dissertation are primarily limited by the preliminary nature of the empirical testing and the lack of field testing. Future research opportunities exist in terms of further testing and validating the proposed motivation-based approach as well as comparing the effectiveness of other psychological constructs in similar applications.

Keywords: web personalization, Fundamental Motives Framework, temporal dynamics, systematic literature review, experiment

TIIVISTELMÄ (ABSTRACT IN FINNISH)

Salonen, Ville
Oikea-aikainen personoitu markkinointi: Kohti motivaatiopohjaista temporaalista dynamiikkaa verkkopersonoinnissa
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Verkkopersonointi on keskeinen väline kohdennettujen ratkaisujen markkinoimisessa. Tuottaakseen osuvan lopputuloksen ja hyötyä käyttäjälle – lopulta suorittavalle yritykselle – verkkopersonoinnin tulee huomioida tilannetekijät ja olla oikein ajoitettua. Nykyiset verkkopersonoinnin menetelmät eivät kuitenkaan sovellu hyvin käyttäjän preferenssimuutoksiin reagoimiseksi, mikä heikentää personoinnin tehokkuutta. Tämä väitöskirja ehdottaa, että motivaatiopohjainen lähestymistapa voi helpottaa tätä ongelmaa.

Tarkemmin tarkasteltuna tämä väitöskirja pyrkii edistämään kirjallisuutta tuottaen teoreettisia näkökulmia sekä alustavaa empiiristä todistusaineistoa motivaatiotekijöiden ymmärryksen merkityksestä verkkopersonoinnin kontekstissa. Väitöskirja ehdottaa verkkopersonoinnin ajoitukseen motivaatiopohjaista tulokulmaa – tunnistaen edistyneen kontekstiymmärryksen (pohjautuen kehittyneisiin psykologisiin malleihin) ja ajoitusta keskeisinä tutkimuskohteina järjestelmällisen kirjallisuuskatsauksen kautta (Artikkeli 1). Lisäksi väitöskirja antaa käsitteellisen kehyksen (pohjautuen fundamentaalisten motiivien kehykseen) motivaatiopohjaiselle temporaalidynamiikalle verkkopersonoinnissa (Artikkeli 2). Väitöskirja myös tutkii kokeellisen asetelman kautta fundamentaalisten motiivien sovellettavuutta liiketoimintarelevanttien mittareiden ennustamiseksi digitaalisissa kanavissa (Artikkeli 3).

Tulokset viittaavat siihen, että motivaatiopohjainen lähestymistapa on uusi ja hyödyllinen lähestymistapa perinteisempien verkkopersonoinnin menetelmien rinnalle. Vastaavasti väitöskirjan tulokset osoittavat, että (kroonisia) fundamentaalimotiivien tasoja voidaan soveltaa liiketoimintarelevanttien mittareiden ennustamisessa myös digitaalisissa kanavissa.

Tulosten yleistettävyyttä rajoittaa empiirisen testaamisen alustavuus ja kenttäkokeiden puuttuminen. Tulosten edelleen testaaminen ja ehdotetun motivaatiopohjaisen lähestymistavan validointi sekä muiden psykologisten tekijöiden vertailu ehdotettuun lähestymistapaan muodostavat keskeisimmät mahdollisuudet jatkotutkimukselle.

Avainsanat: verkkopersononti, ajoittaminen, fundamentaalimotiivit, kirjallisuuskatsaus, kokeellinen asetelma

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Isälleni Veikolle, yliopistomiehelle.
Tyttärelleni Ellalle, maailman tutkijalle.
Sukupolvet opettavat.

FOREWORD AND ACKNOWLEDGEMENTS

A sign on the wall of my late father's University office claimed with indisputable validity that even the longest journey gets shorter with a single step. On the journey towards my PhD, I have come to appreciate this notion on a deeper level. The road to this point has been long and coupled with various roadblocks such as failed experiments as well as highlights such as having an article listed as a Commended Paper of the Year. Like all the best road stories, I have had the honor and pleasure to share this wild ride with fabulous people. While there are others, I wish to next highlight some key persons who have my utmost gratitude.

I am grateful for Professor Heikki Karjaluoto who as my supervisor has been instrumental along my journey from start to finish. He is a person who can get a PhD candidate what he or she needs (or wants as a marketer would say) – such as funding for visiting period at Cambridge University. Furthermore, I am thankful for Professor Joel Mero who also acted as my supervisor. I am sure I am not the only one who has learned a lot by being in the presence of Joel.

I am privileged to have Professor Samuel Piha from University of Vaasa and Professor Julie Y. Huang from Stony Brook University as the pre-examiners for my dissertation. The insightfulness and precision of their feedback was something I have not experienced before during my time at University studies. Without a doubt, their feedback made this dissertation better, and gave me ideas for the future.

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I have been blessed with a wonderful set of friends in life. Your eagerness to hear updates on my dissertation sometimes surpassed my own enthusiasm and helped me take the next step when it felt the hardest. Especially Tero, Teemu, Ossi, and Petri have been pushing me forward.

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Finally, I offer my most loving thank you to my dear wife Anni and daughter Ella. You are the bedrock on which I and all my accomplishments rest.

Kauniainen 14.2.2021
Ville Salonen

FIGURES

TABLES

LIST OF PUBLICATIONS

This doctoral dissertation is based on four publications, which are listed below and referred to in the text.

1. Salonen, V., & Karjaluoto, H. (2016). Web personalization: The state of the art and future avenues for research and practice. *Telematics and Informatics*, *33*(4), 1088–1104.

2. Salonen, V., & Karjaluoto, H. (2019). About time: A motivation-based complementary framework for temporal dynamics in web personalization. *Journal of Systems and Information Technology*, *21*(2), 236–254.

3. Salonen, V., Munnukka, J., & Karjaluoto, H. (2020). The role of fundamental motivations in willingness-to-pay online. *Journal of Retailing and Consumer Services*, *52*, 101930.

AUTHOR'S CONTRIBUTIONS

The author's contributions to the publications in this dissertation are listed in Table 1 below.

TABLE 1 Author's contributions.

Manuscript	**Research design and data collection**	**Literature review**	**Data analysis, results, and writing**
Article 1 "Web personalization: The state of the art and future avenues for research and practice"	The author had a lead role in both the research design and the data collection. The co-author assisted in the research design.	The author had a lead role in writing the literature review. The co-author provided comments for the literature review.	Data analysis, results, and writing were led by the author. The co-author provided comments and edits to improve the manuscript's quality.
Article 2 "About time: A motivation-based complementary framework for temporal dynamics in web personalization"	The author had a lead role in both the research design and the data collection. The co-author provided comments to improve the research design and data collection.	The author had a lead role in writing the literature review. The co-author provided comments for the literature review.	Data analysis, results, and writing were led by the author. The co-author provided comments and edits to improve the manuscript's quality.
Article 3 "The role of fundamental motivations in willingness-to-pay online"	The author was responsible for both the research design and the data collection. The co-authors provided general comments to improve the research design and data collection practices.	The author had a lead role in writing the literature review. The co-authors provided comments for the literature review.	The author shared responsibility for the data analysis and results with the co-authors. The author had a leading role in manuscript writing, whereas the co-authors provided comments to improve the manuscript's quality.

KEY CONCEPTS OUTLINED

The key concepts of the dissertation are outlined in Table 2 below to facilitate reading.

TABLE 2 Key concepts of the dissertation outlined.

Concept	Outline of the concept	Sources
Web personalization	Firm-driven process by which products, offerings, and messaging is adapted to match user preferences in the web environment.	Ansari & Mela 2003 Fan & Poole 2006 Montgomery & Smith 2009 Sunikka & Bragge 2012 Tam & Ho 2005
Temporal dynamics	The shifting of user preferences based on contextual effects. Such contextual effects may be based on the user's changing motivation and require re-calibrating the web personalization outcome to produce a timely preference match.	Hong, Li & Li 2012 Koren 2010 Salonen & Karjaluoto 2019
Timing (in web personalization)	Consequence of temporal dynamics, the success of personalized outcomes is dependent on does not only depend on the accuracy of the content but its timeliness. Timing can be considered in two ways: timing along the lifecycle stages and timing temporal dynamics. The prior refers to external factors and usually consider long-term timing. For example, a user may prefer warm winter boots in the winter but not in the summer. The latter refers to internal processes of the user and can be applied to both short-term (e.g., preference shift based on motivational primes) and long-term timing (e.g., personality-based approaches).	Adomavicius & Tuzhilin 2011 Huang & Zhou 2018 Jannach, Lerche, & Jugovac 2015 Jannach, Ludewig, & Lerche 2017 Pereira et al. 2018 Shi et al. 2017
Context awareness (in web personalization)	Context awareness refers to operationalization of contextual information when adapting to user preferences. Some simple examples of context awareness include time of day and geographical location. For example, pizza is often not eaten as breakfast so a context-aware personalization system (of time of day) would not advertise pizza in the morning. Context awareness, however, does not imply human-like understanding of the context, simply taking contextual factors into account in the personalization outcome.	Adomavicius & Tuzhilin 2011 Aggarwal 2016 Villegas et al. 2018
Fundamental Motives (Framework)	A set of distinct motivational systems that have evolved to solve specific social challenges. What makes these motives fundamental is their centrality in reproductive fitness and human evolution.	Griskevicius & Kenrick 2013 Kenrick et al. 2010a; 2010b Neel et al. 2016
Chronic and situational (fundamental) motives	Fundamental motives exhibit both short-term and long-term variability. In the short-term, both internal (e.g., hormonal shifts) and external (e.g., being subjected to visual cues) influence the activation of fundamental motives – thus, making the motives situational. On the other hand, individual differ in their proclivity to certain motives on a baseline measure referring to chronic motivation.	Griskevicius & Kenrick 2013 Kenrick et al. 2010a; 2010b Neel et al. 2016
Psychological fit	General term used in this dissertation to refer to alignment with the manner and goal of the engagement to sustain and match the user's psychological orientation and which can be based on a variety of concepts, such as personality, motivation, or regulatory fit.	Matz, Gladstone, & Stillwell 2016 Higgins 2005

CONTENTS

1 INTRODUCTION

1.1 Web personalization in digital marketing

The 2020s are likely to be an evolutionary period for web personalization, which strengthens the case for the rise of personalization. It has been suggested that data are the foundation of the digital economy (Wedel & Kannan 2016). However, simply having data is not enough; methods for extracting value from data will determine the winners and losers in the digital economy. Personalization is considered a primary application of effective data use and a source of competitive advantage through its reduction of information overflow (Ansari & Mela 2003), enhanced customer experience (Boudet et al. 2019), and differentiation (Murthi & Sarkar 2003). Therefore, with increasing numbers of data points and enhanced processing capabilities (e.g., Montgomery & Smith 2009), more and better personalization is now possible. Additionally, recent studies by market intelligence firms find customer experience either as or more important than the product or the price as a purchase criterion (see Shreve 2019; Walker Information 2013). Given that personalization enables individualized experiences with near mass production costs (cf. Tiihonen & Felfernig 2017), personalization has intuitive appeal (Sunikka & Bragge 2012) in increasingly competitive markets. Thus, by enabling one-to-one marketing (Arora et al. 2008; Peppers & Rogers 1999), personalization is at the center of creating positive customer experiences.

However, personalization seems to be an unredeemed promise that faces challenges both internally and externally. Internally, personalization is difficult to operationalize (Vesanen & Raulas 2006), especially effectively (e.g., Li 2016). Although web personalization has been studied for more than 20 years, an active discussion is ongoing regarding whether the inclusion of a user's/recipient's name in targeted messaging improves business results (cf. Li & Liu 2017; cf. Sahni, Wheeler, & Chintagunta 2018). Interestingly, the internal challenge of ensuring personalization's effectiveness has been contradicted somewhat by the external

challenge of personalization being too effective. Recently, more focus has been placed on data privacy and how to balance the apparent benefits of personalization to both the user and the firm with the ethical use of ever-increasing amounts of data (e.g., Awad & Krishnan 2006; Karwatzki et al. 2017; Zeng et al. 2021). The impact of the ability to operationalize personalization effectively and manage it ethically must not be underestimated. A recent study by the market research firm Gartner (see Blum & Omale 2019) predicts that 80% of marketers who have invested in personalization will abandon personalization efforts by 2025 due to the mentioned challenges. Therefore, personalization practices must take steps toward redeeming their position and offer uncontested value not only for the firm but especially for the user.

1.2 The potential in closer relationship between marketing and web personalization

The goals of marketing and web personalization are inherently intertwined. Marketing is about aligning an organization's processes to create and communicate offerings that are valuable for the customer (American Marketing Association 2017). Thus, adapting to the needs and wants of the consumer is at the heart of marketing. Moreover, when considered from the point of view of customer value, the needs and wants of the customer could be termed preferences on the general level as Holbrook (1999, p. 5) defines value as "an interactive relativistic preference experience". Comparably, web personalization is about matching an organization's offerings and communications to individual users' preferences in an automated way (Fan & Poole 2006). The shared goal is so obvious that web personalization has been considered a form and enabler of one-to-one marketing (Arora et al. 2008; Peppers & Rogers 1999). Furthermore, web personalization is a tool that caters for both intelligence gathering and processing as well as responsiveness in action and hence enables market-orientation (Jaworski & Kohli 1993) and the effective management of marketing efforts in the digital realm.

Although (web) personalization is a timely research priority for the Marketing Science Institute (MSI 2018) and personalization is often considered central to the success of marketing (Kalaignanam, Kushwaha, & Varadarajan 2008), web personalization research is dominated by IS research (Salonen & Karjaluoto 2016). This paradox paves way to two central notions. First, it is important that marketing scholars study web personalization to ensure that the field of web personalization evolves in a relevant direction for the field of marketing. Second, marketing scholars have much to contribute to the user-specific aspects of web personalization and without the understanding of consumer behavior and consumer psychology, web personalization development will lag due to a central aspect of the whole missing (also see Murthi & Sarkar 2003 for the role of management science in personalization as one reference point). Both notions indicate that a marketing perspective is essential.

To begin with the first notion, web personalization has multiple key implications for marketing. As discussed, the concept of customer value is at the heart of marketing and web personalization enables individualized experiences catered to the specific preferences of the consumer. This is the leading reason why web personalization matters to marketing. However, there are numerous other more specific benefits of web personalization to marketing – some of them are briefly discussed below. First, web personalization offers practical benefits as it can guide marketing to maximize customer value (cf. Guenzi & Troilo 2007) and on the other hand be leveraged to choose the most valuable customers (cf. Kumar & Reinartz 2016). Second, web personalization could be considered a research tool or way of gathering data. Web personalization is built on adaptive systems which "learn" about the users. As Murthi and Sarkar (2003) suggest, both learning customer preferences and evaluating that learning are key components of the (web) personalization process. It is possible that through the large datasets that web personalization systems build on could reveal novel insights about consumer psychology and behavior and offer lucrative sources for new research in marketing. Finally, web personalization may (in its respective part) could shape the conceptualization of central marketing concepts as much of marketing innovations occur in the digital realm (cf. Leroi-Werelds 2019 for updated typology of customer value; cf. Yadav & Pavlou 2014).

Equally or even more importantly, marketing has a lot to offer web personalization. First and foremost, marketing can offer web personalization an avenue to a deeper understanding of consumer psychology and behavior as suggested in section 2.3. above. However, the perspective of what marketing can offer for personalization has rarely been considered (see Sarkar & Murthi 2003 for a rare exception) and even the developments in marketing literature on web personalization is scant (see Wedel, Rust, & Chung 2009; see Montgomery & Smith 2009). While the personalization process is automated and objective, the on which foundation the algorithm is formed has great effect on the end result (cf. Sarkar & Murthi 2003). Marketing insights can guide web personalization approaches on where to base the personalization process. An illustrative example of this is timing in web personalization – the topic of this dissertation and an example already raised by Murthi and Sarkar (2003). In this dissertation, it will be extensively discussed how accurate timing is essential for successful web personalization and why it requires an understanding of advanced understanding of the drivers of the mental context of the user. To be truly temporally dynamic, a web personalization approach should apply more advanced models than the SOR model (cf. Ding, Li, & Chatterjee 2015) to account for the varied contextual effects. Since the marketing and consumer behavior literature is ripe with various approaches that take contextual factors into account (e.g., see Dhar & Gorlin 2013; see Kardes, Posavac, & Cronley 2004), marketing science can offer a valuable source on which web personalization models could be built.

1.3 Study motivation: When personalization matters and what is the role of consumer motivation in it

The purpose of this dissertation is two-fold. First, this dissertation takes on the research priority set by the Marketing Science Institute of when personalization matters (MSI 2018). In other words, the dissertation outlines ways for increasing customer value in the context of web personalization. Second, this dissertation seeks to extend the role of marketing in the study of web personalization by offering a novel approach to applying consumer motivation in enhancing timing in web personalization as suggested by Salonen and Karjaluoto (2016).

The primary way of achieving the dissertation goals is to apply fundamental motives (based on principles of evolutionary psychology) to the design of web personalization, especially from the perspective of temporal dynamics and in the context of online consumer behavior. More specifically, the goal is to build a foundation for motivation-based temporal dynamics in web personalization to offer a complementary avenue for increasing the effectiveness and value of personalization for the firm and especially the user. Importantly, this dissertation focuses on product recommendation and promotion in web personalization.

To answer the call for more value for the user, recommendations must be situation-aware and timely to be accurate and valuable. The crux of the issue is that a recommendation may be accurate to a user the first time but inaccurate the next, requiring an understanding of the user's context when making the recommendation (Adomavicius & Tuzhilin 2011). This shifting of preferences based on contextual effects is referred to as temporal dynamics or timing in web personalization. Despite its intuitiveness and growing evidence of its centrality to successful personalization (Ho, Bodoff, & Tam 2011; Koren 2010), research in the area has only recently begun expanding (Huang & Zhou 2018; Jannach, Lerche, & Jugovac 2015; Jannach, Ludewig, & Lerche 2017; Pereira et al. 2018; Shi et al. 2017). Moreover, to account for the timeliness of personalization, advances have been made to provide real-time modeling of user preferences and how best to adapt to them (Ding, Li &, Chatterjee 2015; Hauser, Liberali, & Urban 2014). These advances are paramount when attempting to advance web personalization.

While it seems clear that temporal dynamics and timing are central to the success of web personalization, there is less clarity on the most effective ways to approach and capture temporally dynamic user preferences, especially for determining on what the expected changes should be based. While a user's context builds on important tangible elements, such as location, time of day, and weather, to fully account for the scope of human behavior, intangible factors should also be considered state-dependent preferences (Zhang 2013). This calls for matching recommendations with psychological profiles and namely achieving psychological fit, which refers to alignment with the manner and goal of the engagement to sustain the user's psychological orientation and which can be based on a variety of concepts, such as personality and regulatory fit (see Matz, Gladstone, & Stillwell 2016 for personality; see Higgins 2005 for regulatory fit). While applying

psychological fit is still rare in web personalization research, evidence supporting its benefits is building (see Hauser, Liberali, & Urban 2014 for cognitive styles; see Ho & Lim 2018 for mood congruence; see Tkalcic & Chen 2015 for personality fit). To achieve its full potential, the application of psychological fit to web personalization needs to further establish approaches that ensure explanatory power over the various dimensions of user preferences as well as provide avenues to operationalize and integrate them with web personalization approaches (see Salonen & Karjaluoto 2019). Advancing the basis for psychological fit for web personalization in a way that fulfills these requirements would constitute a major step forward in making web personalization valuable for the firm and especially the user.

Applying motivation as a psychological fit for advanced contextualization and timing may offer an effective avenue for answering the call (Huang & Zhou 2018). In summary, to be effective at contextualization and timing, the following criteria should be met:

(i) **Given that personalization is about preference matching, the applied psychological model should enable both prediction and activation of preference shifting based on contextual effects.**

(ii) **While long-term effects are an important basis for user profiling, the psychological model should also offer avenues for prediction and activation of preferences for short-term user profiling based on contextual effects and understanding; the interplay between chronically manifesting and situationally activated preferences is key.**

(iii) **The source should be easy to integrate with the user's goal orientation because intention is a key driver of the user's context.**

Motivation as a psychological construct seems to cover all the criteria. When examining the criteria via the Fundamental Motives Framework (FMF) (Kenrick et al. 2010a, 2010b; Griskevicius & Kenrick 2013), which is employed by this dissertation, motivation (unlike other constructs, such as personality) is exceptionally well-suited to the criteria for two reasons: preferences shift according to the active fundamental motive (Griskevicius & Kenrick 2013; Griskevicius et al. 2009), and even though fundamental motives manifest chronically with potentially even greater explanatory power than the Big Five personality traits (Neel et al. 2016), they can also be situationally activated and thus potentially enable both short- and long-term profiling (Kenrick et al. 2010a). Considering that personality-based approaches (Fernández-Tobías et al. 2016; Tkalcic & Chen 2015) have been effective in web personalization (despite personality being a stable construct that does not vary situationally and is not goal-oriented), the premise for motivation-based temporal dynamics in web personalization is tempting. However, research in this area is scarce.

Moreover, the FMF is a novel conceptualization of human motivation for which evidence is still building. While early results show promise in terms of explanatory power as predictive power (Durante & Griskevicius 2016, 2018), more research is needed to verify the viability of the FMF and its ability to be

applied in business settings. Furthermore, research into the long-term and moderating effects of fundamental motives has only begun building (see Neel et al. 2016 for long-term effects; see Schaller et al. 2017 for interaction effects). However, with increasing evidence, the FMF may offer a good complementary basis for motivation-based temporal dynamics in web personalization. It is the viewpoint of this dissertation that success in modern markets may require combining the latest technological solutions with a deep understanding of human behavior.

1.4 Research questions: Consumer motivation as an under-investigated source for effective timing in web personalization

Overall, the dissertation builds on the research questions that were identified along the research process, which are summarized in Table 3 below.

TABLE 3 The identified research questions, study approach, and included articles.

Research questions	Methodology	Article
RQ 1 What is the current state of the art of contextualization in web personalization, and what avenues for future research exist in this domain?	A systematic literature review comprising 91 published peer-reviewed articles in the top 20 marketing and information systems journals.	Article 1
RQ 2 How can motivation-based approaches be applied to temporal dynamics in web personalization?	A conceptual article outlining a motivation-based process-oriented framework for both short- and long-term profiling for temporal dynamics in product recommendation and promotion in web personalization.	Article 2
RQ 3 What effects do chronically manifesting fundamental motives have on willingness-to-pay online	An experimental study of 201 participants who were recruited from Mechanical Turk focusing on (a) the chronic effects on willingness-to-pay and (b) the moderating effects of fundamental motivations.	Article 3

This dissertation seeks to lay the foundations for motivation-based temporal dynamics in web personalization – offering both conceptual and empirical contributions at the dissertation level. The first part of the dissertation (Part I) seeks combine the RQs by a single over-arching question: What are the implications of adopting an evolutionarily informed dynamic motivational model in the context of web personalization? As such, the first part of the dissertation will introduce the background for the articles and bring the articles together by integrating the findings in the articles into a "larger than the sum of its parts" general frame. The individual research questions are answered through three journal articles. These

articles comprise a systematic literature review, a conceptual paper with empirical testing, and one fully empirical paper based on experimental research.

A systematic literature review (Article 1) was utilized to answer RQ1. This arose from the simple need to update the prior general syntheses on web personalization (Kabassi 2010; Montgomery & Smith 2009; Sunikka & Bragge 2012; Tuzhilin 2009; Vesanen & Raulas 2006). For this dissertation, the literature review instigated further probing into questions regarding advanced contextualization in web personalization.

During the systematic literature review, it became apparent that, while contextualization (Adomavicius & Tuzhilin 2011) and temporal dynamics (Ho, Bodoff, & Tam 2011; Koren 2010) are central to successful web personalization, this area is largely under-researched. Moreover, motivation-based approaches' lack of utilization to their full potential led to focusing the research effort toward combing motivation and temporal dynamics in web personalization.

RQ2 is answered through a process-oriented framework in a conceptual article (Article 2). This research question arose from the literature review, which found that, despite its potential benefits, motivation has not been fully applied to temporal dynamics in web personalization (see Huang & Zhou 2018 for a rare exception). In the conceptual article, the case for motivation-based temporal dynamics is made by considering how motivation (the FMF in this case) could offer a versatile foundation for more temporally dynamic web personalization, including insights regarding both long- and short-term approaches.

RQ3 focuses on the long-term effects of fundamental motivation and is studied through a combination of two distinct motives in an empirical article (Article 3). Interestingly, while research on temporal dynamics in web personalization has focused more on long- (e.g., Hong et al. 2012) than on short-term user profiling, the FMF has primarily been applied to study short-term preference shifts (e.g., Griskevicius et al. 2009; Li et al. 2012; Huang, Ackerman, & Sedlovskaya 2017). Moreover, few studies have applied the online context to the FMF. Thus, Articles 3 is employed to study the effects of chronically manifesting fundamental motives on willingness-to-pay (WTP) online.

To conclude, this dissertation seeks to contribute to the discussion in digital marketing on customer value by suggesting a general approach on adapting to customer value drivers from the perspective of evolutionary consumer motives and in the context of web personalization. Alternatively, a proaist might say that the dissertation brings the ancestral roots of human behavior to the epicenter of the digital revolution.

1.5 Dissertation outline

This dissertation is divided into two main parts: Part I lays the foundation through five chapters, beginning with an introductory chapter that includes the study background, research questions, and an outline of the dissertation.

Chapter 2 discusses the dissertation's theoretical background. Consideration is given to key aspects of the theoretical foundation, including the central aspect of motivation as a construct and what the evolutionary forces entail.

In chapter 3, the focus is on the methodology employed, with the discussion centering on the ontological and epistemological choices, including arguments for them.

A summary of the selected original articles and their key findings are presented in chapter 4.

Chapter 5 discusses the findings and examines their implications for theoretical and managerial purposes. The limitations of the research are discussed, and avenues for future research are presented.

Part II concludes with the original articles. Figure 1 visualizes the key areas of investigation and the interconnectedness between the selected articles in this dissertation.

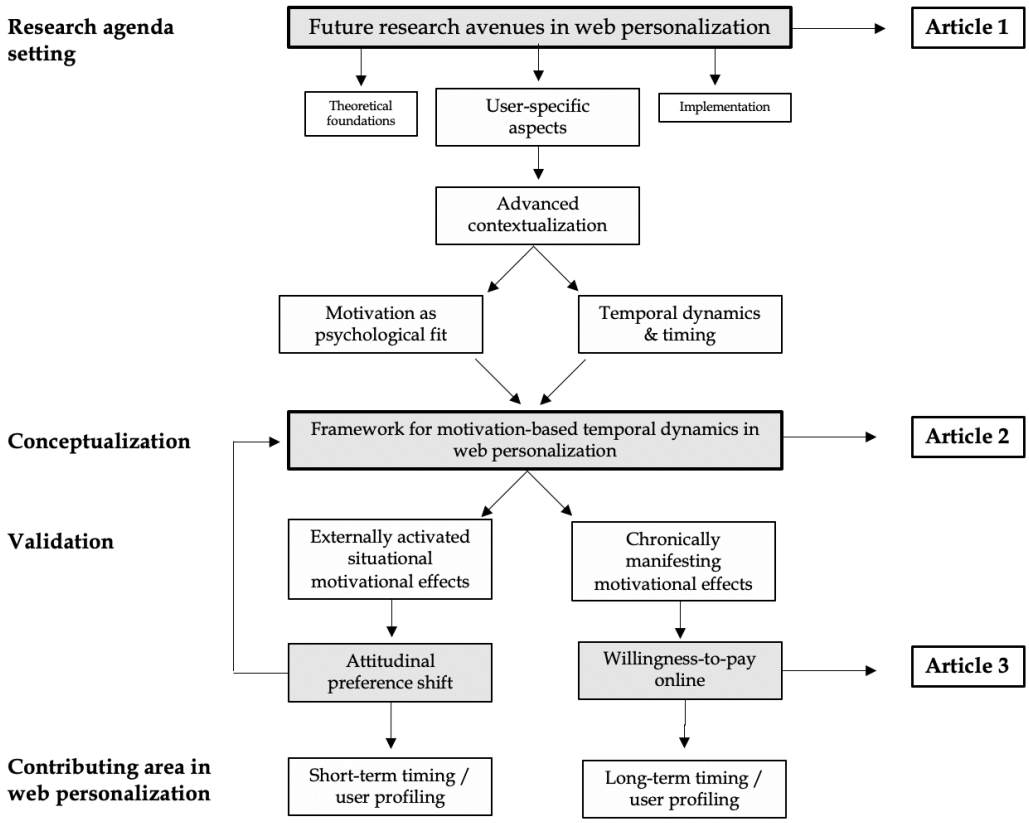

FIGURE 1 Key areas of investigation and the interconnectedness of the articles that are included in this dissertation.

2 THEORETICAL BACKGROUND

This chapter outlines the theoretical underpinnings of the dissertation. The chapter is divided into four sub-sections, which complement the literature covered in the original articles in Part II.

Thematically, this chapter introduces the typologies of context awareness in web personalization, which positions this dissertation's suggested approach: focusing on the mental context of the user. The next section focuses on the psychological drivers of the mental context. It does so firstly by highlighting the connection between user motivation and preference formation and shifting and secondly by explaining the FMF and what its roots in evolutionary psychology entail for the approach suggested. Whereas the first two sections introduce the theoretical background of *what* (i.e., the focal area of the personalization process and which psychological constructs are used), the next section lays the theoretical foundation of *how to do it*. Here, affective computing as an approach to eliciting psychological profiles and the concept of psychological fit as a means to operationalize motivational effects are introduced as ways to establish motivation-based temporal dynamics in web personalization. Furthermore, a theoretical framework for this dissertation is given and discussed. Finally, the potential in a closer relationship between marketing and web personalization is briefly discussed in the final section of this chapter.

2.1 Typologies of context awareness in web personalization

Web personalization is based on the tenet of matching user preferences with recommendations or adaptions to the interface or system at hand (Montgomery & Smith 2009; Tam & Ho 2005; Tuzhilin 2009). Preferences are continuously shifting (Simonson 2005), and preferences in one context may be different in another (Adomavicius et al. 2011), making an understanding of context paramount to successful web personalization (Adomavicius & Tuzhilin 2011; Villegas et al. 2018).

However, context is a multifaceted concept that, despite extensive studies, continues to be a focal point in not only web personalization (Berrocal et al. 2016; Sassi, Mellouli, & Yahia 2017; Villegas et al. 2018; Zheng, Mobasher, & Burke 2016) but generally in computing research (e.g., Alegre, Augusto, & Clark 2016; Augusto et al. 2017; Hong, Suh, & Kim 2009; van Engelenburg, Janssen, & Klievink 2018). Hence, a summary of the typologies of context awareness and their implications is provided here. Following Augusto et al. (2017) in that different strands of computing research bring about synergistic insights to the understanding of context and its operationalization, while focusing on context in web personalization, this section also welcomes entries with a differing or broader computing approach. Figure 2 offers a summary of the typologies of context awareness considered for the use of this dissertation. Elements of Figure 2 are then discussed below in separate sections in more detail.

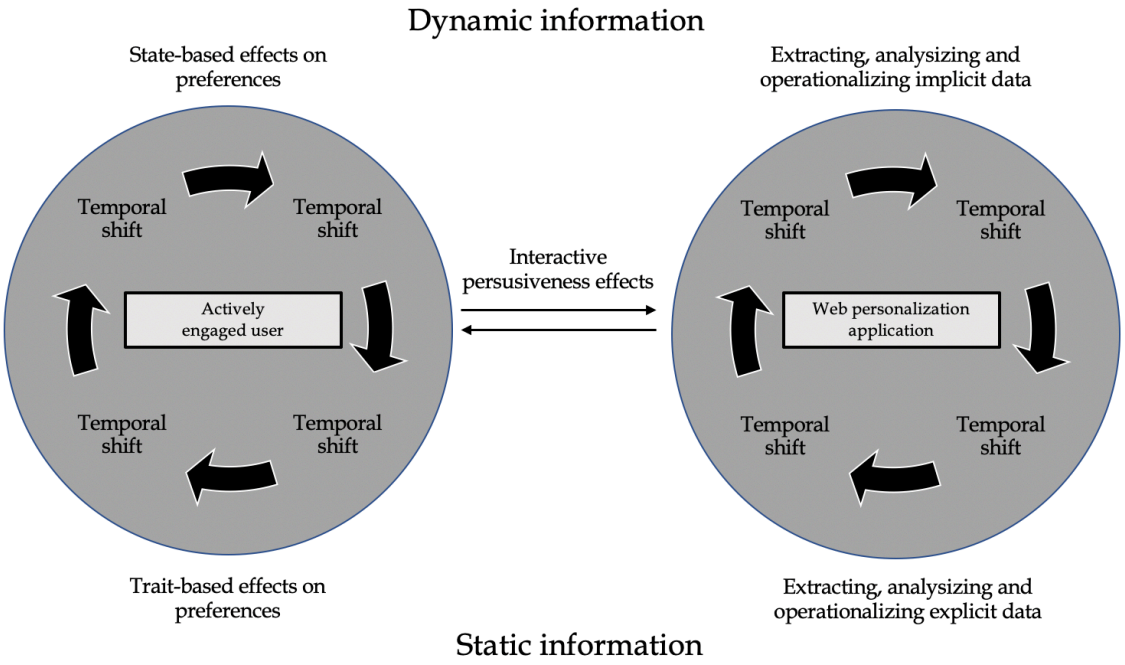

FIGURE 2 Summary of the typologies of context awareness in this dissertation.

Regardless of the way one typifies context, it remains a multifaceted concept, and operationalizing it for the use of context awareness remains difficult. However, certain typologies seem more central than others for enabling a framework for motivation-based temporal dynamics in web personalization.

In the above figure, the four central typologies of context awareness are (i) static vs. dynamic information, (ii) explicit vs. implicit information, (iii) traits vs. state-related temporality, and (iv) persuasiveness as a two-way relationship. While the typologies of temporality and persuasiveness are central (especially for this dissertation), all these dimensions bring about important elements for context awareness for motivation-based temporal dynamics in web personalization. Moreover, the figure illustrates that effective operationalizations of contextual

effects in web personalization (when dealing with advanced psychological profiling) require solutions for both preference identification, as well as, preference matching processes.

2.1.1 Definitions of context

Defining context specifically is a difficult task. In their analysis, Bazire and Brézillion (2005) find more than 150 definitions of context. Furthermore, they raise an important question: What is the central aspect that the concept of context should reveal? A simple but important distinction is whether context refers to the context of the user or that of the system (Abowd et al. 1999). While both approaches are meaningful, because this dissertation focuses on the user aspects of web personalization, the focal point herein is the context of the user to which the personalization systems and personalized service seek to adapt. Even then, there are many ways to approach context. To summarize, Table 4 presents a selection of definitions.

TABLE 4 Summary of key definitions of context.

Source	**Definition**
Abowd et al. (1999)	*Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and the applications themselves.*
Dey et al. (2001)	*Context is typically the location, identity, and state of people, groups, and computational and physical objects.*
Shilit, Adams, & Want (1994)	*. . . contexts are the location of the user, the identity of the people and physical objects that are nearby the user, and the states of devices that the user interacts with.*
van Engelenburg, Janssen, & Klievink (2018)	*The context of a focus is the set of all its context variables that impact it.*

These definitions consider both the user's and the system's central dimensions of context. While primarily resting on the common and rather tangible elements of context (Abowd et al. 1999), such as location, identity, activity, and time, consideration for the state of users is also given, especially by Dey et al. (2001). This is important because it suggests that more intangible or difficult to measure elements can be considered the basis of contextual effects. Overall, these often-referenced definitions (Table 4) align with the findings of Bazire and Brézillion (2005) who, in their broader analysis of definitions of context, find that "context acts like a set of constraints that influence the behavior of a system (a user or a computer) embedded in a given task." However, a more recent attempt by van Engelenburg, Janssen, and Kielink (2018) submits to a less restrictive approach for a general

definition. For them, the context should be defined through a more detailed consideration and definition of context variables (i.e., finding coherence within elements of the fragmented central concept). This may allow the inclusion of complementary special approaches in context-aware personalization systems.

Moreover, context can be considered through a representational or interactionist view (Dourish 2004). The representational view assumes that (i) context is a form of information that is (ii) delineable, (iii) stable, and (iv) independent from the activity it underlies (cf. Adomavicius & Tuzhilin 2011; Dourish 2004). The interactionist view mirrors some of the assumptions of the representational view and argues for (v) the dynamic nature of contextualizing, (vi) situational over static contextual features, and that (vii) context and activity have a cyclical two-way relationship in influencing each other (Dourish 2004). In this dissertation, an interactional view of context is adopted because it reflects the key tenets of psychological user profiling, which are essential for a motivation-based approach to temporal dynamics.

2.1.2 Context awareness: Operationalizing context

Context awareness of a recommendation or personalization application can be described simply as the operationalization of contextual information to adapt to user preferences (Adomavicius & Tuzhilin 2011; Villegas et al. 2018). The goal of context-aware personalization is to adapt to and serve increasingly tailored solutions at the optimal time (Aggarwal 2016). Moreover, Abowd et al. (1999) consider context awareness of applications supportive of three basic categories of actions:

- Presentation of information and services to a user
- Automatic execution of a service
- Tagging of context to information for later retrieval

Of these basic categories, presentation of information and services to a user refers, for example, to automatically changing language in a web systems based on the geographic location. This can be executed automatically when the system detects a change in the coordinates of the user. Furthermore, this location data can be stored for later use and analysis. However, a full spectrum of context-aware approaches to executing these categories of actions exists. To understand that spectrum, a short introduction to the typological dimensions is presented below. These dimensions include (i) static vs. dynamic, (ii) explicit vs. implicit, (iii) traits vs. state-related temporality, and (iv) persuasiveness.

2.1.2.1 Static vs. dynamic

The basic typological division in context-aware systems refers to static versus dynamic contextual factors. Static factors include stable contextual factors, such as content or product type, in a web environment, whereas dynamic factors include

fluctuating measures, such as location or time. The deciding factor behind the logic here is whether the parameters included in the recommendation/adaptation formula or the user profile may change over time (e.g. Adomavicius & Tuzhilin 2011). Notably, time in this case often refers to "clock time" such as time of day and not the targeting of the optimal moment for personalization (e.g., Ho, Bodoff, & Tam 2011), which will be discussed below. Moreover, even in dynamic models for context awareness, some items may be static because other items change (e.g., Zimmermann, Specht, & Lorenz 2005). Dynamism is a fundamental dimension of context, and capabilities for extracting and analyzing contextual information have progressed; however, the most recent advances rely on dynamic contextual-awareness, much of which is implicit (Gauch et al. 2007).

2.1.2.2 Explicit vs. implicit

When considering the nature of contextual information in a web personalization setting, there are two types of information: explicit and implicit. Parts of the information that are communicated by the user (e.g., product ratings, answers on a questionnaire) are explicit, whereas implicit information (e.g., motivational state) must be estimated indirectly based on user behavior (see e.g., Kaptein et al. 2015). A comparable division that reflects this is also given by Adomavicius et al. (2011) from the perspective of the recommender system, which outlines three types of contextual information: fully observable, partially observable, and unobservable. The key differentiator here is how directly available information on contextual factors is for the personalization application.

Both types of contextual information are needed for successful web personalization. Explicit contextual information forms a solid baseline for personalization. Often, at least some parts of the context are known explicitly because the personalization application most likely has access to time and location. However, many other types of explicit data require an action from the user, which may be laborsome. Moreover, some explicit information may be sparse in real-world applications (Jannach, Lerche, & Zanker 2018) or impossible to convey explicitly. For example, unconscious thought may affect online purchase decision-making (Gao et al. 2012), which calls for an implicit approach. However, the role of unconsciousness of attitudes (Gawronski, Hofmann, & Wilbur 2006) and decision-making (Newell & Shanks 2014) has recently been called into question, and a more balanced view has been demanded (Baumeister et al. 2017). Nonetheless, the questions of availability and practicality in many instances support implicit approaches. For example, the personality of a user can be explicitly measured, but estimating it implicitly caters for a better user experience of not requiring explicit actions from the user (see Matz et al. 2019). Explicit information is more readily operationalized if available and more easily exhausted for personalization purposes; thus, implicit approaches are vital to uncovering deeper insights to complement explicit approaches. This is also somewhat prevalent in the web personalization literature, where implicit approaches have become more focal recently (see Jannach, Lerche, & Zanker 2018).

2.1.2.3 Traits vs. state-related temporality

With a focus on the user side of context, preferences are not only guided by traits based on individual difference factors (e.g., Matz et al. 2019) but also state dependency (Zhang 2013). This calls for consideration of the physical context of the user and the mental context in which decisions and actions are taken. However, the web personalization literature has only recently begun incorporating the mental context effectively (e.g., Ding, Li, & Chatterjee 2015; Hauser, Liberali, & Urban 2014; Ho & Lim 2018), although it was suggested previously by Zimmermann, Lorenz, and Oppermann (2007).

The state dependency of preferences is not only about psychological profiling, which will be discussed more extensively below; rather, both traits and state dependency reveal the temporality that is inherent in considering context effects and the required context awareness to effectively match preferences. In understanding the user's mental context, some aspects are more stable, whereas other aspects show greater variation. For example, personality (Cobb-Clark & Schurer 2012) and chronic motivation (Neel et al. 2016) are stable trait-based constructs, meaning that a user who is high in extraversion generally prefers marketing visuals that include many people or social inclusion (cf. Matz et al. 2019). In web personalization, this is connected to long-term user profiles. However, states and thus preferences may be based on and gauged via an active motive (Griskevicius & Kenrick 2013), mood (Ho & Lim 2018), or another highly varying psychological construct, which can change with more immediacy, calling for short-term user profiling. For example, for a user, status may be a chronically inactive motive (long-term profile) but still active at a given moment (short-term profile). For temporality in web personalization, traits, state-relatedness, and the mental context of the user offer avenues for gauging the baseline (long-term profile) and deviations or extensions to it (short-term profile). There are two levels of variation of temporality: static and fluid mental contextual effects. Importantly, this approach differs from the more traditional view of time-critical personalization (cf. Aggarwal 2016), but it is a foundation for important recent approaches (e.g., Fernández-Tobías et al., 2016; Ding, Li, & Chatterjee 2015; Hauser, Liberali, & Urban 2014; Tkalcic & Chen, 2015).

2.1.2.4 Persuasiveness

The interactionist view of context (Dourish 2004) and its tenet of context and activity having a cyclical two-way relationship in which they influence each other, which could be considered a persuasive relationship. Following this notion, this final typology considers the effects of persuasiveness.

In the usual case, a web personalization application adapts to the context of the user. Here, the persuasiveness influence comes from the user, and shifting occurs within the personalization application. However, the personalization application or web environment shapes the user through various cues (Benlian 2015; Kaptein et al. 2015). For example, background imagery can influence choice (Mandel & Johnson 2002). Furthermore, elements in the web environment may be used to nudge users' moods (Ho & Lim 2018). This means that the context in

which web personalization occurs is not solitary; it can contain elements of a designed contextual feature to direct user preferences and thus assist in preference matching.

2.2 Theoretical perspectives of the motivation–preference link of fundamental motives

This section discusses the theoretical pillars of why and how fundamental motivation may provide an actionable basis for temporal dynamics in web personalization. From a macro-perspective, evolutionary psychology and ecological rationality are firstly introduced as the theoretic foundation. Next, the relationship between motivation (fundamental motivation in the case of this dissertation) and preferences is investigated. Finally, the outcome of this relationship is discussed, and consideration is given to both whether and how users may experience value from psychological fit. Figure 3 offers a simplified visualization of the value of psychological fit below.

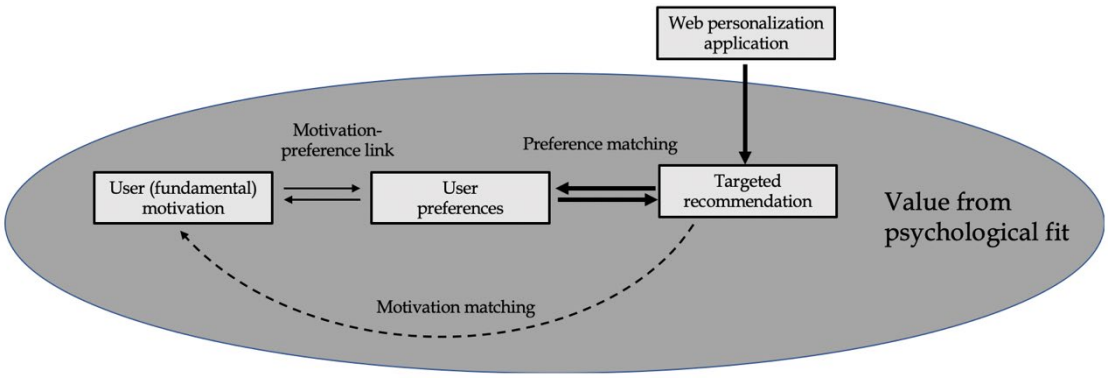

FIGURE 3 A simplified visualization of value from psychological fit in web personalization.

As illustrated in the figure, it is suggested that a user experiences value when the targeted recommendation matches with the psychological – and in this case, motivational, profile. Tracing the steps backwards, this means that effective matching of preferences consists of also matching the user's motivation. This is due to the motivation-preference link which bridges the way from the user's motives to preferred targeted recommendation. The elements of the figure are discussed in more detail in specified sections below.

2.2.1 Motivation and its link to preferences

What is motivation? In layman's terms, in a world with abundant options, an individual with inherently limited resources must make choices, and motivation

tells us where to focus and what to value in a given moment while simultaneously revealing something about human nature. In a more academic sense, motivation can be divided into two general types (see also Bandura 1988 for biological vs. cognitive motivation): *how* and *what* (Carver & Sheier 2012). How approaches to motivation consider the variety of ways in which goal-seeking behavior manifests under different conditions, but they clarify little about core motivation or human nature. Moreover, Carver and Sheier (2012) emphasize the need for motivation theories to distinguish and include top-down goal pursuit as well as reflexive responses to cues. In this dissertation, top-down goal pursuit is synonymous with hierarchical chronic motivation (see Neel et al. 2016), and reflexive responses are termed situationally activated motives (see Griskevicius & Kenrick 2013). It is important to note that not all theoretical frameworks of motivation distinguish between situational and chronic forms of motivation but that this is a key feature of Fundamental Motives Framework (Griskevicius & Kenrick 2013; Kenrick et al. 2010a; 2010b) that will be discussed in more detail below.

Motivation has been considered from various perspectives is often linked with such terms as drives, goals, and interest (cf. Huang & Bargh 2014) as well as other neighboring concepts such as emotions (cf. Lang 2010). Moreover, the various approaches to motivation can be grouped by various general approaches. Table 5 below offers a simple categorization of approaches to motivation with the goal of introducing how the concept of motivation has evolved.

TABLE 5 Summary of key approaches in motivation.

Theme	**Summary of key ideas**	**Source(s)**
Content or need theories of motivation	Motivation stems from unsatisfied needs, whereas satisfied needs do not motivate. Motivations are considered to be hierarchical so that higher level needs claim more attention as lower level needs are satisfied. Furthermore, some motivational outcomes follow a hygiene factor trajectory (limited benefit after specified threshold), whereas some motivational outcomes follow a less restricted continuum.	Alderfer (1969); Herzberg (1959; Maslow (1943)
Process theories of motivation	Motivation occurs and changes over time through various mechanisms such as reinforcing or conditioning, the expectancy of that effort will affect outcome and goal setting.	Grossberg (1987); Locke & Latham (1990); Vroom (1964)
Cognitive theories of motivation	Motivation shaped by various cognitive processes including unconscious processing. Notably, these include the individuals assessment of his or her ability to carry out the task, the effects of and on identity, and mindsets.	Bandura (1986); Dweck & Yeager (2019); Eccles (2009)

As summarized in Table 5, motivation is a concept that can be and has been studied from various angles. However, they all share the notion of being goal-orientated and include the idea of striving toward or away from something. To a marketer, motivation is the energizing force that bridges a customer's need and a product or service together.

What are preferences? In layman's terms, when given a choice between alternatives, preference is the option a person would rather choose. In a more academic sense, preferences are an overall or total evaluation of a choice (Hausmann 2011) that are context-dependent (Tversky & Simonson 1993) and potentially (although contestably) unconsciously driven (Simonson 2005) as well as partly constructed (Yoon & Simonson 2008) and partly inherent (Simonson 2008). Consequently, to fully understand users' preferences, there are at least three dimensions to consider: the context, what is generally appreciated by others in a similar situation, or if no prior experience exists, what feels inherently preferable. Some of these processes are conscious while others are unconscious. In this dissertation, the dimension of inherently desirable outcomes will be discussed through the evolutionary psychology perspective and the FMF in particular. The resulting suggestion is that motivation guides preferences, which creates a motivation–preference link. Furthermore, an understanding of the link between fundamental motivation and preferences may reveal and predict some aspects of inherent preferences and thus become a valuable novel source for user profiling. In this dissertation, the motivation-preference link is applied in the context of the various correlational (and potentially causal) mechanisms between the target fundamental motives and their behavioral tendencies (cf. Griskevicius & Kenrick 2013). This means that there are multiple areas of motivation and preferences as concepts that are not included in the analysis.

2.2.2 Evolutionary psychology as a meta-theory for consumer behavior

Evolutionary psychology investigates the evolution of the mind (Buss 1995, 2015). Compared to how an evolutionary biologist might study the shape of the human hand as a result of evolutionary forces, an evolutionary psychologist seeks to understand human behavior and mental processes, including emotions (Cosmides & Tooby 2000), motivation (Kenrick et al. 2010a, 2010b), and social aspects (Neuberg, Kenrick, & Schaller 2010), as adaptive mechanisms to evolutionary challenges faced by humans as a species throughout their developmental history and within their individual life histories (Del Giudice, Gangestad, & Kaplan 2016) and culture at large (Barkow, Cosmides, & Tooby 1992; Fenici & Garofoli 2019). More precisely, Buss and Schmitt (2011) summarize the key tenets of evolutionary psychology as follows (see also Confer et al. 2010; for consumer context, see Durante & Griskevicius 2018):

> **"(1) Manifest behavior depends on underlying psychological mechanisms, information processing devices housed in the brain, in conjunction with the external and internal inputs—social, cultural, ecological, physiological—that interact with them to produce manifest behavior.**

(2) Evolution by selection is the only known causal process capable of creating such complex organic mechanisms (adaptations).

(3) Evolved psychological mechanisms are often functionally specialized to solve adaptive problems that have recurred for humans over a deep evolutionary period.

(4) Selection designed the information processing of many evolved psychological mechanisms to be adaptively influenced by specific classes of information from the environment.

(5) Human psychology consists of a large number of functionally specialized evolved mechanisms, each sensitive to particular forms of contextual input, that get combined, coordinated, and integrated with each other and with external and internal variables to produce manifest behavior tailored to solving an array of adaptive problems."

To expand the tenets laid out by Buss and Schmitt (2011), evolutionary psychology seeks to offer ultimate rather than proximate (cf. Tinbergen 1963) explanations. However, this does not mean that evolutionary psychology could not be used to study proximate effects (cf. Griskevicius et al. 2009; cf. Griskevicius, Tybur & Van den Bergh 2010; cf. Li et al. 2012). Additionally, while evolutionary psychology always includes a component of the prevalent culture, as suggested by Buss and Schmitt (2011), it produces predominantly universal findings; however, it must be emphasized that universality refers to species typical psychological mechanisms not that universally manifesting behavior that would not include cultural differences (Lewis et al. 2017; Tooby & Cosmides 1990). For example, the drive to attain status is a universal motive (Kenrick et al. 2010a, 2010b), but how this fundamental motive manifests within given cultures and by individuals may take many forms. For web personalization (and this dissertation), this suggests that there are both ultimate and stable universal levels (general guiding principles) as well as the more varying proximate levels (case-specific configuration) that can be operationalized. The universality and in-depth nature of evolutionary motivational factors could be even more powerful forces shaping consumer behavior than proximate, everyday modern motivational factors when considering generalizability.

With these tenets in mind, evolutionary psychology has been suggested as a metatheory for psychological science (Badcock 2012; Buss 2020; Duntley & Buss 2008). Despite its ability to offer cohesion, it is important to note that evolutionary psychology is not a single theory but rather a collection of specific theories that share foundational tenets (cf. Durante & Griskevicius 2016). Thus, more specific hypotheses may be formed within the various specialized theories, some of which will be more central to consumer research and the topic of this dissertation.

2.2.2.1 Applications of evolutionary psychology in consumer research

Evolutionary psychology builds on a multilayered and dimensional study of all human behavior, and the tenets of evolutionary psychology should (Miller 2009; Pham 2013; Saad 2007, 2011) and have been successfully applied to consumer research settings (e.g., Durante & Arsena 2015; Durante et al. 2014; Griskevicius et al. 2009, 2010; Otterbring et al. 2018; Saad & Gill 2000; 2003; Sundie et al. 2011).

Although evolutionary psychology has image problems amongst marketing scholars (Saad 2019), a growing body of evidence and novel insights have been captured in studies utilizing the evolutionary perspective (see Durante & Griskevicius 2016 for consumer behavior; see Durante & Griskevicius 2018 for consumer psychology). These studies vary across different sub-domains, from the effects of hormonal shifts (Durante & Arsena 2015; Durante et al. 2014; Durante, Griskevicius & Ulu 2020) and consumption practices (see Saad & Gill 2000 for general applications; see Saad & Gill 2003 for gift-giving) to the temporal effects of an individual's life history (Griskevicius et al. 2011, 2013; Zhao et al. 2019). Essentially, all these studies, even though they are examples of different approaches, address the contextual effects and the role of evolutionary psychology in helping explain and predict those effects. Moreover, one of the central strands of research applying the evolutionary perspective to consumer psychology has been the study of preference shifts based on the behavioral outcomes of fundamental motivation (e.g., Griskevicius et al. 2009, 2010; Li et al. 2012).

Importantly, while evolutionary psychology has been introduced to the domain of information systems (IS) (Abraham et al. 2013; Abraham & Junglas 2010; Kock 2009), consumer research efforts rarely test hypotheses based on evolutionary psychology in online settings. Only rare exceptions, such as Huang, Ackerman, and Sedlovskaya's (2017) seminal work on disease avoidance in product preferences, exist. Online channels enable complex experimental settings, but if they were applied more often, they could benefit both the empirical base of evolutionary psychology and research into online channels. One such interesting area would be the study of ecological rationality as an integrative explanation for violations of rational choice or irrationality (see Lee, Amir, & Ariely 2009).

2.2.3 Ecological rationality: An alternative take on users' choices

Humans' ability to make entirely rational choices has been questioned by systematic findings of violations of rationality, leading to calls for bounded rationality (Ariely & Jones 2008; Kahneman 2003; Kahneman & Tversky 1979; Tversky & Kahneman 1973, 1981), which suggests that humans are limited in their capacity to make rational choices, leading to irrationality or approximating choices. However, the concept of ecological (Goldstein & Gigerenzer 2002; Pham 2007) or deep rationality (Kenrick et al. 2009, 2012; Kenrick & Griskevicius 2013) proposes an integrative third option. Perhaps human decisions are not exclusively irrational (although they may violate the rules of calculated rationality) but are rather rational within the given context and the goal (motive) of the individual and the life history of that person (Kenrick et al. 2009). If so, predicting user behavior or preferences would not be a question of random idiosyncratic occurrences but rather a question of understanding the link between the preference and the driving force or motivation of the choice.

While traditional rationality focuses on the expected utility of a decision and utility maximation, ecological rationality looks deeper and replaces utility with expected fitness (or reproductive success) (Kenrick et al. 2009) (i.e., a seemingly irrational choice offering lower or equal utility may be preferred if the choice is

thought to enhance fitness). As an example of this effect in consumer research, Hill and Durante (2011) show that priming women with mating goals led to increased willingness to take dangerous diet pills (see also Hill et al. 2012 for effects on economic conditions). Similarly, Griskevicius et al. (2009) show that a preference for products and marketing messages that focus on uniqueness increase when a mating motive is primed and decrease when a self-protection motive is active. These results suggest that the value inferred in a decision—while not completely rational—is guided and somewhat predictable by logical principles.

Moreover, the results of the studies outlined above suggest that much of the contextual effects on preference are guided by shifting motivational effects. Importantly, the results also support the notion of modularity of utility or fitness (Kenrick et al. 2009), meaning that the processing of a situation or a choice will be different based on the active motive, and the activation of one motive excludes the effects of other dormant motives (cf. Griskevicius & Kenrick 2013). This notion opens avenues for predicting preferences based on the understanding of a user's motivation.

2.2.3.1 Fundamental Motives Framework

The FMF suggests that human goal-driven cognition and behavior are functional and derived from seeking evolutionary fitness (see Griskevicius & Kenrick 2013; Kenrick et al. 2010a, 2010b; Schaller et al. 2017 for introductions to the framework). For studying behavioral consequences (see Griskevicius & Kenrick 2013), the FMF offers an updatable conceptual structure that adapts to multiple uses and levels of investigation (Neel et al. 2016; Schaller et al. 2017). The benefit of the ability to detect both chronic and situational forms of fundamental motives is a key reason why it is adaptable to web personalization contexts.

For this dissertation, self-protection (see Ackerman et al. 2006; Neuberg, Kenrick, & Schaller 2011; Schaller, Park & Faulkner 2003) and mate acquisition (see Griskevicius et al. 2006, 2007, 2009; Janssens et al. 2011) are the most focal motives. However, an additional theoretical basis for these individual motives and their functionally specific behaviors in addition to the sources listed above are outlined in the original articles.

2.2.3.2 Linking fundamental motivation and preferences

The FMF proposes four tenets that are central to understanding the motivation–preference link:

> Tenet 1: A fundamental motive can be activated by either external or internal cues (Kenrick et al. 2010a).
>
> Tenet 2: The currently active motive shapes preferences (Griskevicius & Kenrick 2013).
>
> Tenet 3: The currently active motive guides decision processes (Griskevicius & Kenrick 2013).

> Tenet 4: Although all fundamental motives can be activated with immediacy, one or a few motives are expected to manifest more chronically than others regarding individual differences (Neel et al. 2016).

Notably, Tenets 1 and 4 are relevant to temporal dynamics in web personalization because they somewhat mirror each other by suggesting a dualistic model of both chronic (compared to long-term profiling in web personalization) and situationally activated (compared to short-term profiling in web personalization) motivational ignition. This is a somewhat distinguishing feature of the FMF compared to other motivational frameworks and is a key feature when considering temporal dynamics in web personalization as user profiles too have both short- and long-term versions. What this duality in motives suggests is that while people have baseline motivational inclinations of what they strive for most of the time(chronic motivation / long-term user profile) that distinguishes individual differences, we all exhibit motivational inclinations across the spectrum of the FMF some of the time (situational motivation / short-term user profile) when contextual factors demand it. For web personalization, this dual temporality offers a systematic yet flexible source for psychological profiling.

The more essential suggestion for the motivation–preference link comes from Tenets 2 and 3. Tenet 2 claims that an active fundamental motive shapes preference, suggesting an active relationship between the concepts. Furthermore, Tenet 3 proposes that decision processes, which in turn may affect the formation of preferences, especially inherent preferences (cf. Simonson 2008), are guided by fundamental motives, and empirical evidence is building for these effects. For example, as discussed above, Griskevicius et al. (2009) found that priming participants' mate acquisition motivation resulted in an increased preference for products that were marketed as unique and lowered the preference for products that were marketed as popular; participants who were primed with the self-protection motive showed the opposite reaction. Similarly, Huang, Ackerman, and Sedlovskaya (2017) found that disease avoidance priming but not equally negatively valenced self-protection priming led to the depreciation of used products that were sold online. Additional and somewhat consistent findings have been found in other studies (e.g., Griskevicius et al. 2006, 2010; Li et al. 2012; Li, Haws, & Griskevicius 2019; Sundie et al. 2011) that exemplify not only a motivation-congruent preference shift but also its relevancy to the consumption context of the 21st century.

The FMF is useful for characterizing both people and situations (Schaller et al. 2017); thus, it may offer at least a partial understanding of the complexities of analyzing the contextual effects of both the environment of the behavior and the intellectual processing.

2.2.4 Psychological fit as a source of value

There is no single definition for psychological fit, but several psychological constructs contain the idea of an experience of increased value when a user's trait (e.g., Matz et al. 2019), state (Ho & Lim 2018), state, or way of pursuing goals

(Avnet & Higgins 2006; Higgins 2005) match with the stimuli in an environment (Benlian 2015; Ho & Lim 2018) or a decision or action (e.g., Matz, Gladstone, & Stillwell 2016). In this dissertation, by psychological fit is used as a general term that covers various psychological constructs – including personality, motivation, and regulatory fit. It is not to be confused with biological fitness which refers to reproductive success in natural selection in evolutionary sciences.

While not without exception (see Avnet & Higgins 2006 for value from regulatory fit), matching seems to be a key element of producing value from psychological fit. This notion fits well with the central aspect of web personalization, which is often defined as the matching of preferences (cf. Miceli, Ricotta, & Costabile 2007).

Moreover, the concept of psychological fit lends itself to the study of the motivation–preference link and user value experienced therein. Although Higgins (2005) considers the value of regulatory fit experienced as a "feeling of rightness" to go beyond the task at hand to the manner of approaching the task outlining one key tenet of psychological fit, this does not mean that matching the goal and the task would not matter. As discussed above, motivation (and in this case, fundamental motivation) shapes user preferences. Moreover, preferences are a proxy for value because they are considered a total evaluation of a choice (Hausmann 2011). Consequently, it is suggested that matching preferences through psychological fit, when operationalized via motivation, increases value in a web personalization setting. This occurs partly through content and partly through experience. Hence, while successful web personalization is about matching preferences (Miceli, Ricotta, & Costabile 2007), it could be considered to be indirectly about finding psychological fit through matching the user's motivation.

2.3 Operationalizing motivation-based temporal dynamics in web personalization

There are two ways to make web personalization better: improving the recommendation algorithm or seeking ways to reveal sources of unexplained variance (cf. Tkalcic, Kosir, & Tasic 2011). This dissertation opts for the latter, looking for ways to build a more complete view of user psychology and thus behavior to be operationalized through affective computing for personalization algorithms. Reichardt (2020) emphasizes that affective computing needs personalization, although the same mirroring argument that personalization need affective computing could be made (cf. Pappas et al. 2016).

Affective computing (Picard 2000) refers to assigning "computers the human-like capabilities of observation, interpretation, and generation of affect features" (Tao & Tan 2005, p.981). In practical terms, affective computing extracts and interprets implicit data on human emotions to enable predictions about the psychological profile of the user. Whereas early web personalization used to be

based on rather static and simple elements (cf. Mobasher et al. 2002), recent advances tackle the complexities of psychological profiling in real time (e.g., see Chen et al. 2019 for predicting decision-making styles; see Wellbery, Roth, & Fortmann 2017 for affective data and consumer behavior in e-commerce). Given that much of the unexplained variance resides in the psychology of the user, affective computing is a key tool for operationalizing more advanced web personalization approaches based on psychological factors.

There are two main schools of thought regarding emotions in affective computing. The information model or measuring school (Battarbee & Koskinen 2005) seeks to map emotions for machine interpretation (see Picard 2000). This school sees emotions as measurable and aims to make computers interpret and predict the psychological features of the user. The interactional school (see Boehner et al. 2007) focuses more on the user side by seeking to assist users in evaluating their experiences and emotions. In this dissertation, the approach of the information model school is supported because web personalization is an automated process that is detached from any user consciousness of the process. In this dissertation's view, it is possible to elicit the user's emotional and psychological state via computational avenues in a way that can meaningfully support the personalization process.

Moreover, affective computing can be targeted toward both the user and the environment under investigation. Thus, while the primary use cases usually focus on measuring and predicting the user's psychological state, it is also possible to gauge the emotional depth that is connected to certain elements in the web environment. For example, images and their likely effect on the user (see Tkalcic, Burnik, & Kosir 2010) or the effect of other cues (see Benlian 2015) can be estimated through affective computing approaches. Thus, affective computing focuses on the user, but the operationalization may focus on either item or user modeling.

There are three main sources of affective user profiling that can be utilized when estimating the psychological features of users and environments. There are content-based methods, which in turn can be divided into text-based (e.g. Chatterjee et al. 2019; Hasan, Rundensteiner, & Agu 2019) and visual approaches (e.g., Tkalcic, Burnik, & Kosir 2010). Additionally, the growing pool of digital footprints available for marketers is a rich and versatile source for profiling. Digital footprints also include the more single-service oriented clickstream analysis. Again, the target psychological features and the source of the digital footprints vary and can include, for example, decision-making style (Chen et al. 2019) and personality (see Hinds & Joinson 2019; Matz et al. 2019; Tkalcic & Chen 2015). Hinds and Joinson (2018) cataloged 14 different demographic attributes that have been effectively estimated via digital footprints. Finally, there are sources of biological data (primarily through facial recognition but also including other biological measures of a person) that, while not as widely adopted as analyzing digital footprints, are fast-growing and fueling new advances. For example, Spaulding and Breazeal (2019) show how facial expressions can be elicited for personaliza-

tion in social robotics. In sum, the more that data and methods for operationalizing that data to elicit psychological information and reach psychological fit through adaptive systems increases, the stronger the case for motivation-based temporal dynamics in web personalization.

Conversely, motivation (especially fundamental motivation) is perhaps a more complex and thus more difficult variable to systematically analyze than those that have been more heavily researched. For example, personality, which has been effectively applied to personalization (see Hinds & Joinson 2019; Matz et al. 2019; Tkalcic & Chen 2015), is not as temporally dynamic an attribute as motivation is. However, as discussed above, fundamental motivation has two sides of manifestation: chronic (trait-based) and situationally activated modes. In many ways, chronic fundamental motivation should be operationalizable similarly to how personality is because they share key attributes, such as being trait-based, and they have similar predictions in behavioral outcomes – however, early data suggests that fundamental motives may potentially be a better predictor of behavioral outcomes than the Big Five personality factors (cf. Neel et al. 2016 for a more elaborate discussion between the two concepts and their predictive power of behavioral outcomes). In terms of the situationally active mode of fundamental motivation, while not as comparable as personality and chronic motivation, mood and emotions are similarly temporally dynamic to situational (fundamental) motivation, and adapting to these involves similar challenges. Again, affective computing approaches have already been used to support such challenges (see Pappas et al. 2016 for one example). Where does one draw the line between situational and chronic motivation? It is a line in sand but chronic motivation refers to trait-like manifestation of the motive and should take years to shift, although chronic motivation does change more than personality (see Neel et al. 2016). Situational forms of fundamental motives can take on with considerable immediacy (e.g., being subjected to a newspaper article, see Griskevicius, Tybur, & Van den Bergh 2010) and should be considered to last until the next shift in context for the user. Furthermore, the benefit of utilizing the FMF over many other alternative motivational approaches such as Transactive Goal Dynamics (Fitzsimons, Finkel & Van Dellen 2015) is that they are clear expected correlational effects that should be more or less universal. To conclude, while there are challenges to operationalizing (fundamental) motivation for temporally dynamic web personalization, a clear path is available. Now, it is merely a matter of following it.

Moreover, while operationalizing (fundamental) motivation seems beneficial for the stated reasons of what (fundamental) motivation enables over constructs such as personality, perhaps the next step in future research could be to integrate an understanding of the two concepts. While both can be used as measures of individual differences, the angles are different. Motivation is concerned more on the goal or the *what*, whereas personality deals more with *how* a user approaches situations and goals. For example, it could be that neurotic people could pursue motives longer. To ability to operationalize motivation in web personalization

would be beneficial in itself but this ability would also open avenues for even more wholesome psychological profiling with additional benefits.

One avenue to further analyze chronic motivation, and one not yet considered in the domain of web personalization, is through the lens of life history theory (Hill & Kaplan 1999). Life history theory proposes given evolutionary goals (and thus motives) are more central in certain developmental phases. For example, life history theory suggests mate acquisition motivation manifests actively and with more emphasis from adolescence to early adulthood than before or after the developmental phase. This means that chronic motivations not only produce individual differences but that an individual's proclivity for a chronic motivation is likely to fluctuate over the long-term somewhat. Furthermore, life history theory may assist in predicting individuals' decision-making styles (Griskevicius et al. 2011; Mittal & Griskevicius 2014; Zhao et al. 2019). This suggests that an understanding of the individual's "life history context" should facilitate in predicting, how the active motives manifest themselves. Applying life history theory could be the next step in considering the dynamic of chronic and situational fundamental motivation.

2.4 Theoretical framework

The theoretical basis for motivation-based temporal dynamics in web personalization and this dissertation rely on the three cornerstones discussed above, which are summarized here.

An advanced operationalization of context awareness must be adopted by the personalization system. While this includes other advanced contextual adaptations, the key element for motivation-based temporal dynamics is the consideration of mental context. As discussed above, mental context applies to both profiling users as well as analyzing environments, elements, and their likely psychological effects. Much of this information is accessible only through implicit approaches.

Additionally, to understand the effects of mental context in an operationalizable way, the focus should be placed on the direct, yet multidimensional, relationship between motivation and preferences—the motivation–preference link. Here, fundamental motivation is a source of preference shifting and operating on two temporal modalities: chronic (trait-based) and situationally activated effects. Chronic motivational effects enable long-term user profiling and outlining of the user profile's baseline. Conversely, situationally activated effects enable predictive behavioral tendencies in the short term, creating an opportunity for gauging situationally temporally dynamic effects. To simplify, if web personalization is about preference matching, understanding user motivation works as a proxy for predicting what those preferences are and where they are going next. The FMF facilitates this task by offering deeper categorization of the motivational effects and brings the number of target motivations to a meaningful level from the plu-

rality of more proximate motives. Effective matching of motivation and preferences with personalized input should also create value for the user through psychological fit.

Finally, to extract and analyze these psychological profiles, affective computing can be leveraged. Drawing from a mixture of content (text or visually-based), digital footprints (clickstream and third-party information), and biological data (facial recognition), there is a growing body of evidence supporting effective methods for gauging psychographic information and applying that information in web personalization.

Figure 4 structures these main theoretical dimensions into a concise theoretical framework that follows a process-oriented approach including both user and firm perspectives and distinguishes three main stages of the process. As a whole, the figure illustrates in a simplified manner how the end-state of increased user value can be reached through an enhanced understanding of the motivational state of the user. Boxes in deep grey are the main elements and boxes in white supportive or exemplifying elements. The relationships depicted in dotted line represent a secondary or complementing layer to the framework.

First, attention is firstly given to the user by focusing on the antecedents of motivation-based temporal dynamics in web personalization. Here, the motivational state is visualized as the primary element for gauging the mental context of the user. Both chronic and situational effects are considered.

Next, the focus is placed on the personalization system, and a firm perspective is used. The process begins by profiling the user's temporal preferences via estimation of the motivational state of the user by utilizing affective computing. Following this, a recommendation targeting the temporally dynamic user preference is given. Importantly, while not depicted in the figure for simplicity, the motivation-based temporally dynamic approach is only considered a complementary approach to the prevailing personalization approach. This means motivation-based temporal dynamics is suggested as a way to refine the personalization process and facilitate timing but the framework builds on top of the primary personalization methods chosen.

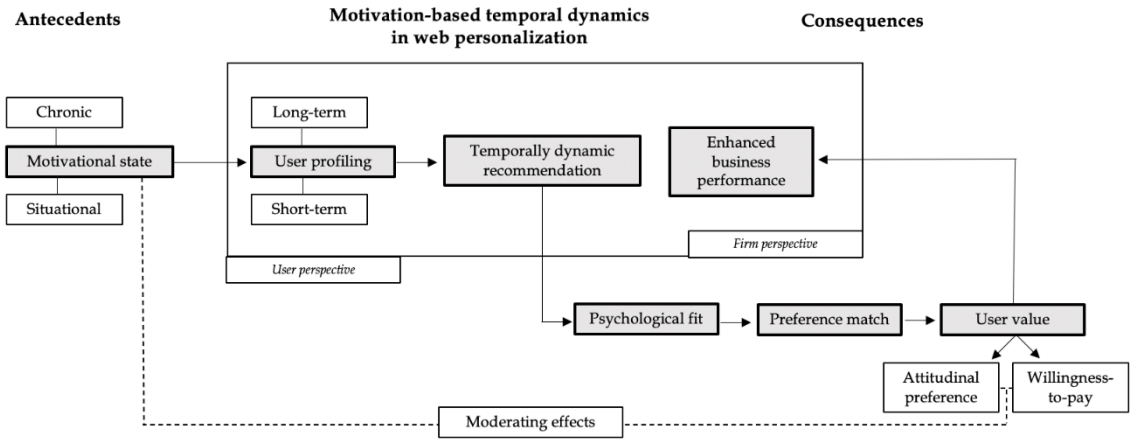

FIGURE 4 The theoretical framework of this dissertation.

Finally, the consequences of the process are considered. Provided that a successful recommendation is given, user value is created through psychological fit preference matching. In this dissertation, user value is measured through both attitudinal preference and WTP and studied through both short-term (attitudinal preference) and long-term (WTP) measures of effects of fundamental motives. A further consequence of this increased user value is enhanced business performance.

3 METHODOLOGY

This chapter introduces the methodological standpoints of this dissertation and focuses on three main elements. The first section discusses the ontological and epistemological perspectives that are adopted in the dissertation; the second section focuses on the key aspects of the chosen measurement practices; and the third section outlines the sources of data and analytical techniques.

3.1 Ontological and epistemological perspectives

This dissertation integrates information systems research and psychology to address the marketing problem of whether personalization matters and when it most does so. Consequently, the ontological and epistemological perspectives must seek to find a shared philosophy of science, including all these fields, to synthesize a research paradigm for this dissertation.

Per Kuhn (2012, p. 10), paradigms refer to a distinct way of approaching research: ". . . some accepted examples of actual scientific practice—examples which include law, theory, application, and instrumentation together—provide models from which spring particular coherent traditions of scientific research." Paradigms shape the way that research is approached methodologically and what (often tacit) assumptions are made ontologically and epistemologically in shaping the understanding of truth (Mingers 2004). To clarify, ontology here refers to the study of the structure of reality, whereas epistemology generally refers to approaches to investigating those truths (Niiniluoto 1999).

Adopting a position on the ontology and epistemology of research and discussing that position are both crucial to understanding the paradigm in which the research is conducted. The ontological and epistemological discussion of paradigms or the lack thereof has often been heated in marketing (see Arndt 1985; Hunt 1990), psychology (see Eysenck 1997; Henriques 2008), and IS research (see Mingers 2004); therefore, it is essential to clarify the position of this dissertation.

Per Bhaskar (1978), there are three domains of reality: real, actual, and empirical. The main insight here is that ontology guides the epistemology (i.e., the way things affect how and the extent to which we know them). Another perspective is through research: there is material reality, but this reality is independent of the human mind, and when conducting research, full certainty cannot be reached and should be approached critically (Bhaskar 1978; Easton 2002; Hunt & Hansen 2009). Moreover, this multilevel approach to reality by Bhaskar (1978) suggests that there are great complexities involved when trying to unify these levels, and by choosing a level of analysis, access to other levels may be stratified (Easton 2010).

These tenets, as outlined above, are foundational for critical realism (see Sayer 1992 for a more elaborate list of the tenets of critical realism). Critical realism could be considered a compromise between positivism and relativism, especially in their extreme forms (Easton 2010; Mingers 2004; Mingers, Mutch, & Willcocks 2013). Critical realism shares the positivistic idea of (the possibility of) knowing reality but rejects its understanding of causality (Easton 2010) (i.e., critical realism values empirical measurement). Critical realism also agrees with relativism to the extent that reality is socially constructed (Easton 2010) but not judgmental relatively, which would entail all viewpoints being equally valid (Mingers, Mutch, & Willcocks 2013).

Critical realism has become a central school of thought in marketing (Easton 2002, 2010; Simmonds & Gazley 2018) and IS (see Dobson 2002; Mingers 2004; Mingers, Mutch, & Willcocks 2013; Smith 2006). Moreover, in psychology, calls for the adoption of critical realism have been made (see de Souza 2014; Pilgrim 2017). The variety of involved fields highlights the applicability of critical realism.

Considering the scope and goals of this dissertation, critical realism is adopted as the base of the ontological and epistemological approaches. While this dissertation does employ experiments to gauge behavioral (and potentially unconscious) measures and argues for valid and reliable measurement of those focal measures, the way participants attach meaning to these simulated situations is at least partly guided by socially constructed subjective forces. Hence, full certainty of reality cannot be reached and a critical approach to the research must be employed, which critical realism demands.

3.1.1 The interconnectedness of marketing, psychology and IS as fields in the context of web personalization

To investigate such web personalization dilemmas as outlined by this dissertation, a marketing perspective needs to be complemented with the lenses of IS and psychology (and to do so beyond shared ontological and epistemological considerations). However, to do so effectively, it is important to identify the theoretical basis on which these fields are linked. While these fields each have their own research goals and are multifaceted in themselves (meaning the interconnectedness is only partial and under certain perspectives), each of them seem to build on a shared paradigm of behavioral science.

To begin with, marketing and its sub-discipline of consumer behavior (MacInnis & Folkes 2010) builds on two primary schools thought: behavioral decision theory (BDT) and social cognition consumer research (Simonson et al. 2001). Of these, behavioral decision theory builds on the foundational research on judgment and decision-making (see Takemura 2014) which has evolved to often be termed behavioral economics. In essence, behavioral decision theory deals with the psychological underpinnings of decision-making. In this strain of thought, focus is put on the contextual effects such as risk or uncertainty on decision-making and when applied to consumer settings used to predict (unlike in the case of social cognition consumer research) consumer behavior. Moreover, while marketing and research on consumer behavior focus on the commercial context, the root of behavioral science is based on the study of psychology. Thus, to fully understand the mechanisms of consumer behavior in web personalization settings, it is key to utilize the lens of psychology to predict the manifesting behavior – especially considering that the focus of this dissertation is on consumer motivation. In this dissertation, the special branch of evolutionary psychology is used to build the foundation for the mental processes of users (see Saad 2017). Finally, also a key paradigm in IS research deals with the behavioral science of predicting human behavior that can be effectively operationalized through various information systems (Hevner et al. 2004). To sum, each of these fields seem to be build (in their respective parts) on the same general approach and area of interest – however, applying the approach in field-specific ways.

What then is the role of each field to address the research problem of this dissertation? In simplified terms, marketing offers the foundation in the form of the research problem, whereas IS research provides the operationalization context and psychology the tools to investigate and reflect user effects in-depth.

What then makes this work that of most essentially marketing and not one in psychology or IS research? This is a marketing study primarily because it seeks to solve the research priority set by the Marketing Science Institute of understanding when personalization matters (MSI 2018). However, in practical terms, it is difficult to draw the line where marketing ends and IS research or psychology begins. However, some distinctions can be made. Paraphrasing the definition of marketing by the American Marketing Association (2017), marketing is about creating and communicating offerings that are valuable for the customer. Because the focal point of the dissertation is on the user-specific issue of when a communicated offering that is catered specifically to the user is most valued (including partial focus on commercial outcomes) compared to on how to operationalize the findings in algorithmic form through technology, the topic of the research is more in the realm of marketing than in IS research. Furthermore, it is the commercial context that distinguishes the approach as a marketing initiative over that of psychology.

3.2 Measurement

Capturing a piece of reality in research is always a demanding task, and the difficulty is most pronounced when establishing procedures for measurement. In this dissertation, the goal is to establish a valid relationship between ancestral behavioral mechanisms and contemporary consumer activities via a temporal angle. It does so by leveraging experimental settings to measure preference shifts. This calls for an emphasis on the contextual effects of measurement and the type of preferences in question.

A basic division in preference measurement in choice modeling instances identifies revealed and stated preference measures. Revealed preferences (see Samuelson 1948 for Revealed Preference Theory; see Chambers & Echenique 2016 for an updated source) build on the notion that choices that are made by consumers in real behavioral settings, which are often gauged through purchase data, reveal consumer preferences. The basic tenet is that, when gauging preferences, it is better to measure behavior than to ask for an opinion. The outcome of this is that descending preferences can be established (Takemura 2019). Traditionally, an assumption of rationality is made when investigating revealed preferences (Chambers & Echenique 2016; Takemura 2019).

The alternative is to study stated preferences. When measuring preferences through stated preference measures, measurement relates to the evaluations that are made by the participant (Ben-Akiva et al. 1994). Often, this involves gauging behavioral intentions or hypothetical choice situations. Stated preference measures have been essential in consumer research (cf. Green & Srinivasan 1978) and have been used more often than revealed preference measures have in marketing (Ben-Akiva et al. 1994).

Furthermore, given that preferences are an overall evaluation of a choice (Hausmann 2011), measuring preferences is an estimation of that value as inferred either by the researcher/algorithm (revealed preference) or the participant (stated preference). In either case, trade-offs are experienced. In some instances, it may be possible to combine analyses of revealed and stated preferences (see Ben-Akiva et al. 1994; Morvinski, Saccardo, & Amir 2017).

These trade-offs call for attention to the contextual effects of stated preferences. For example, how WTP tasks (a common way of eliciting preferences) are presented affects the result (Wertenbroch & Skiera 2002). Furthermore, potential stress (cf. Maier & Wilken 2014) and the subjects' knowledge that they are participating in a research study in a laboratory experiment setting may lead to skewed results (Breidert, Hahsler, & Reutterer 2006).

However, stated preference measures offer a quick and robust measure of what users value. This dissertation adopts two primary measures for stated preference, which are discussed below in more detail. For the practitioner operationalizing the suggested approach, revealed preferences are preferred as the process for motive elicitation is automated and can be inferred via behavioral measures at ease.

3.2.1 Chosen measure 1: Willingness-to-pay

WTP, which is a popular measure for gauging the evaluation of user value in a choice setting (see Breidert, Hahsler, & Reutterer 2006; Dost & Wilken 2012; Miller et al. 2011; Le Gall-Ely 2009 for reviews), is the maximum price at which a consumer would be ready to buy the designated product or service (Le Gall-Ely 2009). This maximum can vary due to contextual effects (cf. Valle et al. 2017)

In consumer research settings that focus more on the psychological and contextual effects of preferences, WTP is often operationalized as a quick and easy proxy measure to gauge the effects of focal relationships (e.g., see Huang, Ackerman, & Sedlovskaya 2017; Maier et al. 2012; Maier & Wilken 2014). For the study of psychological effects, WTP offers a slightly more business-relevant measure compared to other preference measures, such as attitude toward the product, which perhaps makes the research more accessible to practitioners.

Recommender systems have also been considered through WTP (Adomavicius et al. 2018; Scholz et al. 2015; Zhang & Bockstedt 2020) with primarily positive relationships found. While personalization is about preference matching, WTP verifies the business relevancy of web personalization. Despite the promising results outlined above, the effectiveness of web personalization as a business driver is still somewhat contested (e.g., Thirumalai & Sinha 2013). This dissertation does not test the effects of web personalization on WTP directly; however, it seeks to build a supportive case by solidifying the relationship between motivation-based preference matching and WTP.

In this dissertation, WTP is approached following the lines of consumer studies focusing on psychological effects and simulating the experimental setting of Huang, Ackerman, and Sedlovskaya (2017). In the hypothetical choice experiments that are adopted by this dissertation, the participants are asked to rate their WTP pay on an interval scale representing a percentage of the original retail price on a product presented through a fictional e-commerce product site. Such an interval scale is expected to both reduce variance, which is typical of WTP studies, and mitigate outlier effects (Rucker & Galinsky 2008).

3.2.2 Chosen measure 2: Attitude toward the product

It could be argued that attitudinal preference measures have been the core of marketing research for decades (Argyriou & Melewar 2011). As a basic division, there are two types of attitudes: those toward physical objects or products and those toward behavior (Ajzen & Fishbein 2005). In this dissertation, the focus is attitudes toward products (i.e., an acquired predisposition toward a product and the expected value enabled by the product). However, attitudes are complex and consist of affective, behavioral, and cognitive aspects (Ostrom 1969). Understanding a user's attitude toward the product can be used to capture both hedonic and utilitarian value (Batra & Ahtola 1991; Spangenberg, Voss, & Crowley 1997). Consequently, the concept of attitude toward the product is close to that of preference. It could even be said that preference in its attitudinal form can be measured

via attitudinal scales, which is the second main measure employed by this dissertation. It is operationalized as an index value consisting of items of general attitudes toward the product and measured by a seven-point Likert scale (cf. Griskevicius et al. 2009).

The first two main measures often complement each other in research. The relationship (or at least the combined measurement) has been investigated in multiple contexts and from various angles (see e.g., Hultman et al. 2015; Luzar & Cosse 1998). While not a given, it is likely that there is often an attitudinal basis toward WTP. Thus, these two constructs offer synergies for measuring preference shifts in a business-relevant way.

3.2.3 Chosen measure 3: Chronic and situational fundamental motivation

Fundamental motivation manifests through two modalities: situational and chronic motivation. Chronic motivation refers to the trait-like motivation of individuals, which reveals their differences in motivation (Neel et al. 2016). Thus, measuring chronic motivations is comparable to personality measurement, such as through the Big Five personality dimensions. Moreover, fundamental motives shape decision-making and preferences (Griskevicius & Kenrick 2013), and they seem to be facilitated by distinct emotions (cf. Beall & Tracy 2017). This dissertation adopts Neel et al.'s (2016) Fundamental Social Motives Inventory, which aptly captures behavioral tendencies that are linked with motivational dimensions. Importantly, chronic fundamental motivation may exceed the Big Five model in predicting behavioral tendencies (cf. Neel et al. 2016).

While the Fundamental Social Motives Inventory is primarily a scale for chronic fundamental motivation, it could likely be applied to situational motivational effects as well. However, measuring situational fundamental motivation has usually rested on more relaxed and less-established simple item measures (see e.g., Griskevicius et al. 2009; Li et al. 2012; Sundie et al. 2011). This has been partly due to the lack of an established measure but also perhaps due to the practicality of having short proxy measures in experimental settings. Consequently, this dissertation also applies the simplified two-item measure of situationally active mate acquisition and self-protection that is employed by Griskevicius et al. (2009).

3.2.4 A general approach to measurement settings

The studies in this dissertation employ simulated purchase cases and experimental surveys. Thus, the experimental nature comes from the simulated purchase setting instead of a control or comparison group (see the exception below for attitudinal preference measure) because establishing the effects of chronic motivation on preferences and manipulation (and thus control groups) is not conducive to the study setting. However, experimental manipulations have been used to investigate situational effects.

Utilizing experiments provides precision in measurement, but the artificial nature of the research setting may lead to a lack of realism (Dahlstrom, Nygaard,

& Crosno 2008; Davis et al. 2013). The main research setting in this dissertation relies on hypothetical purchase case simulations. While the type of simulation somewhat differs from what is traditionally considered a simulation experiment in marketing, it is plausible that some realism can be attained through the chosen setting (cf. Dahlstrom, Nygaard, & Crosno 2008). Moreover, a similar approach did produce valuable and robust results in a previous study (cf. Huang, Ackerman, & Sedlovskaya 2017).

3.3 Data and analytical methods

This section summarizes the datasets and applied analytical methods in each of the articles listed in this dissertation. Because the goal was to further establish the foundation for motivation-based temporal dynamics in web personalization as a complementary approach, various methodologies were utilized. These included a systematic review and conceptual and experimental methodologies, which were all chosen to cater to the idiosyncratic needs of each original article while also offering triangulation (cf. Downward & Mearman 2007).

3.3.1 Article 1: Bibliometric data on web personalization research (2005–2015)

A systematic literature review was conducted on web personalization literature published in top-tier marketing and IS journals between 2005 and 2015 (May) to establish the state of the art in the field and avenues for future research.

The dataset was firstly formed through journal selection, where journal ranking was used as a determinant following the work of Adolphs and Winkelman (2010). The top 20 journals in marketing and IS, as ranked by the *Academic Journal Guide* (Chartered Association of Business Schools, 2015) were chosen as the pool for further investigation.

The search strategy was based on the following keywords: web personali*/customi*, website personali*/customi*, online personali*/customi*, e-commerce personali*/customi*, and electronic commerce personali*/customi*. While the original focus was on web personalization, customization literature was included because these concepts are sometimes used interchangeably (Sunikka & Bragge 2012). Furthermore, both the z- and s-forms of personalization and customization were included because both were used extensively in the target articles. The search covered the abstract, title, and keywords and initially resulted in 504 (107 marketing, 397 IS) articles without duplicates.

In the filtering stage, the approach by Keränen, Salminen, and Piirainen (2012) was adopted and applied to the context of this research. This included a stage-by-stage filtering process where only articles that 1) were published between 2005–2015 (May), 2) covered web personalization in a business-related context,

and 3) significantly contributed to the web personalization discussion were included. In total, 91 articles (18 marketing and 73 IS) were identified for in-depth analysis.

Content analysis, which is a form of systematic observational evaluation of actual and symbolic content (Hall & Valentin 2005), was used. The analysis consisted of building composites through inductive content analysis (partly led by pre-categorization) and deductive theory-driven analysis of predetermined themes based on a theoretical foundation (cf. Braun & Clarke 2006). Despite wanting to avoid predetermination, which is problematic in literature reviews (cf. Cooper 2010), the general categorization of the themes to user-centric aspects, implementation issues, and theoretical foundations by Adolphs and Winkelman (2010) was adopted. Moreover, out of the ten themes investigated, four theoretical considerations were predetermined through a pre-analysis of the web personalization literature.

The systematic literature review approach was selected because it is replicable (cf. Fink 2019). Moreover, the systematic approach, while complemented with some predetermination for practical reasons here, offers a structure that is often lacking in the field of IS (Okoli & Schabram 2010).

3.3.2 Article 2: Experimental and qualitative data for validation of the conceptual framework

A mixed-methods approach was selected to validate propositions and the conceptual framework on motivation-based temporal dynamics in web personalization. To begin, a set of six propositions were developed to establish the foundational assumptions for understanding the effects of a fundamental motivation-based approach to web personalization. Next, to help validate the propositions, an experiment to test propositions 1 and 2 was created. In the experiment, a 1 (user type: male) x 2 (motivation: mate acquisition and self-protection) between-subjects design, which was operationalized as a simulated purchase case, was used. The participants saw one product page featuring a rainbow-colored T-shirt on a mock-up of a fictional e-commerce site and were then asked to rate their attitude toward the product. In addition to the product information, a banner advertisement for either a dating company or a security company was shown. These were designed to prime the participants with either a mate acquisition or a self-protection motivation. The ads' ability to prime either mate acquisition or self-protection in subsequent groups was established via a pre-test (N = 136) with participants from Amazon's Mechanical Turk (MTurk). The motivational effect was measured with a two-item measure, which was adopted from Griskevicius et al. (2009), and turned into factor scores. The pre-test's main method of analysis was the ANOVA.

In the main experiment, after manipulation checks, the results of 138 participants were included in the analysis. As discussed previously, the participants were asked to rate their attitude toward the product on three adjective pairing items (cf. Batra & Ahtola 1991), which were then turned into factor scores. The main method of analysis was an independent sample t-test, which is a common

methodology for gauging the differences in means (attitudinal preference) of two groups (see Lowry 2014). As in the pre-test, the participants were recruited via MTurk for monetary compensation. MTurk was selected because it is a fast and easy source of participants who are attentive as research subjects (Hauser & Schwarz 2016).

The conceptual model, which was based on the propositions, was then validated through feeding back findings, which is a qualitative method in which there is a two-way interaction between the researcher and expert practitioners (see Hollebeek et al. 2016; Thomas & Tymon 1982). Therefore, interview-based discussions regarding the conceptual framework were held with four expert practitioners in leading roles. The analysis of these conversations led to a critical examination of the strengths and weaknesses of the proposed conceptual framework.

Triangulation was achieved by combining experimental data on the propositions and qualitative data on the subsequent conceptual framework to strengthen the approach's validity (cf. Homburg et al. 2009). The experimental setting maximized the precision but lacked in the dimensions of realism and generalizability of the results (McGrath 1982). However, by including an element of simulation in the procedure, some aspects of realism may have been included. Measuring the somewhat unconscious effects of priming would be difficult to gauge in ways other than experiments, which have been extensively used (see e.g., Dijksterhuis et al. 2005). Moreover, assessing the practicality of the proposed conceptual framework is intuitively easiest and fastest when having a two-way interaction with expert practitioners, and feedback (see Hollebeek et al. 2016; Thomas & Tymon 1982) offers such an avenue. Although not exceptionally specific as an approach, feedback enables fast iteration.

3.3.3 Article 3: Experimental survey data on the effects of fundamental motivation on willingness-to-pay

A simulated purchase case on a fictional e-commerce site was used following the work of Huang, Ackerman, and Sedlovskaya (2017) to gauge the effects of fundamental motivation on WTP from various perspectives. The goals were to investigate the effects of chronic mate acquisition and self-protection motivation (see Neel et al. 2016) on WTP directly and focus on the interaction effects of fundamental motivation on attitude toward the product and WTP (cf. Schaller et al. 2017). In the experimental setting, the participants were divided into two groups. Both groups saw the same fictional product site selling a cabin-sized suitcase, but each group saw the product marketed as either "classic" or "new arrival." Next, the participants rated their WTP for the suitcase on a 10-point interval scale from 50–150% of the original retail price (cf. Huang, Ackerman, & Sedlovskaya 2017) as well as their attitude toward the product on a 5-item scale (cf. Batra & Ahtola 1991). The results were turned into factor scores for analysis. Finally, the chronic fundamental motivations for both mate acquisition and self-protection were measured via an adapted scale from Neel et al. (2016) that featured four items per focal motive. These were also turned into factors scores to account for any

potential overlap. Again, the participants (N = 210) were recruited via MTurk for monetary compensation. Nine participants were excluded for taking more than two standard deviations to complete the experimental procedure. As a result, the results from 201 participants were analyzed.

During the analysis phase of the results, a general linear regression model was employed to investigate the direct relationship between the target chronic motivations and WTP for the product in the two conditions. The following regression equation was formed:

$$\mathbf{Y_{1,2}(WTP) = \beta 0 + \beta 1(MA) + \beta 2(SP) + \varepsilon.}$$

In the regression equation, Y1,2 refers to WTP for the new arrival and classic products, respectively. MA and SP refer to the mate acquisition and self-protection motivations, respectively.

To investigate the moderating effects of chronic fundamental motivations on the relationship between attitude toward the product and WTP, linear moderation analysis was carried out. To study the interaction effects, the following moderation equation was formed:

$$\mathbf{Y(WTP) = b0 + b1(Attitude) + b2(MA,SP) + b3(Attitude \times MA,SP) + \varepsilon.}$$

In the moderation equation, MA,SP refers to the conditions where either mate acquisition or self-protection motives were considered.

By utilizing a simulated purchase case, a combination of precision and relative realism could be achieved (cf. McGrath 1982). However, because the goal was to focus on chronic manifestations of motivation, the manipulation of motives, which creates a more complete experimental setting, was not feasible. In an analysis, employing linear regression offers a commonly used and simple way to gauge the relationships between independent and dependent variables, provided that the conditions for linear regression are met. These conditions include the linear relationship between Y (dependent variable) to X (independent variable) (cf. Seber & Lee 2012). Moreover, moderation analysis is the standard approach to eliciting when or under which conditions the focal effect exists and at what magnitude (Hayes & Rockwood 2017).

4 SUMMARY OF KEY FINDINGS

This chapter summarizes the key findings of the original articles that are included in this dissertation.

4.1 Article 1: "Web personalization: The state of the art and future avenues for research and practice"

This article provides an extensive review of the state of the art of web personalization from the literature published in top marketing and IS journals based on the *Academic Journal Guide* (2015). Its goals were to offer synthesis for the somewhat fragmented field of research and identify research gaps for future studies. The systematic filtering procedure described in Chapter 3.3.1 provided 91 articles for in-depth analysis. The results can be divided into three main sections: basic distribution information, analysis and synthesis of ten themes identified via the review, and a proposed novel conceptualization of a general approach to web personalization.

The distribution of research was somewhat asymmetrical on multiple dimensions. The division of the 91 articles (18 marketing, 73 IS) suggests the domination of IS, although personalization has been proposed as a key driver of marketing success (Kalaignanam, Kushwaha, & Varadarajan 2008). Moreover, there is a considerable division in the number of articles in different journals. For example, *Expert Systems with Applications* accounted for one-third of the dataset, whereas the top six journals in terms of volume, almost three-quarters of the dataset was covered. However, the production of articles was relatively stable and high throughout the time covered in the study, which suggests that web personalization has and continues to be an important topic.

Based on the pre-determined categorization of user-centric aspects, implementation, and theoretical foundations adopted from Adolphs and Winkelman (2010), six composite themes were identified from the dataset for the categories of user-centric aspects and implementation. Additionally, four themes were pre-

determined for theoretical foundations based on the preliminary work of this study. The themes identified for user-centric aspects included (i) privacy and trust, (ii) satisfaction and loyalty, and (iii) contextual factors. Considering the scope of this dissertation, contextual factors were of most interest because they are becoming more topical, and more advanced approaches are being considered. These approaches touch on the sub-themes of cultural effects, timing, and personal disposition, as suggested by the results. Timing refers to both timing along the lifecycle stages as well as temporal dynamics (cf. Lee, Park, & Park 2009). Moreover, the concept of personal disposition covers studies referring to the personality, motivation, or attitudes of the user. Combined, one essential finding is that web personalization should consider timing or temporal dynamics by incorporating more psychologically driven approaches, including user motivation and emotions which could be operationalized via affective computing. Overall, 54 of the 91 articles gave input on user-centric aspects.

Next, the category of implementation included three themes: (iv) design factors, (v) recommender system implementation, and (vi) data collection and processing. Again, while not dominant in this case, one finding was that user motivation should be considered in design (cf. Wang, Minor, & Li 2011) and data collection. Overall, 47 of the 91 articles gave input on aspects of implementation.

The final four themes on theoretical foundations were (vii) research methodology, (viii) the roles of marketing and IS literature in web personalization, (ix) web personalization vs. customization, and (x) web personalization's effectiveness for business results. The reliance on experiments in web personalization research was considered well-founded; however, the longitudinal aspect is missing, and qualitative methods were perhaps too seldomly applied. Regarding the division between marketing and IS studies, future marketing scholars could contribute to web personalization via the consumer perspective. Thus, a fruitful division wherein marketing scholars provide actionable models on consumer behavior, which would then be used by IS scholars to advance their algorithms, was suggested based on the analysis. Similarly, clarity on the use of the term "web personalization" over customization was recommended. Finally, a similar issue with clarity was found regarding the effectiveness of web personalization on driving business results; the effectiveness of web personalization for business success is a contested issue (cf. Cao & Li 2007; cf. Thirumalai & Sinha 2013). Here, it was proposed that greater emphasis on the business-relevant metrics should be adopted. Overall, 18 of the 91 articles gave input on these theoretical foundations.

Finally, as a potential future direction for classifying web personalization, the concept of *interpolated web personalization* was proposed. Traditionally, web personalization has relied on explicit and/or implicit ratings, which are then extrapolated from historical usage patterns. The idea behind interpolated approaches resembles Benlian's (2015) approach, where cues are used to direct the preference formation of the user. Thus, in interpolated approaches, chosen elements would be inserted into the design phase to prime for results, such as motivational effects. This approach could be utilized for active learning as well.

4.2 Article 2: "About time: A motivation-based complementary framework for temporal dynamics in web personalization"

The second article sought to establish the foundation for motivation-based temporal dynamics in web personalization by combining the features of fundamental motivation, including both situational and chronic effects (see Griskevicius & Kenrick 2013; Neel et al. 2016), with the process of temporally dynamic web personalization in two ways: by outlining six propositions of motivation-based temporal dynamics and proposing a complementary framework for temporal dynamics in web personalization.

The six propositions for motivation-based temporal dynamics in web personalization were formed through theory. Here, the literature on the FMF (Griskevicius & Kenrick 2013; Kenrick et al. 2010a, 2010b; Neel et al. 2016) was a central source, but the theoretical basis for the propositions went beyond the tenets of fundamental motives and was informed, for example, by the priming literature (e.g., Dijksterhuis et al. 2005). The propositions themselves suggest core elements of operationalizing fundamental motives for temporal dynamics in web personalization.

To offer validation for the propositions, an experiment was conducted to support Proposition 1 ("*Preference match will be greater when personalization results in matches with the drivers of the currently active fundamental motive")* and Proposition 2 ("*A given fundamental motive can be activated in the web environment through external cues, such as . . . visual cues e.g., website background picture*"). Through the experiment, the selected propositions were at least partly supported because the mate acquisition condition (M = 2.60, SD = 1.15) drove the preference for the focal product, which was designed to stand out compared to the self-protection condition (M = 2.10, SD = 1.29) as hypothesized [t (134) = 2.33, p= 0.02]. This result supports Proposition 1 because product preference increased in the motivationally congruent condition compared to the motivationally incongruent condition. However, the case with Proposition 2 was somewhat more complicated. In the pre-test, the priming capacity of the utilized banner ads was supported for both the mate acquisition condition ([F(1,67) = 6.23, $p < 0.05$]) and the self-protection condition [F(1,67) = 18.42, $p < 0.01$]. In the main experiment, when controlling this via a manipulation check, the results could not be replicated for motivation activation. This may have been due to the experiment's setting. Thus, Proposition 2 was supported but with increased uncertainty.

In the next step, based partly on the propositions, a complementary framework for motivation-based temporal dynamics in web personalization targeted for product recommendation and promotion was proposed. The framework identified both the user and the focal firm as active participants in the process. Moreover, both short- and long-term motivational temporal effects were considered, and the framework offered avenues for effective timing, active learning, and persuasive strategies.

The framework was validated through feedback. For this, interviews with four expert practitioners revealed that the overall evaluations of the framework were positive. The option to apply the framework to either identifying user states or shifting them was highlighted as a strength. Furthermore, while the framework was positively evaluated, there were divisions between the practitioners on whether the framework would be better applied in product recommendation or promotion. Finally, data and the potential lack thereof was recognized as a possible obstacle when operationalizing the framework. In future research, the framework could be operationalized via affective computing methods.

4.3 Article 3: "The role of fundamental motivations in willingness-to-pay online"

The third article deepened the investigation into the effects of fundamental motivation on business-relevant preference measures by focusing on WTP in online channels. Here, the focus was on how chronic mate acquisition and self-protection motives offer diverging yet potentially predictable effects on WTP to facilitate targeting. The study sought to understand both the direct effects of chronic fundamental motivation on WTP in different conditions but also to investigate how fundamental motivation may moderate the relationship between WTP and attitude toward the product.

An experiment was employed to gauge both focal measures. First, emphasis was placed on how the level of chronic mate acquisition and self-protection motives predict WTP for new arrivals and classic products. Here, mate acquisition predicted a significantly higher WTP for the new arrival product (ß = .277, $p < 0.01$), as hypothesized, but also for the classic product type (ß = .306, $p = 0.002$), which contrasted the hypothesis. By contrast, self-protection did not predict a higher WTP for new arrival products but also did not have a lowered WTP (ß = .136, ns), as hypothesized. It did correlate with a higher WTP in the case of the classic product type, as hypothesized (ß = .215, $p = 0.026$). Because the description of the classic product carries connotations of being tried and tested (low risk), it also contains the element of prestige, which may have led to the result being against the original hypothesis in the case of the classic product type. Overall, the results suggest that chronic mate acquisition and self-protection motives correlate with a higher WTP when contextually aligned, and they do so in predictable ways.

Moreover, the fundamental motivation may have a moderating effect on the much-studied relationship between WTP and attitude toward the product (e.g., Hultman et al. 2015). The positive correlation between attitude toward the product and WTP was also established in this study ($F(1,199) = 36.55$, $p < 0.001$). However, the focus was on whether mate acquisition could operate as a catalyst for this relationship, which would boost WTP in high attitude toward the product

conditions and whether self-protection motivation would inhibit this relationship. Indeed, the results suggest that mate acquisition can act as such a booster; a regression model ($F(3,195) = 27.16$, $p < 0.001$) found a significant moderating effect on the relationship between attitude and WTP ($ß = 0.243$, $p < 0.001$). Conversely, self-protection motivation ($ß = -.145$, ns) trended toward an inhibiting effect but remained in the non-significant region and thus had no effect. In summary, fundamental motives may have interesting and rarely studied effects (see Schaller et al. 2017 for interaction effects), but contextual effects (the way the product is positioned and marketed) are likely to impact the formation of these effects.

5 DISCUSSION

This chapter begins with the theoretical contributions and managerial implications of the dissertation. Next, the limitations of the research are discussed alongside opportunities for future research. The discussion summarizes the conclusions of the original articles and focuses on the entirety of the dissertation, including three major focus areas: (i) the state of the art of contextualization in web personalization and its potential future directions (RQ1), (ii) the case for motivation-based temporal dynamics (RQ2), and (iii) the effects of chronic fundamental motives on business-relevant metrics in online channels (RQ3).

5.1 Theoretical contributions

The contributions of this dissertation include those of each original article included (see Table 6) and what they offer in combination. As a result, this dissertation contributes to the literature in three major ways, including article-specific extensions.

Through Article 1, an extended and updated systematic review of the topical web personalization literature is provided. Although previous reviews of web personalization have been fruitful (Montgomery & Smith 2009; Sunikka & Bragge 2012; Tuzhilin 2009; Vesanen & Raulas, 2006), in the fast-moving space of web personalization, continuous updates are required to ensure that the research is topical. The review in the article shows active output in the field.

By analyzing ten themes, including user-specific aspects, implementation issues, and theoretical foundations, a balanced combination of general and theme-specific insights could be drawn. This is rare because reviews are often either quite general (cf. Vesanen & Raulas 2006) or extremely specific (cf. Bavaresco et al. 2020). In addition, the review in Article 1 identifies advanced contextualization, including special attention to timing and integrating more refined psychological user modeling of web personalization as the primary avenue for future research and establishing a firmer base of evidence for positive business effects

of web personalization as a secondary avenue. Together, these two research targets move away from *personalization done* toward *personalization done well* (cf. Fan & Poole 2006). Recent studies (conducted after the timeframe of Article 1) suggest that enhanced timing through a better understanding of psychological user elements (Ho & Lim 2018; Huang & Zhou 2018; Matz et al. 2019; Tyrväinen, Karjaluoto, & Saarijärvi 2020) and the business relevancy of personalization (Chung, Wedel, & Rust 2016; Li 2016) are continue to be topical or even trending upwards. Furthermore, the underlying approach to matching shifting preferences with real-time approaches seems to increasingly rely on psychological user modeling (Ding, Li, & Chatterjee 2015; Hauser, Liberali, & Urban 2014).

It seems that the concept of web personalization as matching with and adapting to user preferences may be complemented by nudging user preferences to facilitate the active learning of preferences and potentially shifting them (cf. Ho & Lim 2018). Another contribution of Article 1 is the novel conceptualization of *interpolated web personalization*, which encompasses the process of actively influencing the user's context to benefit the focal firm. However, it is suggested that interpolated approaches should be complementary to traditional web personalization approaches. Affective computing could be utilized to operationalize the suggested approaches. Additionally, when taken to extremes, potential ethical considerations limit their practicability.

This dissertation also contributes to the literature on timing (Koren 2010; Ho, Bodoff, & Tam 2011) through advanced contextualization based on motivation. In Article 2, it does so primarily by building the case for motivation-based temporal dynamics in web personalization by proposing future research as well as a complementary motivation-based conceptual framework for temporal dynamics in product recommendation and promotion in web personalization. While the sum of the framework's parts and the research propositions are greater in terms of its contribution to the literature, each part advances the field in important ways. For example, highlighting the relationship between motivation and preferences and the theoretical basis for motivation-based web personalization may become clearer; while motivation does not dictate preferences completely, it is likely that a web personalization approach that considers user motivation may enhance its accuracy. The proposed framework also offers a rare approach by combining both short- and long-term timing within a single framework. Importantly, by basing the framework on motivation, the interplay of the two temporal user models may offer avenues for a more accurate prediction of the currently active user preference. Compared to, for example, the concept of personality, which is a stable construct (see e.g., Tkalcic & Chen, 2015 for a personality-based approach to web personalization), motivation provides a more dynamic basis for personalization by including both individual differences (Neel et al. 2016) and situationally activated preference shifts (Kenrick et al. 2010a). Moreover, motivation includes goal attainment (the what), which is likely to have more immediate effects than the alignment of personality (the how). The intention of the user is the focal point of web personalization (Ding, Li, & Chatterjee 2015).

Furthermore, this perhaps the first framework to offer an avenue to seamlessly study both internal and external factors within a single framework in web personalization. In the future, the framework could be expanded to cover cues beyond the online environment since topical events such as COVID-19 news reporting could affect consumer motivation and thus preferences (see Galoni, Carpenter & Rao 2020). Furthermore, what has not yet been considered in the framework is the extent to which an uptick in promotional messages catering to a motive could also backfire. For example, while a match between active motive and promotional content is expected to be generally value creating for the user, an increase in promotional content catering to mate acquisition or status seeking motives could also make a person feel uncomfortable if these are detrimental to the person's self-image and consciously noted by the user.

While more empirical validation is required, Article 2 also provides initial validation for two of the research propositions as well as the proposed framework. This is important not only for the primary goal of building the case for motivation-based temporal dynamics in web personalization but also to showcase that the FMF (Griskevicius & Kenrick 2013; Kenrick et al. 2010a; Neel et al. 2016) can be successfully applied to the context of consumer behavior online and web personalization more precisely, although it should only be targeted as a complementary approach and not tested through a personalization algorithm. Moreover, while the focus of this dissertation is on the timing of web personalization, the results suggest that motivation-based approaches may be feasible and able to advance other areas of personalization approaches, such as active learning (cf. Elahi et al. 2013) or persuasive strategies (cf. Kaptein et al. 2015). Most essentially, the results suggest that motivation may provide important avenues for operationalizing more refined psychological user models in web personalization.

Finally, this dissertation aims to highlight the effects of chronic fundamental motives on business-relevant metrics in online channels. This is an important extension to previous studies on applying fundamental motives but also a key move toward motivation-based temporal dynamics. Showing concrete business results is or should be a focal topic in web personalization, as outlined in Article 1. To cater to this need and probe whether fundamental motives can be used to predict business-relevant metrics, Article 3 focuses on WTP and the roles of chosen fundamental motives on them either directly or through interaction effects.

Mate acquisition and self-protection motives are the most studied motives of the FMF (see Durante & Griskevicius 2016). Article 3 extends the empirical base by being the first to focus on the chronic effects of these motives in a consumer setting. This article is also one of the first to consider the interaction effects of motives on other major marketing concepts, such as the relationship between attitude toward the product and WTP (cf. Schaller et al. 2017). These are important contributions in that they suggest that fundamental motives can be operationalized to study and achieve business-relevant results via an enhanced understanding of them. For motivation-based temporal dynamics in web personalization, these results suggest that fundamental motives could potentially be operationalized to effectively predict enhanced business results through motivation-based

personalization. However, these effects should be studied further in future research.

Combining and considering the results of this dissertation as a whole shows that it contributes by providing both theoretical insights and empirical validation on advances in understanding motivation; thus, it builds the case for motivation-based approaches in web personalization. The building evidence suggests that (fundamental) motivation is not only theoretically well-suited for applications in web personalization processes but that early empirical signs suggest this could be effective if such an approach can be operationalized in an algorithmic form in practice. Concurrently, this dissertation also extends the empirical base of applying the FMF online to increasingly business-relevant settings while focusing on chronic effects, which is a rarity. These results position this work at the intersection of marketing, psychology, and IS research.

TABLE 6 A summary of theoretical contributions and managerial implications.

Article	Theoretical contributions	Managerial implications
1	• Provides a timely overview of the advancement and state of the art of web personalization • Identifies web personalization research output as active but stable. • Analyses ten themes: six themes on user-specific aspects and implementation based on and identified via the dataset and four pre-determined themes on theoretical foundations that are reflected upon in the dataset • Identifies both general and theme-specific avenues for future research while highlighting advanced contextualization focusing on timing and integrating psychological elements and evidence for business results based on web personalization as primary and secondary general areas of interest • Proposes a novel conceptualization of interpolated web personalization	• Suggests a case for business-relevant results based on web personalization to be built that require more evidence. • Provides opportunities to focus on the development of web personalization technologies and techniques toward issues relating to both timing and advanced psychological profiling • Outlines the opportunity to couple active learning and persuasive approaches with web personalization based on interpolated approaches

2	• Proposes a complementary motivation-based conceptual framework for temporal dynamics in product recommendation and promotion in web personalization • Suggests six research propositions for motivation-based temporal dynamics in web personalization for future research • Offers initial validation data for propositions 1 and 2 based on an experiment and for the conceptual framework by feedback • Outlines opportunities for motivation-based approaches, including active learning and persuasive strategies, as well as opportunities for refined psychological user models more generally	• Outlines a general approach for complementing web personalization procedures with motivation-based temporal dynamics to enhance preference matching through better timing • Illustrates avenues for both adapting to and shaping preferences via a motivation-aware approach • Highlights the importance of combining both short- and long-term motivation-based user profiles
3	• Provides rare experimental data on chronic motivational effects in business-relevant consumer contexts • Expands the scope of studied effects of fundamental motivation to include interaction effects • Suggests a novel angle to consider the relationship between attitude toward the product and WTP through the chronic motivation perspective • Provides additional experimental evidence of business relevancy of fundamental motives and especially the focal motives of mate acquisition and self-protection	• Highlights the importance of psychological user modeling based on chronic motivation to drive business results in online channels • Outlines opportunities for and the benefits of motivation awareness when positioning products and their marketing beyond the dimension of positive vs. negative valence

5.2 Managerial implications

As with the theoretical contributions, the managerial implications of this dissertation include those made in each of the original articles and those that stem from the synergy of those articles as a whole. Table 6 summarizes the article-specific managerial implications.

5.2.1 The implications of Article 1

The managerial implications of Article 1 are vast because the article discusses multiple strands of web personalization research (please consult the original article for theme-specific managerial implications). However, there are three important implications for managers.

1. The suggestion to make advanced contextualization a focus in research reflects opportunities for managers to place their development efforts on enhanced timing and the psychological profiling of users. The reviewed articles suggests that these are key areas for making web personalization more effective.
2. The effectiveness of web personalization is indeed crucial for managers. Article 1 suggests that the empirical evidence is leaning toward web personalization being effective in creating a positive business impact, but the case is not completely settled. Hence, managers should take the position of agnosticism toward web personalization by investigating the possibilities in their firm's context but letting the results decide whether web personalization is worth the investment. As stated earlier, this is a vital issue; a recent study by the market research firm Gartner (see Blum & Omale 2019) predicts that 80% of marketers who have invested in personalization will abandon the practice due to difficulty in acquiring the expected results. However, this dissertation suggests that enhancing timing through refined psychological profiling will allow web personalization to be successful.
3. Article 1 also proposes a novel conceptualization of interpolated web personalization approaches that are directed toward facilitating active learning and persuasive strategies. The benefit of the interpolated approaches for managers is that they expand the toolset of web personalization from merely adapting to preferences to actively learning and shaping those preferences. However, interpolated approaches have two drawbacks: they need to be ethically implemented, and even then, they are no more than a complementary approach.

5.2.2 Implications of Article 2

This dissertation not only pinpoints the need for enhanced timing but also delivers a general approach to complementing web personalization procedures with motivation-based temporal dynamics. For managers, the proposed framework in Article 2 provides a process-oriented model for developing their web personalization procedures for product recommendation and promotion. Both adapting to and shaping preferences are motivation-based approaches that were chosen to complement the primary personalization approach. Furthermore, through the proposed framework, the importance of combining an understanding of both short- and long-term motivation-based user profiles is highlighted. For managers, this means that, while short-term timing has especially been stagnant (cf. Ding, Li, & Chatterjee 2015), an understanding of the long-term profile may support

establishing accurate recommendations. Moreover, the framework is validated through feedback from other expert practitioners, which should apply to managerial settings. However, further empirical testing is suggested.

5.2.3 Implications of Article 3

Finally, this dissertation also provides empirical data on the business-relevant effects of using a motivation-based approach. Article 3 shows that an understanding of fundamental motivation may be used to predict WTP through direct and interaction effects. The results suggest that, when attempting to drive business results in online channels, it is beneficial for managers to consider the importance of understanding motion-based effects and to utilize psychological user modeling, including chronic motivation effects. This may enable positioning products and their marketing beyond traditional positive over negatively valenced messaging. Some instances may require promotional utilization of motivation-aware approaches, whereas other instances will benefit from understanding how to mitigate the negative effects of motivational drivers. Moreover, the results suggest avenues for targeting the most profitable psychographic customer segments.

When combined, the managerial implications of this dissertation comprise a set of groundwork tools for motivation-based temporal dynamics in web personalization. This research also provides an understanding of where to focus (development area), presents a map of how to move forward (framework), and offers possibilities in the form of early data (enticing empirical examples). However, to fully grasp and validate the benefits of motivation-based temporal dynamics in web personalization, practitioners need to move forward by reviewing these implications and implementing this approach in practice.

5.3 Limitations and future research opportunities

There are three major categories of limitations that require caution when evaluating the findings of this dissertation, including the range of applicability of the suggested motivation-based temporal dynamics in web personalization, the applicability of the chosen motivational framework, and the preliminary nature of empirical evidence that validates the approach.

The suggested approach for motivation-based temporal dynamics should be considered a complementary approach only. While motivation may indeed be a conceptual key to unlocking a refined understanding of preferences, there are (at minimum) two potential drawbacks. Practically, it may not be possible to gauge motivational effects with enough precision that the user's intent could be estimated with near-perfect effectiveness, especially in a range of different settings (cf. Ding, Li, & Chatterjee 2015). Furthermore, the user case is likely to be directed by more specific (functional) needs than can be accurately and effectively sourced

from a deeper understanding of motivation. Rather, motivation should be compared to such sources of complementary approaches as personality, which has proven valuable to successful web personalization (Tkalcic & Chen 2015; Matz et al. 2019). Compared to personality, motivation may be a much more valuable and dynamic tool, especially for timing in web personalization, but it is not the sole factor to consider.

The chosen motivational framework has multiple benefits yet considerable weaknesses as a platform for motivation-based temporal dynamics in web personalization. One weakness is that the FMF is rather fragmented from the perspective of web personalization. The framework provides excellent inferences for certain contexts and personalization, such as understanding price sensitivity, but with certain product categories, it may be unable to direct personalization in any meaningful way regarding which product categories will perform better over others. Similarly, it may be difficult to gauge through motivation whether a session is a buying session or an information search session, which will have considerable effects on timing and is related to the discussion above regarding the suggested approach being considered complementary. Another weakness of the motivational framework is that there are not yet such elaborate measurement tools which exist for measuring and estimating a user's personality, which produces practical problems in operationalization. The third issue stems from the novelty of the motivational framework; while evidence of its applications is building, as a motivational framework, it is not well established. This raises concerns for the reliability of the approach as well as risks due to potential blind spots.

Finally, the empirical evidence that this dissertation includes should be approached with caution. The experimental setting relied on a single product, which raises the question of whether the results apply across products. In addition, the experimental settings often did not have an intervention with a control group and were more like surveys within an experimental setting. In such a preference setting, there is always a risk that the participants' answers do not reflect their actual preference or behavior (see Murphy et al. 2005). Considering that the research settings were based on a hypothetical purchase case, these results should be replicated through field experiments to strengthen the validity and reliability of the empirical findings. Moreover, the articles included in the dissertation could have included more measures on validity such as sensitivity power analyses to better gauge the level of effect.

Both the limitations and the contributions of this dissertation provide enticing avenues for future research. Given that the goal of this dissertation was to build the foundations of motivation-based temporal dynamics in web personalization, an intuitive future research effort would be to use the suggested approach in an algorithm for a recommender agent or other personalization system and to test it in either field or laboratory conditions. Such empirical feedback is essential when establishing motivation-based temporal dynamics as a research strand. Furthermore, while there is a need for empirical testing of the entire suggested approach, there are also interesting avenues for research within the suggested approach.

For example, further investigation of the possibilities of interpolated approaches would break new ground. Another opportunity lies in the creation of features that can be used to capture and operationalize the current (short-term) and chronic (long-term) motivational disposition of the user. This requires work on both refining our understanding of the behavioral tendencies of the fundamental motives and development of tools to extract and analyze information on them. Furthermore, applying the lens of life history theory (Griskevicius et al. 2011; Hill & Kaplan 1999; Mittal & Griskevicius 2014; Zhao et al. 2019) could be fruitful. A third option would be to compare different psychological constructs regarding their feasibility to cater to enhanced timing through a better understanding of dynamic user preferences. As discussed previously, investigations on personality (Tkalcic & Chen 2015) and mood (Ho & Lim 2018) exist, but the constructs and their strengths and weaknesses have not been considered. Especially the interplay between the concepts of personality, mood, and motivation could open intriguing research opportunities. For example, is motivation the determining factor of *what* or the goal of a user and personality a measure of *how* a user seeks to attain that goal? If so, there could be considerable benefits of combining measures of motivation and personality to build an even more wholesome psychological profile of the user. Finally, while the primary target of this work focused on motivation-based temporal dynamics, motivation could potentially be effectively utilized to solve other perplexing issues, such as active learning or the kick-starting problem in web personalization. Expanding the use of motivation-based approaches in web personalization may include many other possibilities. In summary, the case for motivation-based temporal dynamics in web personalization has begun to build, and it offers many directions for future research. However, it is important to consider that even the longest journey begins with a single step.

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ORIGINAL PAPERS

I

WEB PERSONALIZATION: THE STATE OF THE ART AND FUTURE AVENUES FOR RESEARCH AND PRACTICE

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Web personalization: The state of the art and future avenues for research and practice

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ABSTRACT

Although web personalization has been examined by earlier literature reviews, an updated analysis of recent advances in the field is needed. The authors extend prior reviews of web personalization by discussing current areas of interest, research gaps and future directions. A literature review of the top 20 marketing and information systems journals published during the period of 2005–2015 (May) shows active research output and the domination of IS publications. The examined research addresses three categories: user-specific aspects, implementation, and theoretical foundations. We then analyze a total of ten themes: six on topics concerning user-specific aspects and implementation that stem from the dataset and four on theoretical foundations that are predetermined and reflected upon using the dataset. Both theme-specific and general future research suggestions are discussed. Advanced contextualization is suggested as the primary area suitable for future research and building evidence for attaining business goals as a secondary topic. Finally, we propose a conceptualization of interpolated web personalization to be tested as a potential complement to current (extrapolated) approaches.

Contents

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1. Introduction

The conditions are excellent for web personalization to prosper. Through the digitalization of everyday life, an increasing number of datapoints are becoming available, revealing ever more detailed aspects of consumer preferences. Recent technological advances enable procedures that create comprehensive, personalized experiences on the web using the insights gained from the collection of datapoints. Even the available computational power, which was deemed a potential threat to the advancement of web personalization (Montgomery and Smith, 2009), has not hampered the field. Consequently, web personalization has matured quickly, and the field is on the rise (Sunikka and Bragge, 2012).

The potential for impact from personalization is considerable. Personalization is generally assumed to be the most effective tool for achieving business success online (e.g., Cao and Li, 2007). Kalaignanam et al. (2008) consider personalization to be a major driver of marketing efficiency. However, the effectiveness of personalization is a contested issue, as results in both online (e.g., Shen and Dwayne Ball, 2009; Zhang, 2011) and offline (McCoy and Hargie, 2007) find little support for it. This disparity creates ambiguity around the field. As the field progresses, there are a host of important topics that currently lack clarity around where the field of web personalization stands and where it is headed.

Prior general literature reviews (Kabassi, 2010; Montgomery and Smith, 2009; Sunikka and Bragge, 2012; Tuzhilin, 2009; Vesanen and Raulas, 2006) have been instrumental in clarifying the state of the art and producing guidelines for future research. However, fast-paced changes in the field call for an updated review. Importantly, more specific review papers have surfaced recently focused on recommender systems (Lu et al., 2015) and personalization techniques (Gao et al., 2010). Although these specific reviews are valuable for these research streams, they are unable to take a more comprehensive view of the field of web personalization. Consequently, timely insights into the direction of the field are lacking. These include both specific topics such as current research interests as well as more general topics such as terminology, methodology, and the interplay of disciplines for contribution.

This paper contributes to the web personalization literature in two primary ways. First, we identify current research topics and streams that help to clarify how the field of web personalization has evolved in the past 10 years and where the field stands today. Second, we offer insights into the most notable research gaps identified in the literature and, on this basis, identify important future research directions. The outlined potential future directions will facilitate in generating a meaningful research agenda for the field. We distinguish and discuss ten themes for further research. Six of the themes addressing user-centric issues and implementation concern central topics arising from the literature review. The remaining four themes, focused on theoretical foundations, reflect upon the findings from the reviewed papers. Because the latest developments and future directions are emphasized, we focus on the top 20 marketing and information systems research (IS) journals, as they spearhead discussion in the field.

The paper next presents an overview of web personalization and its topical theoretical issues. Then, the methodology utilized in the review process is fully described. After this, results of the state-of-the-art review and the resulting ten major themes are presented and discussed. Theme-specific recommendations for future research are given. Then, conclusions are drawn from the results and the general future direction of the field is discussed. We also propose a conceptual division between extrapolated and interpolated web personalization. Finally, we consider the limitations of our approach.

2. Web personalization

Personalization is a process whereby products and services are tailored to match individual preferences utilizing consumer data (Montgomery and Smith, 2009; Tuzhilin, 2009). The process of personalization consists of learning customer preferences and synthesizing the gathered knowledge into offers, recommendations, and multiple versions of interaction touchpoints (Miceli et al., 2007; Vesanen, 2007). Consequently, the personalized outcome relies on estimates based on prior actions, i.e., extrapolation. In essence, personalization enables one-to-one marketing (Peppers and Rogers, 1993), assuming that the creation of idiosyncratic value in the process forms a competitive advantage for the focal company.

Personalization is considered to be an umbrella term for preference matching (Miceli et al., 2007; Sunikka and Bragge, 2008). Personalization is closely related to customization, which creates some inconsistencies around the use of the concepts (Arora et al., 2008; Fan and Poole, 2006; Sunikka and Bragge, 2012). There are clear overlaps within the terms, and they are sometimes used synonymously or nearly so (e.g., Miceli et al., 2007; Parra and Brusilovsky, 2015; Singh et al., 2008; Zhang and Wedel, 2009). Most researchers distinguish personalization as a company-initiated, automatic process, whereas customization is user initiated (Fan and Poole, 2006; Ho and Bodoff, 2014; Montgomery and Smith, 2009; Sunikka and Bragge, 2012).

Web personalization is a sub-topic of personalization research (Tuzhilin, 2009). The taxonomy between the concepts is not very clear, as personalization is commonly considered to be Internet related (Sunikka and Bragge, 2012), automated, and mostly concerning digital channels (e.g., Fan et al., 2006). Hence, personalization typically refers to web personalization, leading to the often interchangeable use of the terms. Traditionally, web personalization has been considered to be related to the personalization of websites (Eirinaki and Vazirgiannis, 2003) or e-commerce systems (Adolphs and Winkelmann, 2010). While no clear-cut definition exists, web personalization routinely covers personalization processes in the web environment, including the personalization of content, structure and other interaction touchpoints. Although Tuzhilin (2009) differentiates web personalization research from recommender systems research and user profiling, web personalization is considered to cover these streams (e.g., Brusilovsky et al., 2007; Chau et al., 2013; Johar et al., 2014; Shinde and Kulkarni, 2012;). Thus, web personalization is the process of individualized matching to consumer preferences through automated processes in the web environment.

Web personalization is a focus area for multiple fields, especially for marketing and information systems (IS) research. Because web personalization addresses human–computer interaction, it is regularly examined in relation to technological applications. In fact, a majority of web personalization research has a technological focus, addressing topics such as recommender systems, data collection and processes, or user profiling (e.g., Adolphs and Winkelmann, 2010; Sunikka and Bragge, 2012). While technological topics prevail, the multidisciplinarity of the field has resulted in versatile approaches, where technological approaches are supplemented with models from consumer research or psychology.

Only a few studies have considered the effect of the quality (Li and Unger, 2012) or usability (Murray and Häubl, 2009) of web personalization. Similarly, an on-going discussion revolves around whether web personalization has worthwhile effects for business. Ho and Bodoff (2014) find that web personalization is able to increase both advertising and sales revenues. Cao and Li (2007) propose that web personalization is the most effective tool in driving business success. Others (e.g., Thirumalai and Sinha, 2013), however, have found it difficult to prove that web personalization offers a boost to business performance. This may be because web personalization is appealing as a concept (Sunikka and Bragge, 2012) but is difficult to implement as a business tool. There is also a great deal of variety in what is synonymously considered web personalization. It is expected that ‘personalization done’ and ‘personalization done well’ produce different results (c.f. Fan and Poole, 2006). However, what constitutes ‘personalization done well’ keeps evolving, as both customer expectations and technological possibilities change.

Customer preferences are in the epicenter of web personalization. The success of web personalization relies on accurately detecting and then reacting to current preferences. However, preference finding is difficult (Chen et al., 2010). In the web personalization literature, preferences have often been viewed as static (Tuzhilin, 2009), while in reality, contextual issues such as timing (Ho et al., 2011), location (Li et al., 2014), and phases in the buying process (Lambrecht and Tucker, 2013) keep preferences in a flux. The complexity of customer preferences and lack of knowledge of the contextual effects make it difficult to establish successful web personalization procedures.

3. Methodology

State-of-the-art reviews are necessary tools in furthering any academic study (Cooper, 2010). The goal of state-of-the-art reviews is to provide a point of reflection on the present location and direction of the chosen field. Sunikka and Bragge (2012) also see review articles as gateways to solidifying research questions. There is a multitude of methods for conducting a state-of-the-art review, ranging from a free, iterative literature selection and description to a systematic review methodology. Both Cooper (2010) and Weed (2005) raise the issues that predetermination of theme selection and their descriptive nature are common flaws in literature reviews. These weaknesses can, at least to some extent, be overcome by a systematic review process, which has been considered to produce high reliability and quality when assessing large batches of literature (Denyer and Tranfield, 2006; Keränen et al., 2012).

We have sought to combat the threat of focusing on predetermined themes by conducting as systematic a review as possible. However, four general themes were predetermined and we also use thematic analysis to build composites of our findings. While lessening the objectivity of a systematic approach, this allows us to form a clearer picture of the major developments in the field.

3.1. The scope of the research

This state-of-the-art review seeks to provide a comprehensive analysis of web personalization research, giving special attention to user-centric aspects, implementation and theoretical foundations. Due to the extensive literature available on

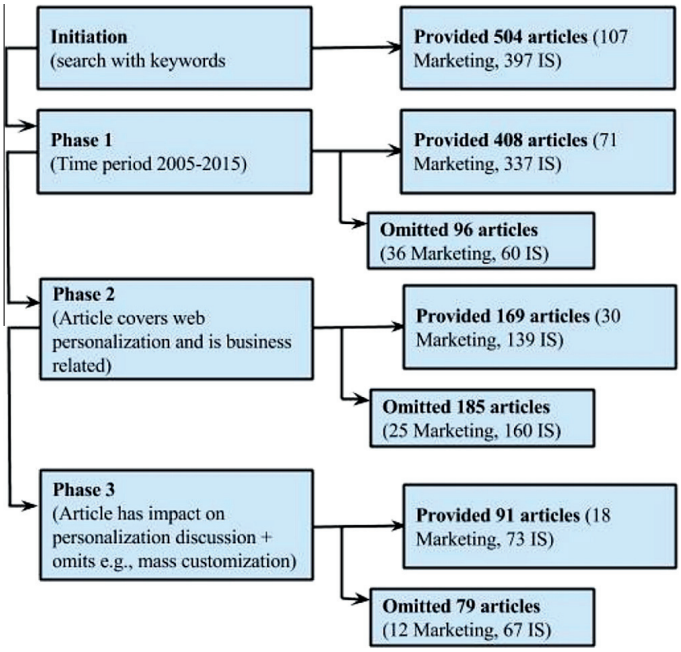

Fig. 1. Summary of the systematic review process.

the topic, the following filters have been administered to make a more in-depth analysis of the target articles possible. To begin, the period under review is restricted to the years 2005–2015 (May). This restriction allows us to chart the most recent developments in the field and focuses on a period beyond most prior literature reviews. Second, the focus is on business related issues, leaving other major topics such as learning and healthcare out of scope. Although personalization is a common theme in these research streams, the goals of these fields are qualitatively different from a business-centered view. Additionally, a decision to focus on the personalization of websites and web services means that mass customization and product customization have been omitted from the analysis. Finally, following Adolphs and Winkelmann (2010), our analysis uses journal rankings to determine the quality of research. By focusing on the top 20 marketing and IS journals, the analysis includes research with the highest quality and impact. Our selection of journals comes from Academic Journal Guide (2015), published by the Chartered Association of Business Schools (ABS), and includes marketing and information systems journals.

3.2. Search strategy

We conducted a search within the target journals with the following search words: web personali*/customi*, website personali*/customi*, online personali*/customi*, e-commerce personali*/customi*, and electronic commerce personali*/customi*. Our search covered the abstract, title, and keywords. The stem of the terms personalization and customization were used in the search because our pre-analysis showed that both z- and s-forms of the terms are used in the literature.

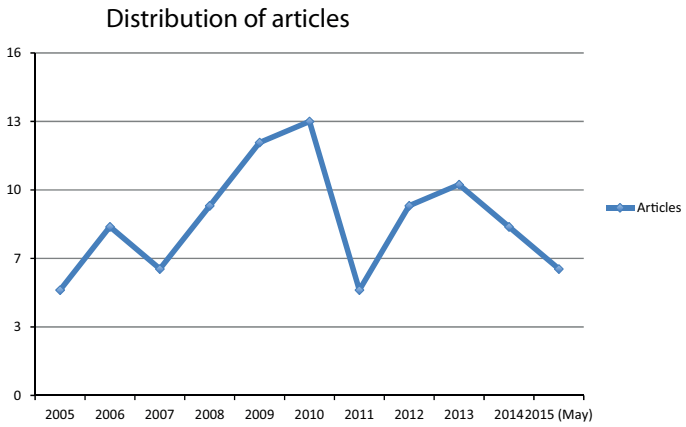

Fig. 2. Annual distribution of articles in the dataset.

While this strategy produced a great increase in non-target articles, a higher inclusion rate of target-articles was possible. The search of target journals was conducted in May 2015.

With these criteria implemented, the search produced 504 (107 marketing, 397 IS) articles without duplicates. Our systematic review process followed Keränen et al. (2012) by forming a funnelling process to segregate target articles from non-target articles, although our evaluation criteria differed. In the first phase, only articles published between 2005 and 2015 (May) were included. The second phase excluded articles that either did not mention personalization or customization in the article contents or in which these search items played minimal role. In addition, we examined whether articles were business related and excluded articles that dealt with areas such as gaming, education, and healthcare or particular function areas such as search. In the third and final phase of the segregation process, articles on mass customization, product customization and avatars were omitted from further analysis. This was due to the separation of these approaches from web personalization (see Sunikka and Bragge, 2012). We also omitted tourism-related articles but included news and advertising related articles. This selection was due to the latter being more business-related, offering contributions that were more generalizable. The articles were finally rechecked to ensure that they offered a significant contribution to the personalization discussion, which led to the exclusion of a few articles. The funnelling process is summarized in Fig. 1.

Ultimately, 91 articles (18 marketing and 73 IS) were identified for in-depth analysis. A listing of selected journal articles is provided in Appendix B.

3.3. Theme formation and analysis

We began by constructing composites for themes. This strategy proved its viability, as we first tried to implement Adolphs and Winkelmann's (2010) categorization structure for e-commerce personalization, which we found hard to apply to our dataset and our research goals. However, we follow Adolphs and Winkelmann's (2010) general structure that distinguishes (i) user-centric aspects, (ii) implementation issues, and (iii) theoretical foundations, as this division covers the overarching themes in our dataset. User-centric aspects consider the interplay of human–computer interaction and the effects of web personalization approaches on consumer behavior. Implementation covers issues in executing web personalization, such as findings on optimal interface designs or testing different types of recommender systems. Theoretical foundations address developing research models, study methods and general issues in web personalization.

4. Results and discussion

The topic of web personalization remained actively pursued throughout the analyzed period. The annual distribution of articles was relatively stable. The complete distribution of articles can be seen in Fig. 2.

The findings suggest that web personalization continues to be an important topic in the top 20 marketing and IS journals. Given that the analysis only reached until May in 2015, a growing trend is possible.

There was significant variation in the distribution of selected articles in different journals, as marketing journals provided only a small portion of the selected articles, and many journals did not include any articles for further inspection. However, the discussion in the IS journals was active. *Expert Systems with Applications* accounted for one third of the entire dataset, with the top five contributing journals covering almost three quarters of the dataset. The top six contributing journals are listed in Table 1. A complete list of the article distribution among selected journals can be seen in Appendix A.

The results were somewhat expected, as web personalization plays varying roles in the top 20 marketing and IS journals. Additionally, prior research suggested that a focus on model-testing research on recommender systems as well as data collection and processing would form a significant share of the dataset, thus explaining the centrality of *Expert Systems with Applications* in our dataset. However, the polarization between journals was higher than expected.

4.1. User-centric aspects

A total of 54 articles were categorized as having significant input in the category of user-centric aspects. This category is thus central to research efforts in web personalization during the analyzed period. Three main themes from the articles were identified: (a) privacy and trust, (b) satisfaction and loyalty, and (c) contextual issues. A detailed list of the selected user-centric aspects literature is shown in Table 2.

Table 1
Top six contributing journals in the dataset.

Journal	Articles
Expert Systems with Applications	31
Decision Support Systems	9
MIS Quarterly	7
Information Systems Research	6
Computers in Human Behavior	6
European Journal of Marketing	5

Table 2
Summary of selected research on user-centric aspects.

User-centric aspects	Reference
Perceived interactivity	Ha et al. (2010) and Song and Zinkhan (2008)
Cultural effects on consumer behavior	Gevorgyan and Manucharova (2009), Ha et al. (2010), Steenkamp and Geyskens (2006), Reinecke and Bernstein (2013) and Singh et al. (2008)
Privacy	Aguirre et al. (2015), Awad and Krishnan (2006), Chellappa and Shivendu (2007), Koch and Möslein (2005), Lee et al. (2011), Li and Unger (2012), Tucker (2014), Van Doorn and Hoekstra (2013) and Zhao et al. (2012)
Customer experience	Rose et al. (2012) and Verhagen et al. (2014)
Customer preferences	Albadvi and Shahbazi (2009), Chen et al. (2010), Devaraj et al. (2006), Mathwick et al. (2010) and Wattal et al. (2009)
Brand image	Da Silva and Alwi (2008)
Customer trust	Aguirre et al. (2015), Chau et al. (2013), Hong and Kim (2012), Komiak and Benbasat (2006), Li and Yeh (2010), Martín-Vicente et al. (2012) and Mukherjee and Nath (2007)
Customer satisfaction	Devaraj et al. (2006), Ha et al. (2010), Herington and Weaven (2009), Kim et al. (2009) and Liang et al. (2006)
Consumer loyalty/commitment/revisit intention/repurchase intention	Zhang et al. (2011), Che et al. (2015), Chang and Chen (2008), Ha et al. (2010), Mukherjee and Nath (2007), Thirumalai and Sinha (2013) and Tsai and Huang (2007)
Purchase intention	Hong and Kim (2012), Lee and Kwon (2008) and Van Doorn and Hoekstra (2013)
Timing	Blanco-Fernández et al. (2010), Ho et al. (2011), Hong et al. (2012), Lee et al. (2009, 2008) and Li et al. (2014)
Personal disposition/customer attitude/motivation	Ho and Bodoff (2014) and Tam and Ho (2005)
Information processing/decision making	Kang and Sundar (2013), Lee and Kwon (2008) and Tam and Ho (2006)
Customer personality	Capuano et al. (2015) and Martin et al. (2005)
Product-specific knowledge	Chang et al. (2006) and Chou et al. (2010)
Customer adoption	Komiak and Benbasat (2006) and Lee and Lee (2009)
Social presence	Choi et al. (2011) and Verhagen et al. (2014)

4.1.1. Theme #1: privacy and trust

Privacy was the most discussed subclass for user specific aspects in our dataset. A clear consensus was formed in the dataset: breaches in privacy are maladaptive for a business. High personalization in online ads was found to increase feelings of intrusiveness and to harm business performance (van Doorn and Hoekstra, 2013). Awad and Krishnan (2006) expect consumers to be more willing to be profiled for websites than for online ads because the customer experiences greater potential benefit from profiling for websites. They suggest that companies only focus on customers who are willing to be profiled for personalization, as even additional privacy features were not effective in increasing participation of the unwilling group. However, the effects of privacy features may differ between use for commercial and social purposes (Chellappa and Shivendu, 2007; Lee et al., 2011). Based on the findings (Awad and Krishnan, 2006; Li and Unger, 2012; Zhao et al., 2012), there is a division between users who are willing and those who are unwilling to be profiled. However, studies have not reached consensus as to whether this division can be effectively mitigated by higher fit (van Doorn and Hoekstra, 2013), privacy controls or policies (Aguirre et al., 2015; Awad and Krishnan, 2006; Lee et al., 2011; Tucker, 2014; Zhao et al., 2012) or incentives such as price reductions (Zhao et al., 2012). Both Koch and Möslein (2005) and Lee et al. (2011) see user-led privacy controls as best practices.

Trust addresses how trustworthy users perceive either a web personalization technique (e.g., recommendations by a recommender system) or its provider to be. In web personalization, trust and privacy are often intertwined (e.g., Aguirre et al., 2015; Mukherjee and Nath, 2007). In our dataset, personalization was consistently positively related to trust (Komiak and Benbasat, 2006; Li and Yeh, 2010). Komiak and Benbasat (2006) see trust as being based on cognitive as well as emotional factors and report that perceived personalization significantly increases both, whereas Hong and Kim (2012) see trust as a means of segmentation for marketing personalization. Chau et al. (2013) studied distrust towards recommender systems and found that competence distrust has negative implications towards the use of recommender agents but integrity distrust based on biased product recommendation did not. Further, Martín-Vicente et al. (2012) discovered benefits from incorporating trust mechanisms in collaborative recommendations.

Privacy and trust are closely knit concepts (Urban et al., 2009). However, they differ somewhat in their effects on overall personalization effectiveness and success. Privacy appears to be a hygiene factor in that increased security has a limited effect on boosting business performance, whereas breaches in security have a significant impact on business performance and trust. Privacy is also viewed as a precursor for trust and adoption willingness (Li and Unger, 2012). However, trust is considered to be both a precursor to successful personalization (e.g., Hong and Kim, 2012; Li et al., 2013) and an outcome of personalization (e.g., Komiak and Benbasat, 2006; Li and Yeh, 2010).

Privacy and trust suggest manifold interesting future research areas. To begin, it is important to gain further knowledge on the divergence between different customer groups in terms of their reactions toward privacy issues. Moreover, the effect of varying settings from commercial to social to foster trust is an interesting new direction for research. Second, the role of the user in the privacy discussion could be deepened by studying whether users would perceive security breaches differently if they personally contributed to the incident and whether communicating the role of the user in detected security breaches

would mitigate the negative impact. Finally, longitudinal studies might reveal important aspects of how the negative/positive impact of created/lost trust and privacy effects may wear off.

4.1.2. Theme #2: satisfaction and loyalty

Customer satisfaction was an actively studied concept in our dataset. Some contradicting evidence was found regarding the link between personalization and satisfaction. In most studies, personalization was found to have a strong positive impact on satisfaction by some (Devaraj et al., 2006; Ha et al., 2010; Herington and Weaven, 2009), whereas not significant effects were also reported (Kim et al., 2009). Liang et al. (2006) suggest that the effect of personalization on satisfaction could also be indirect and moderated by the motivation of the user. Customer satisfaction also played a role in many other articles, although they were not classified in this section. Moreover, customer satisfaction was found to be intertwined with consumer loyalty.

The consumer/customer loyalty subclass was built to integrate the commitment, revisit intention and repurchase intention literature under consumer loyalty. Similarly to customer satisfaction, our dataset proposes contradictory findings on whether personalization generates consumer loyalty. Some find support for the claim that web personalization, at least indirectly, positively influences the formation of consumer loyalty (Chang and Chen, 2008; Ha et al., 2010; Mukherjee and Nath, 2007; Zhang et al., 2011). Tsai and Huang (2007) go as far as to suggest that personalization is a necessary condition of maintaining loyalty but not sufficient in itself. However, other recent articles did not report a positive relationship between the two (Che et al., 2015; Thirumalai and Sinha, 2013). Che et al. (2015) noted the possible moderating effect of the type of consumers based on whether they come from either direct or affiliate visiting channels.

Satisfaction and loyalty are key concepts in web personalization because they are considered essential drivers of business performance. It is difficult to conceptualize successful web personalization if it does not have a positive effect on satisfaction and loyalty. However, the results do not unquestionably confirm this in our dataset. The issue also relates to the more general question of whether web personalization is effective and worthwhile, which will be discussed in more detail in Theme #10.

The results further indicate that a more general and more detailed approach to measuring the direct and indirect effects of web personalization on satisfaction and loyalty is needed. A meta-study might reveal these specific effects and further confirm the expected positive relationships between the concepts. However, while some variation in these results is expected, the variation in our dataset appears to be quite high and calls for further inspection. A more detailed approach in studying (a) what type of web personalization was used, (b) in what setting and on which type of users, and (c) the interplay in the effect on satisfaction, loyalty and its sub-dimensions such as attitudinal and behavioral loyalty and web personalization might bring out new insights or at least help to understand the current variation in results. The inclusion of contextual factors in these analyses is suggested.

4.1.3. Theme #3: contextual factors

The inclusion of contextual factors is a relatively new trend in web personalization (Sunikka and Bragge, 2012). Contextual factors contribute both new areas to personalize as well as a new dimension for assessing the effects of web personalization. In our dataset, three major subclasses were identified: (i) cultural effects, (ii) timing, and (iii) personal disposition.

Cultural effects on consumer behavior recognize the power of culture as a context for interaction in changing the way consumers react to web personalization. The results from the dataset appear to disagree substantially. A study on young Korean and UK customers' purchasing attitudes found no significant cultural effect (Ha et al., 2010), whereas Hispanic communities in the US tested for moderate preference for culturally customized web content (Singh et al., 2008). However, both Reinecke and Bernstein (2013) and Gevorgyan and Manucharova (2009), investigating differences between US and Chinese users, underline the importance of cultural effects in web design. Further, Steenkamp and Geyskens (2006) found the effect of customization on the perceived value of websites to be higher in countries where national-cultural individualism is higher.

Timing refers to the contextual effect of either clock time or situational time in the personalization process and its effect on consumer behavior. One central theme in the reviewed literature was the effects of lifecycle in personalization and recommendation accuracy (Blanco-Fernández et al., 2010; Hong et al., 2012; Li et al., 2014). Another theme was when to show personalized content to consumers and what type to show (Ho et al., 2011; Li et al., 2014). Moreover, Lee et al. (2009, 2008) found that recommendation approaches fueled by temporal dynamics provide better results.

Personal disposition is a composite subclass of our dataset, including topics such as personality, attitudes, and motivation. Tam and Ho's (2005) findings suggest that users with low motivational levels for cognitive effort are more likely to comply with suggestions from recommender agents. Ho and Bodoff (2014) created a model on how attitude influences both item sampling and selection processes. Martin et al. (2005) found that sensation-seekers prefer more complex visual designs than users with low sensation-seeking levels. Capuano et al. (2015) systematized a process for extracting customer personality measurements through social activity.

While there is significant variation in the results for different specific contextual factors, the general view supports the notion that the user's context is an important driver in determining web personalization success. Our dataset shows that timing or temporal dynamics are of key importance. However, the effects of context should be considered as a matrix: some contextual factors support and some hamper successful web personalization in a given sample. For example, successful timing could be determined by a fit with a current motivational state that is in part activated by cultural and environmental cues (e.g., Griskevicius and Kenrick, 2013). Unfortunately, a coherent framework that would consider contextual effects on web personalization is currently lacking.

Table 3
Summary of selected literature on web personalization implementation.

Implementation	Reference
Dynamic retargeting/customized promotions	Lambrecht and Tucker (2013), Van Doorn and Hoekstra (2013) and Zhang and Wedel (2009)
Design/interface	Chang and Chen (2008), Gevorgyan and Manucharova (2009), Li and Yeh (2010), Martin et al. (2005), Parra and Brusilovsky (2015), Reinecke and Bernstein (2013), Seneler et al. (2009) and Wang et al. (2011)
Processing resources	Liu et al. (2010) and Xu et al. (2014)
Recommender systems	Albadvi and Shahbazi (2009), Cao and Li (2007), Chen et al. (2010), Hung (2005), Jalali et al. (2010), Jiang et al. (2010), Lee et al. (2013, 2008), Lee and Huang (2011), Lee and Kwon (2008), Li et al. (2014, 2005, 2013), Liang et al. (2008), Lin et al. (2010), Shinde and Kulkarni (2012), Zhang and Jiao (2007) and Zheng et al. (2013)
Data collection & processing	Ahn et al. (2010), Blanco-Fernández et al. (2010), Capuano et al. (2015), Chang et al. (2009), Chou et al. (2010), Colace et al. (2015), Fan et al. (2006), Hong and Kim (2012), Hong et al. (2012), Huang et al. (2008), Lazcorreta et al. (2008), Liao et al. (2009), Martín-Vicente et al. (2012), Al-Shamri (2014) and Yang (2010)
Support mechanisms	Wang and Li (2013)
Content design	Gedikli et al. (2014)

Direction for future research in the contextual factors of web personalization could include (i) reviewing current studies on the effect sizes of different contextual factors on web personalization to estimate the overall effect, (ii) finding relationships between different contextual factors to build more advanced models, and (iii) turning the tables—studying not just what effects a given contextual factor has on web personalization but how a certain personalization procedure influences the role of contextual factors.

We find advanced contextual factors as the primary direction for future research as it complements many of the main sub-topics such as recommender systems, data collection and processing, and user-specific aspects overall. Further, we find that applications of web personalization should consider not only such basic contextual factors as time of day or distance to a physical location but advance to include more psychologically complex issues such as motivation and emotions. This kind of advanced contextualization is undoubtedly difficult to achieve but it could be a key driver in making web personalization more worthwhile for the user.

4.2. Implementation

A total of 47 articles focused on various aspects of implementing web personalization. The three major subclasses were design/interface, recommender systems and data processing. Of these three, recommender systems (17 articles) and data processing (15 articles) were the most active subclasses in our dataset. A detailed list of the selected implementation literature is shown in Table 3.

4.2.1. Theme #4: design factors

Design/interface covers the means and effects of personalization in web design. Our dataset did not produce any coherent clusters of research but rather highlighted the variety in this subclass. Both Reinecke and Bernstein (2013) and Gevorgyan and Manucharova (2009) discussed the cultural dimension of design. Others focused on the effects of personalization or customization, arguing that design can increase trust (Li and Yeh, 2010) and loyalty (Chang and Chen, 2008) as well as shape preferences (Seneler et al., 2009). Users prefer medium complexity in web design elements on average, but user groups differ in this regard (Martin et al., 2005). Similarly, Wang et al. (2011) recommend integrating different aesthetic dimensions into web personalization based on different motivational states of the user. Finally, Parra and Brusilovsky (2015) tested user controllability in a recommender system interface for increasing engagement.

The results suggest two things. First, an understanding of design factors is essential in successful web personalization. Second, while limited in scope, design personalization appears to be beneficial regardless of whether it is user controlled or automatic. This also pinpoints interesting future research avenues. A comparative study on user controlled versus automatic personalization in different web channels could reveal interesting insights into what makes design personalization effective. Moreover, the broadness of design factors calls for a review article specialized on the design factors in web personalization.

4.2.2. Theme #5: recommender system implementation

Recommender systems or recommender agents refer to the automatized recommendation of products, services and content to users. Our dataset consisted of all three popular approaches to recommender systems (Jiang et al., 2010), including collaborative filtering (e.g., Lee et al., 2008), content-based (e.g., Li et al., 2014), and particularly different types of hybrid (e.g., Albadvi and Shahbazi, 2009; Hung, 2005; Li et al., 2005; Shinde and Kulkarni, 2012) approaches. Discussion in this subclass has been active and varied. The methods of acquiring recommendation accuracy and focus in development vary greatly. Many approaches with different focus areas exist, such as maximizing customer's after-use gratification (Jiang et al., 2010), using social relations (Li et al., 2013), temporal interest (Li et al., 2014), clustering (Shinde and Kulkarni, 2012; Zheng et al., 2013), causal maps (Lee and Kwon, 2008), product taxonomy (Hung, 2005), graph partitioning (Jalali et al., 2010), and analytic hierarchy processing (Chen et al., 2010) as well as associative- (Zhang and Jiao, 2007) and fuzzy-

based examination (Cao and Li, 2007) as a basis for recommendations. Lee and Huang (2011) applied recommender systems to green shopping; Lin et al. (2010) constructed a salesman-like solution, and Lee et al. (2013) used their recommender system to recommend sellers instead of products.

A clear trend of rising complexity in approaches can be established between the earlier (e.g., Hung, 2005) and more recent articles (Li et al., 2014, 2013). This finding is in line with the suggestions of a literature review by Gao et al. (2010) to extend recommender systems research. Another finding is that contextual factors are still an underresearched topic, but temporal effects in particular have received growing interest. There has already been some research to basic temporal dynamics, which is encouraged to continue. However, as mentioned above, advanced contextualization should take into account more complex factors such as motivation and emotions. We see that all three popular categories of approaches (collaborative, content-based, and hybrid) continue to be fertile ground for new research if coupled with more advanced techniques in user profiling with contextual data.

4.2.3. Theme #6: data collection and processing

Data collection and processing involves methods of acquiring data for customer profiling and processing it for use in web personalization either through or for recommender systems or other applications. This subclass primarily considered three types of approaches. First, some articles focused on the user, trying to extract and process data on personality (Capuano et al., 2015), product-specific knowledge and interior desire (Chou et al., 2010), reputation and expertise (Martín-Vicente et al., 2012), or implicit needs (Chang et al., 2009). Second, information on product views and clickstream behavior was applied for user identification (Yang, 2010), psychographic segmentation (Hong and Kim, 2012), customer life-cycle stage assessment, and the enhancement of collaborative filtering (Ahn et al., 2010). Finally, several techniques were suggested, such as two-stage models for information routing (Fan et al., 2006), back-propagation for association rules (Huang et al., 2008), metadata and semantic reasoning (Blanco-Fernández et al., 2010), and a two-step Apriori Algorithm for assessing the type of behavior. In particular, the recent literature (e.g., Colace et al., 2015) suggests combining several inputs in data collection and processing.

Data collection and processing is advanced and continues to produce meaningful insights. Our dataset suggests that similar to recommender systems, the needed expansion should address the psychological features of users and a better understanding of the layers of context in question. Future research directions should converge with the latest advances in psychology to find new material for processing. These might include approaches such as regulatory focus (Higgins, 1997) and regulatory fit (Higgins, 2000), as well as Fundamental Motives Framework (Griskevicius and Kenrick, 2013; Kenrick et al., 2010a,b), as these theories suggest predictable changes in behavior, which may enable computational modeling.

4.3. Theoretical foundations

Within the theoretical foundations, we focus on the following general themes: (a) the research methodology used, (b) the roles of the fields of marketing and information systems in the web personalization literature, (c) the conceptualization of web personalization versus that of web customization, and (d) whether personalization provides value. We identified 18 articles in our categorization that focused on a broad variety of theoretical foundations but because many other articles had insights to contribute to the literature, our analysis here concerns the overall dataset.

4.3.1. Theme #7: research methodology

A variety of research methodologies were applied in the reviewed studies. Experiments were the prevailing method, with 55 of 91 articles applying some form of experiment and seven articles making use of one or multiple field experiments. The experiments, however, relied heavily on model testing, as approximately one third (29 articles) are classified in this category. These, for the most part, dealt with testing the recommendation accuracy of recommender systems. This was an expected result, as Sunikka and Bragge (2008) reported similar results. In addition, surveys and questionnaires were the second largest method group (21 articles), followed by conceptual studies (9 articles). Qualitative methods such as interviewing and focus groups were only found in two articles (Mathwick et al., 2010; Singh et al., 2008).

We support the reliance on experiments. Web personalization often addresses issues that require quantitative verification or refers to changes that influence users subconsciously. Much of the work concerns recommendation accuracy, which is difficult to study without experimenting. However, we propose two amendments. First, although field experiments are present, increasing their number would help to cement the applicability of a given research finding to practice. Laboratory experiments are good in that they are very precise. Users, however, encounter web personalization practices in conjunction with other stimuli that affect their overall experience. Second, the inclusion of qualitative methods could enrich and broaden the data, especially that on user-centric aspects. While behavioral or attitudinal research might tell us about the overall effect of web personalization practice, inspecting it through a qualitative lens could reveal aspects of user experience. Interviews and ethnographic methods are already widely used in other fields of user testing, and they are sometimes used in pretesting in web personalization. Best practices from user testing should be applicable to web personalization also.

All of the research in our dataset focused on the immediate impacts on web personalization. A longitudinal approach was absent. This is partly understandable, as the field is evolving rapidly. However, even a time span of 1 or 2 years could shed light on the effects of web personalization in the long-term—something that the field is currently lacking.

4.3.2. Theme #8: the roles of the marketing and IS literature in web personalization

Web personalization is a multi-faceted field on which many other fields converge. The fields of information systems and marketing are both central to the overall discussion. However, as evident in our dataset of 73 IS articles and 18 marketing articles, web personalization is much more prominent in IS studies than in marketing. This becomes even more highlighted when considering that although central enough to be included in our analysis, some marketing articles were not solely focused on web personalization issues. This raises questions of whether marketing scholars feel that they have little to say regarding web personalization or if web personalization is simply sidelined from other focus areas. The latter suggestion appears to be unfounded, as the importance of digital channels and impact of quality service via digital channels continues to grow, and personalization is an important topic in marketing (Goldsmith and Freiden, 2004; Kalaignanam et al., 2008).

The IS literature is very focused on recommender systems and data processing. This area is actively studied, and the subfield has advanced during the analyzed period. The ability to find better algorithms and data mining methods has continued to improve rapidly, yet the area has become more complex. We suggest that constructing more complex algorithms could benefit from the input of marketing studies, especially consumer behavior and consumer psychology. This is to say that the technological advances of IS scholars are the motor of advancing web personalization, but the motor must run on a deeper understanding of consumer psychology. A meaningful division of effort between the fields might be that marketing scholars produce actionable models on consumer behavior on which IS scholars advance their algorithms.

4.3.3. Theme #9: web personalization vs. web customization

As stated, the concepts of personalization and customization have been confused in the past (Arora et al., 2008). In their review, Sunikka and Bragge (2012) found support for consensus, defining personalization as a company-driven process in the web environment. Customization, meanwhile, is a user-initiated process that matches needs with offerings. Our review supports this definition, as the articles in our dataset followed this division with few exceptions (e.g., Miceli et al., 2007; Singh et al., 2008). While web personalization and web customization continue to be two sides of the same coin, thus providing synergies by including both approaches, this evolution toward distinction between the terms is welcomed because it will help clarify the field.

Also, the terms "personalization" and "web personalization" appear to be used interchangeably. There are benefits in not differentiating the terms; personalization is internet-related (Sunikka and Bragge, 2012), making it difficult to draw a line between the terms. However, there are also differences, as web personalization focuses on the web environment, which has a somewhat idiosyncratic nature. The confusion between the terms resulted in difficulty searching for and outlining research on web personalization. Hence, it is suggested that researchers ought to discuss this division to clarify their approach.

4.3.4. Theme #10: web personalization effectiveness for business results

The variety of approaches in the dataset makes it difficult to examine the effects of web personalization on business results. Further, according to the dataset, although business results appear to be discussed, they are often not the focal topic. There is some general support for the positive business effects of web personalization in the dataset. Ho and Bodoff (2014) claim that web personalization is able to increase both advertising and sales revenues, whereas Cao and Li (2007) note the general assumption that personalization is the most effective tool for driving business success. However, Thirumalai and Sinha (2013), in terms of customer loyalty through personalization, and Tsai and Huang (2007), for purchase intention through customization, did not find support for a boost in business performance. Cultural effects work as a prime example of this variation: Singh et al. (2008) and Gevorgyan and Manucharova (2009) found cultural effects important for business-related goals supported by Steenkamp and Geyskens (2006), whose study partially supported this finding. However, Ha et al. (2010) report not-significant effects. Moreover, the results appear to vary greatly depending on many contextual factors such as the type of customers (Che et al., 2015), buying process phase (Lambrecht and Tucker, 2013), and timing (Ho and Bodoff, 2014; Hong et al., 2012). Given the fluctuating nature of customer preferences, the effect of a single web personalization procedure is likely to change over time as customer expectations and habits change.

We suggest that researchers place greater emphasis on uncovering the relationship between web personalization and business outcomes. A meta-study could reveal important aspects of the overall effects of web personalization for businesses. Further, current studies often focus on "soft" business goals such as customer satisfaction, customer loyalty (especially cognitive, attitudinal and conative aspects) or trust rather than "hard" primary business goals such as increased sales, customer lifetime value (CLV) or lower marketing costs. Knowledge on direct business goals would clarify the role and importance of web personalization in driving business success. We consider field experiments important in gathering this knowledge. Overall, this development would also facilitate the application of web personalization research results to practice.

A complete list of the selected literature with the significant sub-categories identified is listed in Appendix B.

5. Conclusion

This research contributes to the web personalization literature by giving an over-arching view of issues in web personalization found in published articles from the top 20 marketing and IS journals. A focus on top ranked journals was chosen, as these outlets should spearhead the discussion of web personalization. Our focus areas were plentiful, including most dis-

cussed themes, general theoretical issues such as terminology, the division of interest between different academic fields, methodologies applied, and especially research gaps and future trends.

Web personalization is relatively actively discussed in the top 20 marketing and IS journals. The discussion, however, is polarized in two manners. Firstly, IS journals dominate the discussion, with marketing journals having less impact. The focus appears to be on technological applications, even when discussing user-centric issues. This calls for a more active dialogue from marketing scholars, who could share insights from the consumer psychology and consumer behavior literature to apply to the technological applications being developed. Secondly, a few of the forty journals dominated in terms of output numbers. As web personalization research appears to evolve around technological advances, journals such as *Expert Systems with Applications* expectedly take the leading role in the overall discussion.

We identified ten themes, which we categorized into three groups: user-centric issues, implementation and theoretical foundations. The top themes in user-centric issues were (i) privacy and trust, (ii) satisfaction and loyalty, and (iii) contextual issues. Privacy issues continue to be central but appear to be a hygiene factor, whereas trust works as glue on many dimensions in web personalization. The role of satisfaction and loyalty as predictors of web personalization success is debatable. A meta-study could provide more detailed insights into the overall effects of web personalization on satisfaction and loyalty. Contextual issues dealing with web personalization continue to be identified and the trend has room to grow. Issues such as timing, motivational state, and cultural effects are fertile ground for scholars to build upon. We see contextual issues as the dominant stream for future research, as their complexity unveils an abundance of different possible effects to be researched.

Issues in implementation primarily addressed three themes: (i) design/interface, (ii) recommender systems, and (iii) data collection and processing. Design and interface issues covered the role of the user as an initiator of design changes and the role of design in web personalization success. Recommender systems and data collection and processing methods are receiving the most interest from researchers and are advancing rapidly. There are two trends here. One trend shows an increase in integration between different recommender and data collection methods, where the array of methods continue to contribute both individually and together in hybrid forms. The other trend focuses on enhancing recommendations with broader and deeper contextual data.

The established themes covered in the theoretical foundations included (i) research methods, (ii) the division of labor between the fields of marketing and IS, (iii) terminological issues between web personalization and web customization, and (iv) the effectiveness of web personalization in driving business results. The most commonly used method was experiments, especially model testing. The lack of qualitative methods and longitudinal study designs was striking. The field of information systems is actively producing advances for many different avenues. Marketing insights, however, would be welcome in enriching these developments, but this area currently lacks momentum.

Our study also confirms the terminology division between web personalization and web customization (Sunikka and Bragge, 2012). Web personalization is a firm-controlled activity that matches current user-specific needs with appropriate content, design and functionality. Web customization, however, addresses similar issues but is user-controlled. There is considerable variance in results concerning the effectiveness of web personalization in driving business success. This topic calls for special examination and more research specifically considering the primary business goals of increasing sales and lowering marketing cost. This conclusion is also our secondary general suggestion for future research.

The field of web personalization continues to expand and advance rapidly. There has been a clear shift from the old days, when the key question was *how to do it*, to more a sophisticated discussion on *how to do it well* (c.f. Fan and Poole, 2006). However, the question of whether web personalization is effective for business appears to be an inquiry into how and where web personalization is implemented. This is an important development for both theory and practice. While the effectiveness of web personalization remains somewhat debatable, the methods for acquiring business results developed convincingly during the analyzed timeframe. There is a minor difficulty with fragmentation in the field, as novel possibilities appear mostly due to technological advances. In addition, markers of unification exist, as the terminology around web personalization is more or less cemented.

5.1. Recommendations for future research

This literature review offers fertile avenues for further research in this domain. As discussed earlier in this article, web personalization will evolve around the increasing complexity of calculable elements such as contextual factors. There are still new opportunities from converging different recommendation techniques with new contextual elements. One future direction is likely to be the integration of these various approaches. Moreover, the issue of timing is still underresearched. With the temporal aspect of web personalization, the procedures can only produce suggestions for what the user *usually wants* and not what is *wanted right now*. The study of timing coupled with different psychological models (e.g., regulatory fit or fundamental motives framework) should be fruitful, especially if methods for more immediate web personalization are developed. Such possibilities are not farfetched, as the facial recognition of moods, for example, is rapidly evolving (Zhang et al., 2015). This development further directs focus toward advancing and integrating psychological elements into web personalization approaches. Advanced contextualization that takes the emotions and currently active motives of users into account should be the primary focus of future research. Still, the effects of ever more complex approaches should be measurable using direct business results to both verify end goal effectiveness and clarify the field for practice. Thus, we suggest this line of research as the secondary future research direction.

In another direction, we see potential avenues for research in further expanding the classification of web personalization. We suggest defining two forms of web personalization: extrapolated and interpolated. The basic idea of web personalization revolves around estimating the desired personalized outcome version for the focal user based on previous usage patterns. Thus, the personalized outcome version is based on extrapolation. A great majority of, if not all, articles in our dataset relied on extrapolating personalization. We see the possibility for complementing this main form of web personalization with interpolated web personalization. By interpolated web personalization, we mean that a chosen element is intersected with the web environment to prime a chosen motive that guides user behavior in a predictable way. For instance, product choice can be affected through the different website backgrounds and pictures utilized (Mandel and Johnson, 2002). In extrapolated web personalization, it is difficult to estimate immediate preferences. Consequently, the value of the interpolated approach could be that primes act as beacons to guide personalization processes and facilitate finding a point of reference.

The interpolated approach should be viewed as a complementary tool to extrapolated approaches. Moreover, the interpolated approach requires testing and calls for a better understanding of motives in digital channels.

5.2. Limitations

Our results must be evaluated in the light of certain key limitations. First, while offering clear benefits, our dataset only covers the top 20 marketing and IS journals. This leaves a plethora of other high quality outlets, such as other journals, books, and conference papers, out of our analysis. The excluded set of articles provides room for a more general review in the future. Moreover, we utilized only web databases in our search, potentially excluding relevant articles due to limitations of the database search tools and keyword selection. Second, our focus on business-related studies potentially discarded relevant findings made in other contributing areas of web personalization such as education, gaming, tourism, healthcare or mass customization. Inspection of these neighboring areas might reveal insights that are shared between them and an understanding of what is unique to each. Third, the chosen time span of 2005–2015 (May) is a compromise between scope and timeliness. Major insights that still influence web personalization today have been made prior to our chosen time span. However, it is possible that due to the rapid evolution of web personalization, just 5 years erodes the currency of earlier findings, especially in the case of web personalization technologies. Thus, it is possible that the most recent findings are somewhat diluted by the inclusion of older entries. However, we believe that we found a good balance of scope and immediacy in light of our research questions. Finally, we chose to identify ten themes out of our dataset, leaving some minor themes in the periphery. We felt that this was appropriate for clarity and because of the impact we see for the chosen themes. However, many interesting developments are being made outside of these themes. Server capacity in the case of implementation and perceived interactivity in the case of user specific aspects serve as examples of relevant but not major themes in our dataset. Future reviews can work as points of reflection on the evolution of these underlying themes.

Appendix A. Complete listing of articles per journal, based on the rankings of Academic Journal Guide 2015 for marketing and IS journals.

Marketing journals	Number of target articles
Journal of Consumer Psychology	0
Journal of Consumer Research	0
Journal of Marketing	2
Journal of Marketing Research	3
Marketing Science	0
International Journal of Research in Marketing	0
Journal of Retailing	4
Journal of the Academy of Marketing Science	0
European Journal of Marketing	5
Industrial Marketing Management	0
International Marketing Review	0
Journal of Advertising	0
Journal of Advertising Research	1
Journal of Interactive Marketing	1
Journal of International Marketing	0
Journal of Public Policy and Marketing	0
Marketing Letters	1
Marketing Theory	0
Psychology & Marketing	1
Quantitative Marketing and Economics	0

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Appendix A. (*continued*)

IS journals	*Number of target articles*
Information Systems Research	6
MIS Quarterly	7
Journal of Management Information Systems	3
Journal of the Association of Information Systems	0
Computers in Human Behavior	6
Decision Support Systems	9
European Journal of Information Systems	1
Expert Systems with Applications	31
Government Information Quarterly	0
Information & Management	3
Information and Organization	0
Information Society	0
Information Systems Frontiers	1
Information Systems Journal	0
Information Technology and People	0
International Journal of Electronic Commerce	3
International Journal of Human-Computer Studies	2
Journal of Computer Mediated Communication	2
Journal of Information Technology	0
Journal of Strategic Information Systems	0

Appendix B. Complete article listing of the dataset.

No.	Citation	Year	Method	Category	Journal
1	Aguirre et al.	2015	Survey	PR; TR	Journal of Retailing
2	Capuano et al.	2015	Experiment	PE; DCP	Computers in Human Behavior
3	Che et al.	2015	Survey	LO	Information & Management
4	Colace et al.	2015	Case study	DCP	Computers in Human Behavior
5	Lu et al.	2015	Literature review	TH	Decision Support Systems
6	Parra and Brusilovsky	2015	Experiment	DI	International Journal of Human-Computer Studies
7	Gedikli, Jannach, and Ge	2014	Experiment	CO	International Journal of Human-Computer Studies
8	Ho and Bodoff	2014	Field experiment	PD; TH	MIS Quarterly
9	Johar, Mokherjee, and Sarkar	2014	Conceptual	TH	Information Systems Research
10	Li et al.	2014	Experiment	TI; RS	Expert Systems with Applications
11	Tucker	2014	Field experiment	PR	Journal of Marketing Research
12	Verhagen et al.	2014	Experiment	CE; SP	Journal of Computer Mediated Communications
13	Xu, Benbasat, and Cenfetelli	2014	Experiment	PrR	Information Systems Research
14	Al-Shamri	2014	Experiment	TH	Expert Systems with Applications
15	Chau et al.	2013	Field experiment	TR	Decision Support Systems
16	Kang and Sundar	2013	Experiment	IP	Computers in Human Behavior
17	Lambrecht and Tucker	2013	Field experiment	DR/CP	Journal of Marketing Research
18	Lee, Choi, and Suh	2013	Experiment	RS	Expert Systems with Applications
19	Li, Wu, and Lai	2013	Experiment	RS	Decision Support Systems
20	Reinecke and Bernstein	2013	Experiment	CU; DI	MIS Quarterly
21	Thirumalai and Sinha	2013	Counterfactual analysis	LO	Information Systems Research
22	van Doorn and Hoekstra	2013	Experiment	PR; PI; DR/CP	Marketing Letters

Appendix B. (*continued*)

No.	Citation	Year	Method	Category	Journal
23	Wang and Li	2013	Survey	SM	Decision Support Systems
24	Zheng et al.	2013	Experiment	RS	Expert Systems with Applications
25	Hong and Kim	2012	Survey	TR; PI; DCP	Expert Systems with Applications
26	Hong, Li, and Li	2012	Experiment	TI; DCP	Expert Systems with Applications
27	Li and Unger	2012	Experiment	PR	European Journal of Information Systems
28	Lucas, Segrera, and Moreno	2012	Case study	TH	Expert Systems with Applications
29	Martín-Vicente et al.	2012	Conceptual	TR; DCP; TH	Expert Systems with Applications
30	Rose et al.	2012	Survey	CE; TH	Journal of Retailing
31	Shinde and Kulkarni	2012	Experiment	RS	Expert Systems with Applications
32	Sunikka and Bragge	2012	Literature review	TH	Expert Systems with Applications
33	Zhao, Lu, and Gupta	2012	Conceptual	PR; TH	International Journal of Electronic Commerce
34	Choi, Lee, and Kim	2011	Experiment	SP	International Journal of Electronic Commerce
35	Ho, Bodoff, and Tam	2011	Field experiment	TI	Information Systems Research
36	Lee, Ahn, and Bang	2011	Conceptual	PR; TH	MIS Quarterly
37	Wang, Minor, and Wei	2011	Experiment	DI; TH	Journal of Retailing
38	Zhang, Agarwal, and Lucas	2011	Experiment	LO	MIS Quarterly
39	Ahn, Kang, and Lee	2010	Experiment	DCP	Expert Systems with Applications
40	Blanco-Fernández et al.	2010	Experiment	TI; DCP	Expert Systems with Applications
41	Chen et al.	2010	Experiment	CP; RS	Expert Systems with Applications
42	Chou et al.	2010	Experiment	P-SK; DCP	Expert Systems with Applications
43	Gao, Liu, and Wu	2010	Literature review	TH	Information Systems Frontiers
44	Ha, Muthaly, and Akamavi	2010	Survey	PeI; CU; SA; LO	European Journal of Marketing
45	Jalalali et al.	2010	Experiment	RS	Expert Systems with Applications
46	Jiang, Shan, and Liu	2010	Experiment	RS	Decision Support Systems
47	Li and Yeh	2010	Survey	TR; DI	Computers in Human Behavior
48	Lin et al.	2010	Experiment	RS	Expert Systems with Applications
49	Liu, Sarkar, and Srikandarajah	2010	Experiment	PrR	Information Systems Research
50	Mathwick, Wagner, and Unni	2010	Interview/survey	CP	Journal of Retailing
51	Yang	2010	Experiment	DCP	Decision Support Systems
52	Albadvi and Shahbazi	2009	Experiment	CP; RS	Expert Systems with Applications
53	Chang et al.	2009	Survey	DCP	Expert Systems with Applications
54	Gevorgyan and Manucharova	2009	Survey/content analysis	CU; DI	Journal of Computer Mediated Communication
55	Herington and Weaven	2009	Survey	SA	European Journal of Marketing
56	Kim, Kim, and Kandampully	2009	Survey	SA	European Journal of Marketing
57	Lee and Lee	2009	Experiment	AD	Information & Management
58	Lee, Park, and Park	2009	Experiment	TI	Expert Systems with Applications
59	Liao et al.	2009	Survey	DCP; TH	Expert Systems with Applications
60	Seneler, Basoglu, and Daim	2009	Experiment	DI	Computers in Human Behavior
61	Wattal, Telang, and Mukhopadhyay	2009	Conceptual	CP; TH	Journal of Management Information Systems
62	Weng, Lin, and Chen	2009	Experiment	TH	Expert Systems with Applications
63	Zhang and Wedel	2009	Experiment	DR/CP	Journal of Marketing Research
64	Chang and Chen	2008	Survey	LO; DI	Computers in Human Behavior
65	Da Silwa and Alwi	2008	Survey	BI	European Journal of Marketing
66	Huang et al.	2008	Experiment	DCP	Expert Systems with Applications
67	Lazcorreta, Botella and Fernández-Cabalero	2008	Conceptual	DCP	Expert Systems with Applications
68	Lee and Kwon	2008	Experiment	PI; IP; RS	Expert Systems with Applications
69	Lee, Park, and Park	2008	Experiment	TI; RS	Expert Systems with Applications
70	Liang et al.	2008	Experiment	RS	Decision Support Systems

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Appendix B. (*continued*)

No.	Citation	Year	Method	Category	Journal
71	Singh et al.	2008	Survey/focus group	CU	Journal of Advertising Research
72	Song and Zinkhan	2008	Experiment	PeI	Journal of Marketing
73	Cao and Li	2007	Experiment	RS	Expert Systems with Applications
74	Chellappa and Shivendu	2007	Conceptual	PR	Journal of Management Information Systems
75	Miceli, Ricotta, and Costabile	2007	Conceptual/survey	TH	Journal of Interactive Marketing
76	Mukherjee and Nath	2007	Survey	TR; LO	European Journal of Marketing
77	Tsai and Huang	2007	Survey	LO	Information & Management
78	Zhang and Jiao	2007	Experiment	RS	Expert Systems with Applications
79	Awad and Krishnan	2006	Survey	PR	MIS Quarterly
80	Chang, Changchien, and Huang	2006	Experiment	P-SK; DCP	Expert Systems with Applications
81	Devarai, Fan, and Kohli	2006	Survey	CP; SA	Decision Support Systems
82	Fan, Gordon, and Pathak	2006	Experiment	DCP	Decision Support Systems
83	Komiak and Benbasat	2006	Experiment	TR; AD	MIS Quarterly
84	Liang, Lai, and Ku	2006	Experiment	SA; TH	Journal of Management Information Systems
85	Steenkamp and Geyskens	2006	Survey	CU	Journal of Marketing
86	Tam and Ho	2006	Field experiment	IP; TH	MIS Quarterly
87	Huang	2005	Experiment	RS	Expert Systems with Applications
88	Koch and Möslein	2005	Conceptual	PR	International Journal of Electronic Commerce
89	Li, Lu, and Xuefeng	2005	Experiment	RS	Expert Systems with Applications
90	Martin, Sherrard, and Wentzel	2005	Experiment	PE; DI	Psychology & Marketing
91	Tam and Ho	2005	Field experiment	PD; IP	Information Systems Research

AD = customer adoption, BI = brand image, CE = customer experience, CO = content design, CP = customer preferences, CU = cultural effects, DCP = data collection and processing, DI = design/interface, DR/CP = dynamic retargeting/customized promotions, IP = information processing, LO = loyalty, PD = personal disposition, PE = personality, PeI = perceived interactivity, PI = purchase intention, PR = privacy, PrR = processing resources, P-SK = product-specific knowledge, RS = recommender systems, SA = satisfaction, SM = support mechanisms, SP = social presence, TH = theoretical foundations, TI = timing, TR = trust.

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II

ABOUT TIME: A MOTIVATION-BASED COMPLEMENTARY FRAMEWORK FOR TEMPORAL DYNAMICS IN WEB PERSONALIZATION

by

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About time

A motivation-based complementary framework for temporal dynamics in Web personalization

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Abstract

Purpose – The purpose of this paper seeks to develop a motivation-based complementary framework for temporally dynamic user preferences to facilitate optimal timing in web personalisation. It also aims to highlight the benefits of considering user motivation when addressing issues in temporal dynamics.

Design/methodology/approach – Through theory, a complementary framework and propositions for motivation-based temporal dynamics for further testing are created. The framework is validated by feeding back findings, whereas some of the propositions are validated through an experiment.

Findings – The suggested framework distinguishes two ways (identifying/learning and shifting) of using a motive-based approach to temporal dynamics in web personalisation. The suggested outcomes include enhanced timing in matching current preferences and improved conversion. Validation measures predominantly support both the framework and the tested propositions. The theoretical basis for the approach paves a path towards refined psychological user models; however, currently on a complementary level.

Research limitations/implications – While the framework is validated through feeding back findings, and some of the propositions are validated through basic experimentation, further empirical testing is required.

Practical implications – A generalised approach for complementing personalisation procedures with motivation-based temporal dynamics is offered, with implications for both user modelling and preference matching.

Originality/value – This paper offers novel insights to web personalisation by considering the in-depth effects of user motivation.

Keywords Timing, Temporal dynamics, Fundamental motives framework, Preference matching, Web personalization

Paper type Conceptual paper

Introduction

Web personalisation requires the matching of user preferences by delivering the right option at the right time (Tam and Ho, 2005). However, when is the time right? Despite its centrality to the practice of web personalisation (Koren, 2010), timing – or temporal dynamics – has received insufficient attention in the literature (Ho *et al.*, 2011; Huang

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and Zhou, 2018; Salonen and Karjaluoto, 2016). Few attempts have been made to either effectively produce a real-time model that considers the effects of changing intentions (Ding *et al.*, 2015) and cognitive styles (Hauser *et al.*, 2014) or to develop methods for adapting to these. We wish to continue this development by expanding on the psychology of shifting preferences.

Temporal dynamics in web personalisation refers to user preferences changing with time. Here, time is primarily a context for interaction (Ho *et al.*, 2011), which could be termed either situational or contextual time. The element of timing presents many problems for web personalisation practices. For example, because preferences are in flux (Simonson, 2005), timing requires an understanding of the user's immediate context, which is often different from that of the long-term user profile (Jannach *et al.*, 2015). In addition, understanding, predicting and activating such contextual effects require refined psychological models (Salonen and Karjaluoto, 2016). Matching preferences can also become increasingly difficult when no prior user profile exists. In such cases, recommendations are based on guesses at best (Johar *et al.*, 2014). Finally, it is difficult to grasp rapid changes using currently available approaches (Ding *et al.*, 2015).

Previous studies that have investigated timing effects in web personalisation and web adaptation have been fruitful (Bodoff and Ho, 2014; Bogina *et al.*, 2016; Ding *et al.*, 2015; Hauser *et al.*, 2009, 2014; Ho *et al.*, 2011; Hong *et al.*, 2012; Jannach *et al.*, 2015, 2017; Koren, 2010; Lambrecht and Tucker, 2013; Li *et al.*, 2014; Pereira *et al.*, 2018; Urban *et al.*, 2013). However, these studies predominantly focussed on long-term changes rather than on having more immediate effects (Hong *et al.*, 2012) built upon a rational view of user behaviour (Ho *et al.*, 2011) or neglected contextual factors (Li *et al.*, 2014). Therefore, a framework that also captures more immediate contextual effects is needed.

Although recent advances have been made towards effective real-time modelling (Ding *et al.*, 2015; Hauser *et al.*, 2014; Jannach *et al.*, 2015, 2017; Pereira *et al.*, 2018), these models have mostly been built via simple psychological modelling. For instance, Ding *et al.* (2015) found encouraging results for their real-time intent-based model, which was based on the stimulus-organism-response (SOR) framework. However, the SOR framework does not provide specific answers regarding when, why and how a certain stimulus is likely to affect a user's choices. Similarly, Hauser *et al.* (2014) based on their real-time approach on cognitive styles, which could possibly benefit from considering the interplay between motivation and preferences. Hence, we wish to provide the first steps towards more refined psychological models to enable an enhanced psychological fit in web personalisation.

Although preferences are state dependent (Zhang, 2013) and motivation is driven (Griskevicius and Kenrick, 2013), motivation-based approaches have been lacking in the web personalisation literature (Salonen and Karjaluoto, 2016). While Pappas *et al.* (2017) and Huang and Zhou (2018) have recently found encouraging results based on both complexity theory and uses and gratification theory, we envision a more effective approach by using a motivational framework that:

- fully acknowledges chronic (long-term) and situational (short-term) effects; and
- provides a detailed list of expected behavioural tendencies.

Therefore, we suggest a motivation-based approach that relies on the fundamental motives framework (FMF) (Griskevicius and Kenrick, 2013; Kenrick *et al.*, 2010a, 2010b). In this article, we suggest that applying the FMF to web personalisation enables both explanatory advances and practical inferences as follows:

- incorporating motives into the personalisation process may enhance the current understanding of contextual effects;
- via the framework, user preferences and choices can be predicted when the currently active motive is estimated. Thus, it provides a tool for addressing temporal dynamics in web personalisation;
- it may be possible to activate a given motive by managing cues in the given web environment, which could yield persuasive benefits (Kaptein *et al.*, 2015); and
- the framework may facilitate active learning by predicting motivational effects based on exposure to web content (Fernández-Tobías *et al.*, 2016 for a personality-based approach).

Furthermore, we believe that a motivation-based approach can complement the current understanding of what, for instance, click-stream analysis reveals about user preferences (Ding *et al.*, 2015; Montgomery *et al.*, 2004). The benefit of our suggested approach is that it is possible to learn not only the goal of the user but also the function of the goal and to expect different behavioural tendencies based on that knowledge (Griskevicius and Kenrick, 2013). Understanding which of these behavioural tendencies are likely to manifest and when these manifestations will occur is essential for effectively timed personalisation. While the FMF can provide only a complementary tool for solving timing issues in web personalisation, even an incrementally better match with the user's motivation could yield considerable benefits.

We also raise the possibility of using motivation to facilitate active learning and the use of persuasiveness in personalisation. Motivation-based active learning could be used in a similar fashion to show how personality has helped mitigate the kick-starting problem of collaborative filtering (Tkalcic and Chen, 2015; Zhang and Zhao, 2017). While personality is a stable construct (Cobb-Clark and Schurer, 2012), motivation manifests both chronically and situationally (Kenrick *et al.*, 2010a, 2010b), which is more aligned with temporally dynamic preferences. Furthermore, an approach based on the FMF could facilitate determining, which persuasive strategies will be most effective (Kaptein *et al.*, 2015) because preferences can be predicted through motivation (Griskevicius and Kenrick, 2013; Ho and Lim, 2018).

This study contributes to the web personalisation discussion in three significant aspects and is the first to address many of the inherent issues. We firstly provide a systematic but non-restricting motive-based framework for temporal dynamics in web personalisation that is applicable to both short- and long-term timing in personalisation processes. Our model is not intended to be a standalone for determining psychological fit (i.e. matching recommendations with psychological profiles) in web personalisation. However, several benefits make the FMF a good introductory and complementary model because psychological fit has not been considered extensively before in the temporal dynamics' literature. The framework is validated through feeding back findings by interviewing expert practitioners.

We secondly suggest the testing of several practical propositions in future research, which will deepen our understanding of the interplay among preference matching, timing and motivation. Insights arising from these propositions should be applicable beyond timing issues in web personalisation. The propositions are validated through a simulated purchase case experiment.

Finally, we highlight possibilities for applying motivation-based temporal dynamics to a variety of instances, such as active learning and persuasive strategies.

Temporal dynamics in web personalisation

The area of temporal dynamics has been neglected prior to recent developments in the web personalisation literature (Bogina *et al.*, 2016; Ding *et al.*, 2015; Hauser *et al.*, 2014; Hauser *et al.*, 2009; Ho *et al.*, 2011; Ho and Tam, 2005; Hong *et al.*, 2012; Jannach *et al.*, 2015, 2017; Lambrecht and Tucker, 2013; Li *et al.*, 2014; Pereira *et al.*, 2018; Urban *et al.*, 2013). Despite clear benefits and rising interest, temporal dynamics remains an understudied dimension of web personalisation (Ho *et al.*, 2011; Huang and Zhou, 2018; Salonen and Karjaluoto, 2016).

The use of temporal dynamics in web personalisation represents a multi-faceted concept. A simple example of temporal dynamics is how a user living in the northern region of the globe and looking for outdoor footwear likely prefers winter boots in December but not in July. If we consider the scope of temporal dynamics, this situation is an example of a long-term approach, which considers the long-term profile that is built for repeat users and often results in catering to either incremental changes in established needs or patterns of lifecycle shifts. Such long-term or lifecycle-based approaches have been shown to have a significant positive effect on personalisation results (Hong *et al.*, 2012).

However, user preferences show variation, are dependent on the user's state (Zhang, 2013) and – at least partially – are short term in nature (Griskevicius and Kenrick, 2013; Simonson, 2005). Thus, a more immediate approach to determining shifted preferences has intuitive appeal. For this purpose, we categorise both mid-term and short-term approaches here. By mid-term approaches, we mean temporal dynamics that can be primarily applied to sessions in short proximity to one another. A good example of such an approach is Lambrecht and Tucker's (2013) study on how the particular stage of the decision making process affects whether the re-targeting of banner ads is effective. Moreover, our focus is on the second possibility: the personalisation that occurs either within the short term or within a single session. Examples of such an approach are few but growing (Ding *et al.*, 2015; Hauser *et al.*, 2009, 2014; Urban *et al.*, 2013). Hence, temporal dynamics in web personalisation can address the currently active user preference (which is subject to both long- and short-term changes) through personalisation processes. We summarise the key literature on temporal dynamics in web personalisation and web adaptation in Table I.

Although long- and mid-term approaches provide other interesting insights, short-term approaches are required to determine what the user wants right now. For example, users choose high-calorie foods when e-shopping while hungry (Nederkoorn *et al.*, 2009). This immediate effect is likely to manifest, even if the long-term user profile contradicts it. However, there is a need for more research regarding immediate effects, especially in combining short-term behaviours with long-term profiles (Ding *et al.*, 2015). Moreover, although context awareness in recommender systems has been extensively researched, the existing studies rarely consider contextual issues from the psychological perspective (Adomavicius and Tuzhilin, 2011). Thus, a complementary approach based on a refined psychological model could enable new insights.

Why should we consider motivation?

Timing does not simply rely on knowing when and how to act; it also increasingly depends on the approach. Therefore, finding an effective approach for user modelling is a foundational question in web personalisation (Krishnaraju and Mathew, 2013). Recent efforts to map and model the emotional aspect of user behaviour have been highlighted (Kwon and Lee, 2014). In this article, we suggest that motivation could be made the reference point for understanding user preferences.

Several dimensions of motivation make it valuable to temporal dynamics in web personalisation. For example, web personalisation is about matching preferences (Tam and Ho, 2005) and motivation is a key driver of preferences (Kenrick *et al.*, 2010a). Motivation and

Table I.
Summary of the key literature for temporal dynamics in web personalisation and web adaptation

Source	Approach	Application area	Focus of interest	Timescale	Key finding(s)
Ho and Tam (2005)	Matching stated preferences	E-commerce	Stage of decision making	Mid- to short-term	Personalisation is effective when users form their consideration sets but not after the decision has been made
Hauser *et al.* (2009)	Matching user cognitive styles based on click-stream	Website (conversion)	Psychological fit	Short-term (long-term)	Adapting to match cognitive styles boosts conversion considerably
Ho *et al.* (2011)	Matching simulated preferences/click-stream	E-commerce	Timing of showing personalised content within the visiting period	Short-term	The effectiveness of personalisation is a question of optimising the early presentation of recommendations and the quality of the recommendations
Hong *et al.* (2012)	Collaborative filtering coupled with short- and long-term profiles	E-commerce	Stage of lifecycle	Long-term	Incorporating lifecycles into recommendations boosts performance
Lambrecht and Tucker (2013)	Dynamic re-targeting	Banner advertising	Stage of decision making	Mid- to long-term	Dynamic re-targeting is only effective if it fits a user's stage of decision making: high-level information is effective in the early stages; detailed information is effective in later stages. preferences narrow
Urban *et al.* (2013)	Matching user cognitive styles based on click-stream	Banner advertising	Psychological fit and stage of decision making	Short-term	Improved banner effectiveness goes beyond traditional targeting
Hauser *et al.* (2014)	Matching user cognitive styles based on click-stream	Website (conversion)	Psychological fit and stage of the visit	Short-term (Long-term)	Morphing to match a user's cognitive style increases conversion
Li *et al.* (2014)	Content-based filtering coupled with short- and long-term profiles	Online news	Variance between long-term and short-term profiles	Mixed	Combining long-term and short-term profiles increases personalisation effectiveness
Ding *et al.* (2015)	Real-time backward learning with dynamic learning	E-commerce	Learning user real-time intent based on browsing behaviour and tested the effectiveness of marketing and web stimuli	Short-term	Intent-based website transformation decreases shopping cart abandonment and increases conversion

the ensuing user mindsets also operate and yield insights regarding both chronic (long-term) and situational (short-term) effects (Rucker and Galinsky, 2016), which are optimal for temporal dynamics that combine long-term and short-term profiles. For example, while approaches based on personality (Fernández-Tobías *et al.*, 2016; Tkalcic and Chen, 2015) have been fruitful, personality is a stable construct (Cobb-Clark and Schurer, 2012) that cannot be applied to short-term preference shifts. Furthermore, the explanatory power of chronic fundamental motivation may exceed that of the Big Five personality factors (Neel *et al.*, 2016). A motivation-based approach could then facilitate active learning of both long-term and short-term preference shifts and mitigate the cold-start problem – as measures of personality have done (Fernández-Tobías *et al.*, 2016; Tkalcic and Chen, 2015) – but offer a new and perhaps improved source of accuracy for user profiling. In addition, considering that motivation shifts preferences (Griskevicius and Kenrick, 2013), the appeal of various persuasive approaches is likely to differ based on the active motive (Kaptein *et al.*, 2015; Tam and Ho, 2005). A motivation-based approach for persuasion could be used similarly to how mood congruence can be used to predict unpredictable purchases (Ho and Lim, 2018). Finally, an in-depth approach to motivation in temporal dynamics in web personalisation could complement our current understanding of contextual effects. To date, contextualisation has been based on rather simple factors and rational models (Adomavicius and Tuzhilin, 2011). Additionally, the approach in temporal dynamics has relied on rather basic psychological models, such as the SOR (Ding *et al.*, 2015). While the SOR model is well-established, it is limited at the level of user mindsets (Murphy and Dweck, 2016; Rucker and Galinsky, 2016). Therefore, it lacks more specific answers regarding when, why and how a certain stimulus is likely to affect a user's choices. We propose that a more advanced approach could offer at least a heuristic value in determining contextual effects. Despite the various potential advantages, such in-depth motivation-based approaches have rarely been considered in web personalisation (Salonen and Karjaluoto, 2016). We thus, aim to provide an introductory method for such modelling that complements the state-of-the-art approaches.

To address the identified issues, we offer the FMF (Griskevicius and Kenrick, 2013) as a promising framework and an example of refined psychological models on the level of user mindsets (Rucker and Galinsky, 2016). Although the importance of understanding user motivation may be obvious, the link between ancestral goals (see below) and modern web personalisation may seem unclear. We completely agree that our approach is not suitable for a standalone model for temporal dynamics, but we believe that it carries considerable potential when combined with other approaches. We will show that this framework could be a viable starting point for motivation-based web personalisation for the following reasons:

- it provides explanatory power to both long- and short-term preference shifts, which is essential for effective timing;
- it predicts contextual effects in ways that other motivational frameworks do not; and
- it is built upon tenets that can be operationalised into specific, valuable hypotheses.

The key benefit is that, while current personalisation approaches rely on simple behavioural tracking ("the best predictor of future behaviour is past behaviour"), the FMF predicts that a user may behave inconsistently based on the active motive, and it facilitates both the prediction and estimation of these effects.

Notably, other motivational approaches could be effectively used in temporal dynamics for web personalisation. For instance, regulatory focus theory (Higgins, 1998) and its

offspring – the concept of regulatory fit (Avnet and Higgins, 2006) – offer simple alternatives. However, we expect the FMF to provide a broader set of user behaviours (Griskevicius and Kenrick, 2013) and a more elaborate guide to the complexities of user preference shifting. Similarly, uses and gratifications theory is a viable approach to timing (Huang and Zhou, 2018) in a general sense, but the FMF can potentially go deeper into the study of the mechanisms of user preference shifting. Determining which of the many potential motivation-based approaches is best in practice requires testing and consideration of the application area. For our theoretical purposes, we find the FMF suitable due to multiple factors, which are discussed in more detail below. To narrow our focus regarding application areas, we will use product recommendations and promotions as more specific examples of interest for the remainder of this article. Many of the expected behavioural mechanisms in each motive class have more established touchpoints that are related to product recommendation and promotion issues (Griskevicius and Kenrick, 2013) compared to, for example, personalisation in e-learning, in which the focal process is different, and thus, may require a different approach (Salonen and Karjaluoto, 2016).

Fundamental motives framework

Based on the principles of evolutionary psychology (Confer *et al.*, 2010 for general evolutionary psychology; Durante and Griskevicius, 2016 for consumer behaviour; Kock, 2009 for information systems research), the FMF (Griskevicius and Kenrick, 2013; Kenrick *et al.*, 2010a, 2010b) posits that modern consumer motives have been shaped and continue to be affected by evolutionary challenges. At the root level, evolutionary challenges involve survival and reproduction, but they manifest themselves through a number of mediating motives. The FMF distinguishes but is not restricted to the following seven motives: evading physical harm, avoiding disease, making friends (or affiliation motive), attaining status, acquiring a mate, keeping a mate and caring for family (Griskevicius and Kenrick, 2013). Each motive is expected to result in predictable behavioural tendencies (Griskevicius and Kenrick, 2013, p. 376 for a list of behavioural tendencies that correspond to each motive class).

The FMF focusses on ultimate rather than proximate motives (Tinbergen, 1963); hence, a user is expected to have multiple concurrent motives that drive behaviour on different levels (Griskevicius and Kenrick, 2013). A user may have many proximate motives, such as having a fast, red car from a well-known brand (e.g. Ferrari). These "surface" motives relate to fulfilling one fundamental motive – mate acquisition – through conspicuousness. Notably, although users may be more consciously aware of their proximate motives, they are rarely aware of their choices on a fundamental level (Griskevicius and Kenrick, 2013).

In web personalisation, these insights are essential. For example, many true needs may go unnoticed if only proximate features are considered. With this in mind, should web personalisation simply provide different choices of red dresses or should it seek to understand the willingness to stand out in that given space of time? Using the FMF may enable the latter, deeper approach. Additionally, the number of proximate motives is enormous. While matching such a scale of preferences is difficult, the FMF focusses on the roots of the proximate motives, and can thus, condense the number of factors to a workable level. Although the task and the difficulty of linking proximate motives with likely fundamental motives remain, the FMF provides a manageable starting point.

Within the FMF, motives direct attention, memory and social inferences in both functionally specific (Kenrick *et al.*, 2010a) and unconscious ways (Griskevicius and Kenrick, 2013). For example, when the mate acquisition motive is active, men (but not women) – as evolutionary principles suggest – prefer products and promotional messages that highlight

uniqueness (Griskevicius *et al.*, 2009). With such extensions, the FMF distinguishes itself from many other comparable approaches. Next, we consider how the main tenets of the framework apply to web personalisation.

General tenets for fundamental motives framework-based product recommendation and promotion in web personalisation

While other motivational theories may be more prominent, there are some distinct benefits of using the FMF in web personalisation. Regarding temporal dynamics in product recommendation and promotion, four general tenets of the FMF are essential as follows:

(1) *Tenet 1*: A fundamental motive can be activated by either external or internal cues (Kenrick *et al.*, 2010a).

(2) *Tenet 2*: The currently active motive shapes preferences (Griskevicius and Kenrick, 2013).

(3) *Tenet 3*: The currently active motive guides decision processes (Griskevicius and Kenrick, 2013).

(4) *Tenet 4*: Although all fundamental motives can be activated with immediacy, one or a few motives are expected to manifest more chronically than others regarding individual differences (Neel *et al.*, 2016).

Tenet 1

The first tenet highlights the interactivity between internal and external factors that shape motive activation. Internal cues include hormonal changes that shift preferences for products (Durante and Arsena, 2015), per evolutionary guidelines. More importantly, users are unconsciously primed by environmental cues, which lead to preferences and decisions based on the environment (Dijksterhuis *et al.*, 2005). As suggested by a pool of literature that is substantially deeper than the few examples cited here, the case for the evolutionary driving mechanisms of human and consumer behaviour is solid (Durante and Griskevicius, 2016).

With that said, how does the supposed motivational driving mechanism function in an online environment? For instance, product choice may be affected by website backgrounds and pictures (Mandel and Johnson, 2002). Thus, elements in the web environment may be managed to activate a chosen motive, although simply being in the presence of external cues does not completely dictate the activation of a motive; other internal processes may be more salient. For practical purposes, the external cues are suggested here as the primary concern of short-term web personalisation processes.

What the first tenet means for web personalisation is that the user's interaction with web content can be used to estimate an active motive in two ways:

(1) by rating how saturated the content is with motive-eliciting cues and how exposed the user is to those cues; and

(2) by predicting the currently active motive via click-stream analysis.

Each click is estimated to indicate the active motive, which can be estimated by the motive congruence of choices. For example, reading a newspaper article online with pictures of attractive Hollywood stars should activate the mate acquisition motive, whereas reading about violence in the neighbourhood should activate the self-protection motive (Griskevicius *et al.*, 2009). Conversely, if the user makes the choice to read about these topics, that choice would predict the prevalence of a congruent motive.

Tenet 2

The second tenet directly reflects the goal of web personalisation – preference matching. Specific changes in cognition and predictable shifts in preferences occur in relation to an active fundamental motive (Kenrick *et al.*, 2010a). In practice, although the risk of buying a non-functional product generally does not threaten a user's well-being in modern society, due to deep-seated mechanisms, users form preferences and approach choices as if those choices might pose a threat through *unconscious* processing (Griskevicius *et al.*, 2009). Further, Simonson (2005) proposes that offers that fit the current evaluation context will be perceived as superior. We suggest that motivation is a key factor in determining the context of a user's choice. The shifting nature of preferences per an active motive class complements other general preference studies in web personalisation (Koren, 2010) that emphasise contextual effects on preferences. Simonson (2005) also suggests that the effect of motivation-shaping preferences is expected to be stronger for users who perceive the context to be credible and who have not developed strong prior preferences. Notably, the FMF suggests that only one fundamental motive is active at a given time, which makes it possible to predict changes in preference. Such a capacity could enhance prior efforts towards the timing of web personalisation (Ho *et al.*, 2011). Likewise, prior strong preferences are expected to reign supreme (see Tenet 4 below) as long as the underlying motive remains active without changing to another functionally polarising motive for preferences.

Tenet 3

As the Tenet 3 claims, user decision making processes are also guided by motivational factors. Here, we wish to highlight that the information processing of the product or promotional information may differ per the active motive class. For instance, when making economic decisions, people become loss averse when their self-protection motives are active, but especially men become significantly less so when mate acquisition motives are active (Li *et al.*, 2012). This finding emphasises the regulatory focus of users regarding whether they are in either a promotional state or a prevention state (Avnet and Higgins, 2006). As suggested by Avnet and Higgins (2006), users experience value when an offer is in line with their currently active state. The FMF may offer a practical tool for web personalisation that enables value through this motivational fit. In the web personalisation realm, such a cue (or psychological) fit has already been shown to increase users' willingness to pay (Benlian, 2015).

Tenet 4

The Tenet 4 suggests that fundamental motives are not always in a flux; rather, either one or a few motives manifest themselves more chronically based on individual differences (Neel *et al.*, 2016). Each motive is active in each individual at a given time, but individuals differ in their proclivity to manifest a given motive. The identification of a chronic motive opens an avenue for long-term profiling. In the case of product choice, previous shopping and/or browsing history could reveal, which features the user prefers, especially, if the history is analysed for motive congruence. This long-term motive-based profile would then function as a baseline in web personalisation processes, including more immediate approaches (Li *et al.*, 2014), where the chronic motive could be used to predict susceptibility to cues for that motive. To emphasise this aspect, the FMF may be able to enrich user profiling by providing a tool for assessing prior behaviour and/or product choice from a motivational perspective (Ding *et al.*, 2015; Montgomery *et al.*, 2004). Such a tool could facilitate determining the meaning of motivation when the user, for example, chooses either the most or the least expensive product (Han *et al.*, 2010).

The key takeaway from the FMF is that both user preferences and decision making follow predictable tendencies based on the active motive. Hence, the use of the FMF comes from not only the understanding that a self-protection motive might lead to a preference for safe products but also the cognitive processes that seek to decrease risk, even in seemingly unrelated choices. For a complete list of expected behavioural tendencies for each active motive, see Griskevicius and Kenrick (2013, p. 376).

Priming for motivational effects

One of the distinguishing features of the FMF is its capacity to account for behavioural change according to cues in the (web) environment on a deeper level than those that are often considered in web personalisation (Adomavicius and Tuzhilin, 2011). In addition to, for example, motive-congruent click-stream analysis, it is important to understand that, to some extent, the choices that users make are due to environmental cues. Hence, we will consider the role of priming the produced motivational effects in users in more detail.

Priming may also guide behaviour. Notably, behavioural priming can have even stronger effects than semantic priming because of its ability to activate downstream constructs, such as goals (Wheeler *et al.*, 2014). Primed consumer behaviour shows signs of automated goal pursuit (Dijksterhuis *et al.*, 2005), which gives credence to the tenets of motive-based preference shifting in accordance with environmental factors, as suggested by the FMF. Buying decisions are strongly affected by the environment, even though the effect is unconscious (Dijksterhuis *et al.*, 2005). Similarly, online channels may include cues that shift users' willingness to pay (Benlian, 2015). Yet, it is important to consider that priming cannot dictate user behaviour because it has no direct control over either judgment or behaviour (Loersch and Payne, 2014). To illustrate, one prime can have different effects based on the context (Wheeler and Berger, 2007). Therefore, applying the FMF may provide insight regarding what specific effects occur.

Priming effects are especially strong when the associative power of the prime is high (Dijksterhuis *et al.*, 2000). However, as demonstrated by Wheeler and Berger (2007), it is essential to consider the context as well because it may divert users from stereotypical actions, and thus, either prevent or invert the expected effect.

Based on findings in other related contexts, as described above, understanding prime-to-behaviour effects is likely to be beneficial for advancing the field of web personalisation. Importantly, how the many visual and/or semantic cues shape preferences and the subsequent motive-based behaviour have not been comprehensively considered. Using the FMF may be suited for such a task.

Propositions for motive-based temporal dynamics

Here, we summarise our theoretical basis thus, far in the form of actionable propositions for future research. Our primary argument is that the current understanding of preference shifting and formation in web personalisation can be enhanced using a complementary motive-based approach. The suggested propositions should be tested with empirical data beyond our partial empirical validation.

While a motive-based approach should be beneficial for web personalisation in general, our chief application area for this approach is in the temporal dynamics of high-involvement product recommendation and promotion. Regarding temporal dynamics in web personalisation, we suggest that accurate timing is unlikely if a motivation match is not found. Not all the propositions listed consider temporal dynamics directly; instead, they contribute the more nuanced perspective of preference shifting that underlies our suggestions for temporal dynamics. Table II summarises the propositions, which are individually discussed in the section that follows.

Table II.
Propositions for motive-based temporal dynamics

P1	Preference matching will be greater when personalisation results match the drivers of the currently active fundamental motive
P2	A given fundamental motive can be activated in the web environment through external cues, such as the following: A: visual cues (e.g. website background picture) B: semantic cues (e.g. newspaper article content) C: auditory cues (e.g. music)
P3	The greater the user's awareness of the cues, the stronger the priming effect for the activation of a fundamental motive
P4	The higher the cultural congruence between the prime and any product or promotion features in relation to the drivers of the currently active fundamental motive, the stronger the priming effect and the preference match
P5	Regarding individual differences in chronic-like motives, users are more susceptible to cues for certain motives than others

The *P1* relies on the key assumption that motivation primarily dictates the direction of preferences. This assumption follows the tenets of the FMF (Griskevicius and Kenrick, 2013). In this view, preferences facilitate goal attainment, and thus, work as an intermediary for motives. Empirical evidence of this has been built through the use of promotional message preference shifts and economic decisions for each active fundamental motive (Griskevicius *et al.*, 2009; Li *et al.*, 2012). In the world of web personalisation, either a product or product message should be prioritised if it supports the attainment of the currently active motivational goal. For example, the popularity of products that are promoted as "unique" should increase when the mate acquisition motive is active in male users, and they should decrease when the self-protection motive is active (Griskevicius *et al.*, 2009).

The *P2* expands on the assertion that the user's current environment directs motive activation to secure the best fit (Griskevicius and Kenrick, 2013). These external cues can take many forms. Visual cues consist of background pictures, photos and video content that are consumed in the immediate session, whereas semantic cues are text content based. Furthermore, auditory cues, while possible, are rare in practice. The influence of motive shaping cues is expected to vary per the level of initial product knowledge, the confidence in the beliefs that are vested in the product knowledge and trust in the recommendation agents (Adomavicius *et al.*, 2013; Yin *et al.*, 2016). Thus, motive-eliciting cues do not work solely on priming effects; rather, they require broader predictions about the user. To conclude, through implicit ratings, web personalisation processes should become more aware of the motivation congruence of the elements with which the user interacts. Personalisation processes should also expect these elements to guide behaviour through motive-directing priming cues and to generate predictable changes in preferences. Using the FMF enables actionable inferences for this purpose.

The *P3* follows the findings by Lähteenmäki *et al.* (2015), who emphasise the importance of awareness in recognising the prime to ensure effective results. This does not mean that processing the prime would not, at least in part, be unconscious; the priming cue will instead have a stronger effect if it is consciously recognised. In the web environment, this statement implies that the priming effect is stronger when the user is more aware, for example, of a background picture, which means that more distinguishable pictures are more effective at priming.

The *P4* is based on findings regarding the relationship between associative strength and priming (Dijksterhuis *et al.*, 2000). Sassi *et al.* (2017) have called predicting the relevance of items in regard to contextual factors the next step in recommender systems. Here, we

suggest that those priming cues that can be associated with attaining the motivational goal will show predictable preference shifting per the active fundamental motive. As discussed above, a sexy background picture may activate the mate acquisition motive in a male user. Additionally, such a picture is more likely to generate a preference for flashy cars than a carton of premium milk because flashy cars are more likely to be culturally recognised as increasing one's value in the mating market. Consequently, both the priming effect and the preference match are expected to be stronger when the associative power is stronger. If this proposition holds true, it should enable the identification of the currently active motive based on a click-stream analysis (Ding *et al.*, 2015; Montgomery *et al.*, 2004). It is more established that each user's choices may indicate his or her preferences, but linking these choices to motivation and building a temporal user profile by testing that link is new in web personalisation. Using such an approach could enable a new level of accuracy in matching fluctuating preferences.

The *P5* follows one of the FMF's tenets in expecting either one or a select few motives to manifest chronically, which will lead to individual user differences (Neel *et al.*, 2016). Hence, some users are more readily affected by cues that relate to a certain motive. The significance of this proposition for temporal dynamics in web personalisation is most notably in long-term profiling. Knowledge of prior motive-laden choices can be used to create a baseline, which can be validated as more data on the immediate session are gathered. While such an approach follows current practices, interpreting the data through motive congruence should reveal a greater variety of details regarding the user's preferences.

Validation of the propositions

A 1 (user type: male) × 2 (motivation: mate acquisition and self-protection) simulated purchase case experiment was created for an empirical test for *P1* and *P2*. For the experiment, a mock-up of a fictional e-commerce site selling men's T-shirts was built. The participants saw one product page featuring a rainbow-colored T-shirt. In addition to the product information, we placed a banner advertisement for either a dating company, featuring an attractive woman or for a security company, featuring an aggressive man. Both advertisements had the same copy text: "Life is full of chances". A pre-test (N = 136) based on an analysis of variance revealed that these banner ads were effective at priming the participants' motivation so that the dating company advertisement increased mate acquisition [$F(1,67) = 6.23$, $p < 0.05$] more than the self-protection group did, and the security company advertisement increased self-protection [$F(1,67) = 18.42$, $p < 0.01$] more than the romantic cue group did. For the motivation measurement, we used the same items as Griskevicius *et al.* (2009), which were combined into factor scores.

For the experiment, although we recruited 194 male participants via MTurk, 56 of them failed to correctly answer a manipulation check question, which left 138 participants. In the experiment, we asked participants to rate their attitude towards the rainbow-colored T-shirt on three adjective pairing items (bad-good, dislike-like and undesirable-desirable), which we combined into a factor score. An independent sample *t*-test was conducted to compare their attitudes towards the product in both the mate acquisition (dating ad) and self-protection (security ad) conditions. Our hypothesis, which was based on the behavioural tendencies of the focal motivators (Griskevicius and Kenrick, 2013), was that mate acquisition should drive a preference for the most eye-catching product. Support for this hypothesis was found; there was a significant difference in the scores for the mate acquisition ($M = 2.60$, $SD = 1.15$) and self-protection ($M = 2.10$, $SD = 1.29$) conditions and [$t\ (134) = 2.33$, $p = 0.02$]. These results provide support for *P1* and *P2*. The results further support that cues, such as banner ads, may be used to activate such motives. While the preliminary study confirmed the

effectiveness of the priming cues, in the experiment, the values of this manipulation check remained in the non-significant region. This limitation may be due to the fact that participants answered other questions between priming and the manipulation check question, which was not the case in the pre-study. This may explain the difference in the priming effect between the pre-study and the experiment. We posit that, while support for the propositions that were tested was found overall, they must be empirically tested further.

For this additional testing, evaluating the role of the motivation-preference link is key, and at least three approaches are possible:

(1) Emphasis could be placed on how the user's chronic motivational disposition may predict preferences in online environments. This would facilitate the creation of a long-term user profile and a baseline for possible short-term preference shifts.

(2) Short-term effects could then be studied through, for example, click-stream analysis to measure whether preferences that are inferred from user choices in an online environment follow the expected preference shifting mechanisms (based on the FMF here). In practice, this requires categorising elements and content in the focal online environment, grading them on the motivational scale and making predictions regarding the expected motivation-preference link.

(3) The same approach for short-term effects could also be inverted and studied through the priming effects of the elements and the content in the focal online environment.

Thus, motivational grading of elements and content can be used for predicting possible shifts in a user's preference prior to gathering enough data to create a more established user profile. The expected mechanisms are based on priming effects.

When combined, these five propositions outline a possible new direction in temporal dynamics in web personalisation. A deeper understanding of motive-based preference shifts may reveal an actionable framework for more accurate timing as a complementary and introductory tool if the propositions hold true under the scrutiny of empirical testing.

Framework for product recommendation and promotion in web personalisation

We have thus far outlined how a motive-based approach, via following the FMF in our case, could be a valid complement for a temporal recommendation. Here, we distil our key points into an actionable framework for product recommendation and promotion based on the FMF. As illustrated in Figure 1, our framework follows a process orientation by depicting the activation of a motivational state as the starting point for a firm-initiated personalisation process for increased conversion. Following Sunikka and Bragge's (2012) claim that information gathering regarding users' preferences usually includes both user- and company-driven initiatives, our framework distinguishes both as active players.

The suggested framework focusses on the user in the first phase. The personalisation process may be company initiated, but the user must first reveal his or her preferences through his or her actions. In this framework, the currently active motive is the focal point that guides the following steps. As suggested above, a motive is activated through both internal and external factors. Internal factors include situational factors and stable chronic motives, which create opportunities for long-term profiling while possibly restraining the activation of other motives. The external factors include environmental cues that tend to take visual and semantic forms, which are more easily accessed by the company and can potentially be managed.

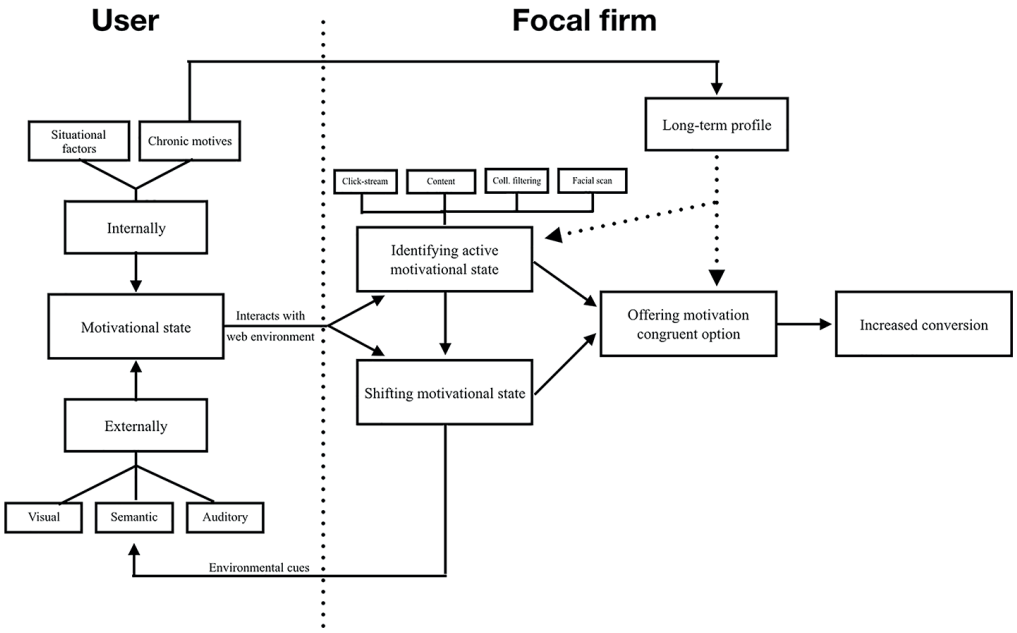

Figure 1.
A process-oriented framework based on the FMF for temporal dynamics in product recommendation and promotion in web personalisation

The role of the focal firm is two-fold in the framework. In the second phase of the framework, the focal firm can seek to identify the currently active motive class via several methods (e.g. content analysis, collaborative filtering and advanced methods, such as facial scans) to assess the motive-eliciting cues in the environment and user profile features. The learned preferences may primarily be used to offer a motive congruent option. The firm may also seek to shift the motivational state through motive eliciting environmental cues (i.e. managing cues in the web environment to prime a motivational state).

The third phase further emphasises the need for understanding motivational factors in web personalisation. If a user's active motive has been successfully identified, the personalisation process should produce a choice selection that matches the drivers of the motive class. The framework suggests not only that a motive is identified but also that the focal firm must provide a motive-matching alternative.

Finally, following our main hypothesis, the fourth phase claims that, if the process of first identifying the user's active motive class and then providing a motive-matching alternative is successful, the end result is increased conversion. While motivation as the primary focus is novel in web personalisation, the process of seeking to connect user needs with company offerings is rooted in its foundation.

The suggested framework offers a combination of generality and specificity. The aim of the framework is to provide a systematic and actionable roadmap for considering motivation in web personalisation. The framework is non-restrictive in that it is inclusive of many inputs and open for additional inputs, but it is specified to product recommendations and promotion because these share similar goals. It may be possible to apply the framework elsewhere if similar goals are identified. Furthermore, the framework relies on the FMF, meaning that using the framework requires an evolutionarily educated approach, which is believed to provide a manageable number of motives and actionable inferences. However, if other motivation theories can provide these, then the suggested process may also be applicable to other motivation theories.

We suggest that, while the framework is complementary to current approaches and introductory, it reveals the possibility of inducing advanced psychological measures into the personalisation process. The framework is not flawless in terms of either scope or specificity, but it does provide an extensive basis for testing future avenues of psychological preference fits through the personalisation process.

Validation of the framework

To validate the framework, we used feedback findings by interviewing four expert practitioners in leading positions (Hollebeek *et al.*, 2016; Thomas and Tymon, 1982). The framework gained overall support from all involved experts. Specifically, they saw a number of benefits, such as that the framework offered new insights and opened avenues for a more detailed motivational approach. In addition, the option to either identify or shift motivational states received praise, and the discussion led to concrete application ideas in the case of one expert. Finally, the option to combine long-term motivational profiles with short-term profiles was considered useful. Overall, the feedback for the framework was encouraging. However, weaknesses were noted, which primarily addressed a potential lack of access to enough data. While large players were seen to have enough data to use the framework, it was noted that an avenue for smaller players to either access or purchase supporting data would be useful. One expert requested further elaboration of the expected behavioural tendencies of the motives. Interestingly, the framework was predominantly considered applicable to practice, but the experts' views differed regarding whether the framework is more applicable to promotion (digital marketing) or e-commerce, with both sides gaining support. Considering the feedback as a whole, the framework seems to offer a good foundation for the effort to complement current state-of-the-art practices with a deeper psychological fit based on motivation.

Conclusions

In a sense, all problems in web personalisation are timing problems. Knowing what a user usually wants represents a substantial achievement, yet true success lies in mastering the time component of "right now". Although contextual issues have been considered previously, motivation has rarely been identified as a key driver of preference shifts (and is thus, inseparable from temporal dynamics) in web personalisation. Additionally, it is novel to suggest an advanced psychological framework for preference dynamics that has both explanatory and predictive powers in web personalisation. However, this is only one possible complementary approach to determining how contextual factors play a role in temporally dynamic preference matching.

This study makes three contributions to the discussion of temporal dynamics in web personalisation:

- Several practical propositions, which address how motivation and preferences are linked and how the understanding of the interplay among preference matching, timing and motivation can advance the field and which could be tested in future research, are outlined.
- The above contributions are combined into a systematic but non-restrictive framework for temporal dynamics in product recommendation and promotion.
- Possibilities for applying motivation-based temporal dynamics to a variety of instances, such as active learning and persuasive strategies, are considered. In summary, this article has sought to not only indicate that motivation is an important dimension but also to provide a means of operationalising this knowledge in testable models, as suggested by our validation work. We believe that such extensions to current approaches serve as important complements to recent advances, such as those of Ding *et al.* (2015).

Our approach has several limitations, especially concerning the use of the FMF. Because the FMF is based on evolutionary psychology, it faces much of the same criticism (Confer *et al.*, 2010). In addition, because the FMF has not been designed for web personalisation, the applicability of each motive class may vary considerably, depending on the goal of the personalisation effort. For example, there are apparently more application areas for motives of mate acquisition and self-protection than there are for avoiding disease in the realm of web personalisation. More research on the effects of each motive, for which the suggested behavioural tendencies provide an excellent basis, is needed to determine how links between evolutionary drivers and online behaviours manifest (Kock, 2009). Finally, while the suggested framework for web personalisation offers novel and potentially significant advances in specific product recommendation and promotion situations, it may not be fruitful in all situations and for all products. For example, attempts to increase conversion for low-involvement products may be more difficult.

The theory, propositions, and framework that are included here all have solid bases in findings from other fields; however, we provide new insights into web personalisation. Further empirical testing beyond our validation efforts is required to cement the viability of the propositions and framework. If empirical support is found, web personalisation could begin to take steps towards using more sophisticated approaches to motivation-based temporal dynamics to enhance timing in web personalisation. The benefits of such a change should be considerable.

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III

THE ROLE OF FUNDAMENTAL MOTIVATIONS IN WILLINGNESS-TO-PAY ONLINE

by

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The role of fundamental motivations in willingness-to-pay online

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ABSTRACT

This study aims to determine whether an understanding of chronic fundamental consumer motivations can help determine the mechanisms of willingness-to-pay for products online. To do so, it employs a simulated buying task on a fictional e-commerce site for a consumer product (branded either as a "new arrival" or a "classic") to investigate the effects of two fundamental motivations (mate acquisition vs. self-protection) on willingness-to-pay for the product online. The primary focus of the paper to investigate the capacity of mate acquisition and self-protection motives to moderate the relationship between attitude toward the product and willingness-to-pay, as well as, the effects of the motives on willingness-to-pay are considered. Through regression and interaction effect analyses, it is shown that chronic fundamental motivation for mate acquisition is directly correlated with an increased willingness-to-pay for both product types, and it moderates the relationship between attitude toward a product and willingness-to-pay. Self-protection motivation increases willingness-to-pay for classic products but not new arrivals. By offering a rare look at chronic fundamental motivation in the consumer context and potentially being the first investigation of the moderating effects of fundamental motivations, the results mostly support the notion of predictable motivation induced behavioral tendencies.

1. Introduction

Consider being tasked with boosting sales for an e-commerce site on a tight marketing budget. When utilizing dynamic pricing and looking for the highest yield, who do you target? Following convention, you might focus on prospective customers who seem to have the highest preference for the products on offer (Homburg et al., 2005). However, despite their love for your products, some customers will be more price sensitive than others, which affects profitability. Hence, the key to your and any marketer's success is finding ways to predict which prospective customers would be willing to pay more for a product.

To do so, few marketers' first instinct would be to consider evolutionary motivational mechanisms over more traditional dimensions such as branding (Augusto and Torres, 2018). This is understandable because modern consumer behavior, especially online, has evolved to contain novelties that were never encountered by our ancestors. However, consumer behavior today does follow evolutionary guidelines (Durante and Griskevicius, 2018; Kock, 2009; Miller, 2009; Saad, 2007). There has been a recent and growing interest in how evolutionary consumer motives may guide consumer behavior in various ways (Durante and Griskevicius, 2018; Saad, 2017). Approaches based on the Fundamental Motives Framework (FMF) (Kenrick et al., 2010a; 2010b)—when applied to the consumer context (Griskevicius and Kenrick, 2013)—have been fruitful in expanding our understanding of how fundamental motives may help predict preference shifts and decision-making (e.g., Griskevicius et al., 2009; Huang et al., 2017; Li et al., 2012).

Previous research on fundamental motives in consumer settings has been rather narrow in two ways: (a) While the focus has primarily been on simple motivation-preference links (Table 1), potential moderating effects of fundamental motivation have largely been neglected, and (b) one of the key strengths of the FMF is that it distinguishes both chronic and temporally activated motivational sources, with the former leading to rather stable individual differences (Neel et al., 2016) and the latter yielding short-term preference shifts (Kenrick et al., 2010a). Prior research has focused more on the latter than the former (Table 1). Moreover, in the larger context of consumer mindsets, a better understanding of these dynamics, which are characteristic of the FMF, is essential (Rucker and Galinsky, 2016). The FMF enables a greater number of motives than dichotomous growth (belief in the ability to change) versus fixed (belief in stable characteristics) mindsets (cf. Carnevale et al., 2018; cf. Murphy and Dweck, 2016) and offers one approach to distinguishing foundational (fundamental) mindsets in a hierarchical order (cf. Kenrick et al., 2010b; cf. Rucker and Galinsky, 2016; cf. Wagner and Rudolph, 2010).

In this research, we investigate the effects of two fundamental

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Table 1
Summary of key literature for consumer research utilizing either the FMF or a similar evolutionary approach.

Source	Durante and Arsena (2015)	Durante et al. (2010)	Griskevicius et al. (2010)	Griskevicius et al. (2009)	Griskevicius et al. (2006)	Huang et al. (2017)	Li et al. (in press)	Li et al. (2012)	Sundie et al. (2011)
Key finding (s)	Women in a high fertility stage prefer more variety in products than women in a low fertility stage	Women in a high fertility stage prefer appearance enhancing products	With status activated, consumers prefer "green" products when purchasing is public vs. private and the green product vs. the control is more expensive	The MA prime leads to a preference for marketing messages that highlight uniqueness/scarcity vs. social proof, whereas the SP prime has the opposite effect	SP leads to more conformity in both sexes. MA leads women to more conformity and men to more non-conformity	Disease avoidance motivation leads to lessened WTP for used products	Men are more future oriented, whereas women are more present oriented, as is evident in the temporal aspects of rewards and attitudes toward marketplace entities	SP motivation increases loss aversion in men and women; MA motivation eradicates loss aversion in men	Conspicuous consumption is led by men with a short-term mating strategy
Focus of interest	Variety-seeking in products	Product type choice	Product preference/WTP	Preference, attitude, intention	Conforming vs. non-conforming behavior	WTP	Temporal effects in decision-making	Loss aversion	Conspicuous consumption
FOCAL motive (s)	MA	MA	Status	MA/SP	MA/SP	Disease avoidance	Caring for family	MA/SP	MA
CUE TYPE(s)	Hormonal fluctuation	Hormonal fluctuation	Contextual Priming	Contextual Priming	Contextual Priming	Contextual Priming	Contextual Priming	Contextual Priming	Contextual Priming

motives—mate acquisition (MA) and self-protection (SP)—on willingness-to-pay (WTP) in an online context from two angles. Firstly, we explore how these motives may affect WTP for a product branded either as a "new arrival" or as a "classic" in a simulated online purchase case setting. In line with prior literature (Griskevicius and Kenrick, 2013; Griskevicius et al., 2009; Li et al., 2012), we expect MA to increase and SP to decrease WTP for the new arrival version, whereas the classic version should show an opposite pattern. These expected patterns primarily rely on differing mindsets (see Rucker and Galinsky, 2016) on risk shaped by the motives. Perceived risk is a driver of WTP (Casidy and Wymer, 2016). "New arrival" products fundamentally contain more risk than "classic" products as trustworthiness has not yet been established by experience or social proof. Prior studies on MA and SP motives have revealed that SP increases risk aversion and the effectiveness of social proof claims, whereas MA shows the opposite pattern (e.g., Griskevicius et al., 2009; Li et al., 2012). Furthermore, the mechanisms driving MA relate to standing out, which may further act as catalyst to spend more as function of conspicuousness (Sundie et al., 2011). Secondly, as our primary focus we broaden the scope of prior research to include the potential moderating effects of fundamental motivations on the relationship between attitude toward a product and WTP by focusing on the effects of mate acquisition and self-protection motives. This is important for two reasons: firstly, because it expands the conceptual sphere of fundamental motives toward a motivational context, whereby motivation may guide other key relationships in consumer decision-making, and secondly because it may complement other recent investigations of the moderating and mediating effects of motivation in consumer research (Nabi et al., 2019; Shao et al., 2019). In this case, the motivational preference mechanism should be agnostic to the product type (new arrival vs. classic) yet should create a motivational context for the choice as it pertains to a generalized mechanism to decreased (vs. Increased) price sensitivity and risk-taking based on the tendencies of the focal motives (Griskevicius and Kenrick, 2013).

The main results suggest there to be a multifaceted relationship between chronic fundamental (MA and SP) motivation and WTP. MA motivation significantly boosted WTP for both new arrival and classic products, whereas SP motivation only for classic products as was hypothesized. Moreover, MA motivation moderated the relationship between attitude toward a product and WTP by catalyzing the effect of attitude on WTP. However, the moderating effects of fundamental motives may be motive-specific as SP motivation did not moderate the focal relationship.

The current research makes several contributions. Firstly, it breaks new ground by investigating the moderating effects of fundamental motivation in a consumer setting. Our primary findings support the general notion of moderation effects of fundamental motives but also highlights some potential differences and nuances that are motive-specific. The results pave way to expand the knowledge of the motivation-preference link to include broader effects on consumer behavior. Secondly, we offer a rare look at the role of chronic motivation in a consumer setting. Our findings suggest that the level of chronic MA and SP may increase WTP but in different conditions. Increased understanding here may help scholars and practitioners account for the possible long-term and/or baseline effects of motivation. In the online context, this could enable enhanced targeting based on user profiling (Salonen and Karjaluoto, 2016). Finally, by focusing on the role of fundamental motivation in the relationship between attitude toward a product and WTP, we strive to deepen and expand our understanding of the primary relationship (e.g., Ha-Brookshire and Norum, 2011; Hultman et al., 2015; Husted et al., 2014; Luzar and Cosse, 1998) by offering a psychological lens to investigate the contextual effects of the primary relationship (cf. Valle et al., 2017).

2. Literature review

2.1. An overview of the Fundamental Motives Framework

The FMF (Griskevicius and Kenrick, 2013; Kenrick et al., 2010a, 2010b) follows the principles of evolutionary psychology to explain consumer motivation (see Confer et al., 2010 for general evolutionary psychology; see Durante and Griskevicius, 2016 for consumer behavior; see Kock, 2009 for information systems research). Per the FMF, consumers' motives continue to follow cognitive, affective, and behavioral tendencies that were adaptive in ancestral conditions in the modern world (Kenrick et al., 2012; Schaller et al., 2017). At their root, evolutionary challenges involve survival and reproduction, but they manifest themselves through a number of mediating motives. The FMF's seven distinguished mediating motives include but are not restricted to the following: (i) evading physical harm, (ii) avoiding disease, (iii) making friends (or affiliation motive), (iv) attaining status, (v) acquiring a mate, (vi) keeping a mate, and (vii) caring for family (Griskevicius and Kenrick, 2013). One strength of the FMF is its capacity to predict both the behavioral tendencies per each active motive (see Griskevicius and Kenrick, 2013) and the possible interaction effects of different motives (Schaller et al., 2017).

The FMF focuses on ultimate rather than proximate motives (cf. Tinbergen, 1963), suggesting that there may be several simultaneous motives that are operating on different levels (Durante and Griskevicius, 2018). For example, although a consumer's motive to buy the new Tesla S-series may be either design or environmental friendliness on the proximate level, it is still guided by status-seeking on the fundamental level (see Griskevicius et al., 2010). Implementing the FMF could enable a complementary foundational approach to, for example, either the basic typologies of online consumer motivation (e.g., Childers et al., 2001; Lopes and Galletta, 2006; Rohm and Swaminathan, 2004) or the discussion of consumer mindsets (cf. Murphy and Dweck, 2016). For the latter, the FMF enables a potential approach that includes many of the features that have previously been outlined as important for the study of consumer mindsets (cf. Rucker and Galinsky, 2016), including insights into chronic and situational activation (Kenrick et al., 2010a; Neel et al., 2016) and a hierarchical structure (Kenrick et al., 2010b), with an increasing understanding of interaction effects between the motives (Schaller et al., 2017).

2.2. Applying the Fundamental Motives Framework in consumer studies

The FMF has been fruitful when applied to consumer studies. In Table 1, we outline key empirical studies that have either utilized the framework or a similar approach in consumer settings. Surprisingly, many studies have addressed the increased impulsivity, risk-taking, and conspicuous consumption that are associated with the behavioral tendencies of MA motivation (Griskevicius et al., 2006, 2009; Li et al., 2012) as well as variety-seeking and product preferences (Durante and Arsena, 2015; Durante et al., 2010). Similarly, SP motivation has been the focal counter-part in many studies (Griskevicius et al., 2009; Li et al., 2012) because it mirrors many of the tendencies of MA, including increased loss aversion (Li et al., 2012), conformity (Griskevicius et al., 2006), and persuasiveness of social proof (Griskevicius et al., 2009). Status has been another focus in consumer studies (Griskevicius et al., 2010; Sundie et al., 2011). Other motives have gained less attention to date, but interesting findings have recently been found regarding disease avoidance (Huang et al., 2017) and caring for family (Li et al., in press). This small sample outlines the broad applicability of the FMF for many different applications.

2.3. Potential roles of fundamental motivation in consumer studies

Research has noted many predictable motivational effects on consumer behavior, most of which have resulted from primed motivational states. However, this leaves some important information gaps, such as the role of motivation as the long-term baseline rather than the temporally-activated and focalized mechanism (see Neel et al., 2016). It is feasible that, compared to primed motivation, chronic motivation will lead to similar effects (Maner et al., 2005). If this is the case, the level of chronic MA motivation as a driver leads to increased willingness to stand out (Griskevicius et al., 2009) and decreased loss aversion, especially in men (Li et al., 2012). In addition, eagerness to adopt new products (Griskevicius and Kenrick, 2013) should show preference for newly arrived products and a lower preference for classic products, whereas the level of chronic SP motivation should show the opposite patterns (Griskevicius and Kenrick, 2013; Griskevicius et al., 2009; Li et al., 2012) as it is function of mitigating risks (cf. Casidy and Wymer, 2016). With a focus on WTP as the main preference measure, the following hypotheses were created:

H1A. The level of chronic MA motivation increases WTP for new products.

H1B. The level of chronic SP motivation decreases WTP for new products.

H1C. The level of chronic MA motivation decreases WTP for classic products.

H1D. The level of chronic SP motivation increases WTP for classic products.

We further hypothesized that fundamental motivation may also play a role in WTP as a moderator of other central relationships. This means that the motivational context that is created by the level of chronic fundamental motivation could enable generalized effects on choice and preference in such cases. Preliminary evidence for this was provided by Durante and Arsena (2015), who found that increased general variety-seeking leads to increased variety-seeking in products for women in the high fertility stage. While the first set of hypotheses focuses on situations wherein the choice or preference task is more or less associated with attaining the motivational goal, the moderating role could also be present when there is a lower associative strength between the choice and the motivational goal (cf. Dijksterhuis et al., 2000). Such an effect would expand the applicability of fundamental motivations.

We investigated the potential moderating role of the level of chronic fundamental motivation on the intuitive relationship between attitude toward a product and WTP for the product (Ha-Brookshire and Norum, 2011; Hultman et al., 2015; Husted et al., 2014; Luzar and Cosse, 1998). While it is possible that the product and its marketing positioning may be less associated with attaining the fundamental motivational goal in some cases, attitude toward the product is a construct that is directly related to the product. Furthermore, attitude toward the product is a relatively good proxy for WTP for the product; therefore, we expect a direct relationship there (Ha-Brookshire and Norum, 2011; Hultman et al., 2015; Husted et al., 2014; Luzar and Cosse, 1998). In our case, MA is expected to moderate the relationship between attitude toward a product and WTP by catalyzing the primary relationship, whereas SP motivation is expected to inhibit the relationship based on the general tendencies of these fundamental motives (Griskevicius and Kenrick, 2013). However, because these effects stem from generalized mechanisms, they should be agnostic to the product type (new arrival vs. classic). Hence, the following hypotheses were developed:

H2A. The level of chronic MA motivation moderates the relationship between attitude and WTP so that high MA motivation promotes WTP.

H2B. The level of chronic SP motivation moderates the relationship between attitude and WTP so that high SP motivation inhibits WTP.

3. Methodology

This study was conducted as a simulated buying task online on the

Qualtrics platform. We followed Huang et al. (2017) and created a mock-up version of a fictional e-commerce site, of which the participants saw one product page featuring a cabin-size suitcase. In addition to a large picture of the product, including the price and product specifications, the participants saw a highlighted text that advertised the product as either a new arrival ("New Arrival! This handy, cabin-size suitcase defines the latest surge in suitcases") or as a classic ("Classic! This handy cabin-size suitcase defines what tried-and-tested means for suitcases"). The participants were randomly assigned to these different versions. Importantly, we utilized a white background to not cues contextual background information (cf. Maier and Dost, 2018).

The 210 participants (115 male, 95 female) were recruited via Amazon's Mechanical Turk platform for monetary compensation. The number of participants resembles that of other similar experiments such as experiments carried out by Huang et al. (2017) which we emulated. The study procedure included three main types of questions: background questions (gender, age, relationship status, and ethnicity), product preference metrics, and a measure of the chronic motivation levels for MA and SP. For product preference metrics, both WTP as a slider option (5–15 equaling 50%–150% of the given recommended retail price) and attitude toward the product as a 5-item adjective pairing task on a 7-point scale were utilized. Finally, motivational disposition for chronic motivation on MA and SP was measured with 4 items for each motive class on a 7-point scale (1 = strongly disagree; 7 = strongly agree), which was adapted from Neel et al. (2016). We excluded 9 participants who took longer than 2 standard deviations to complete the task, leaving 201 participants for analysis (109 male, 92 female, M_{age} = 37.74, SD = 11.13, ranging from 21 to 69 years). The respondents were predominantly of Caucasian origin. WTP across the population (N = 201) was less than the recommended retail price, with the average being 7.34 or 73.4% (SD = 2.74, min = 5, max = 15). For a summary of demographic information, see Table 2 below. The new arrival and classic product versions were similarly valued, meaning that there was not a predisposed difference in the WTP for the product between the product type versions (F(1,199) = 0.655, ns). Similarly, attitude toward the product items showed little variance across the means of the items across the product types (F(1,199) = 2.17, ns).

A general linear regression model was used to investigate $H_{1A\text{-}D}$, and a linear moderation analysis was used for $H_{2A\text{-}B}$. For the first set of hypotheses, the following equation can be formed.

$Y_{1,2}(WTP) = \beta_0 + \beta_1(MA) + \beta_2(SP) + \varepsilon$.Where $Y_{1,2}$ refers to WTP for new arrival and classic products respectively. For $H_{2A\text{-}B}$, the following moderation equation can be formed.

$Y(WTP) = b_0 + b_1(Attitude) + b_2(MA,SP) + b_3(Attitude \times MA,SP) + \varepsilon$.

Where MA, SP refers to instances where either MA or SP is considered.

Table 2
Summary of sample demographics (outliers excluded).

Gender	Age in cohorts (range 21–69 years)	Ethnicity	Relationship status
Female: N = 92/45.8%	21–30 years: N = 66/33%	Caucasian: N = 168/83.6%	Single: N = 72/35.8%
Male: N = 109/54.2%	31–40 years: N = 65/31.5%	Black/African: N = 16/8%	In a relationship: N = 126/62.7%
	41–50 years: N = 39/17%	Hispanic/Latino: N = 6/3%	Other: N = 2/1%
	51–60 years: N = 23/11.5%	South Asian: N = 1/0.5%	
	61- years: N = 9/4.5%	East Asian: N = 6/3%	
		Mixed: N = 3/1.5%	
		Other: N = 1/0.5%	

Table 3
Direct effect of fundamental motivation on WTP for new products.

	B	*se*	*ß*	*t*	*p*
Constant	7.195	.248		28.968	.000***
Motivation (MA)	.711	.247	277	2.880	.005***
Motivation (SP)	.360	.254	136	1.416	.160

R^2_{Model} = 0.09, p < 0.01. Motivation (MA) refers to a chronic level of mate acquisition. Motivation (SP) refers to a chronic level of self-protection motivation. ***$p < 0.01$, **$p < 0.05$. Dependent variable: WTP.

To account for potential variance overlap, the scores for fundamental MA (4 items), SP (4 items) motives, and attitude toward a product (5 items) were transformed into factor scores.

4. Results

The first set of hypotheses explored whether fundamental motivations can predict WTP for different product types. The first step included investigating whether MA motivation increases WTP for new products and whether SP motivation decreases it. A significant relationship between MA motivation and WTP was found ($ß = .277$, $p < 0.01$) suggesting that MA increases WTP for new products. In practice, this means that those high on MA motivation prefer new products and are willing to pay more compared to those that are low on MA motivation. SP motivation neither predicted WTP for a new arrival product nor predicted a lower WTP ($ß = .136$, *ns*). This means that those high on SP motivation are not willing to pay more for new products but also that the new arrival status of the product does not lower their WTP. The R^2 value, which signifies the model's explanatory power, was low ($R^2 = 0.09$), but the overall regression model was significant (F (2,99) = 4.88, p < 0.01). Table 3 presents the findings below.

Moreover, an analysis of the classic products showed multiple significant relationships. As hypothesized (H_{1D}), SP motivation did increase WTP for the classic products ($ß = .215$, p < 0.05). This means that whereas a product marketed as "new arrival" did not predict lower WTP under higher SP motivation, highlighting the established nature of the product as a "classic" did predict increased WTP. However, MA motivation ($ß = .306$, p < 0.01) raised WTP also in the "classic" product type, which was against the hypothesis (H_{1c}). This finding means that MA motivation may operate on more dimensions than just the dimension of risk. The term classic refers to social status (in the form of owning classic products) which is behavioral driver of MA (see Griskevicius and Kenrick, 2013). As in the case of new products, the regression model for the classic version produced a relatively low R^2-value (0.15), but the model was significant (F (2,94) = 8.35, p < 0.001). These results are summarized in Table 4.

These results mainly support the alternative hypotheses ($H_{1A\text{-}D}$) because the MA motivation predicted WTP for new arrival products and SP motivation for classic products. However, SP motivation did not predict lower WTP for new arrival products. Additionally, MA motivation also predicted WTP for classic products which was against the hypothesis. This may be due to the conceptualization of what classic

Table 4
Direct effect of fundamental motivation on WTP for classic products.

	B	*se*	*ß*	*t*	*p*
Constant	7.461	.269		27.748	.000***
Motivation (MA)	.871	.271	.306	3.211	.002***
Motivation (SP)	.689	.305	.215	2.256	.026**

R^2_{Model} = 0.15, p < 0.001. Motivation (MA) refers to a chronic level of mate acquisition. Motivation (SP) refers to a chronic level of self-protection motivation. ***$p < 0.01$, **$p < 0.05$. Dependent variable: WTP.

means: it is an established alternative offering safety but one with usually high esteem which also supports the drivers of MA motivation (Griskevicius and Kenrick, 2013). New arrival products are riskier; hence, there may be more contrasting effects between the focal motives (Griskevicius and Kenrick, 2013) than in the case of "classic" products which carry positive annotations both in risk reduction, as well as, social status. Combined, the results suggest that marketing messages aimed at matching with motivational goals seem to boost WTP but in the case of mismatch do not cause aversive reactions.

The second set of hypotheses ($H_{2A\text{-}B}$) proposed that fundamental motivation may moderate the relationship between attitude toward the product and WTP for that product. To investigate the alternative hypotheses ($H_{2A\text{-}B}$), a linear moderation analysis was carried out. The analysis revealed new findings about the moderating role of fundamental motivations on the primary relationship. Specifically, as expected, attitude toward a product had a significant and direct relationship with WTP ($F(1,199) = 36.55$, $p < 0.001$) which means that a more favorable attitude towards the product increases WTP. In the case of MA motivation, a regression model ($F(3,195) = 27.16$, $p < 0.001$) found that the motive significantly moderates the relationship between attitude and WTP ($ß = 0.243$, $p < 0.001$), as summarized in Table 5. The results support the notion that MA motivation strengthens the effect of attitude toward the product in determining WTP.

Fig. 1 below shows the effect in visual form. The scale for WTP equals the percentage of WTP the recommended retail price (5 = 50% of RRP, 10 = 100% of RRP). The results suggest that MA motivation significantly strengthens the relationship between attitude and WTP. The difference in WTP between the conditions (low vs. high) is considerable, suggesting that participants are willing to pay 40 percentage points or more for the same product when in a highly motivated condition. This result supports the notion that, when a product is liked, those with high, chronic MA motivation do not mind paying more money to get it.

Conversely, the results for SP were not significant ($ß = -.145$, ns). As hypothesized, the interaction effect, which suggests an inhibiting effect, was negative; however, this effect was miniscule overall. The findings are summarized in Table 6.

The results further suggest that the effects of SP motivation do not operate as a clear mirror image of the effects of MA motivation, and they do not necessarily even share general tendencies. For example, whereas MA motivation showed a clear moderating trend toward strengthening the effect of attitude toward a product on WTP, the effects of SP motivation did moderate the focal relationship. Thus, H_{2A} is supported, and H_{2B} is rejected.

To summarize the key results, fundamental motivation may have both predictive and moderating power. Support for predictive power was found for MA, which significantly boosts WTP for both new arrival and classic product versions. SP motivation predicted higher WTP for classic products but not for new arrivals, as hypothesized. Furthermore, support for moderating power was found where MA works as a catalyst for the relationship between attitude toward a product and WTP for the product. However, SP motivation did not moderate the focal relationship, which suggests that the moderation effects are motive-specific.

Table 5
Conditional effect of attitude on WTP (MA motivation).

	B	*se(B)*	*ß*	*t*	*p*
Constant	7.265	.163		44.474	.000***
Attitude	1.145	.168	.414	6.821	.000***
Motivation (MA)	.684	.163	.253	4.188	.000***
Attitude x Motivation (MA)	.658	.164	.243	4.006	.000***

$R^2_{Model} = 0.30$, $p < 0.001$***, $\Delta R^2_{interaction} = 0.058$, p < 0.001***. Motivation (MA) refers to a chronic level of mate acquisition. ***$p < 0.01$, **$p < 0.05$. Dependent variable: WTP.

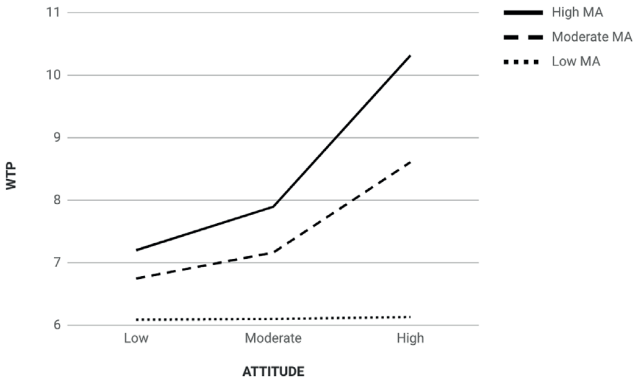

Fig. 1. The moderating effect of MA motivation on the relationship between attitude and WTP.

Table 6
Conditional effect of attitude on WTP (SP motivation).

	B	*se(B)*	*ß*	*t*	*p*
Constant	7.334	.177		41.350	.000***
Attitude	1.093	.183	.395	5.963	.000***
Motivation (SP)	.326	.191	.112	1.708	.089
Attitude x Motivation (SP)	-.145	.176	-.054	-.826	.410

$R^2_{Model} = 0.18$, $p < 0.001$***, $\Delta R^2_{interaction} = 0.003$, ns. Motivation (SP) refers to a chronic level of self-protection motivation. ***$p < 0.01$, **$p < 0.05$. Dependent variable: WTP.

5. Conclusion

Fundamental motivation may not be an intuitive driver of WTP for products; however, this research shows that it may play a part in the process. In this research, fundamental motivation predicted WTP, showing categorical differences between product types, marketed either as "new arrival" or "classic". In the case of new arrival product type, higher MA motivation increased WTP but higher SP motivation did not, as was hypothesized. However, contrary to our hypothesis, SP did not decrease WTP. Furthermore, MA motivation raised WTP in the "classic" product category. While this result acted against the hypothesis, the result was not completely unexpected. New arrival products communicate inherent risk, whereas classic products are related to not just lower risk perception through social proof but also the positive annotation of social status. Hence, as conspicuousness is one tendency of MA motivation (Griskevicius and Kenrick, 2013), MA motivation may increase WTP in the case of "classic" products too. Overall, the results of the analyses suggest that the effects of fundamental (MA and SP) motivations on WTP provide opportunities for marketers, however, in a nuanced way. The results point towards relative safety of applying motive congruence in marketing messaging: motive congruence yields increased WTP, whereas a mismatch results in baseline WTP in the worst case. However, these results should be re-confirmed by more research and in different contexts.

Moreover, an interesting connection between fundamental MA motivation and its capacity to moderate the relationship between attitude toward the product and WTP gained support. When MA was very low, the effect of attitude towards product on WTP was substantially reduced, whereas in the high MA condition, the effect was substantially strengthened. Our research suggests that there may be a generalized spillover effect, where MA operates through – potentially – risk mitigation and impulsiveness (see Durante and Arsena, 2015 for a similar concept). In high MA conditions, impulsivity may take hold of consumers and drive them to get a favored product with less consideration of price. This raises both opportunities for marketers as it raises the need for ethical considerations for utilizing MA fueled tactics. As this is

the first study to look at the moderating effects of fundamental motives in consumer contexts, further research is required to explore under which conditions the moderation effect may be stronger and when it may be weakened.

5.1. Theoretical implications

This study contributes to the extant literature in several ways. Most importantly, it offers the first empirical evidence that supports the potential moderating effects of fundamental motives on consumer behavior measures. While previous research has investigated the narrow relationship between motivation and either preferences or decision-making under MA and/or SP priming (Griskevicius et al., 2009; Li et al., 2012), this study expands the scope to both chronic and moderating effects. These findings are important because they may expand the impact of fundamental motivation from specific situations to more general consumer settings. Additionally, the results may complement previous research based on arousal as both MA and SP motivation could be considered high arousal states (cf. Viera and Torres, 2014) Whereas this study focused on the moderating effects of fundamental motivation on the relationship between attitude toward a product and WTP, it is plausible that similar effects could be found for other key measures, such as attitude certainty (Rucker et al., 2014) and perceived switching costs (Jiang et al., 2014). This is because the behavioral tendencies of MA and SP (see Griskevicius and Kenrick, 2013) imitate those of high versus low power (cf. Jiang et al., 2014) as well as highlight different reactions toward social consensus (cf. Rucker et al., 2014). However, more research is required to validate and systematize these findings across different settings. Furthermore, this study offers rare empirical evidence of the effects of chronic motivation in consumer settings. An understanding of such effects is essential because chronic measures have been fruitful predictors in other domains of consumer mindset studies (Anderson and Galinsky, 2006; Rucker and Galinsky, 2009). However, prior research in the FMF has neglected this dimension, even though the predictive power of chronic fundamental motivation surpasses the Big Five personality factors in some instances (Neel et al., 2016). Further understanding of chronic motivations is important because they may either operate independently in determining behavior or interact with other constructs, such as those that are situationally activated (Kopetz et al., 2012). Finally, this study offers insights into how an evolutionary approach might yield insights into a modern online consumer setting, which would enable possibilities for other areas of study, such as motivation-based web personalization (Salonen and Karjaluoto, 2016).

5.2. Managerial implications

For managers, this research highlights the impact of fundamental motivation on consumer behavior online. For example, MA was found to have relevance to WTP, both as a moderator and directly; therefore, managers should find ways to target customers who rank high on this motivation. Applying understanding of MA motivation to marketing creates many opportunities for practitioners. For one, MA motivation may mitigate against risk associated with new products which may make launching new product lines more successful if targeted towards consumers high on MA motivation. Targeting can be achieved either through less precise demographic screening (e.g., young adult males are more likely to be high on MA motivation) or through more fine-tuned user modelling/web personalization methods (Salonen and Karjaluoto, 2016). Additionally, impulsiveness associated with MA motivation may make consumers less price sensitive when considering buying a favored product. On the other hand, also SP motivation can be successfully applied to marketing. One way is to apply understanding how SP motivation lowers willingness to take risks and increases preference for safe and trustworthy brands (Griskevicius and Kenrick, 2013). Here, a market leader as the safe choice may wish to highlight the risk associated with changing vendors as it should increase preference for the market leader. Conversely, if a marketer's product is deemed risky, an effective way to mitigate the effect is to utilize social proof claims (Griskevicius et al., 2009). Another option is to highlight the safety features of a product or guarantees (Griskevicius and Kenrick, 2013). The key here for practitioners is that although many themes related to SP motivation are negatively valenced, SP motivation can be used to drive business results (cf. Griskevicius et al., 2009), such as increase WTP as highlighted by our results. To sum, the results of our research suggest that fundamental motives can offer opportunities for marketers in a variety of situations. In addition, these effects were found on a chronic measure of fundamental motives, which enables building enhanced long-term user profiles for web personalization and data-driven marketing that is based on the motivational tendencies. While these motivational effects may be situationally activated, the value in targeting those chronically high on MA motivation lies in a favorable baseline that is relatively stable similar to personality. Considering risk taking behavior in the online context, while it is essential to apply other risk mitigating tactics, targeting those who are less risk averse by nature is a good basis for successful marketing efforts. Focusing on fundamental motives enables such an approach. Finally, this study offers managers an in-depth approach to motivation by proposing a complementary approach to targeting the most recent cultural phenomena. Reacting to cultural phenomena is important, but.

5.3. Limitations and suggestions for future research

While offering concrete contributions, there are several limitations to our research. We utilized a simulated purchase case to maintain control of the study's setting. A field experiment would be helpful to gauge the reliability of the results in a natural environment, especially because we faced problems with setting the inclusion criteria for respondents. For example, we included a control question that asked respondents to identify whether the product they rated was advertised as either a classic or a new arrival from four different options presented. Of the 210 initial participants, a large number (53) failed to identify the product type correctly. While the moderation analyses produced similar results, independent of either excluding or including the participants who failed the control question (with SP being closer to significance by excluding the participants), the direct effects fell out of the significant range when excluding such a large number of participants. Including the full participant pool for analysis does, of course, limit the reliability of our results. However, we decided to do so for two reasons: (a) there was no manipulation of the motivation levels being carried out in the task, and (b) the control question was positioned at the end of the experiment, which means that participants may have been influenced by the product type information when rating the product but may have forgotten such secondary information after answering the multiple other questions in between. In addition, we only explored one product. As hypothesized in this article, the results could differ for other products if they are more (vs. less) directly linked with attaining motivational goals. This assumption also reveals an enticing opportunity for further research, such as seeking a systematic and predictable way to identify when a motivational goal match is greater. A further understanding of this effect would be essential in establishing both how and when fundamental motives can be best operationalized for practical purposes. Finally, an expanded approach that combines chronic and temporally activated motivations could yield interesting findings in the contexts of user profiling in web personalization and data-driven marketing, which could further reveal how the temporal dynamics of motive-preference links operate (cf. Spears et al., 2016).

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Appendix. Table defining linear regression model variables and measurement

Table 7
Linear regression model variables and measurement

Variable	Variable items	Measurement scale	Source
Self-protection (SP) motivation Description: Propensity to seek safety and make safe choices (see Griskevicius and Kenrick, 2013, pp. 376 for triggers and behavioral tendencies)	i. I think a lot about how to stay safe from dangerous people. ii. I am motivated to keep myself safe from others. iii. I do NOT worry about keeping myself safe from others (reverse coded). iv. I worry about dangerous people.	1 (not at all) – 7 (very much)	Neel et al. (2016)
Mate acquisition (MA) motivation Description: Willingness to attract a new mate (see Griskevicius and Kenrick, 2013, pp. 376 for triggers and behavioral tendencies)	i. I spend a lot of time thinking about ways to meet possible dating partners. ii. I am interested in finding a new romantic/sexual partner. iii. I am NOT interested in meeting people to flirt with or date (reverse coded). iv. I would like to find a new romantic/sexual partner soon.	1 (not at all) – 7 (very much)	Neel et al. (2016)
Willingness-to-pay (WTP) Description: Stated willingness to pay offered product as a function of recommended retail price.	i. Please indicate your willingness to pay for the product in terms of percentages of the recommended retailing price.	5–15 equaling 50%–150% of the given recommended retail price with a slider tool	Huang et al. (2017)
Mate acquisition (MA) motivation Description: Overall evaluation of favorableness of an object (see Ajzen and Fishbein, 2000)	i. Bad – Good ii. Negative – Positive iii. Undesirable – Desirable iv. Unfavorable – Favorable v. Dislike - Like	1 (first adjective) – 7 (second adjective)	Ajzen and Fishbein (2000)

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