Practitioners' Views on Cultural Adaptation of Web-based Products

Judith Yaaqoubi

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Reading Committee:

Sean Munson, Co-Chair

Katharina Reinecke, Co-Chair

Jennifer Turns

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Abstract

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Judith Yaaqoubi

Chairs of the Supervisory Committee:
Associate Professor Sean Munson
Human Centered Design & Engineering

Associate Professor Katharina Reinecke
Computer Science & Engineering

Researchers have repeatedly found cross-cultural differences in how people behave, perceive, and interact with information. However, it is unclear how these findings translate into cultural adaptations in global products - the process of optimizing a technology's user interface and interaction design to address cultural differences beyond a mere change in language and date/time formats.

My dissertation research is the first to explore how the industry does cultural adaptation from a practitioners' view. It examines whether, and how, engineering teams consider their customers' cultural differences when working on mature, globally available, digital products. Using interviews, surveys, and two case studies, I investigated what type of cultural adaptations practitioners consider, the challenges they face, and analyzed their use of academic research to inform cultural adaptations through the human-computer interaction (HCI) Translational Science model. My intention is to show the point of view of the practitioners in my study and, through the case studies, to add an ethnographic perspective. By being embedded in product teams of two major technology companies, I was able to gain access often unavailable to other researchers.

My findings contribute empirical understanding, an overview of what practitioners in my study currently do to culturally adapt their products and what is left unaddressed, and barriers to the information flow between practice and research previously unknown. I

discuss the importance of culture in product development as a matter of social inclusion and why it is challenging to address. I offer next steps, including opportunities for researchers to address concrete challenges, focus areas for educators, and call out the responsibility for leadership teams to foster inclusive product development for users often located in more than 200 markets.

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DEDICATION

to Max, Jo, and Tess

Chapter 1

INTRODUCTION

In 2020, 59% of the world population is already connected to the Internet [24]. This growth over the last decade in Internet audiences means that, for many of the top technology companies located in Europe and the US, the majority of their customers are already accessing their products from outside of their home market [66]. As example, 80% of Twitter's customers are already international [27]. Moreover, future growth is expected mainly in regions outside of the Western world [51], a trend backed by the example of Facebook who, in October 2020, indicates an absolute quarter-on-quarter increase of +20,000,000 customers in potential advertising reach in India alone [51].

This growth presents a unique opportunity for companies to capture additional market share for their globally available products, but it also is a responsibility for social inclusion by allowing their customers across markets to experience culturally adapted products. To do so, companies often address language localization, with research showing that the number of languages products are translated into is growing consistently since 2000 [112]. For example, Netflix, a global streaming provider, added Hindi as a language, based on the insight that only about 10% of the 1.3 billion people living in India understand English. Addressing this market in Hindi has the potential to bring Netflix 100 million customers to the platform [95].

While language is one of the most notable and obvious distinctions between people across markets, other manifestations of culture influence people's preferences in product design and interaction with technology. A variety of studies in the field of human-computer interaction (HCI) have confirmed this: 1) Research comparing local products across countries showed differences in a variety of design attributes [72, 3, 34, 5]; 2) Studies on how users across countries interact with messaging and social networking sites, collaboration tools, and other web-based products indicate differences in online behavior that often can

be traced to people's inherent cultural characteristics [77, 111, 84]; 3) Insights from these studies have resulted in culture-related user interface (UI) and user experience (UX) guidelines for websites [62, 82] and models to design with culture in mind [101, 105]; and 4) Tests in academic environments with culturally adapted websites according to aforementioned insights indicate that users were less anxious [42], needed fewer clicks, made fewer errors, and found an adapted version easier to use [82].

This body of research indicates customer benefits through cultural adaptation and can help inform the design of socially inclusive products in practice. However, it is unclear whether this research has reached industry and, if it has, how industry makes use of it. In turn, there is limited knowledge of how practitioners already culturally adapt their products for a global audience and how this can inform researchers' scholarly work in HCI. For example, a visual comparison of a global news aggregator homepage, msn.com, shows an apparent design difference between the US and Japan home pages (Figure 1.1), indicating attention to cultural adaptation. Still, we do not know what informed such change and how this can inform further studies.

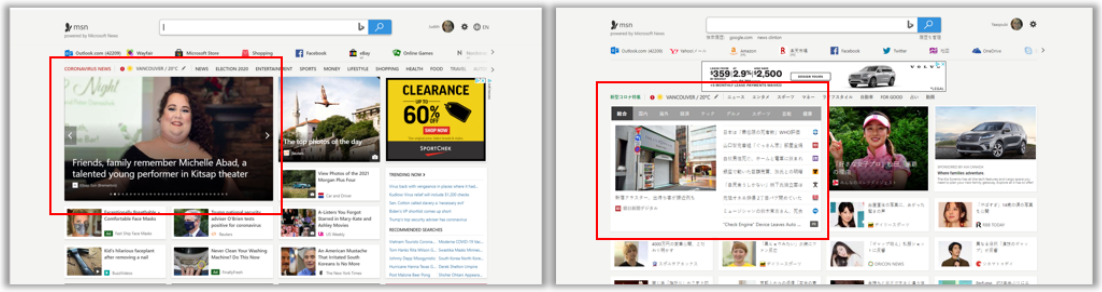

Figure 1.1: The home page of MSN in the USA and Japan: In the USA (left), there is one image per news article, while the same space on the Japan home page (right) has various tabs and offers multiple headlines against the lone, reduced image of the top article.

Additionally, the speed of global scale for digital-native companies presents a challenge to cultural adaptation - often lacking the need for extensive distribution and sales setup, digital companies can scale immediately at launch or within a few years after launch as their

products can be accessed virtually anywhere through an app or web browser [15]. Designers of such global products, often unconsciously, use their own intuition instead of data when designing [37], and naturally integrate their own cultural values into functionalities and aesthetics, causing the products to be less optimally designed outside of the home market. It is unclear how practitioners working on globally available products overcome such challenges and culturally adapt these products to include users in all markets.

1.1 Thesis statement and research questions

In this dissertation, I propose the following thesis statement:

> *Insights into the cultural adaptation efforts of practitioners responsible for globally accessible websites and web applications reveal barriers and challenges hindering culture inclusive product development practices.*

To examine the thesis statement[1], I studied the following research questions (RQ) :

1. **RQ1**: Do practitioners culturally adapt their product's design, and if yes, what aspect of culture do they consider?

2. **RQ2**: What challenges do practitioners face when culturally adapting the design of their products?

3. **RQ3**: Do practitioners use academic research that informs cultural adaptations, and if not, what information do they rely on instead?

4. **RQ4**: What is the use and usefulness of academic research on cultural adaptations in practice?

---

[1]My own background inevitably influences the ways in which I investigate, interpret, implement, and explain the research. I have been professionally employed in the digital industry in the US, Germany, The Netherlands, and Canada. Additionally, I have embraced teaching, design, and research in both industry and academia.

1.2 Dissertation overview

Chapter 2 provides an overview of the relevant literature for my study. It begins by reviewing the current research on localization approaches in practice and theoretical frameworks. I then examine the literature on cultural models to understand approaches and perspectives on how researchers have used culture to explain differences in digital products. To analyze the information flow between practice and research, I reviewed the literature on Translations Science, specific to HCI.

Chapter 3 describes the methods and results of an interview and survey study to answer RQ1 - 3. I conducted interviews with 18 practitioners inquiring about their experience with adapting the design and user interaction of globally available products for different locales, the challenges they face, and the insights used to inform their decisions. During the interview, I also asked practitioners to provide feedback on various research artifacts stemming from academia and how they would use this in practice. I verified the findings through a survey with a wider audience of 36 survey participants. For the analysis, I used a model defining the knowledge flows between researchers and practitioners, the HCI Translational Science Model [26], as a lens to understand gaps in communication specific to cross-cultural design questions.

Chapter 4 presents two case studies with an ethnographic perspective developed from personal work experience and informal interviews with product owners for e-commerce localization in Booking.com and Managing Editors at Microsoft involved in the development for the AI Cortana, Microsoft's intelligent assistant. These case studies are aimed to inform RQ 3 and 4. I provide insight into the efforts to develop or optimize a locally relevant product and contribute to the academic discussion of the use and usefulness of cultural models by examining the value of existing academic research when applied in specific circumstances.

Chapter 5 describes the fulfillment of the research questions and contributions relevant to the development of culturally adapted products for social inclusion: (1) Differentiation between Essential Localization and cultural Adaptation; (2) Empirical insight into challenges practitioners in the study faced when culturally adapting globally available products; (3) Understanding how cultural research can inform practice and an analysis of the information

transfer between research and practice, identifying gaps and barriers.

Chapter 6 discusses the importance of culture in product development as a matter of social inclusion and addresses issues that make decisions on cultural adaptation hard. I offer next steps, including opportunities for researchers to address challenges the interviewees faced, collaborations between research and practice aimed at increasing the body of knowledge of cultural adaptations, and focus areas for educators to create empathy and awareness of cultural differences in new and existing generations of employees. I call out the responsibility for leadership teams to foster socially inclusive product development practices for users often located in more than 200 markets.

Chapter 7 closes this dissertation with a summary and review of all investigations, contributions, and discussions.

See Table 1.1 for an overview of the research questions, studies and associated conclusions.

Research question	**Study description**	**Contribution**
RQ1: Do practitioners culturally adapt their product's design, and if yes, what aspect of culture do they consider?	I conducted 18 semi-structured interviews with product managers, designers, and researchers working on globally available digital products. I analyzed the interview study through thematic discourse analysis and the lens of the HCI Translational Science framework. A survey (N=36) on Google Forms further investigated the themes from the interview study.	An empirical understanding of the extent to which practitioners culturally adapt a global product's design and how this differs from research suggestions.
RQ2: What challenges do practitioners face when culturally adapting the design of their products?		An understanding of the technical and business challenges practitioners face when considering updates to user interactions.
RQ3: Do practitioners use academic research that informs cultural adaptations, and if not, what information do they rely on instead?		An analysis of the information flows between Applied Research and Design practice. My insight into practice shows that research on cultural adaptations of products can be used in various ways to inform the product team's decision-making.
RQ4: What is the use and usefulness of academic research on cultural adaptations in practice?	I developed two case studies from my work experience and through informal interviews within Booking.com and Microsoft..	

Table 1.1: Overview of research questions, study descriptions of, and contributions per research question.

Chapter 2

RELATED WORK

Internet products are often accessible worldwide. For example, LinkedIn, an Internet platform business, serves now 700 million members in 200 countries and regions [71]. Slack, a digital solutions firm, is available in over 150 countries and territories [18]. Booking.com, an online retailer, is available in 43 languages but does not specify the markets it can be accessed from. Netflix, a digital content producer, has incrementally added markets to their list, adding 130 new markets in 2016 alone [70]. The high diversity of users in many locations present unique challenges for product teams.

This chapter provides an overview of literature relevant to international product localization and global expansion strategy. I first review research, concepts, and frameworks that inform internationalization practices in product engineering (section 2.1). I then review the concept of culture, the relevant literature on understanding cultural differences, and how these differences shape people's attitudes towards technology and their interaction with that technology (section 2.2). To help understand the expected information flows between the actual localization practices and the research-driven insight on a culture to support the design and development of inclusive products, I describe the HCI Translational Science model and its relation to this investigation (section 2.3). I conclude with a summary of the related literature and its link to my research questions (section 2.4).

2.1 Localization processes

Scaling a product for an international market is a deliberate, incremental, and slow process for brick-and-mortar companies, with efforts focused on analyzing their costs and risks based on market characteristics and considering their own resources [50]. The opportunity to scale fast is much higher for born digitals or digital native companies, which, lacking the need for extensive distribution and sales setup, can often be accessed virtually anywhere at

launch or within a few years after launch through an app or web browser [15]. Despite or because of the 'lightning' speed and opportunity for companies to bring digital products to a global market, companies have to decide very early what their intended future globalization strategy will be in order to initiate the necessary processes at the early phases of product development. I review different aspects of a globalization strategy for digital products and distinguish between common terms of standardization, internationalization, and the various interpretations of localization.

2.1.1 Globalization or standardization - an early decision

Product globalization is a broad term spanning the technical processes and the strategic decisions and processes to manage international products. Companies need to decide early on between localization and standardization to prepare their product for a global audience. Following a standardization strategy, companies often assume homogeneous customer needs, which allows them to leverage the same template, product & service configuration globally. Using the same home-country product globally significantly reduces the localization expenses for translation and other local content adaptation [96] - the company does not have to set up a platform architecture to allow for language flexibility, does not have to pay translators, or fund engineering resources to maintain customizations needed for their global product. Having a standardized product worldwide might be sufficient if the product is targeted at a niche user group that is homogeneous internationally. However, there are benefits to product localization. Only localizing the language of the product can already lead to an improvement in customer satisfaction and higher conversion [85].

Once a company has decided to follow a web globalization strategy that involves localization of their product, the following considerations are important: internationalization, localization, cultural adaptation.

2.1.2 Internationalization

Internationalization or I18n refers to the technical layer of cultural adaptation. It describes the engineering process and product architecture necessary to enable localizing the product

in various languages and adapting for cultural-specific use cases. Common technical changes enable the use of Unicode, a worldwide character-encoding standard, to facilitate translation in many languages without the need for re-engineering, proper handling of legacy character encoding, and support for features like bidirectional text. Internationalization also includes the ingestion of predefined localization data to respect units such as the localized date and time formats, local calendars, numbers formats, and more [109]. Internationalization is a fundamental step to enable a globally functional product and cannot be overlooked. Hsin Eu, director of a global team creating the user interface for security products of Trend Micros emphasized the importance of early preparation of the technical builds and the importance of enabling flexibility of technical builds in an interview cited in Quesenbery's book 'Global UX' [81]: *"Thinking about deep customization early makes it easier for the technical builds to be flexible enough to accommodate customization. We often decide what functional modules to include or even swap out modules for specific markets. This might be presentation and brand, like the visual design and style or the product spokesperson, but even behaviors can be customized. For example, a summary page with a lot of alerts might be appropriate in North America but would seem too aggressive in Japan. Both the technical module and the behavior need to be flexible."* (Hsin Eu)."

2.1.3 Essential localization

Localization refers to the adaptation of a product to meet the language, cultural and other requirements of a specific target market (a 'locale') [56]. Localization is often used as a synonym for language translation and necessary customization related to currency, date, and time formats. Language is an essential factor for making a product accessible to its global customers and often a necessary step for the company to be competitive in a market. Research shows consumers prefer accessing information, making online purchases, and getting technical support in their language [30]. Language localization is also well understood, with examples and models of localization companies allowing to calculate the return on investment (ROI) of language localization [90, 89]. As mentioned in the introduction, Netflix recently added Hindi as a language based on the insight that only about 10% of the

1.3 billion people living in India know English. Addressing this market in Hindi has the potential to bring Netflix 100 Million additional customers to the platform [95].

2.1.4 Cultural adaptation - beyond essential localization

To understand the cultural adaptation of a product beyond what is considered essential localization focusing on language and unit formatting, I find Sturm's framework for Technology Language Culture Cognition (TLCC) for product internationalization [99] helpful. The framework separates into four layers: the first layer is the technical base, similar to my description of I18n above, followed by three additional layers to adapt the product to the other requirements of a specific target market: language (as described in section 2.1.3), culture, and cognitive. The cultural layers in Sturm's model include adjustments to the context of the use and the meaning of symbols, graphics, colors, and metaphors used in the user interface. The cognitive layer is described as the most complex layer. It *"goes beyond the pure meaning of interface components covered by the cultural level. It encloses menu structures, priorities, interaction styles and techniques, and basic cognitive processes used in human-computer interaction. This level is undoubtedly the most underestimated one but has a great impact on the usability of a technical product."* [99]. The cognitive layer of localization, according to this model, is focused on cultural adaptations to align the UX of the product with the cognitive processes of customers in different cultures (Figure 2.1.)

Little insight exists on both the level of adaptations companies do to adapt their products to the cultural and cognitive layers and what informs their decisions. Like the TLCC model, which shows the spectrum of increasing complexity, researchers in Quesenbery's book *Global UX* [81] also describe different layers of culture that need to be considered in product development. The layers of culture are situated on a spectrum from 'easy to predict' to 'hard to predict.' The layers of culture are tasks, infrastructure, legal, market, language, and culture (Figure 2.2.)

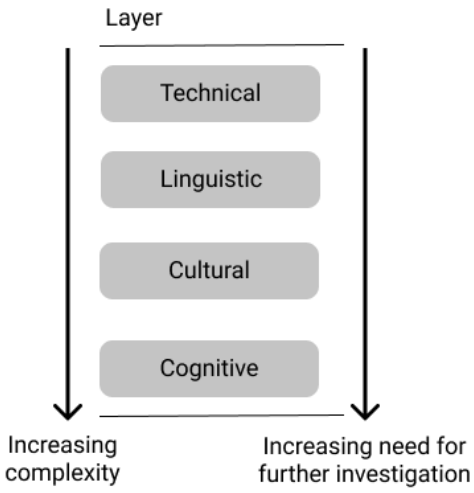

Figure 2.1: The Technical Language Culture Cognitive (TLCC) model for internationalization [99]: the model differs between layers of localization that build upon each other.

2.2 Culture

The term culture is comprehensive and lacks a single generally agreed definition [57]. For my dissertation topic, the definition of Bates and Plog [79], authors of 'Cultural Anthropology' is useful. They defined culture as "The system of shared beliefs, values, customs, behaviors, and artifacts that the members of a society use to cope with their world and with one another, and that are transmitted from generation to generation through learning" [79]. The values and practices that define groups as collective can be looked at through various lenses: geographic and tied to the individuals' location (e.g., national or regional culture), demographic (cultural construct based on age, gender, religion, etc.), psychographic (attitudes, beliefs, emotion, etc.), or behaviorist (habits, patterns of consumption, etc.), among others. Culture is at least partly shared by people who live or have lived within the same social environment, and for this dissertation research, I will focus on the characteristics of national culture.

National culture manifests itself through various visible and invisible aspects. Hofstede uses the layers of an onion [49] to describe four important manifestations (Figure 2.3). In the

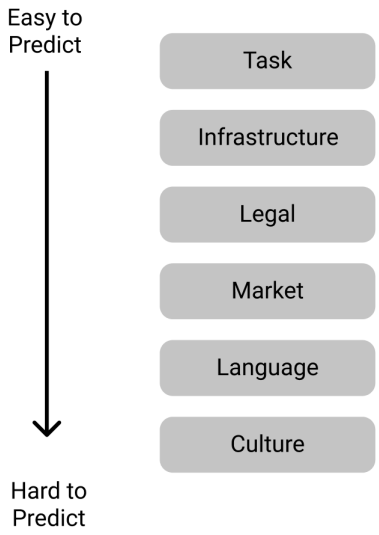

Figure 2.2: Layers of Culture [81]: Describing the layers of culture to be considered in product localization on a spectrum from 'easy to predict' to 'hard to predict.'

onion analogy, the three outermost layers are observable aspects of culture and, therefore, referred to as 'practices.' *Symbols* is the onion's skin, the most visible, and includes the language used in the culture, date formatting, currency, and general measurement formats. The second and third layers of the model are built by *heroes* and *rituals* unique to a culture. *Heroes* are described as actual persons, alive, dead, imaginary, or real and used as a point of reference in a culture. *Rituals* are described as collective activities that are socially essential and often reinforce group cohesion. It is important to note that the *rituals* layer includes discourse, which is how language is used in text and talk; it describes the variations and interpretation of the text, which is often different between cultures even if they speak the same language. Again, *symbol*s, *heroes*, and *rituals* are all visible to external observers but the cultural meaning of *heroes* and *rituals* often lies in how the practices are interpreted by the insiders and are therefore not easy to evaluate objectively. The onion's 4th layer, the inner core, holds the most subjective and difficult to interpret aspects of culture, its *values*. *Values* are described as tendencies to prefer certain states of affairs over others, with

qualifications of good and bad, dirty and clean, ugly and beautiful (page 9) [49]. *Values* affect how people act and react, and are therefore abstract in itself. For outside observers, it is difficult to explain the *values* and behaviours without an understanding of the applicable cultural background.

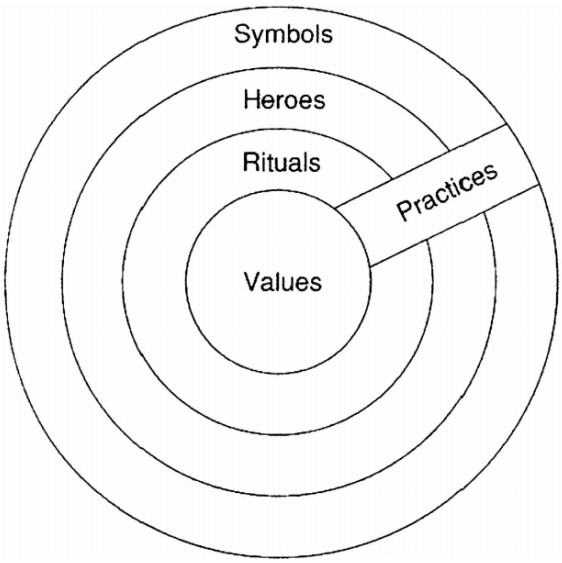

Figure 2.3: The onion model [49]: Manifestations of culture are described based on an onion model with *symbols* being the outer skin of the onion, *heroes*, and *ritual* being visible but can only be interpreted by insiders, and cultural *values* being hidden in the core of the onion.

2.2.1 Cultural models

To help see these cultural manifestations that are otherwise hidden, researchers have developed comparisons, often between countries or national cultures. Hall [44], a well-known anthropologist, compared American cultural patterns with Japan, Germany, France, Greece, the island of Turk, and the Middle East [38]. His research on differences in time (chrometics), space (prometrix), and context highlight differences in the value and behavior of people. For example, from the concept of time and its relation to action, he developed the concept of monochronic and polychronic cultures [44]. In predominately monochronic cultures like

Northern America and Northern Europe, adherence to an external clock dictates schedules and stresses the completion of tasks over social relationships. In predominately polychronic societies like Latin America, the Middle East, and parts of Asia, human interactions are more important than adherence to present schedules [44, 102]. In his book *Beyond Culture*, Hall also researches differences in non-verbal communication and distinguishes between high and low-context societies. Many Asian nations are considered high-context societies. The actual text of a message is secondary in those societies - the importance of communication is instead inherent to the interpretation of the occasion, the physical setting, and the relationship between participants when communication occurs. In low-context societies like the US and Germany, the message is the text, and there is little room for interpretation [43]. Similar classifications of culture based on its differences were created by Hofstede & Minkov [48], Schwartz [91], Inglehart [52], Trompenaars & Hampden-Turner [45], Kluckhohn & Strodtbeck [60], Victor [106], and Meyer [67]. A widely cited and utilized cultural model was developed by Geert Hofstede, who created several dimensions that typify nations based on research within IBM in 1972. From survey data collected on values related to universal aspects of social relationships, he derived four cultural dimensions with two more dimensions added at a later point, often referred to as the Hofstede 6D model [54]. The model compares cultures based on differences in societies regarding power distance, uncertainty avoidance, masculinity, individualism, long term orientation, and indulgence [49]. Country scores explain the preferences or behavior of people in social relationships and are valuable only in comparison to other nations. The usage of country scores and a freely available tool to provide context to the findings has made it a popular model, embraced by researchers to understand customer interaction with products across a variety of countries. Although, the approaches to *'systematically catalog the breadth of human cultural experiences and understand the parameters of cultural diversity'* [32], are under criticism.

Challenges to cultural models

While cultural classifications may be helpful to shine a light on otherwise intangible cultural behaviors, scholars argue that these models may fall short of explaining contemporary pat-

terns of globalization, transnationalism, and how the increasingly interconnected world has influenced and changed behavior and patterns of communication, leading to more hybrid cultures [11]. Hofstede's work has explicitly been criticized for using the national population as a homogeneous whole, the fact that the main study was conducted more than 50 years ago, and that their research was based on corporate employees' responses only. In 2018, a revision of Hofstede's model of national culture was published, using new data from 56 countries [68]. The researchers critically looked at Hofstede's model, proposing that the validity of the established dimensions is reduced to only the dimension of 'Individualism vs. Collectivism' and a new category called 'Flexibility vs. Monumentalism.' Other dimensions, like power distance, were found to be highly related to the Individualism dimension. Researchers suggest that revisions like Hofstede's dimensions may indicate that other national models have been losing their predictive properties over the years and that it is a general trend that dimensions change [58]. Researchers have also started to understand how generational shifts influence culture. Beugelsijk et al. [13] find that cultural change is significant. They found that the younger generation has expectations and preferences that differ from older generations, specifically to hierarchy and individualism, despite the overall cultural values being relatively stable [13].

Alternatives to cultural models

Considering the possibility of fluctuations in culture, and with a specific lens on the influence of technology on such changes, other scholars argue that *"technology design requires an understanding of cultural change as much as cultural stabilities"* [55], inline with scholars who believe that culture can be assessed only through the observation of behaviors. Sun [100] suggests a cyclical design process to integrate action and meaning to make technology both usable and meaningful to local customers. $CLUE^2$, her methodology for a culturally localized user experience, highlights the importance to truly enable and critically engage with cultural differences; it places social practice at the center of the stage and *"moves from the critical to the generative, integrates the theoretical and the empirical and envisions a socially just future that engages and bridges cultural differences"* (page 192) [100]. Similarly,

Dourish & Bell [32] believe that a generative account of culture, based on ethnographic research and focus on how culture operates and is enacted in everyday practice, needs to be considered when designing socially inclusive products. Seeing technology as part of the activity and creating new cultural behaviors is suggested as the ultimate form of social and cultural investigation for product design. Various HCI researchers have developed methods, tools, and techniques for practitioners to examine and design for culture and include such practices in their design process. For example, Lachner et al. [61] aim to bridge the gap between theoretical cultural studies and practical application through *cultural personas*, application-oriented tools that characterize derived cultural differences; Van Boeijen [105] published a card set to help designers towards a culture-conscious approach to design; and Sun [101] is in the process of writing a handbook with instructions for design methods and research instruments to follow her methodology, $CLUE^2$, described above.

2.2.2 Culture and technology design

Researchers in HCI have investigated product differences by comparing products popular in local markets, investigating how users interact with these local products, and determine cultural differences in user behavior with global products. Cultural models often provide a lens to the interpretations of findings. The following section provides an overview of the breadth of research that points to a need for cultural adaption of information technology and shows the difficulty in interpretation and some conflicting outcomes.

Local product comparisons

Researchers have used manual and automated techniques to understand and confirm differences in design attributes between local products. For example, in 2008, Fogg et al. [34] looked at design differences between Mixi, a then-popular social network application in Japan, and Facebook. They found that cultural differences were indeed inherent in the product:

> *In starting this research, we didn't expect - or want - to reach stereotypical conclusions about our cultures. As researchers, we were open to finding that the*

> *Internet creates a new world and that behaviors online may not reflect respective cultures. However, the evidence in our analysis clearly suggests that Facebook better reflects the persuasion dynamics that are common to US culture, while Mixi conveys a stronger Japanese sensibility* [34].

Specific to website design, Barber and Badre [6] have coined the portmanteau of *culturability*, a joining of the word of culture and usability, by manually comparing local sites and identifying cultural markers "interface design elements and features that are prevalent and possibly preferred, within a particular cultural group.") The researchers found patterns in design that reflect cultural practices and preferences. More recently, Alexander et al. [3] used a combination of automated and manual techniques to investigate differences in design attributes between Australian, Saudi Arabia, and Chinese websites. The researchers found significant differences in design attributes like layout, navigation, links, color, and text, suggesting a need for culturally adapted interfaces. Nordhoff et al. [72] conducted a large-scale study using computational image metrics to compare the most visited websites per country. The researchers found significant differences regarding a website's colorfulness, visual complexity, the number of text areas, and the average saturation of colors. Nordhoff et al. also found that the design of global websites is often more homogenized between the countries compared to local websites. Looking into marketing research to better understand why the design of global brands may be more homogeneous across countries, a study by Bartikowski et al. [7] suggests that strong brand equity might be diluted through cultural adaptations. To come to this insight, the researchers adapted the global HP website according to typical French advertising: extravagant, illustrative, and colorful with comic-style figures or fancy illustrations, and national symbols and prominent colors. The same design was done by replacing the HP logo to reflect an unknown brand. Comparisons between the culturally adapted version with the standard version for both strong brand (HP) and unknown brand showed that cultural adaptation of the user interface significantly increases trust only if the brand equity is weak. More research is suggested to understand if this is the case for more cultures and affects other areas than trust [7].

Investigating the differences in design within a global brand, a website comparison of Shi

et al. [93] shows that 14 out of the 31 examined Chinese firms already adapt their Sino-US websites to the American culture. To my understanding, there is no recent comparable research analyzing US-based global brands to understand the cultural design adaptations made to succeed in Asian markets.

Differences in user perception and behavior when interacting with local products

Research through user observations, user log analysis, or surveys with customers from different countries frequently shows differences in online behavior, often aligned with cultural characteristics. For example, Oliveira et al. [77] analyzed data from popular Q&A sites and found significant differences in user contributions that could partially be explained through national culture. Similarly, Yang et al. [111] found that culture plays a vital role in the frequency, motivations, and content of questions asked, and expectations on answers received. Reinecke et al. [84] investigated the influence of national culture on people's scheduling behavior by looking at anonymized date/time polls provided by Doodle. The researchers found behavioral variations in scheduling behavior, which were explainable to a large part with the cultural characteristics of individualistic societies and more group-oriented collectivist countries.

Specific to social network sites, Zhao [114] found that Chinese customers are more likely to customize their profile images on social network sites than customers from the US, a finding that they also could explain with cultural characteristics. However, the researchers also found that their hypothesis that Chinese customers select more group pictures as a profile picture, aligned with their collectivistic culture, was not confirmed. Similarly, looking at Facebook's usage patterns between customers from Namibia and the US, Peters [78] could not find any differences in motivations to join, attitude towards connections, self-presentation, and photo sharing, despite Namibia being considered different in various cultural aspects. On the other hand, a large-scale global study using logged activity and a survey among 38,000 Facebook customers found significant differences in the frequency of social comparisons between demographic groups located in different countries. Although the study's goal was not targeted at finding cultural differences, the results point to the

need for further research to better understand social comparison worldwide and develop design adaptations that help users most affected [20].

Empirical studies with culturally adapted user interfaces

With significant research pointing to a relation of design differences and culture, researchers in HCI have gone further to empirically show that there are measurable benefits of adapting the design of technology products to known cultural aspects of the customers. Reinecke et al. [82] created a culturally adaptive system. The to-do-list dynamically adapted information density, navigation, the appearance of functions, guidance, structure, color, saturation, image-to-text ratio, support, and help text according to previously identified relationships between Hofstede's dimensions and UI design aspects. The researchers found that participants were 22% faster using the culturally adapted interface based on the weighted average of the user's duration of stay at current and former residences compared to the non-adapted interface of the same web site. The participants in the study needed fewer clicks and made fewer errors when interacting with the version adapted to their cultural profile, and found the adapted version easier to use [82]. Culture can also inform the design of technology for older adults. In a study with two culturally appropriated design solutions for older adults, the researchers found that their participants from East Asia preferred a rich interface and felt less anxious with it than with the minimal design, which was preferred by Caucasian participants [42].

This overview of research on cultural differences significant for information technology is in no way complete. Still, the literature indicates that culturally specific values and behavioral norms are reflected in local product design and visible in peoples' behavior when interacting with technology. It is a compelling indication that culturally adapted products positively affect peoples' preference for product choice, enhance usability, and create an overall feeling of belonging for customers interacting with technology.

2.3 Translational Science

Chapter 2.2 summarizes the literature on cultural models and the scholarly work of researchers in HCI who have investigated and explained differences in local products and culture-related differences in peoples' values and behaviors, resulting in guidelines and suggestions on how to adapt technology products culturally. In Chapter 2.1, I outline the industry practices focused on localization and the processes to adapt technology products to its customers' cultural characteristics. However, these practices and fields of study do not exist in isolation like they do in my chapters. They are interconnected, with research in HCI informing design practice and practitioners' practices and challenges pointing to new areas of research. This information exchange is, however, sometimes interrupted [25, 17]. In the following sections, I detail the HCI Translational Science model that allows us to analyze the information flows, discuss known barriers between the individual information producing steps, and explain solutions proposed by researchers to address the failure of information flows.

2.3.1 The HCI Translational Science model

Norman (2010), in an opinion piece published in the journal 'Interactions,' describes how practitioners *"deride research results as coming from a pristine ivory tower – interesting perhaps, but irrelevant for anything practical"* and how researchers *"proudly state they are unconcerned with the messy unsavory details of commercialization - while complaining that practitioners ignore them"* [75]. While this is a personal opinion (although grounded in Norman's experience in both research and practice), the absence or at least reduced transfer of information between research and practice is a well-studied phenomenon. The metaphor of 'The Gap' is commonly used to describe this lack of information flow. Colusso et al., [26] in 2019, conducted an empirical study to define this gap further, resulting in a model that allows looking at the steps, detail the gaps and define barriers preventing the transfer of information. The HCI Translation Science model visualizes the individual steps and resulting gaps (Figure 2.4.)

In the context of my investigation of the transfer of cross-cultural information, I use the

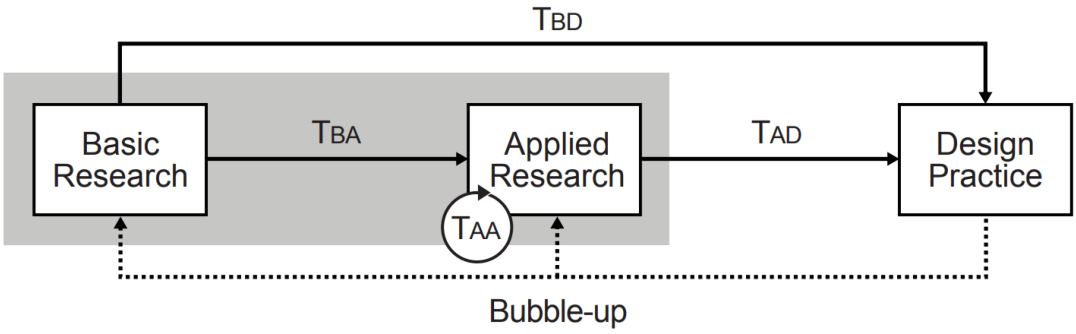

Figure 2.4: The HCI Translational Science Model, as per Colusso et al. [26]: the model consists of three main steps (Basic and Applied Research and Design Practice), four main gaps (T_{BA}, T_{AD}, T_{BD}, and T_{AA}), and a Bubble-up (gap) from practice to research.

description of Colusso et al. [26] of the individual steps of the information flow and augment with my interpretation for the cross-cultural context:

- **Basic Research** is performed without thought of practical ends, resulting in general knowledge to answer a large number of problems [26]. Norman describes fundamental or basic research as *"searching for pure knowledge without consideration of use or aimed at some fundamental, practical problem"* [75]. Looking at chapter 2.2 and the literature review on culture, I consider cultural models as Basic Research. These insights, often from anthropology, are used as the foundation for researchers to build guidelines and practices.

- **Applied Research**, according to the HCI translational science model, describes results in practical, goal/solution-oriented research [26]. It provides answers to specific practical problems, e.g., interface efficacy and tensions between people and technology. Referring back to Chapter 2.2, I consider the creation of literature on product comparisons and investigation on how people behave with technology and its relation to culture, leading to guidelines for product design as applied science.

- **Design Practice** is defined as HCI practitioners using HCI and design knowledge

> to create something new in the 'made world.' It involves the deep consideration of specific users, related stakeholder, and technical and market requirements, and the integration of art, science, and engineering to make aesthetically functional interfaces [26]. Referring to Chapter 2.1, I consider localization practices and cultural adaptations considered by design and engineering teams in industry to be mainly falling into the design practice.

Colusso et al. [26] identified gaps between each of the steps and have found a variety of barriers impacting the information flow. In 2.3.2, I describe the most critical identified barriers between Applied Research and Design Practice. 2.3.3, in turn, focuses on methods for practitioners to engage with researchers.

2.3.2 Barriers between Applied Research and Design Practice

Essential to my dissertation work is the gap identified between the steps of creating Applied Research and using the findings in Design Practice (T_{AD}). The translation and synthesis of knowledge into usable resources, considering specific application domains - like, for example, guidelines on cross-cultural design - is within this gap. The main barrier to the information flow was identified as the Applicability barrier. It is described as the most significant barrier keeping applied research from influencing design practice. Applicability is related to difficulties of practitioners accessing and understanding terminology in research contributions, and the applied research process not resulting in actionable resources [26].

Based on an interview study with design practitioners, Colusso et al. [25] also identified language elements to undermine practitioners' ability and interest in reading academic research; language elements made it 'boring' for practitioners to read academic research. Additionally, according to the study, practitioners did not consider academic resources as actionable, reinforcing the identified applicability barrier and the sentiment of practitioners that academics do not care about implementation details. What is lacking from literature is an empirical study if the applied research can be successfully used in practice and what advantages practitioners had who used the research, compared to peers that did not use research.

In addition to the applicability and content barriers, practitioners also found academic research as being hard to find, pointing to a findability gap: practitioners lack the vocabulary to create successful searches and, if found, lack access to the research [25]. Instead, practitioners used resources like Medium posts, NNG articles, Ideation cards, Design books, or forums as resources for the different design activities they are conducting.

The research on translational resources indicates that to overcome this applicability barrier, theory-driven examples to support different design activities can be beneficial and suggests for academics to partner with designers to build examples of theories. Similarly, designers emphasized that they need more actionable design guidelines and academics acknowledge the need to reframe academic resources to communicate with designers. Colusso et al. [25] describe how academic researchers often discuss the finding in terms of a theory while practitioners need solutions to problems they face like an increase in trust, engagement, sign-ups, or the design for a button for their context. To further increase the use of scholarly work in practice, the researchers suggest that the integration of academic resources into existing tools and workflow could address a lack of motivation to search for academic resources. Having design patterns in the tools designers interact on a daily basis could help them work more efficiently.

2.3.3 Bubble-up & Twin-Win

While the HCI Translational Science model is a two-way exchange between practice and science, it often focuses on the adaptation of research findings in practice. The Bubble-up and Twin-Win model both investigate how the collaboration between the two fields can happen. *Bubble-up*, initially developed by Gray et al. [40], describes an important step of how practitioners can inform the work of researchers by disseminating their learnings. Like the *Bubble-up* concept, Shneiderman [94] introduces the Twin-Win Model, highlighting the importance of practitioners partnering with academics to address authentic problems to produce more potent solutions.

In the context of this study on the cultural adaptation of technology products, I use the HCI Translational Science model as a lens to understand the information flow that informs how

practitioners use the information produced in the field of HCI research and how practitioners report the findings from their practice back to academia.

2.4 Summary of related work

The literature review shows that there are valuable insights available from academia, establishing differences in user behavior and preferences across people from different countries and cultures, and providing some guidelines to be used in practice. While the impact has not been tested in widespread field studies, some UX design changes have been tested in small empirical studies and showed that culturally adapted design could positively affect product usage and companies' core metrics. However, little is known about what aspects of their product companies optimize for culture after they have launched a functional, globally available product. What barriers do product teams face to adapt those products further and make them better for users in different locales? Similarly, my literature review did not reveal any insights on how practitioners use academic research to inform their decisions or about the value the research has to cultural adaptation of user interactions in practice.

In summary, it is worth studying the information flow between research and practice to understand better how the research translates into practice. My analysis of the literature suggests gaps of learnings on how cultural research in HCI is used in practice, which informed my research questions:

1. **RQ1**: Do practitioners optimize the UX design of their digital products culturally and, if yes, what aspect of culture do they consider?

   The definition of *localization* - the adaptation of a product to meet the language, cultural and other requirements of a specific target market (a 'locale') - indicates that cultural adaptation to user interaction design is part of the established localization process. Models like the TLCC framework [99] and the layers of culture by Quesenbery [81] also suggest that there is an attention to the adaptation of aesthetics and functionality according to cultures. However, *localization* is often also used synonymously with language translation. There is little empirical insight on what product changes practitioners consider in their localization processes. Technology products

often have the same look and feel worldwide and are unchanged to reflect culture, except for language. This dissertation offers novel insights into practitioners' work through interviews with product managers, designers, and researchers (Chapter 3) to understand their efforts to optimize globally available products to a culturally diverse audience's needs and behaviors.

2. **RQ2**: What challenges do practitioners face when culturally optimizing the UX of their products?

   In "Localization Strategies for Global e-Business" the authors discuss the reasons practitioners chose standardization as their globalization approach. The practitioners cited lack of skills, a lack of knowledge, and a lack of application of tools, among other reasons for a homogeneous website approach [96]. No empirical study or further insight is available on what challenges practitioners face when culturally adapting their design (or why not), leading to a lack of opportunities for academia and practitioners to work together and create research insight within a specific use context. My dissertation research addressed this question (Chapter 3) through interviews and a survey with practitioners to understand the challenges practitioners face when optimizing global products for a worldwide audience.

3. **RQ3**: Do practitioners use academic research that informs UX localization, and if not, what information do they rely on instead?

   The literature review on culture in HCI has shown that researchers have created guidelines and insights based on product comparisons between countries that could inform practitioners' work. Translating this academic research into design practice is described in the literature as the "research-practice gap" and has been acknowledged as a challenge for HCI. Researchers have identified various barriers and gaps specific to the information flow between applied research and design practice. To my knowledge, no research exists to date, investigating the gap between research and practice specific cultural adaptation. It is unknown if the established barrier of applicability applies to this context. I explored this through both a mixed methods study and by

reporting from two case studies describing my work experience in Booking.com and Microsoft.com.

4. **RQ4: What is the use and usefulness of academic research on cultural adaptations in practice?**

   While research question RQ3 addresses IF cross-cultural research reaches practice, with RQ4, I investigate HOW the research can be applied in practice.

   Translational Science in HCI investigates the barriers in the use of research insights and suggests opportunities for academia to change the content and access to their research. However, it is unknown if practitioners would be able to use the research if indeed they were able to overcome the content and access barriers. Specific to the context of cross-cultural research, I investigated if the research is useful in practice and under which circumstances practitioners were successful in applying the research. Chapter 4 presents two case studies from my work experience at Booking.com and Microsoft, where I introduced academic research related to the cultural adaptation of product interfaces.

Chapter 3

RESEARCH-INFORMED CULTURAL ADAPTATION IN PRACTICE

The literature review reveals cross-cultural differences in how people behave, perceive, and interact with information. However, it is unclear how these findings translate into practice and if they are addressed through modifications of aesthetics and functionality in globally available technology products.

This chapter answers the following questions:

- **RQ1:** Do practitioners culturally adapt the design of their product, and if yes, what aspect of culture do they consider?
- **RQ2:** What challenges do practitioners face when culturally adapting the design of their products?
- **RQ3:** Do practitioners use academic research that informs cultural adaptations, and if not, what information do they rely on instead?

To answer these questions, I conducted interviews with product managers, designers, and researchers asking about their experience with adapting the design of globally available products for different locales, the challenges they face, and the insights used to inform their decisions. During the interview, I also asked practitioners to provide feedback on various research artifacts stemming from academia and how they would use this in practice. I verified the findings through a survey with a broader audience of survey participants. I used a thematic analysis to identify themes and analyzed findings through the lens of the HCI Translational Science Model [26] to understand gaps in communication specific to cross-cultural design questions.

3.1 Methods

3.1.1 Interviews

Between February and April 2020, I conducted 18 semi-structured interviews with product managers, designers, and researchers working on globally available digital products to understand their experiences with culturally localized user experience design. The interviews were conducted via video conference. Interviews lasted for approximately 60 minutes, and participants were not compensated for their participation.

Interview Protocol

The interview protocol was organized into three sections. In the first section, I sought to understand how practitioners approach designing for different markets when being in charge of a globally available product. It asked what changes to the product were made and the needs of the users it addressed. The interview probed for challenges practitioners encountered when designing culturally localized experiences, what information the participants relied on, and their needs to further drive localization. The second part of the interview targeted understanding practitioners' familiarity with commonly used cultural dimensions like Hofstede, Schwartz's model for cultural theories, or the World Value Survey. The interview probed on understanding the participants' use of academic research for design in general and specifically for cultural differences. With the final and third part of the interview, I aimed to understand how practitioners evaluate resources coming out of academia and if and how they would anticipate integrating these into their design practice. For this, I showed practitioners examples of a publicly available model to determine cultural differences, a summary of guidelines (Figure 3.1, Table 8.1) [83] to inform web design, a model on how cultural-specific information can be integrated into a persona development [61], and a tool aimed to foster creativity in visual design by predicting aesthetic preferences of users based on their location.

I refined the semi-structured interview protocol after 13 sessions were transcribed, and initial analysis was conducted. The modified interview protocol used in the remaining sessions with P14-P18 was focused on gaining more depth and understanding of the initial

Table 1. Relationships between Hofstede's Dimensions and UI Design Aspects (Reinecke 2011)			
	Low Score	**High Score**	**Reference**
Power Distance	Different access and navigation possibilites; nonlinear navigation	Linear navigation, few links, minimize navigation possibilities	Burgmann et al. 2006 Marcus and Gould 2000 Voehringer-Kuhnt 2002
	Data does not have to be structured	Structured data	Marcus and Gould 2000
	Most information at interface level, hierarchy of information less deep	Little information at first level	Burgmann et al. 2006 Marcus and Gould 2000
	Friendly error messages suggesting how to proceed	Strict error messages	Marcus and Gould 2000, 2001
	Support is only rarely needed	Provide strong support with the help of wizards	Marcus and Gould 2000
	Websites often contain images showing the country's leader or the whole nation	Images show people in their daily activities	Gould et al. 2000 Marcus and Gould 2000
Individualism	Traditional colors and images	Use color to encode information	Marcus and Gould 2000
	High image-to-text ratio	High text-to-image ratio	Gould et al. 2000
	High multimodality	Low multimodality	Hermeking 2005
	Colorful interface	Monotonously colored interface	Barber and Badre 1998
Masculinity	Little saturation, pastel colors	Highly contrasting, bright colors	Dormann and Chisalita 2002 Voehringer-Kuhnt 2002
	Allow for exploration and different paths to navigate	Restrict navigation possibilities	Ackerman 2002
	Personal presentation of content and friendly communication with the user	Use encouraging words to communicate	Callahan 2005 Dormann and Chisalita 2002 Hofstede 1986
Uncertainty Avoidance	Most information at interface level, complex interfaces	Organize information hierarchically	Burgmann et al. 2006 Cha et al. 2005 Choi et al. 2005 Hodemacher et al. 2005 Marcus 2000 Marcus and Gould 2000, 2001 Zahed et al. 2001
	Nonlinear navigation	Linear navigation paths / show the position of the user	Baumgartner 2003 Burgmann et al. 2006 Corbitt et al. 2002 Kamentz et al. 2003 Marcus 2000 Marcus and Gould 2000, 2001
	Code colors, typography & sound to maximize information	Use redundant cues to reduce ambiguity	Marcus and Gould 2000, 2001
Long Term Organization	Reduced information density	Most information at interface level	Marcus and Baumgartner 2004 Marcus and Gould 2000
	Content highly structured into small units	Content can be arranged around a focal area	Marcus and Gould 2000

Figure 3.1: Relationships between cultural dimensions and UI design aspects [83]. This table was presented to interviewees to understand if the information can be used in the product development process. Please see the Appendix (Table 8.1) for an accessible version of the information.

themes found. The three areas of focus were (a) barriers practitioners reported on to culturally localize the UX design, (b) the lack of knowledge on cultural theories and reliance on other information sources, and (c) needs practitioners voiced.

Interview Recruitment and Participants

I aimed to recruit practitioners responsible for product and design decisions. This included the roles of designers, product managers, and UX researchers working with a product team

on mature, digital products that are available in more than two continents and languages. To do so, my research collaborators and I posted a call for participation on our professional networks with a small screening survey and subsequently contacted respondents who indicated an interest in our full interviews. Only two participants reacted to the general call for participation and the screening survey, with one participant not being qualified as their product was only available in one market. The majority of our participants were recruited through reaching out to LinkedIn connections and their referrals. Referrals from interview participants lead to additional participants. Despite this recruitment approach, only three of the eighteen participants worked for the same company, and they worked in different teams and functions. Of the eighteen participants, nine were product or program managers, six worked in a design capacity, and three were user experience researchers. Fifteen of our participants had a senior title or higher (three principals, two directors). Ten of our eighteen participants were female. Nine of the participants had +15 years of experience in their field, five had +10 years of experience, three +5 years of experience, and one participant had +3 years of experience. Eight of our participants worked for global companies with +10,000 employees, six of the employees worked in companies with +5,000 employees, one in a +1,000 company, and three participants worked in companies that were between +2 and +50 employees. Ten participants worked for US companies; seven of the participants worked for European companies. Ten participants were physically located in the US, five in Europe, and three in Asia. The products our participants worked on were all available in at least nine languages, the highest number of languages being 43. All of the products were available in at least 20 markets, with many companies not publishing the number of markets as digital products are available everywhere. The products participants worked on included expense management systems, BI intelligence, enterprise logistics products, e-commerce platforms, news aggregators, job sites, travel platforms, messaging, real estate, and online food delivery. Two of the participants worked in agencies supporting research. Table 3.1 shows an overview of the participants, years of experience, the size of the company, the continent the company is headquartered, the location of the participant, and the high-level industry as per LinkedIn.

	Role	Years of experience	Company Size	Industry	Headquarter	Participant Location
P1	Product Manager	15+	10,000+	Computer Software	US	US
P2	Product Manager	15+	10,000+	Internet	US	US
P3	Product Manager	20+	10,000+	Logistics and Supply	Europe	US
P4	Product Manager	15+	10,000+	Computer Software	US	US
P5	UX Design	10+	5,000+	Internet	Europe	Europe
P6	UX Design	15+	5,000+	Computer Software	US	US
P7	UX Research	7+	5,000+	Internet	Europe	Europe
P8	Design Ops	15+	5,000+	Internet	Europe	Europe
P9	Product Manager	10+	5,000+	Internet	US	US
P10	Product Manager (Loc.)	15+	1,000+	Computer Software		US
P11	UX Design	5+	10+	Market Research	US	US
P12	Product Manager	3+	10,000+	Logistics and Supply	US	US
P13	Product Manager	20+	10,000+	Internet	US	US
P14	Product Manager	20+	10,000+	Internet	Europe	Europe
P15	UX Research	10+	2+	Research	US	US
P16	Product Manager	10+	10,000+	Internet	Europe	Asia
P17	UX Design	10+	5,000+	Real Estate	US	Asia
P18	UX Research	7+	50+	Internet	US	Asia

Table 3.1: Interview practitioners in study 1. Job titles, years of experience, company size, industry & headquarter per LinkedIn. Location of participants is self-reported.

Interview Analysis

My collaborators and I analyzed the interview findings following a thematic analysis [14]. After the first thirteen interviews (P1-13) were conducted and transcribed, we expected to have reached a high degree of saturation [41] and started the analysis. One researcher and I first examined four random interview transcripts to develop a codebook independently. We

then discussed with all collaborators and reached an agreement on the final codes. We then both coded the rest of the interviews independently, frequently comparing and discussing new codes that came up or codes that were merged. All four authors participated in thematic mapping, collating all the relevant coded data extracts within the identified themes through discussions and with the help of online tools. Based on the themes developed, I modified the interview protocol and conducted five additional interviews (P14-18). We discussed the themes during the interviews, and practitioners challenged and elaborated on our findings.

Consistent with the qualitative research approach, I report our results verbally, describing whether most, many, some, or a few participants reported a particular code or a particular theme was common, prevalent, sometimes, or rare [88].

3.1.2 Survey

To supplement the qualitative lens of the interviews and understand if the findings from the initial interviews apply to a broader number of practitioners with a broader range of roles, I conducted a follow-up survey (N=36) on Google Forms. Participants in the survey were not compensated.

Survey Design

The survey had 29 questions, which were structured into eight distinct sections. The first two sections explained the survey goals and terminology used throughout the questions. The core of the survey was section three to six. In each of these sections, I asked a mix of closed-ended questions about the participant's own experiences and if they agreed/or disagreed with the theme found in the interviews. Each section closed with an open-ended question asking the participants to elaborate on their thoughts. Sections were 'Design localization in product development,' 'Resources used at work,' 'Resources used by product teams,' 'Needs product teams have.' The survey ended with questions on the participant's role and the organization they work for, followed by a 'Thank you' section.

Survey Recruitment & Participants

The survey was shared through LinkedIn, Twitter, Slack design groups, through snowball networking with interview participants, and others of my professional connections, who were asked to share it in the appropriate channels or to forward to colleagues. I counted 38 responses but excluded two responses as duplication, given the identical open-text responses and email addresses. Of the thirty-six respondents, 28% (ten) identified as product or program managers, 17% (six) designers, 17% (six) user experience researchers, 22% (eight) content strategists, 13% (five) localization managers, and 3% (one) marketing manager. 89% of participants worked for larger global companies with over 500 employees, 11% for small companies with less than 50 employees. 80% of respondents were located in the US, 17% in Europe, and only one participant responded from Asia.

Survey Analysis

I used the survey report from Google Forms to report on percentages of answers received to the different responses. I used only a selection of the questions asked to support or challenge the qualitative answers on appropriate themes. Answers to open-ended questions were not used in the analysis as only a few participants provided insights.

3.1.3 Limitations

1. *Recruitment.* The recruitment for the study participants is based on my network and their referrals and is, therefore, a non-representative sample.

2. *Over-representation of large-scale companies.* Based on my network and sampling, I over-represent large and mature companies. Future research should include start-ups and smaller companies in smaller and mid-range sizes. Smaller companies could be partially more agile in their approaches, but they may also lack resources and infrastructure for global inquiry.

3. *No in-group differentiation based on small sample size.* Based on the small sample size of the interview study and survey participants, I cannot make statements on

different approaches and lines of thoughts between the groups of product managers, user experience researchers, and designers.

4. *The study is limited to globally available products.* We were interested in how product teams culturally localize the UX of *existing* global products and have consciously excluded participants who work on new product development (NPD) or just begin to scale a product.

3.2 Results

The interview study revealed four themes that were also confirmed through the survey. The four themes were: (1) Practitioners solve cultural usability issues but rarely engage in cultural adaptations to UI and UX design; (2) Technical barriers and prioritization challenges lead to homogeneous designs; (3) Practitioners rely on market experts instead of academic research; (4) Cultural guidelines are anticipated to be good for ideation and to analyze experiments.

3.2.1 Practitioners solve cultural usability issues but rarely engage in cultural adaptations to user interaction design

Through interviews and confirmed by a follow-up survey, I found that practitioners in the study engage in complex localization efforts to enable their product's basic usability for different markets. However, I also found that adaptations to the UI and UX design to align with local cultural practices and preferences, as suggested with academic research guidelines, are rare. Aspects of culture that practitioners described as cultural design adaptations were language and discourse fixes, changes needed because of differences in market regulations, as well as payment and shipment changes. The changes in more detail:

When asked to describe their efforts to adapt the UX design of their products to their users' culture, many of the interview participants immediately talked about linguistic issues that were not solved through established localization processes, but also local regulations that needed addressing and enabling of and building features around local practices for payment and shipping.

Related to linguistics, I found two recurring issues that are often not addressed, although most of the practitioners I talked to are working in companies with mature localization teams and processes. First, practitioners described language expansion problems when the size of words changed in other languages causing alignment issues or unexpected and undesired line breaks. While localization software already accounts for some language expansion, frequent edge cases need the UX engineering team to make changes. For example, one participant described how local salespeople often use their products to show their clients charts on a tablet. Rotating the tablet in bi-directional languages led to many unexpected issues with language positioning that needed fixing to make the product usable on a most basic level.

> *If we wanted to be able to help salespeople and give them materials that they could kind of turn their computer around or their laptop their iPads around and show how to, you know what, how to grab certain, certain data or certain products or investment options, and if they are in double-bite that was, that would change our display that would change the length of our labels, it would change maybe the words that we used. We had to go through a lot of localization.* (P2)

Secondly, language issues were also related to discourse, a more complex and hidden cultural value, manifested when the translations through the automated pipelines did either not consider the context the language string appeared in and or translations were in the correct language but did not address the cultural aspects of the market.

> *What we are doing today, they usually hire a localization team that provides all strings, but we very often hear from the market PM. So while it's the correct translation, it doesn't make sense in this context or it doesn't communicate right when you put it in the app.* (P1)

In addition to language issues engineering teams needed to address with manual adjustments, many interview participants described their efforts to cultural adaptation to design and develop for local regulations, infrastructure, and shipping and payment practices. Examples were legal issues, designing for smaller mobile devices, supporting new local payment

and shipping providers, or enabling culture-specific features like installment payments. The problems encountered were described as specific to a market or region, complex, and required design & engineering changes. For example, P3 described how they localized for different languages and then adapted some of the functionality, for which she described the main change as enabling payment installments, which is a very common practice specific to Brazil. P4 mentioned that, in some markets, they needed to introduce sign-up for text messages on package delivery for fear of high-value packages getting stolen. Similarly, a culturally-specific infrastructure setup led to investments by teams to design for smaller screen sizes. P8 indicated that while, generally, their team does not make a lot of cultural adaptations to their products, they needed to support payment and a variety of delivery services.

> *First, how our product differs or market - there are not many but there are still some differences. For example, the payment methods, there are a lot of local payment methods that are specific for each market. And in some markets, we offer delivery service in others we don't. And then the delivery service itself differs for the market because, again, it is based on what users need and trust. For example, in [one market], they trust a little more working with couriers, whereas in [another market], we work with the central post office. Because that is what they trust, so these are the market specifics.* (P8)

Interview participants reported on such localization for different locales as 'must-haves' to ensure the product can be used in a market.

In addition to market-specific norms that needed to be addressed, interview participants also reported the need to adapt their product based on cultural mismatches between the product design and the users' cultural expectations. Such cultural mismatch included a case where the color red in a web design did not prompt the desired reaction in a market (red is not associated with 'attention' in all markets). The participant described how the mismatch was addressed to changing the specific color only; the general color palette and branding was not adjusted. Another participant described how their team needed to change a heart icon in a market to a star icon to better match the audience's cultural preference.

After the participant was introduced to cultural dimensions, they remembered this feature change and tied the change from a heart to a star back to the 'masculinity' dimension of Hofstede's model given the predominantly male audience of the product.

A few participants indicated that they were surprised by deep-rooted differences between markets they found through their own team's research or heard from their marketing research efforts. For example, the perception of the used goods industry varied significantly between the countries, which needed to be addressed from a marketing perspective. Another interview participant described how they found that women in a market could not have an account as they suffered from harassment. Specific to India, the team needed to change how user accounts are designed, based on the user research finding that the mobile device is shared between family members. The team learned from this cultural difference by doing research in that specific market; they were not aware of previous research insight that this is a common practice in India. The learning led to a local feature that allows users to have different accounts associated with one app.

In regards to UI and UX changes related to cultural patterns that make it easier and more efficient to interact with the product, some practitioners described visual complexity as a general design preference in the Asian market. This was described as common knowledge on cross-cultural design and was not tied back to any specific research insight. Practitioners also acknowledged that changes to accommodate such a design were difficult without knowing the specific differences. One of the interview participants described how their team solved this by hiring a designer; in their case, it was specifically for the Japanese market. P9 critically looked back at this decision, identifying a gap in the feedback loop as his team would not challenge any of this designer's design decisions.

> *I think a US designer or a European designer would be able to do a good job for the US, Canada, maybe even LATAM and Europe. But when you go into culture when the product's environment is totally different [in this case Japan], then I don't think they can. I need to hire someone in that market. I do see a risk, though – now that I brainstorm with you. Because then when this designer says anything – anything - it is the truth. And you don't have anything against*

> *that... 'yeah, I guess you know better.' So it is also risky for an organization for international markets. How can they create a balance on how to challenge yourself and others when there is a lack of knowledge?* (P9)

In summary, I find that practitioners engage in cultural localization that goes beyond translation. However, the efforts made often focus on observable manifestations of culture (the outer layers of the onion model) and address problems and difficulties that substantially hinder the use of a product. Adaptation of the product design to the more difficult to interpret aspects of culture (the core of the onion model) that have shown in research to improve efficiency, reduce error, or create a feeling of belonging is rare. This finding was confirmed through the survey. 71% of survey participants agreed with the statement that *Product teams have little bandwidth for design localization as there is an ongoing need to fix, maintain and update essential localization features to ensure a functional product (e.g. updates to regulatory requirements, language adjustments, payment systems, etc.).* (12% disagreed, 17% did not have an opinion.)

3.2.2 Technical barriers and prioritization challenges lead to homogeneous designs

The interviews revealed that, when considering cultural adaptations, practitioners prefer to creating designs or functionalities that are applicable globally. The main themes that explain this standardization approach were that (1) deviating from the often templated structure of a product interface for cultural customization is associated with a high engineering cost for implementation and maintenance, and (2) practitioners prioritize for highest impact, which is usually associated with the culture of users in their home market.

Practitioners often were in charge of products or aspects of products that were available in many markets, accessed by millions of customers. P12 explained how their team, instead of culturally adapting the design and functionality for a market or region, seeks to combine local requests and find a global solution to avoid time and effort to maintain such local changes: *"In terms of localization and how to see what the market is like in a particular country, but it's a lot of tiny details. It's a lot of overhead management for an app. So*

instead of that, it's better to include the feedback and make it a global change to make it simple enough to use for most users rather than making it like one specific thing for one specific user. That's something that I think will save us a lot of time."

A few interview participants emphasized this focus on a globally unified design by describing how they even rolled back previous feature localization for individual markets. They could not justify the effort to maintain this localization as the change's advantage or impact was considered small.

> *We wanted to make the product as consistent as possible. And we even think a couple of smaller local English speaking features which were not much used, were actually deprecated during this process, okay? Because there's the other side of the coin that yes, on the one hand, it's crazy great to have everything like tailor-made and the cultural differences for individual components, on the other hand, there is purely [inaudible] maintenance, and it's a nightmare if you have so many differences between different markets. So I guess the hardest part is finding the balance between these two things.* (P8)

Based on inflexible platforms, participants described it as challenging to justify the effort and cost to implement culture-specific UX changes. P17 described how essential changes to a loyalty program, which were considered crucial to align with users' national expectations (and competitor programs), could not be implemented. This change was considered important to increase market share and came with a clear growth expectancy. However, the effort and length of implementation time, given the existing inflexible backend designed to support a single global feature, did not allow for such change.

P16 further elaborated on the difficulty of culture-specific changes being blocked by inflexible platform architecture. The participant described how his company is planning to introduce a front-end architecture that would allow markets to have a higher degree of control over the look and feel and placement of the modules. The company's goal in adopting this architecture is to keep its unified design language while giving the market flexibility to change the representation of components. The company reportedly only introduced such a paradigm following a strategic decision by the leadership to increase their presence in

Japan based on the knowledge that there is high differentiation between how people in their home-market and in Japan consume content. However, even with this change, the interview participant acknowledged that there would be features that would need to be built specifically for a market to align with the preferences of its users, again, running into the consideration if the benefit to the user leads to an increase in market share and revenue and therefore outweighs the cost of implementation and maintenance of such features.

High engineering costs to implement and maintain local customizations described above were only one barrier to cultural adaptations to design. Some interview participants reported that even if the need for cultural adaptations were well understood and possible from a technical perspective, they could or would not act upon it, given that the teams goal is to create features and functionalities that have a high impact on key performance indicators (KPIs); the resources go where the revenue is. Therefore, culture-specific UX often took a back seat behind 'keep-the-light-on' tasks (what team's see as their must-do efforts to keep the global product running) and new global product innovations targeting the most significant markets. This deprioritization led to market requests for cultural adaptations sitting in the depth of the engineering teams backlogs, and, despite best intentions, they were not able to prioritize it. For example, P1 described how a global layout change they introduced was considered to be against the preferred information consumption style of users located in Japan, but that the team decided to launch it globally nevertheless to not exclude Japan from getting new and improved features that came with this change. The team's intention was to address the culture-specific need for Japan immediately after the worldwide launch, only to have to deprioritize it constantly in favor of other, more impactful features.

> *Yes, we talked about adjusting for markets, but it never could fit the scope and the timeline with the dev team. We expected to start optimizing after launch, so we said, "Let's go with what we have [for launch]". ...and we had this item in the backlog for probably half a year now.* (P2)

One interview participant also described how they would not prioritize a cultural adaptation given that they have 'way more basic things to figure out' on the core product. They were

referring to common usability issues that affected the core product and needed attention first. Another participant indicated that it is considered more profitable to expand the current user base in markets where the product is strong already, instead of innovating for smaller markets. A few practitioners pointed out that, without a leadership-supported strategy and commitment to focus on individual markets and to culturally localize the UX of a product for that market, market-specific UI and UX will not be prioritized. P11 compared cultural adaptations to the effort to design for accessibility: unless a culturally inclusive UX design is not enforced like accessibility or has a clear monetary benefit, companies will not fund these approaches.

> *Similar to accessibility. As long as the business does not care about it – yes, designers care – but they don't get funding for it. Yes, some developers cared but they were 'I told you this shit like yesterday'. Companies often don't care until they get sued for it. Like with accessibility, WCAG is around since 1990 but they are like oh crab, this actually matters and I have to now build for it? Same with GDPR, people did not start putting customers data in separate data centers across the world until those regulations existed and started being enforced. Money needs to be used in our context. Hey, you can make a lot more money.* (P11)

Similarly, P14's concern was that small step optimization to culturally localize the UX only has a certain limited amount of impact. He describes that unless there is a strategy to become a market leader for a specific locale, product teams' focus will be on the home market.

> *It has to be a conscious decision to optimize for a smaller market for sure. Or to consciously exclude smaller markets. It is a strategy. And, granted that with a small step like UI level adjustment, there is going to be a limit of how much impact you can bring, and you hit that fairly quickly unless there is a strategy we want to be an absolute winner in that market. But for the latter, Marketing,*

> *UI, supply-side, and a willingness to spend that money on what is maybe a much lower ROI, then the current market is important.* (P14)

In summary, through interviews, I found that practitioners prefer globally applicable solutions as local customizations are considered complicated to implement and maintain, and therefore often difficult to prioritize when compared with the opportunity to improve the product for the most significant markets with the highest revenue opportunity. The follow-up survey confirmed these findings through two survey questions:

- 83% of survey participants agreed with the statement that *Product teams aim to create global design optimizations over customized solutions for specific markets considering the high cost of implementing and maintaining variations per market* (8% disagreed, 9% did not have an opinion).

- Equally, 80% of survey participants agreed with the statement that *Product optimization is heavily skewed towards innovating for the needs and desires of the biggest market, as this is considered to have more impact than focusing on design localization.* (3% disagreed, 17% did not have an opinion).

3.2.3 Reliance on market experts insight instead of academic research.

Most practitioners in interviews relied on market experts to help them understand the necessary cultural adaptations. None of the practitioners in the interviews conducted were familiar with the guidelines resulting from academic research. Perception of academic research in general not being written for practitioners hinders the information transfer between research and practice. The findings in detail:

Reliance on local market experts

Most interview participants reported that they rely on input and feedback from team members located in the market as a primary source of information for any efforts to make culture-specific UX changes to their products. In-market colleagues who provide local insight are affiliated with UX product teams but often have different functions like sales managers,

market PMs, and marketing managers. Colleagues were described as sharing the target users' nationality and being familiar with the users through engagement with social media, customer feedback, and marketing insights. Therefore, practitioners considered these colleagues as the experts in the market and consulted them to provide feedback on prototypes and designs or to help understand discrepancies in telemetry specific to the target market. It is important to note that often the design changes that were described as being reviewed by in-market specialists were not created specifically for the local users. Instead, the design was targeting the main user base or was designed as a global feature. The final approval or feedback from on-site colleagues was mostly described to find mismatches to the local culture, which, without being addressed, would lead to a usability barrier or negative press attention. P9 described the function of the local market team to approve a feature rollout.

> *But then we also have a local market team. And nothing is released, or nothing is done without them going over it. They are local to the market, and they can also already shake off prejudices.* (P9)

One participant in our group described how, despite lacking access to corporate colleagues, their team also did what he described as 'sanity checks' with people that they had a working relationship with in the target market.

> *We might send them like, you know, a link to the interface and say this thing, are the words here, do they make sense? Even that was outside of our budget on the research side, and we used it only for critical screens that we knew, for example, that had a drop-off - then it would be like a double-check that we're not cussing anybody out or anything. (P11)*

In addition to their function to approve prototypes and catch cultural mismatches in language and design, a few practitioners in the interviews also reported that the local colleagues provide general market insight and capture trends. A product director described how the leadership team is very engaged in understanding Asian market trends and where the long-term strategy needs to land. The local colleagues bring information to the product team.

> *The market managers would also bring, like they do that, pretty regularly, where they're bringing probably like, on a weekly cadence, like demonstrating changes. Not only are they looking at pricing changes that are happening in the market, and we're also looking at just trends. That's like, where different opportunities have been identified.* (P4)

Besides consulting with colleagues in the markets, a few interview participants also reported having consulted team members who originated from the same market as the target user group but are not located in that market. This was mostly mentioned in relation to quickly verifying translation or understanding telemetry variations that could indicate potential market problems.

Only one participant mentioned the risk of relying on colleagues instead of gaining market insight through user research. The participant described how colleagues tend to give feedback based on their lived experiences and biased understanding of the market from the perspective of their role. The participant's concern was specific to a situation in India, where she described the colleagues as being in an enabled economic class as they are working for a multinational company and spoke fluent English, therefore not being attuned to the problems of the majority of their target group and users. While they also used the help of the colleagues in the market, they would not entirely rely on them to provide insight on design concerns but were traveling to the market to conduct the research.

In addition to the in-market experts', practitioners also relied on a strong A/B testing platform and data analysis to identify cultural mismatches. For example, many practitioners in the interview described how they developed aesthetics and functionalities based on the needs of the cultural profile of their home market. These changes were then rolled out globally. If there was no in-market expert that provided feedback, the practitioners were still comfortable in exposing the change to a global audience, knowing that a market-specific data analysis would indicate through irregularities in data that there is a cultural mismatch or negative perception of the change (for markets with sufficient traffic to get a statistically significant signal). For example, P9 described how they had developed a new, time-critical feature based on insight from users in their home market. At the time of the interview,

the participant described how the feature is now going through translation and will then be experimented with globally, with the full understanding that it might not be suitable for some markets:

> *It [new feature introduction] is being internationalized now. Of course, as we are going to launch globally, we might find that it might not work internationally. Maybe it only makes sense in the US.* (P9)

Similarly, P4 describes a global experiment with a post-experiment analysis of impact per market: *"So in this case, we're designing an experiment which we wanted to run, globally, in multiple markets, so that we can evaluate the performance of the changes to the design, and determine if there were any differences and engagement between markets."* Both of these participants showed that they are taking the risk of features not being designed for the user profiles of smaller markets but relied on a robust experimentation platform, allowing them to gather the necessary insight to understand the impact on the user.

Additionally, practitioners use telemetry and data analysis to understand potential problems in specific markets. These efforts include looking at mobile transactions to understand if the growth in specific markets is aligned with the overall growth rate, comparing market-specific data to segments in other markets to understand if there are differences, and just in general, look at the drop-off points that were unexpected compared to other markets.

Lack of awareness of academic research for cultural adaptations to the design

All interview participants described during the interviews at least one culture-specific change they introduced to their global product. As shown in Section 3.2.1, none of the changes were directly informed by academic resources. Through a thematic analysis, I found that a lack of awareness that research exists to inform culture-specific adaptations is a massive barrier to inform cultural adaptation of user interaction in practice.

Interestingly, this barrier was even more pronounced between applied research and design practice compared to the information flow between basic research and design practice. A few interview participants had heard of cultural theories and cultural models in general. Work by Hofstede, Schwartz, Geertz, and the World Value Survey, which we used as

examples to prompt participant memories of resources they might have used, was rarely recognized during the interview. However, a few participants who went through a graduate HCI program recalled that they learned about the research from Geert Hofstede, but only remembered when I showed them applicable cultural comparisons as examples. Only one interviewee had applied cultural models in practice. The participant reported having used the Hofstede cultural dimensions in brainstorming sessions for product development. In comparison, none of the interview participants were familiar with guidelines or scholarly research output from HCI that showed concrete examples of how cultural dimensions affect user behavior.

This lack of awareness of academic knowledge did not mean that participants were entirely unaware of cultural needs. Overall, most participants were aware of cultural differences but did not tie these back to theories or research on cultural differences. For example, attention to cultural needs was voiced by P3:

> Also, just the look and feel - like when you design for Asia, Japan or China, then you have to really change the whole user experience because it looks quite different. (P3)

80% of survey participants agreed with the statement '*Cultural theories (e.g., Hofstede's dimensions, Schwartz's cultural values) developed to explain differences between markets and the resulting design guidelines for product optimization are not commonly known or discussed in the design community.*' 20% did not have an opinion.

Academic research is perceived as challenging to synthesize

Similar to the findings of Colusso et al. [25], most participants perceived academic research, in general, to be *"impractical"* (P4), *"not related to the real world,"* (P11), *"fascinating to read, but pretty far away from being applicable"* (P6), and *"too time-consuming to read and too complicated."* (P8). P14 expressed that it takes an overwhelming amount of effort to go through academic papers, as *"academic research is written, well, for academic audiences and not for practitioners."* P16 further described how it was nearly impossible to

read and interpret academic papers while under the pressure of a fast-paced, agile product development environment, further emphasizing the barrier in translating academic findings into practical action.

> *So it takes an overwhelming amount of effort to just go through that literature because it's not easily socialized by the scientific community into the industry audience. They don't write for the industry audience.* (P16)

In general, and not specific to the cross-cultural context, interview participants indicated that they find it challenging to find relevant and applicable academic research, and when found, they find it difficult to share because of access rights. This general finding was emphasized in the cross-cultural context. One participant indicated they would not even try to search for insight on a specific market but would leave this up to their colleague located in the market. A few interview participants also pointed out that paywalls prevent accessing and sharing academic insights, further deepening the gap.

> *Yes, journal papers in terms of shareability is always terrible. You know, if I have access to a research paper, rarely does a person that I want to share it with have access too. So that tends to be some piracy that occurs. Either like, downloading a pdf and sending it over, which I kind of feel uncomfortable with. Or, like, taking screenshots of the important thing. And then linking to where I think we should pay for this information.* (P11)

Little first-hand user research in locale or explorations of technology use in practice

Most interview participants indicated that they rarely do research requiring traveling to a specific market to further localize the UX of their product. Some practitioners considered that insights of on-site colleagues in the markets are sufficient, or the practitioners lacked budget and resources (or a combination thereof).

> *We typically are not doing international user research, I would say, we do rely on, we have a distributed international team that we rely on for direct consumer feedback and input. (P4)*

UX researchers also emphasized that ethnographic research, which is often considered an essential tool in cross-cultural research, is a hard sell to the leadership team that approves resources and budget. P7 described how it took the launch and failure of an app in a market to get resources allocated. The participant described launching the app in the global design as "a disaster, which triggered the hiring of a research team." P16 explained how it is not only a lack of budget or upfront financial means to send people to a market; it is an opportunity cost as the team or part of the team that is doing research is not working on shipping regular software during the time of their research. P15 described it both as an absence of a budget for ethnographic research and the need to move fast and get things done. It is hard to justify getting a budget for research with the goal of *'we don't know what we are going to learn, but we will learn something.'*

While most participants did not travel to conduct research in the market, some mentioned gaining insights through surveys, the creation of user journeys, or personas.

3.2.4 Cultural guidelines are anticipated to be good for ideation and to analyze experiments

When shown applied academic research on culturally localized UX design guidelines during the interviews, participants anticipated that the research insights would be helpful for product ideation and to support data analysis. For example, the table with UI guidelines developed from a literature review of design recommendations based on cultural dimensions [82] was considered highly usable and applicable for brainstorming or for hypothesis creation. Participants also found these recommendations useful for informing their user research questions. P6 describes these guidelines as allowing them to *"point your binoculars to understand the problem space better, although not accurate enough to make specific predictions."* P12 also found the guidelines most useful as it has a *"clear indication of what are some of the things that people actually are peculiar like they are looking for something about, like, for example, they want high monitors colored surfaces."* P9 was similarly excited about the opportunities the design guidelines and academic research insight provide, indicating that this leads to immediate hypothesis creation.

> *This is very interesting. It could be very useful because it actually translates, so to say, acknowledges cultural differences into more specific and actionable recommendations. Because as I read it, immediately, I am formulating a hypothesis in my mind. It's all about experiments, right? So yeah, definitely valuable. Depending on the scale of the product, for bigger organizations are unlikely to make changes.* (P9)

When asked what information practitioners would desire to enable them to further the cultural adaptation of their global products, practitioners indicated that access to case studies and practical examples of how other companies have approached design localization and the impact had on their product would be helpful. Participant 11 described the need for accessible human examples to use in their repertoire to convince stakeholders of the importance of cultural adaptations.

> *That is similar to this problem - like all of these case studies and stories that are like, Hey, here's how this product failed in this particular market or here's how caring about this, for example, Kanji characters really mattered in japan. These little case studies - from a research perspective, these might not be very robust but are like what executives really listen to if you bring it. You know, bring a problem into the boardroom, and you say like, "Look, here's why this matters - like I can point out this exact problem why that product failed in Japan because of this exact reason - and they go, huh, I think we should fund this."* (P11)

One participant, however, noted: *"Examples are not how 'innovation' works. That is how 'following' works. A truly global company that does innovation well brings local insights into the global product. For example, take Google in India as a success. The downloadable YouTube comes from a local innovation that went global. People downloaded at work, and long commutes were watching online."*

89% of survey respondents found it somewhat or very useful to have access to case studies and practical examples of how other companies have approached design localization and the impact had on their product.

In addition to real-world examples, practitioners also pointed out the lack of access to free and essential information on markets when it comes to the technology footprint in the market, online audience, basic demographics, and segments, which would be helpful to set their data from their product in the bigger context.

> *So I would love to have maybe something like Wikipedia for designing for different cultures when you can go just like an answer like for example. I want to learn about this region, like what is different from what we know about it? What kind of users will face and not like doing research from the Internet and trying to learn and can read a million different sources, but some consolidated knowledge. I think even simple do and don'ts also would help, but overall understanding your audience better helps with anything from product conversations to designs.* (P1).

89% of survey respondents found it somewhat or very useful to have a single place with general information on a market, including basic demographics and segments, technology footprint, platforms used, online audience, Internet availability, etc.

3.3 Summary

In this work, I set out to understand if and to what extent practitioners optimize the UX design of digital products available across many markets and the barriers they face. I explored whether, and in what ways, practitioners use academic research insights to inform their decisions and, if not, what other resources they rely on.

The results show that the practitioners in my study mostly solved users' problems and difficulties to make the product functional to the requirements of the markets and by avoiding and fixing cultural mismatches. Implementation of locale-specific changes addressing cultural differences in values and behaviors and improving the user experience as suggested with academic research guidelines were rare. The lack of cultural adaptation was based on the following challenges: (1) technical limitations did not allow to adjust the user interface and interaction design easily, making it an uphill battle if arguing for investing in broader localization efforts; (2) efforts for the home market were considered more impactful to revenue metrics and therefore prioritized; an unknown or lower expected return on investment

(ROI) of cultural adaptations to user interaction made it difficult to get to the top of the priority list; (3) practitioners in my study relied on colleagues in the markets for feedback and were not aware of or motivated to seek academic research on cultural adaptations to user interaction. More encouraging, when exposed to culturally-informed design guidelines during the interview, practitioners found artifacts and tools stemming from cross-cultural research in academia to help ideation and analysis of experiment results and telemetry.

These insights indicate that practitioners in my study did not actively seek standardization or consciously aim for homogeneous products. Instead, based on the interviews and surveys, I conclude that their lack of cultural adaptation was based on the technical limitations not allowing easy adaptations, interviewees focus on ROI that often was higher when designing and innovating for users in the home markets, and their reliance on local colleagues who were often not involved early in the design process but rather were consulted for feedback and to point out cultural mismatches.

Looking at the findings through the lens of the HCI Translational Science model, I found that research awareness is the primary barrier in information transfer in a cross-cultural context. The interview study also showed that there is little motivation for practitioners to seek such insights: people from the target country already provide feedback, and it is not even possible to prioritize all the asks from the markets against the combination of low expected ROI in combination with high technical effort. For example, P1 described how a request from the market was sitting on their backlog for a long time. Chapter 5.2 will discuss the findings with a specific emphasis on analyzing the transfer of science between research and practice.

While the interviews and survey results show evidence that practitioners are neither aware of nor do they seek scholarly insights that inform the cultural adaptation of products, I also found that they anticipate some research introduced during the study to be helpful in the design process. However, there is also no evidence from practice that the insights tested only in an academic environment will be useful for practitioners. Norman (2010) critically describes the existence of the gap as follows [75]: *Scientists usually operate in what has been called "white room" conditions, carefully forming abstract characterizations of the phenomena under consideration and studying them in a controlled research environment*

or the clean precision of the laboratory. Similarly, the theories are of necessity, simplified and abstracted to a pristine form of mathematical or simulation models. Science works best when all the variables are understood and controlled. But the real world is complex and messy, with uncontrolled variables, sometimes behaving in ways that contradict the neat, tidy, logical assumptions of the scientist. No wonder there is a gap.

Chapter 4 investigates and tests cultural models and guidelines applied in a 'messy' and real-world setting.

Chapter 4

THE USE AND USEFULNESS OF CULTURAL RESEARCH IN PRACTICE

The literature review shows that research suggests going beyond translation to local target languages and to additionally improve technology products by designing for people's local needs and behaviors [82, 76]. The advantage of using cultural dimensions to inform the design of user interfaces is that they can provide guidelines as to how a country's national culture might compare to another. Using cultural dimensions and research insights can reduce the need for engineering teams responsible for global products to conduct time-consuming and expensive studies in each society for which a localized version of the product is needed, thus avoiding delays in time-to-market [80]. Such design suggestions have been verified in small-scale testing in academia [83], but it is unclear how industry makes use of it. With this chapter, I investigate RQ4: What is the use and usefulness of academic research on cultural adaptations in practice?

To answer this question, I contribute two case studies [1], developed based on my work experience and interviews with Product Owners for e-commerce localization in Booking.com and Managing Editors involved in the development for the AI Cortana, Microsoft's intelligent assistant, that provide insight into the efforts to culturally adapt a product to the needs of the society it is used in. These case studies contribute to the academic discussion by examining the value of existing academic research when applied in specific circumstances.

In section 4.1, I first describe the methodology used to develop case studies. Section 4.2 reports from findings from Booking.com, and Section 4.3 describes the development of Cortana. Section 4.4 provides a summary of insights in the context of the literature review.

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[1] A condensed version of this work has been published at CHI 2018: *Yaaqoubi, J., & Reinecke, K. (2018, April). The use and usefulness of cultural dimensions in product development. In Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (pp. 1-9).*

4.1 Methods

Insights were gained from my personal experience of working with Booking.com as Product Owner and at Microsoft.com as Program Manager. For both studies, I worked with the product development teams and provide an ethnographic perspective to the case studies as described below.

4.1.1 Case Study 1: Booking.com

Teams at Booking.com work in an agile environment [10], meaning that designers, product owners, and engineers all work closely together in self-organized groups with daily scrums, and they are often supported by shared resources from data science, research, copywriting, and an agile coach. Product teams quickly develop, implement, and test ideas that were supported by a strong hypothesis, and they allow the data pulled from the A/B tests to determine whether the user considers the changes as useful.

During my time at Booking.com, I optimized the Booking.com e-commerce product according to the travel behaviors of mobile and desktop users. I designed and implemented a range of user-centered design and research activities, analyzed data, and synthesized findings into actionable design recommendations. I lead cross-functional teams to design, develop, and launch experiments increasing country-specific conversion rates.

The following setup of engineering teams, the Booking.com A/B testing platform, and a culture of experimentation made this case study possible:

- During my time working at Booking.com, the company funded region-specific engineering teams. The revenue objective for these engineering teams was based on achieving the highest impact for the specific region within their responsibility. Additionally, based on the diversity within the Booking.com employee pool, practitioners working in region-specific teams often shared the culture or insight on the culture with their focus area. Such a charter is unusual. For example, only two of the participants in the interview study reported from a region-specific user-experience setup: one candidate was working in a China-specific setup, and one practitioner hired a designer

specific for Japan to support their presence there. All other practitioners interviewed were responsible for products and features targeted at a global audience.

- Booking.com has a strong experimentation platform, where teams can envision a change in the morning and, depending on the engineering effort, deploy in the afternoon if needed. There are many concurrent randomized controlled trials – A/B tests – that quickly validate ideas. This setup allowed to target customer segments per feature and audience segment.

- The culture of experimentation at Booking.com allows for the rapid testing of hypotheses. Failed tests are considered learning experiences and do not negatively affect the product team.

To understand the use and usefulness of cultural dimensions and guidelines for cultural adaptations of aesthetics and functionality, I rely on my personal experience during this time, supplemented by open-ended interviews with colleagues asking for their insight and opinions to expand on the depth of my personal experience. The reader needs to be aware of the following:

- I report from my personal experience from working in the team and the type of explorations conducted within my time on the team from November 2014 – February 2016.

- I modified the work environment by introducing information on cultural dimensions that were not used in the teams' daily processes and report from this experience.

- I conducted informal interviews with other employees at Booking.com, intending to supplement knowledge acquired during the time in the team. Interviews with product Owners at Booking.com responsible for localization in Japan and China could give insights into localization efforts for their markets.

The results include a detailed description of procedures and explanations of the meaning of the explorations.

4.1.2 Case Study 2: Microsoft Cortana

Cortana is a virtual assistant who can manage a user's schedule or send texts. In addition to task-oriented interactions, the user can ask questions with no real purpose in mind, which Cortana answers. This conversational feature is referred to as a "chit chat" functionality and helps to shape Cortana's personality.

During my time on the team, I worked with the editorial managers to inform the localization strategy and successfully introduced chit-chat to Australia and India. The case study is mainly informed by semi-structured interviews with the Principal Content Publishing Manager, the Content Developer for Germany, Austria, and Switzerland, and the former International Editing Manager of the Cortana global team, explaining how the personality of Cortana was developed.

In the context of this dissertation, it is essential to note that during my time in the team, Cortana was not yet available internationally. Developing a globalization strategy for market rollout deviates from the problem statement, which is focused on the cultural adaptation of available websites and web applications. However, this case study is provided to further understand the use and usefulness of cultural dimensions when creating a new product or developing a global rollout.

For both case studies, my personal experience from working in the teams and interview insights were combined into the evaluations and verified with all interviewees for content and accuracy. Modifications to remove insights that should not be publicly known have been made post writing and did not change any conclusions drawn from the research.

4.2 Case study 1: Cultural adaptation at Booking.com

Booking.com is one of the leading digital travel agencies, available in 43 languages and has in-market support through local companies in 76 markets. The company does not list its global availability – it is a website and can be accessed anywhere. However, it has 6.2 million listings of homes, apartments, and other unique places to stay in a total of 230 markets.

Booking.com has a culture of experimentation and uses A/B testing for product development. Such A/B tests or controlled experiments allow over 100 product teams to evaluate

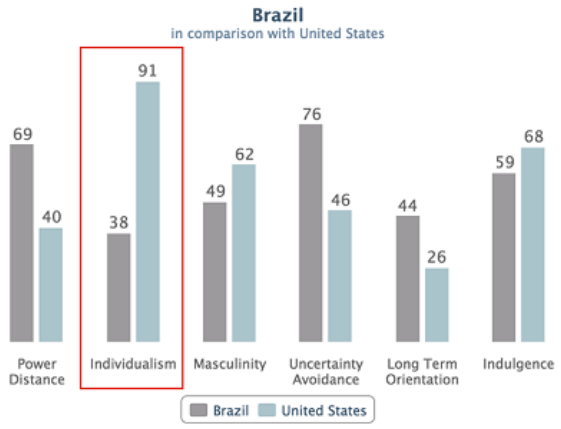

Figure 4.1: Hofstede's index scores for Brazil and the US [53]: the chart shows the differences in the score for the dimensions of power distance, individualism, masculinity, uncertainty avoidance, long term orientation, and indulgence for Brazil and the US.

the value of changes or new product features introduced to the e-commerce experience and to make data-driven decisions. To give insight into the scale, at Booking.com, approximately 1000 experiments are running concurrently across all channels, which allows the company to discern a clear understanding of customer preferences. All experiments described in this section had more than 1 million page views and were statistically significant at the 95% confidence level.

4.2.1 Use of cultural dimensions for idea generation

I introduced Hofstede's model of cultural dimensions first in a team meeting, which led to a discussion on the Individualism score. The team was particularly interested in the Brazilian market. With an individualism score of 36 (Figure 4.1), Brazil is considered a collectivistic society, which manifests itself in close long-term commitments to the member 'group', be that a family, extended family, or extended relationships. A team member from Brazil confirmed this finding, giving context to everyone in the team on how this is shown in daily life.

This discussion led to considerations which of the information on Booking.com could be

Figure 4.2: Booking.com experiment 1: The copy above was rendered to the control group while the updated copy in the lower part of the image was rendered to the treatment group confirming a conclusive increase in conversion.

used to increase the trust of Brazilian travelers. The team found that Booking.com has a high amount of our account holders in Brazil, and exposing the number of fellow Brazilians that have created an account seemed important information for individuals that seek to be a member of a group. The hypothesis, therefore, was that exposing this number dynamically on Booking.com's main landing page would increase trust in the website and hence, increase the finalized bookings made by travelers from this country. The copy team introduced a text change that exposed the number of account holders from Brazil as a unique selling point on the main landing page and showed this condition to 50% of all visitors from Brazil for a pre-calculated time period (Figure 4.2). The result of this experiment showed that the hypothesis was confirmed - bookings made by Brazilian site visitors who were shown the number of account holders had significantly increased compared to the control group that did not see the number of account holders.

Retroactively tying findings to cultural dimensions

While many employees in localization at Booking.com are familiar with cultural dimensions, not all are familiar with research on culturally-related UI guidelines (Figure 3.1) [82]. Instead, employees often rely on their own experiences to identify potential changes. For example, the idea to change the background color of the Booking.com search box from dark yellow to a light pastel tone (Figure 4.3) stemmed originally from local knowledge of team

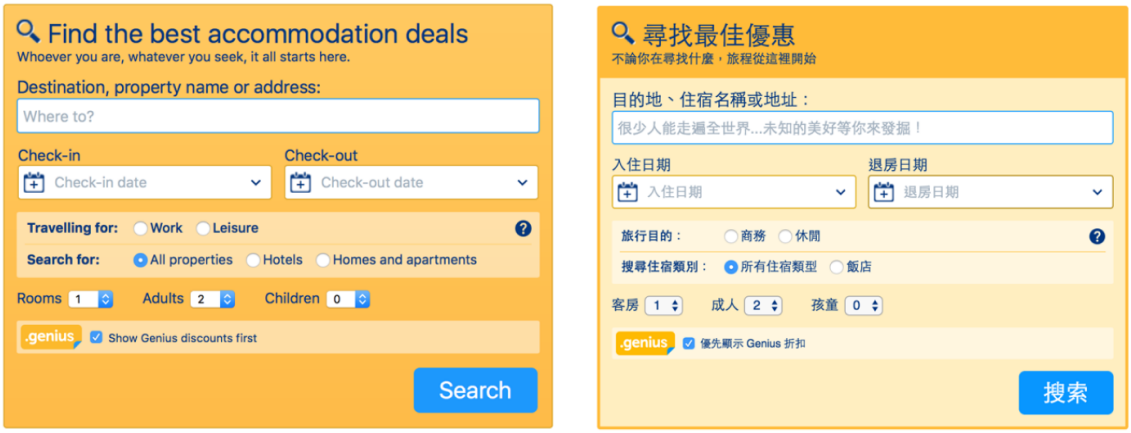

Figure 4.3: Booking.com experiment 2: Changing the color scheme on the search box. The image on the left was rendered to the control group; the image on the right was rendered to the treatment group.

members who noticed that websites in Asian markets often use pastel colors. They decided to test whether altering the background could positively impact the conversion rate by conducting a controlled experiment with users whose language choice is Chinese (traditional and simplified), Japanese and Korean. The result showed indeed a positive impact on search fields filled when using pastel tones, which ultimately led to a higher conversion rate for customers exposed to the change. To further expand this test, the change was introduced to all languages. The team found that the change still increased the number of people that filled in the information; contrary to what was seen for Chinese, Korean, and Japanese languages, there was also an increase in people abandoning search, and no significant increase in conversion rates was detected.

To find out why changing the background color was impactful for users whose language choice was Chinese, Japanese, and Korean, but not for other languages, the team then turned to the literature. Research has indeed found similar results, such as presented in [21] who found that Japanese university websites use predominantly pastel colors. In addition, the team tried to explain the results with the help of cultural dimensions. This proved to be challenging as pastel colors are attributed to a low masculinity index. With an index score of 95, Japan is one of the most Masculine societies in the world, which contradicts the success

Figure 4.4: Booking.com experiment 3: Introducing a clickable search for Chinese, Japanese, and Korean visitors

of this experiment. However, moving to a lighter color has also improved the contrast and shows overall a lighter color, which is a recommended design decision for a society high on the masculinity index and could therefore explain the increase in conversion. Altogether, the team found it difficult to reconcile the sometimes contradictory links between cultural dimensions and UI design.

Similarly, based on local knowledge, the Booking.com team also hypothesized that users with language choices of Chinese, Japanese and Korean are used to more complex navigation interfaces and text density and that therefore introducing an alternative option to the search box would allow this user group to more easily complete a booking. To prove this, the team introduced a 'clickable search' (Figure 4.4) in addition to the regular search box and introduced this change as a controlled experiment for users with language choices of Chinese, Japanese and Korean for a pre-defined time frame. The results showed that allowing alternative ways to search for a destination indeed led to an increase in conversion.

To explain this result, the team again turned to cultural dimensions and associated UI design aspects. Navigational preferences have previously been related to the dimensions of Uncertainty Avoidance and Power Distance (see, e.g., [65]). However, China and Japan

both score very differently on these dimensions, with scores of 30 (China) and 92 (Japan) for Uncertainty Avoidance and 80 (China) and 54 (Japan) for Power Distance. Japan should therefore be less comfortable with complex interfaces, which this change introduced. Similarly, China is rather high on Power Distance and therefore, should be more comfortable with fewer navigation options according to prior work.

4.3 Case study 2: Hofstede as a lens for personality development

Cortana is an intelligent personal assistant integrated into the Windows 10 operating system and uses Microsoft's artificial intelligence platform. Cortana takes care of a wide variety of tasks for the user, from setting alarms and reminders, making lists and scheduling meetings to tracking packages, opening apps, or identifying and managing travel plans from a user's calendar.

The Cortana product team realized early on that for Cortana to succeed, it was important to build trust with the user; the more information the user shares with Cortana, the more she can assist. As a result, the team made a bet on giving Cortana a personality to make her feel more like a 'real' person and, therefore, more trustworthy. When developing Cortana's personality, the team built on Nass and Yen (2010) [69], who suggested that people have emotional responses to inanimate objects. They also suggest that if an AI personality is not carefully developed, people will imbue it with the personality they think it should have. Instead of allowing the user to imbue their own personality, the team worked on creating a believable personality that served the product and the user in the most optimal way while at the same time conveying that Cortana was not actually human to avoid the uncanny valley effect (an area of repulsive response aroused by a robot with appearance and motion between a "barely human" and "fully human") [92].

In advance of the launch of Cortana, the US-based product team defined Cortana's US personality in deep detail and ensured that her responses in any context conformed to that personality. The Cortana Personality Design Team focused on creating a digital assistant that can be perceived as professional and helpful, friendly, kind and sensitive, trustworthy,

and other positive, relatable attributes, all aimed at the goal of making the user feel good about their interaction with Cortana.

When the team started thinking about international expansion, they knew from prior experiences that they would need to adjust Cortana's personality to different markets. It was clear that, while the core US tenets might be globally relevant, personality was an area where "traditional" localization would not be enough. They, therefore, build an international team that was tasked with developing Cortana's unique personalities in each market. They started by researching cultural theories and decided that Hofstede's cultural dimensions were the most relevant and approachable for the team. The dimensions were used to help guide the team's thinking, and in some cases, validate their intuition about Cortana's personality in different markets. Two of Hofstede's cultural dimensions were especially relevant due to the nature of the product: Power Distance (Cortana is an assistant, a subordinate), and Individualism vs. Collectivism.

4.3.1 Verifying intuitions with cultural dimensions

Of all the European team members, the French were the only ones who felt that Cortana should address the user with the formal pronoun ("Vous"). The team verified this insight by referring to Hofstede's high Power Distance index in France (68) compared to Germany (35), Italy (50), or Spain (57).

Individualism vs. Collectivism was also used as a lens, with the 'default' (US) personality being individualistic in subtle but definite ways. For example, a lot of 'chit-chat' content, meant to entertain and build trust in Cortana in the US (Individualism index 91), was focused on Cortana (her history, family, interests, tastes in music, events, food, etc.). In more collectivist markets, some of that content did not hit the right tone. In India, for example (Individualism index 48), the team decided to provide Cortana with a more community-focused repertoire, with a very robust set of responses around regional food and regional celebrations, including different rituals of Diwali.

The category of Uncertainty Avoidance was used to determine how Cortana differs in responding to user questions. Germany (65) is among the countries with a high Uncertainty

Avoidance compared to the US (46). Where the German Cortana answers questions directly, the answers of the US Cortana include more ambiguity. For example, when a user asks Cortana for a date, the German Cortana responds with a clear "Yes, I would love to go out with you, but you pay" while the US Cortana is more ambiguous and does not answer with a clear yes or no. The team was hesitant to just replicate the crisp style of German communication for the German Cortana: "Because they were interacting with a computer instead of a person, [visual] clues were missing... they had to inject more humor, warmth and politeness to maintain correct balance with blunt German efficiency" [103].

4.4 Summary

Cultural models have been used by both the localization team at Booking.com as well as the product development team of Microsoft's Cortana for idea generation.

After discussing cultural models with the product teams, the research insights informed possible design interventions that might increase various success metrics. The case studies showed how cultural models have helped shape experiment hypotheses and how this process was able to significantly and measurably improve several success metrics. However, while Hofstede's cultural dimensions were being used as a tool for ideation and hypotheses generation, I also showed that only a small fraction of all experiments was informed by cultural models and only when brought to the attention of practitioners. Instead, the majority of localization experimentation was based on first-hand research, data analysis, and the personal experiences of team members from the target culture they are designing for. In some cases, findings were retroactively aligned with cultural dimensions so as to verify their accuracy or to explain contradictory results but found it difficult to reconcile the sometimes contradictory links between cultural models and UI design.

The product development for Cortana mainly used cultural models for generating ideas about how the intelligent assistant should behave differently in the various target markets. Given that Cortana was a new product, Hofstede's cultural dimensions provided an essential lens to guide ideation in this early phase of development. However, similar to Booking.com, the Cortana team only used cultural models for a small part of the development and instead

most often referred to team member's experiences and intuitions.

While the applicability of cultural models within these two large, international companies is encouraging, both case studies indicate that cultural models alone are insufficient:

Product teams rely on local knowledge and first-hand insights

Although team members working in localization were aware of cultural models, the teams still supplemented or verified these with local insights. Such a mixed approach is not as scalable as relying on cultural models alone. The process still depends on having access to people from the target country or conducting first-hand research, which is often cost-prohibitive and infeasible for smaller teams and companies. In addition, it bears the risk that insights are biased if decisions are based on co-workers from a specific target country whose demographics and experiences might be different from the actual target population. Interestingly, cultural models were also used to explain and justify personal experiences and intuitions. This retrospective use of cultural models is interesting as it suggests the need for justifying whether personal suggestions are generalizable.

Cultural models and their implications are often unknown

The case studies indicate that there is only limited use of cultural models and UI guidelines provided by researchers in the industry. The majority of experiments are informed by data analysis, first-hand research, and the personal experience of team members from the target culture. Interestingly, the two case studies show that companies are often aware of differences between countries and cultures, but they often lack the knowledge of cultural models or the tools to explain these differences or act upon them. The case studies suggest that one of the main problems is that cultural models suggest theoretical variations between countries that are difficult to translate into actionable design changes for a specific product.

Looking at the case studies through the lens of the HCI translational science model, I find that, contrary to the finding in Chapter 3, practitioners were often aware of cultural models. This is not surprising given the distribution of responsibilities for the product within the engineering teams.

The teams at Booking.com were focused exclusively on product improvements for a specific target group, without the need to 'keep the lights on' or innovate for a global market. This means that product owners, designers, and researchers were able to find out everything about the particular region they were assigned to. However, even as their knowledge included cultural dimension, none of the team members were aware of the resulting guideline stemming from HCI research before I introduced these. Similarly, at Booking.com, none of the team members had used cultural models prior to our discussions to inform their product changes, they instead relied on their own knowledge and local resources.

This indicates a barrier in translating the acquired insight from academic research into actionable product changes. Similar to the interview and survey study, the case studies also indicate that practitioners rely mainly on local resources available to them to inform their product decisions. The Microsoft Cortana case study also shows that there is no awareness barrier. However, this was also for a product that was not yet available global – the team was discussing launching this into new markets and, therefore, at least partially relied on cultural dimensions.

Chapter 5

ANSWERS TO RESEARCH QUESTIONS AND CONTRIBUTION

This dissertation research provides a unique insight into the efforts to cultural adaptations to user interactions for digital products. Research questions outlined are answered based on an understanding from both an empirical study with product managers, designers, and researchers working on globally available products and two case studies showing how cultural models can be used in practice. My analysis of the research findings makes different types of contributions to the HCI field: (1) Differentiation between Essential Localization and Cultural Adaptation; (2) Empirical insight into challenges practitioners in my study face to culturally adapt globally available products; (3) Analysis of the information transfer between research and practice, specific to cross-cultural research identifying various gaps and barriers.

5.1 Differentiation between Essential Localization and Cultural Adaptation

The answer to RQ1 - *"Do practitioners culturally adapt their product's design, and if yes, what aspect of culture do they consider?"* is twofold. I found that interviewees working with engineering teams responsible for the global experience of a product or a feature consider a wide range of essential localization to make their product usable for the markets. However, I also found that few of the changes that interviewees reported on were related to hidden cultural manifestations and the values and behaviors of their customers. Instead, practitioners in the study considered design changes to ensure a functional product in a market by fixing mismatches and interface breaks, often based on different language integration (e.g., RTL) and the implementation of regulatory requirements or updates to shipping and payment options.

The case studies provide additional context and indicate that a different responsibility

distribution between engineering teams can shift this outcome. If product teams can focus on a specific region as they do in Booking.com (Chapter 4.2), cultural adaptations to aesthetics and functionality to improve the user experience for those users in a particular locale are then executed (e.g., a clickable search box for Japan, China, Korea). The case study of Microsoft Cortana (Chapter 4.3) additionally indicates that the findings from the interview study, unsurprisingly, may be limited to the cultural adaptation of existing products and cannot be extended to new product development (NPD) like in the case of Cortana. To expand Cortana to new markets, the team did use Hofstede's cultural dimensions in combination with local market feedback.

Two insights from the interview study show how the work of practitioners in my study differs from what academic research is focused on:

First, I found that interviewees working with engineering teams were, to some extent, still involved in language translation and often considered this a design adaptation. While a mature company's actual translation process is established and often outsourced, with little responsibility falling on engineering teams, various other aspects of linguistic adaptations are within an engineering team's commitment. For example, even though there was a high awareness of the need to plan for language extensions when a new feature is developed initially, practitioners in the study encountered what is considered aesthetic or functional bugs in various instances across languages, screen sizes, and screen rotations (e.g., text overlap in different languages, buttons not functional based on language extension). Fixing such experiences were described as design adaptation specific to a culture. A different but consistent problem with language was contextuality and discourse, also described in practice as a cultural design adaptation. For example, string translation did not always provide the necessary insight to the translator in what context the copy appears, leading to a misunderstanding of user flows, often only visible through user feedback, data analysis, or feedback from colleagues in the market.

Second, practitioners in my study spent significant effort aligning products with regulations across markets and allow for preferred payments for products or for shipment based on the users' preference and availability in the market. The complexity of the issue and breadth

of considerations were wide-ranging and can be highlighted by an example from product delivery. Suppose that practitioners find that there is a new shipment provider in a market that needs to be enabled to expand the product to new areas; this is one engineering aspect that falls on the team to integrate. If packages begin disappearing at a high rate, there may be a need to enable text notifications for package delivery that is specific only to a region; a second and unrelated cultural adaptation the team has to work on. They may also need to design for the cultural differences for in-person meetings to exchange second-hand products purchased online instead of enabling shipping; a third scenario related to shipment.

Each of the instances mentioned above are associated with cultural differences that need to be addressed by product teams through design interventions. Some scenarios might be informed by cultural models (e.g., uncertainty avoidance) [48]. However, none of the interviewed practitioners had considered insight from academia to inform such problems. Instead, practitioners relied on local knowledge of practitioners situated in the market, experimental analysis, or, to some extent, first-hand user research.

This finding from the interview study indicating that practitioners' understanding and effort on cultural design adaptations differ from academia is essential for both research and industry. Researchers gain insight into what is critical for practitioners and what prevents practitioners from adopting suggestions made in academia. Practitioners can identify blind spots and insight in cultural contexts from academic work that they have not considered but could be beneficial to their users.

As a first step towards highlighting the differences in cultural adaptation as practiced in industry and studied in academia, I show the findings in a table (Figure 5.1), clearly distinguishing what practitioners reported during the studies and providing examples of what topics are researched in academia but were not mentioned in the interviews. Such an overview, although never complete, clearly outlines some differences in practice and research. It can provide awareness to both researchers and practitioners as to what type of cultural adaptation to interaction design they perform and can provide a basis for discussion on the potential of features not yet acted upon. This suggested artifact has not been tested in a research study. However, it was developed based on the empirical insight from the interviews, under consideration of the relevant literature, specifically the TLCC model [99],

and Quesenbery's layers of culture in 'Global UX' [81]. My practical experience of working in UX teams also influenced the development of the artifact. The overview is meant to be a starting point for discussion, and then expanded upon, and can and should be appropriated within UX teams and researchers. Researchers may find it useful when conducting product comparisons. Practitioners can use it to evaluate what cultural adjustments are still needed to ensure an inclusive product for all their users.

In summary, through interviews, I found that interviewees work on a wide range of issues. The practitioners interviewed described a focus on cultural aspects that make the product functional and often easier to observe, such as adaptations of the language or specific legal requirements. I found little evidence that practitioners adapt their products based on users' cultural preferences in interface and interaction design related to their values and behaviors.

5.2 Technical challenges and unknown ROI of cultural design adaptations are drivers of homogeneous designs

RQ1, as answered in section 5.1.1, showed that practitioners in my study rarely culturally adapt the UI and UX design of their product according to insights from academic research. It does not explain what prevents practitioners from doing so. Probing into the question *"What challenges do practitioners face when culturally adapting the design of their products?"* (RQ2), I found through the mixed methods study that practitioners in my study desired global features over cultural adaption for two reasons: (1) practitioners considered it a high effort to implement and to maintain cultural adaptations specific to a locale; (2) practitioners were designing for highest impact to the bottom line of the business and found it challenging to prioritize localization with unproven impact estimates. Practitioners in the case studies did not face the challenges to the same extent: the Booking.com platform architecture is built for more flexibility (although there are also limitations which were not visible with the experiments conducted), and Microsoft Cortana was built explicitly for new markets. Both teams' focus was on designing for a specific region only, and the concern of prioritizing global features for the highest impact did not apply to them. The case studies were therefore excluded from further analysis of RQ2.

First, Chapter 3 demonstrates that companies often do not consider different cultural adaptations to their products when designing the platform architecture. While all of the participants' products in the research study were successfully localized into multiple languages, demonstrating a platform setup and process that allows for linguistic localization, practitioners in the study still specified that they prefer to develop global features as maintaining customizations requires a high effort. This indicates that the platform architecture was not sufficiently flexible in order to allow for cultural design adaptations. Practitioners in the study described it as being too costly to implement changes for a single market. A researcher cited in Quesenbery's book 'Global UX' highlights the need for making technical builds flexible from the beginning [81]. This initial setup to design the platform architecture not only for flexibility in language localization but also for design adaptations seems to be missing.

Second, the findings in Chapter 3 show that practitioners in my study often designed for the highest impact. A focus on overall impact explains why interviewees preferred global feature developments: it addresses their entire user base or the users in their home market, which often yield the highest revenue. However, industry research suggests that global digital products often have more visitors from outside of their home market than from within, which would indicate there is more opportunity to design for users in other markets. The example of Twitter explains how this is not the case. As mentioned in the introduction, Twitter has more than 80% of its users reportedly outside of the US [27]. However, looking at the revenue distribution, it only receives 43% of its revenue from markets outside of the US. Such a difference in revenue distribution explains why local markets are often not top of mind when maintaining a global product. Moreover, academic research has only a few studies that indicate a measurable impact of cultural adaptations to the aesthetics and functionality of products. Such a lack of knowledge often makes it impossible for the practitioner to understand if they can justify the effort to implement any changes, especially if there are technical complications (see the section above). Mitigations suggested in Chapter 5.2 suggest growing the body of knowledge by publishing successes and failures of cultural adaptations for practitioners to estimate the outcome of changes. I will also discuss how an engineering team's focus on cultural adaptations can lead to more

socially inclusive products.

5.3 Cultural research can inform design practice – if it would be known in practice

The mixed study in Chapter 3 and the case studies in Chapter 4 showed that the information flow between academic research and design practice is interrupted. There is little awareness of cultural models, and even if practitioners in my study were aware, they did not apply this knowledge in practice (reminder that my immersion in the team triggered the use of cultural models in Booking.com). Moreover, cultural guidelines resulting from the models as published in scholarly papers were unknown to practitioners in my study, and the motivation to seek academic insight was generally low. The majority of cultural changes made by practitioners were informed by local knowledge from in-market resources, data analysis, and to some extent, first-hand research. In the case of Booking.com, which has a very high cultural diversity among the engineering team members, some cultural changes were also informed by the team members' personal cultural experiences. There is little awareness that relying on information from local resources bears the risk of potential bias if decisions are based on co-workers from a specific target country whose demographics and experiences might be different from the actual target population.

More encouragingly, through the case studies, I have shown how cultural dimensions can be used in a variety of ways to inform the product team's decision-making: (1) Cultural dimensions were successfully used for idea generation; (2) Cultural dimensions were used to inform design interventions at a global scale; and (3) Cultural dimensions were used to justify personal experiences and intuitions. Similarly, interview participants anticipated the guidelines to help in ideation and to analyze market-specific results of their global experience.

This insight is a direct answer to RQ3 and RQ4 – *"Do practitioners use academic research that informs cultural adaptations, and if not, what information do they rely on instead?"* and *"What is the use and usefulness of academic research on cultural adaptations in practice?"*

Using the HCI Model for Translational Science, I set the findings in the context of the

literature to further identify challenges and opportunitiess (Figure 5.2.)

Looking at the individual barriers and gaps in more detail, I first describe the awareness barrier as the most prominent barrier, preventing applied research from informing design practice. My dissertation research indicates that cultural models are little known. More importantly, applied HCI research and guidelines informing cultural design adaptations were unknown to practitioners in my study. 80% of survey respondents agreed with the statement that cultural theories and resulting design guidelines are not commonly known or discussed in the design community, while the remaining 20% of survey respondents did not have an opinion. No one disagreed with the statement. The strong evidence of the empirical study was also visible in the case studies. While team members at Booking.com were aware of cultural theories, guidelines or recommendations stemming from applied programs in HCI were unknown.

Such an awareness barrier is not yet mentioned as a prominent barrier in the HCI Translational Science model. The literature points to a related barrier of *Findability* [25], describing mostly limitations to searching for the correct information. Based on the interview study, I find that the awareness gap in cross-cultural research is different from *Findability*. Insights from my study indicate that practitioners do not know about the research that can help inform cultural adaptation, and hence there is no motivation to search for it. This makes awareness the most significant barrier to the information flow from applied research to design practice. Interestingly, both studies also show that practitioners are more aware of the differences between countries and cultures and, to some level, are familiar with cultural models, indicating that the awareness barrier is apparent but less pronounced between basic research and design practice (T_{BD}). Still, even with this insight from cultural dimensions, practitioners lack the knowledge and the tools to explain these differences or to act upon them. Only one participant in the interviews had used cultural dimensions in an ideation session; others described how they learned about the models but never used these in practice.

Contributing to the awareness gap is the finding that practitioners in the study were highly reliant upon local insight from colleagues situated in the market. This confidence that market resources cover all cultural needs lowers the motivation to consider academic

insight, especially given the perception that academic research is not applicable, a finding I explain in the next section.

Second, I confirm applicability as a prominent barrier in the cross-cultural context. The *Applicability* barrier in the Translational Science model is explained as the *'translation and synthesis of knowledge into usable resources, considering specific application domains. Development of resources that can lead to new knowledge being adopted in Design practice'* [26]. My dissertation study confirms the applicability barrier for academic work in the context of the interviews I conducted. Practitioners in my study did not seek what they consider lengthy and theoretical academic papers that they perceived as being irrelevant to their needs. They found it unreasonable to engage with the information to determine if the information is applicable. After reading a lengthy paper, they potentially may still have to translate it into their context to make it actionable. Given the time constraints and the constant pressure to deliver results in an agile environment, practitioners in my study seemed to rely on information that is specific to their known context by relying on market insights from local resources familiar with their product, data analysis, and, at times, first-hand research.

More encouraging and countering the *Applicability* barrier, when introduced to academic insight on cultural differences in charts, tables, and tools during the interviews, practitioners in my study anticipated the insights to be useful for ideation and to explain A/B testing results. One participant was very optimistic about the insight, exclaiming, *"I am already creating hypotheses in my head"* (P9) when looking at guidelines presented in a table format. This finding confirms the case studies where cultural models and guidelines were successfully used for idea generation and informed design interventions on a global scale. However, I found in the case studies that the application is limited. For example, analyzing results for different markets showed that the interpretations based on cultural dimensions were rather vague and contradictive. There were variations and options to interpret the results differently, making it difficult to translate into actionable design changes for a specific product.

Additional insights from the interview study were:

- *Label of individual translation steps in the HCI Transactional Science model*: The label of 'Design Practice' in the HCI Translational Science model may be too limiting - designers alone are rarely the decision-makers to determine if cultural adaptation should be considered. Unless the designer is part of an engineering team with the charter only for specific markets, like in Booking.com, other actors often determine the focus, including leadership team members and product owners who evaluate the impact of potential changes in collaboration with design and research. I also find that local colleagues can be important stakeholders who can benefit from academic research and be included as an addressable audience. I would suggest considering a label of *HCI practice* to be more applicable.

- *Case studies and examples:* Participants in the interview study voiced a need for a) easy access to essential market information and b) access to case studies and practical examples. Practitioners hypothesized that such information would facilitate cultural adaptations. This desire also underlines that there are currently few case studies or insights from practice on how companies have approached design localization and the resulting impact. This points to an additional gap within Design Practice and confirms the distance between Design Practice to Applied Research (Bubble-up). The lack of sharing may be based on a desire to protect their competitive advantage, a lack of time for preparing information that is approved to be disseminated, or a desire to protect their practices and processes that allow them to be successful. Colusso et al. [25] found that designers use reputable case studies on Medium posts or NNG articles, among others, and I'll discuss in the next section the opportunities to close this gap using these platforms.

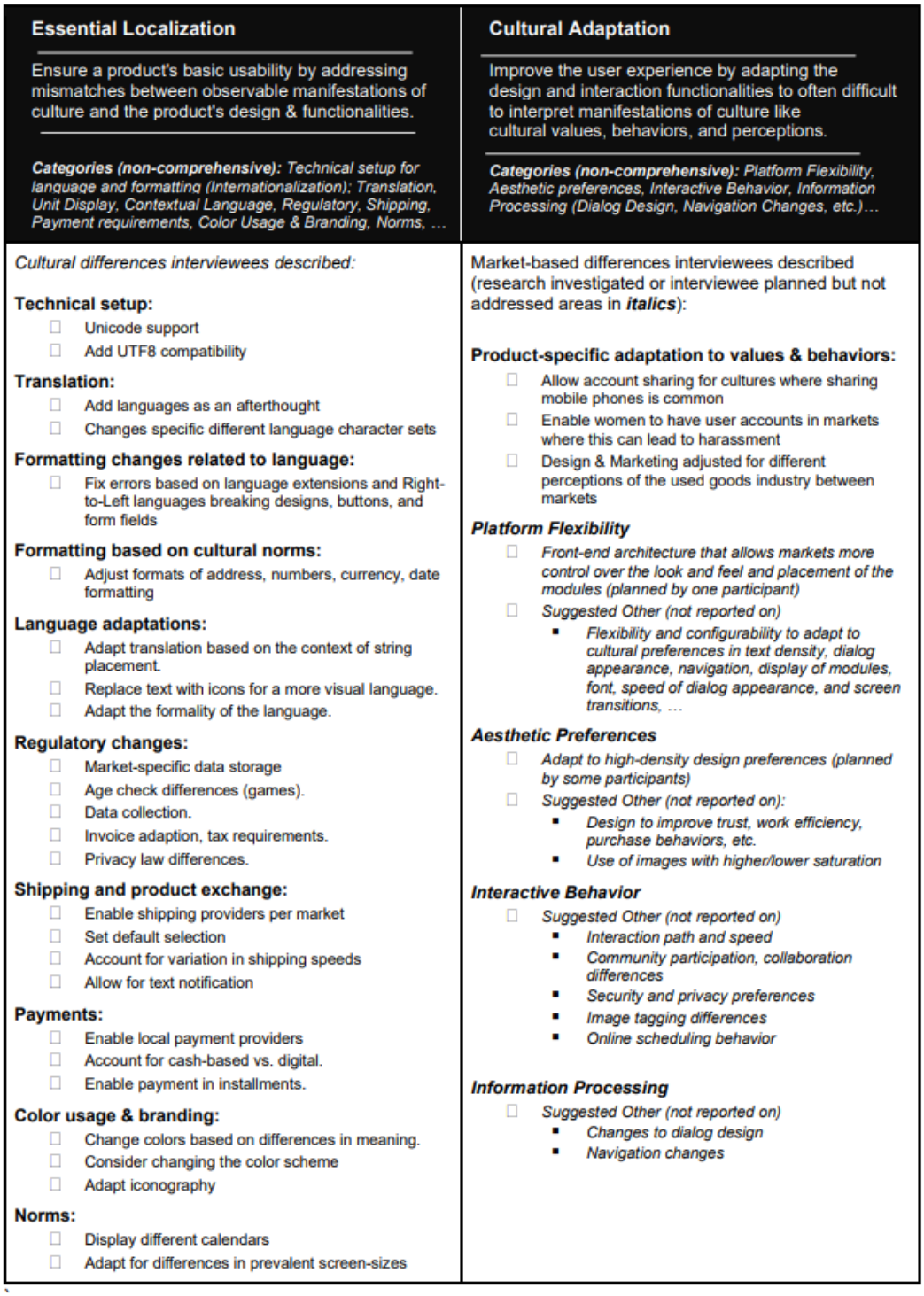

Figure 5.1: Differentiation between Essential Localization and Cultural Adaptation: The overview shows that practitioners in my study mainly focus on essential localization. Areas for cultural adaptation as suggested in research remain largely unaddressed.

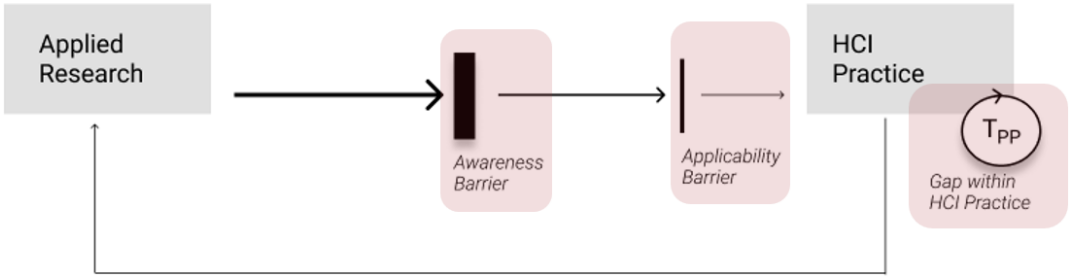

Figure 5.2: A nuanced view of the T_{AD} gap of the HCI Translational Science Model: the bi-directional information transfer is interrupted between Applied Research and between and within HCI Practice

Chapter 6

DISCUSSION & FUTURE WORK

Findings from the research questions are discussed in the following section in fulfillment of the thesis statement. The research also brought to light overarching questions worthy of further discussion before outlining implications of my findings for researchers, practitioners, educators, and global companies' leadership teams.

6.1 Does culture matter in product design?

Within the context of my research findings, I would first like to address the question, "Does culture matter in product design?" Norman [73] posted this as a critical opinion piece in 2012 and debated two interpretations based on the feedback he received: (1) standardization in technology products is valuable and can bring cultures together, enabling better communication and understanding; (2) Cultural diversity is powerful, and our responsibility as HCI designers is to support contextual use.

The latter, pro-cultural position is aligned with the current 3rd paradigm in HCI we are experiencing, which embraces the experience and underlines the importance of the contextual use as technology has reached homes and the private lives of people [87]. It may become even more important as we are entering a paradigm shift into the 4th wave with more attention and responsibility to how technology changes us and our societies [35]. It is also aligned with the literature review (Chapter 2.2), highlighting cultural differences through comparisons of local products, user behavior when interacting with local products, and experimental approaches to modifying products according to the cultural context and measuring the impact. Such changes to align aesthetics, functionality, and information prioritization according to the cultural context of a customer have resulted in increased efficiency, fewer errors, and less anxious customers [83, 42, 2].

In my study, practitioners reported from complex changes to adapt to observable manifestations of culture like language, regulatory, and user transactions specific to a market (the outer layer of the Onion model [48]). Given these efforts in practice, combined with the insights from the literature on the positive effects on cultural adaptations to users' values and behaviors, I conclude that culture matters in product design.

However, my dissertation work also suggests that cultural adaptation to the values and behaviors of users, or the more difficult to interpret manifestations of culture as indicated in research (the core of the Onion model), is more difficult to understand and implement and was mentioned at a lower rate by practitioners in my study. This can be partially attributed to my findings that a) practitioners face technical and business challenges to easily adapt their products to a cultural context, b) that there is a lack of awareness of guidelines and recommendations on how to adapt global technology products culturally, and c) that guidelines are still few, challenging to interpret, and lack confirmation in the industry (including some studies showing undesired effects, like a potential decrease in brand recognition and loss of trust in the product [7]). While I address these limitations in section 6.2, my study raised additional areas for discussion.

6.1.1 Global product design is never 'culture-neutral.'

Friess [37] describes how the design in the early stages of human-computer interaction studies fell in the camp of either technology-centered design, driven by software developers, or design-centered design, based on designer intuition. Since then, it has evolved with human-centered design being based on conducting research to understand users and using such research to drive the design solution. However, through a discourse analysis of decision-making in a design company, the researcher found that designers only use data for part of their decisions and often rely on their own instincts and intuition [37]. Chang et al. [22] also found the design tools like personas are not always based on data alone but are based on designers' own thoughts and experiences [22].

Friess argues that, in addition to data, it is essential for designers to consider their own intuitions and experiences to drive innovation. While I agree, this notion needs to be further

evaluated in a cross-cultural context. Designing with one's own intuitions and experiences, often heavily influenced by western traditions through either upbringing, company culture, or similar curriculum and methods taught in design schools across the world, also means that the design innovation is imbued with one's own culture. Companies, therefore, if not culturally adapting their products for values and behaviors of their target audience, export their own cultural values through the globally available technology product. And, as a respondent to Norman's critical statement wrote, "no one knows as yet the exact amount and extent of potentially harmful and detrimental effects caused by 'homogenization' of artifacts, neither at the individual level nor at levels of regions and of the entire planet" [73].

During my research, I did not explicitly discuss practitioners' own cultural identity and am therefore unable to verify or falsify practitioners' awareness of and concern with exporting their own culture. Overall, I find that practitioners in my study were aware that there are differences in other markets, but, at the same time and potentially influenced by the difficulties to implement cultural adaptations, there was a desire to take a 'one size fits all' approach. There is also an indication that practitioners in my study were not aware of their own cultural blind spots. For example, one participant acknowledged the need for a Japanese designer in this statement: "*I think a US designer or a European designer would be able to do a good job for the US, Canada, maybe even LATAM and Europe. But when you go into culture when the product's environment is totally different [in this case, Japan], then I don't think they can. I need to hire someone in that market*" (P9). This participant acknowledged and was aware of a cultural difference in design for Japan and solved for this. However, the statement also indicates that there may be other cultural blind spots, aspects we do not know that we do not know. For example, not knowing about different cultural manifestations in the Latin-American market makes us believe that a Western-educated designer can successfully create for that market. Therefore, helping practitioners recognize and acknowledge their blind spots is a necessary step in creating culture-inclusive product development practices. Examples from real life and efforts to overcome the awareness gap to consider basic and applied research, as described in section 6.2.2, can help practitioners to become sensitive to their blind spots. Additionally, I highlight in section 6.2.3 the

opportunity for educators to provide Cultural Intelligence (CQ) training, a further step to allow practitioners to overcome blind spots.

6.1.2 Global products can be designed with different cultural intentions.

Van Boejien et al. [105] outline five intentions of culture-sensitive design approaches. I revisit these intentions with examples from physical product design to discuss my findings and non-findings:

1. *Affirm a culture.* The design consciously enhances and affirms the culture of his or her intended users and gives its members a sense of belonging. Examples from product design mentioned are souvenirs, but also i-phone, i-pads targeted at individual usage introduced in highly individualistic cultures.

2. *Attune to a culture.* The design is in tune with existing cultural values and avoids mismatches between the cultural group and the product. Examples mentioned are colors - in South Korea, the power button on a remote control is red, while in Western countries, it is green.

3. *Change a culture.* The design changes the current socio-cultural value. For example, in a society with strictly separated gender roles, the design could attempt to make the roles more equal by designing something that would be used be desired by both, e.g., a tough-looking baby carrier to lower the resistance of men to carry a child.

4. *Bridge two or more cultures.* The design elicits cooperation and respect between cultures. Examples used are the burkini, which combines the burka with a bikini.

5. *Bypass culture in design.* Focuses consciously on other aspects of design or even strive for a global solution. The authors users an example from Tropmenaars and Hampden-Turner to point out that even in these instances of attempting to ignore culture, it still plays a role. They are using the example of a roller-coaster where Western riders waved the arms in the air, while Japanese tended to bend forward, resulting in injuries leading to adjustments to make the roller-coaster suitable for Japanese riders.

The majority of efforts from practitioners in my study were focused on attuning to a culture, by addressing existing and avoiding future mismatches between a cultural group and the global product, like color changes and linguistic changes, and adapting for cultural practices related to regulatory and transactional issues (Figure 5.1). None of these changes addressed issues that went against the values of a company. Based on challenges encountered, practitioners in my study also explored ways to bypass culture in design by creating global features. However, some practitioners encountered more substantial problems and ethical considerations on the impact their change has on the culture, leading to concerns on whether they affirm or change a culture. Two examples: the perception of the used-goods industry varied significantly between the countries. In some markets, it was associated with sustainability; in other markets, it was associated with not having sufficient money to buy new. The marketing and design efforts to position a used-goods platform in the latter markets mean that the company made a conscious attempt to change a cultural perception. Another participant during the interview, when discussing Hofstede's Masculinity dimension, remembered how they found that women in a market could not have an account as they suffered from harassment: *We found out that a woman can't have a user account in our platform because they suffer from harassment [in market] because - ahh - the country works like that. So it was also a challenge to try to solve that problem in our platform. And I remember that because of the masculinity (dimension) here.* I did not discuss this further during the interview, but the example shows that practitioners are faced with decisions if they affirm or attune to cultural values they disagree with, or they attempt to change a culture through their design. Either decision needs to be made consciously. Further research is required in order to fully understand the difficulties practitioners face and what tools are needed to solve such issues. A first step is an awareness that design can influence culture in a variety of ways and that cultural adaptations should be intentional. Cultural Intelligence education, with a strong focus not only on acquiring CQ knowledge but also a strategy on how to address a situation where it would be possible to affirm or change a culture, should be part of any curriculum and training on culture.

6.1.3 Global product design can be considered condescending and stereotyping.

A participant in my study mentioned that they needed to introduce sign-up for text notification on package delivery, "because packages were sitting outside in [city] and they were thinking that it was a concern to transact on a really high dollar product because of fear of it getting stolen." While this is a valid concern for high-density markets as it was in this example, it can also lead to a perception that the team, by rolling out a feature specific to preventing theft in a specific area, is applying negative stereotypes - making assumptions based on unfounded ideas about a group (in this case that there is a high amount of theft in this culture). Different but related, Google's *Next Billion User* unit is introducing apps for users that are new to technology, often emphasizing imagery over text for those who are illiterate or showing tutorials each time they open the app. While lauded for the investment in deep cultural learning, this approach to design is also criticized as overly explanatory interfaces and constant tutorials can be perceived as patronizing [29]. While I am not able to offer a solution to these considerations, the events of the year 2020 may positively influence the awareness of practitioners to cultural stereotyping and condescending behavior and how to avoid it as many companies re-evaluated their overall diversity and inclusion (D&I) practices in the context of the revived conversations fueled by the Black Lives Matter movement. Such re-evaluation often led to revisions of the company's internal hiring and management practices within one market and triggered training and education on cultural inclusion, an important step to eliminating cultural stereotyping and condescending design. Unfortunately, superficial information and training may also lead to further insecurities in distinguishing between cultural values and positive and negative stereotyping, leading to a fear of addressing cultural values in design and, instead, opting for a global solution to not offend. However, as discussed in 6.1.1, there is no real culture-neutral design as the designers or engineering team's own cultural background influences the design. Further research is needed, but knowing about cultural adaptation through examples from real life as suggested in 6.2.2 and awareness of cultural stereotypes we (often unconsciously) carry with us can facilitate practitioners' decisions on cultural adaptation of products.

6.2 Implications for researchers, practitioners, educators, and leadership teams

With these challenges to cultural adaptations in mind, combined with the conclusions from the dissertation research, I suggest the following actions for academic researchers, educators, and practitioners to work together towards more culture inclusive products.

6.2.1 For researchers: Identified practical challenges can inform the field of HCI research.

The dissertation study highlights two main barriers in practice that, without being addressed, will continuously hinder practitioners from creating inclusive global products: a) limitations to the platform architecture to allow flexible UI and UX design culturally adapted to a market, and b) unknown ROI of cultural adaptations. To my knowledge, insights from the literature on addressing such practice-specific problems do not currently exist. I suggest focusing on the following two areas where academic researchers can support practitioners: 1) Best practices for platform architecture; 2) Expand models for a data-driven approach to project the impact of cultural adaptations.

Best practices for platform architecture.

Practitioners' in my study voiced a preference for a unified global design instead of cultural design adaptations. This desire was often based on an inflexible platform that made the implementation and maintenance of design changes difficult. This points to a significant lack of internationalization or attention to creating a platform architecture in the early stages of product development. A director of a global team responsible for the UI of security products is cited in Quesenbery's book on Global UX [81] as highlighting the need for making technical builds flexible when starting to create a product, to allow future customizations that go beyond language and translation, similar to the attention given to usability or accessibility. With advances in platform technology, it would be helpful to have insight into best practices to maintain flexible designs across user segments. This research could both draw and inform personalization efforts in HCI.

Expand models for a data-driven approach to project the impact of cultural adaptations.

My dissertation results indicate that practitioners deprioritize cultural adaptations based on unknown ROI or for lack of necessary information to convince stakeholders to invest in either research or design changes specific to a market. Creating deterministic impact projections, allowing calculation on ROI of cultural adaptations, can help in stakeholder communications and inform the overall strategy and market focus with leadership as supplemental data. Combining markets and creating clusters to which individual design recommendations apply will help practitioners in their experimentation plans and traffic estimates, further informing their priorities and increasing the positive impact on business metrics that would allow for such changes.

6.2.2 For practitioners & researchers: A collaborative approach to provide practical examples underlined by research.

One of the main contributions of this dissertation is to confirm and expand on the gaps and barriers that interrupt the information flow between and within Basic and Applied Research and Design Practice [26]. Furthermore, as a novel contribution, I showed the benefits and challenges of an exchange of such information flow by applying academic research insights into practice: the examples of both Cortana and Booking.com describe how cultural dimension and the resulting guidelines informed the thinking of practitioners and contributed to positive outcomes. Similarly, I highlight the challenges of applying academic research to practice: the engineering teams at Booking.com found that recommendations and guidelines often contradict the results of experiments that are conclusively positive or negative for a variety of markets with different cultural needs as per the research. These insights showed immense potential for the research to be impactful for practice as it led practitioners to think critically about the needs of users and search for explanations of behaviors. I outline three additional examples from the interviews on how an uninterrupted information flow could have informed practice but also use these examples to raise questions for the field of HCI that are important to discuss further:

- Text notifications on package delivery were described as a request for one specific mar-

ket. To further expand this feature, practitioners could lean on cultural dimensions to evaluate a potential expansion to other markets. Looking at the need through the lens of cultural dimensions, engineering teams could hypothesize that cultures with a high degree of uncertainty avoidance could benefit most from scaling this product (Uncertainty Avoidance is a dimension of the 6D model of Hofstede's dimension: it expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity). Of course, aligned with the insights from the interviews, engineering teams could just make this feature available for all markets and use data analysis to interpret the success of the feature. Cultural dimensions can help with this analysis too. However, it is also worth noting that there are limits to what experimentation data can tell; a potentially negative effect on user retention might go undetected if teams rely on data alone without seeing it in the context of local preferences and behaviors. This shows that cultural dimensions and guidelines can inform and inspire conversation, but the body of successful implementation or examples is not yet big enough to draw conclusions.

- One interview participant mentioned how their team changed a heart icon to a star for products they want to mark as their favorite. While this test was based on insight on what a local competitor does, during the interview, the participant looked at it through the lens of Hofstede's cultures. They identified that the change from a heart icon (which reflects more emotions) to a star might align with dimensions of masculinity. While the participant interpreted this dimension correctly, Hofstede's specific dimensions can also be misinterpreted, which bears the question – should practitioners become cultural experts? Are they expected to interpret the models correctly? The case studies in this dissertation have also shown that models can be successfully applied if a team member has the appropriate background knowledge. It, however, raises the question of how guidelines can be created that avoid misinterpretation of cultural dimensions without becoming an expert.

- Mobile phone sharing in India: while this was a novel insight that the practitioner

found only through their research activities, insight into extensive informal phone sharing in other markets is available by publications of ethnographic research [97]. While this is unrelated to cultural dimensions or the guidelines and recommendations mainly explored with this study, it further emphasizes the existence of awareness barriers in the information flow between research and practice. While this awareness should not have prevented the team from traveling to India and doing first-hand research, as I am confident there were many more insights to be gained, having this knowledge could have informed the research protocol in various ways. However, without knowing about account sharing and specifically searching in academic research databases (and having access to the results), how can practice be made aware of such research?

The dissertation research, together with my critical and perhaps lofty view on the examples above, shows the importance and potential benefits of overcoming the awareness and applicability barriers between research and practice, as identified in the HCI Translational Science model and expanded through this research. It also becomes clear that a one-directional flow from research into practice is not sufficient. Research practice alone cannot come up with a variety of examples needed to show the breadth of application, and needs the help of practitioners. Similarly, practitioners alone cannot always interpret the meaning of cultural differences encountered, and need the help of scholars to contribute the necessary theory.

Norman calls for Translational Resources as an intermediary between research and practice to help with the translation from research findings into practical application and from practical insight into scholarly work [74]:

> *Between research and practice a new, third discipline must be inserted, one that can translate between the abstractions of research and the practicalities of practice. We need a discipline of translational development.*

In the interim, while working on establishing this discipline, here are three concrete steps that researchers and practitioners can implement to foster collaboration and the exchange of insights, further explained in the following sections: (1) both practitioners and scholars can

contribute to a large body of examples backed by research; (2) scholars can find avenues to publish research findings outside of academic conferences; (3) practitioners can make real-world data available for research.

Create a repository of concrete examples of what design changes should be made for which culture, backed by theory and market facts.

Inhabiting a universe formed largely from working hypotheses, the key to a practitioner's heart is through concrete examples and case study findings. Market experts provide concrete feedback on what features are considered a must-have in a market or what is clearly a cultural mismatch that could lead to a barrier of usability – or potentially even to bad press. From interviews with practitioners, Colusso et al. [25] outline how practitioners need solutions to concrete problems they face like an increase in trust, engagement, sign-ups, or the design for a button for their context. Through the interviews and the survey in this study, I also found that practitioners desire "white papers" and examples and the essential facts on the markets. They find these examples informative, even if from other industries, and even if there is some cognitive load to translate the findings into their setting.

Academic insight, on the other hand, lacks the concreteness of examples. Suggestions or even experimental comparisons of how users behave differently also often include many changes, leaving the practitioner wondering which aspect to replicate in practice (it is common practice to only test one change at a time in an A/B setting). Colusso et al. [25] also find that academic researchers often discuss findings in terms of theory, expecting that the practitioner is familiar with the field of cross-cultural research, an assumption that cannot be made for teams working on globally available products. Therefore, the practitioner is left with a high risk of either misinterpreting the research insight or deciding not to use it at all.

An exploration of a useful information exchange platform in the cross-cultural context is visualized in Figure 6.1. It provides an opportunity to show the design changes, what theories informed the changes, and, most importantly, provides room for discussion. The platform should be searchable by locale, but needs to be integrated or linked to by existing

tools as suggested in Colusso et al. [25], to overcome an awareness barrier. An internally maintained tool for larger companies could be a first step to overcome the barriers of sharing internal information.

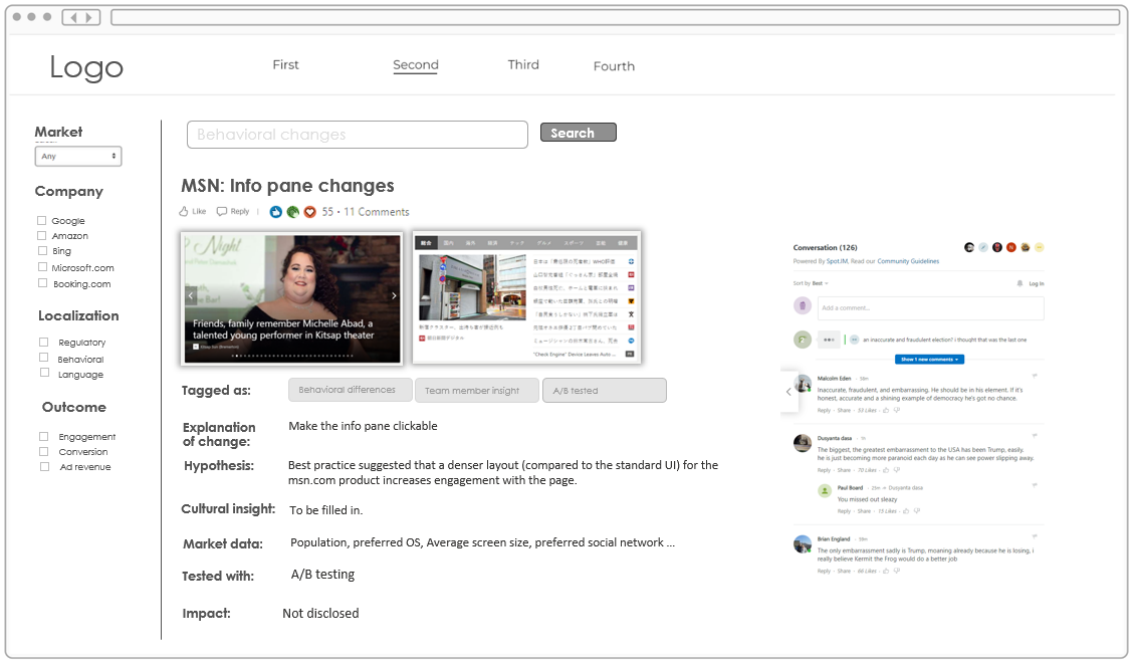

Figure 6.1: Prototype: A platform to allow practitioners and researchers to upload information and to comment and exchange ideas and information.

Find avenues to publish learnings outside of academic conferences aggressively.

The 'gap metaphor' in HCI or the gap between research and practice was previously established [86, 98, 16] and was recently further defined [26]. This gap is also apparent in HCI conferences and affects the dissemination of scholarly work. Practitioners often do not attend CHI or similar conferences, and the cross-cultural field in both practice and research does not have an established conference for information exchange. While dedicated localization conferences exist, the audience focuses on language & translation, and UX conferences seldom focus on cross-cultural research and practice.

Opportunities outside of conferences to bring scientific findings to practice can be through

writing for blogs like Medium, collaborating with industry insights such as Gartner, or writing for popular books like, e.g., Reinecke's inclusion in 'The Smarter Screen' [12].

Bubble-up and Trickle-down for more potent solutions to foster culture inclusive design.

The concept of Bubble-up and Trickle-down [40] describes in detail how the adaption of theory takes place and informs practice (Trickle-down) and how HCI practitioners at times disseminate their findings in academic venues (Bubble-up). Shneiderman introduced the Twin-Win model, showing the importance of practitioners and academics to partner and address authentic problems to produce more potent solutions [94]. Such an ongoing dialog is also suggested by Rogers [86].

There have been recent examples of practical ways for practitioners to collaborate with academia to advance the field of cross-cultural HCI: sharing (anonymized) data from industry, which researchers often don't have access to otherwise. Making industry data available for analysis in academia mitigates the concern that insight from academic work is often generated from research using a student population only [75]. While there are already more large-scale research approaches, academia often lacks access to the logs and opportunities that are available to practitioners to test their hypotheses. I see it as the responsibility of industry to facilitate such collaborative studies, either by participating in capstone projects which benefit both students and industry or by making anonymized internal data publicly available to develop data models. A recent example is the MIND project, which allowed researchers to test on a large-scale English dataset for news recommendation, made accessible by Microsoft. The data set contained 160k English news articles with 15 million impression logs generated by 1 million users [110].

Similarly, the Hofstede organization has created new models to understand cultural behavior. In a strategic alliance with Mediacom, the researchers involved in creating the original 6D model conducted a new study based on Hofstede's work, Schwartz Value Survey, and the World Value Survey. Fifty-six thousand responses collected resulted in 300 consumer segments across 55 markets. This model has not been extensively tested in academia (as opposed to the Hofstede model), and there are opportunities for both research and industry

to collaborate to advance the field of cross-cultural HCI.

6.2.3 For educators: Invoke a deep cultural understanding.

It is essential to disseminate knowledge of the options and possibilities of cultural adaptations and integrate the necessary scientific understanding into the curriculum of computer science and human-centered design program or industrial training programs. However, as my interview results indicate, the sole integration of theory and knowledge in the curriculum might not be sufficient as some practitioners in the interviews, as well as program managers working at Booking.com, were aware of cultural theories but still did not apply this knowledge in practice. I hypothesize that there could be two reasons for this lack of application:

Cultural Theories and the resulting guidelines are difficult to synthesize

Even if introduced to the work during their education, practitioners in my study were not eager to seek theoretical papers. To counter this, Colusso et al. [25] have identified actions to increase scientific literacy. The researchers defined active reading techniques, including annotating texts, extracting and organizing content, among others, to increase the use of scientific information in practice. This information should find its way into the human-centered design programs.

Practitioners find it difficult to step outside of their own culture

Understanding the need to design for different cultures and the impact of cultural adaptations on a user requires the ability to step in someone else's shoes and, additionally, takes a deep understanding of one's own cultures and how this affects how one acts and thinks. Educators in HCI can integrate learnings from two fields in the curriculum on cross-cultural design:

- **Design Empathy:** Aligned with the move to a 4th paradigm in HCI and embracing the experiences of an increasingly diverse audience [35], IDEO promotes a shift to

design empathy – the ability to be aware of, understanding of, and sensitive to another person's feelings and thoughts without having had the same experience [8]. The authors suggest providing easy access to experiences that promote emotional understanding and push for (in their case, organizational) behavior to be *"more empathic, more fearless, more human, more 'out of ego,' more willing to embrace complexity, and more able to process and share empathy"* [8].

- Cultural Intelligence (CQ): Cultural intelligence is defined as "the capability of an individual to function effectively in situations characterized by cultural diversity", and enables people to "look beyond their own cultural lens" [33]. Ang and Van Dyne [4] suggest that CQ is a four-dimensional construct. The construct consists of metacognitive, cognitive, motivational, and behavioral dimensions: 1) metacognitive CQ emphasizes the ability to question one's own expectation, which I have established as important to determine blind spots; 2) cognitive CQ refers to culture-specific knowledge acquired, which, to my understanding, is the main focus of current curricula (e.g., HCDE 512 International User Experience and Communication at the University of Washington); 3) motivational CQ includes an interest in learning and confidence in interactions, important for practitioners working on global products; 4) behavioral CQ is mainly addressing a persons conduct in an international setting.

  For educators, bringing more attention to the metacognitive aspects of CQ (the ability to question one's own expectation) can increase students awareness of their own cultures and their ability to adjust and revise their assumptions. Additionally, triggering cultural curiosity and confidence by addressing and emphasizing the importance of cultural adaptations may build a solid baseline that allows students to be more receptive to teachings of cultural differences.

There are a variety of tools to help educators with cultural teachings of empathy and CQ. Annemiek van Boeijen, a professor at TU Delft's Faculty of Industrial Design & Engineering – section Design Aesthetics, and author of the book *Culture Sensitive Design* [105], has created a set of cards similar to value-sensitive design cards by Batya Friedman [36].

'Crossing Cultural Chasms towards a culture-conscious approach to design.' The cards are specific to industrial design and not specific to digital products, but allow practitioners to understand the cultural differences [104]. Hao et al. have created a poster that supports designers' discussion on cultures (but is mainly targeted at supporting research practices) [114].

6.2.4 For Leadership Teams: Cultural adaptation as long-term strategic goals.

Finally, companies need to give clear guidelines to their employees on the importance of culturally adapted products for social inclusion. In the interviews, practitioners generally positioned locale-specific adaptations as either a usability bug that needs fixing or as an opportunity to aggressively contribute to the business' bottom line for specific markets. Companies need to understand those cultural design adaptations are neither of those. It is not a blocking bug as the product is usable, and the task can be completed by users located internationally. However, cultural design adaptations can and should not be seen solely as an opportunity for immediate revenue growth. The impact is often not immediately visible but contributes to a long term strategy, and the initial target group is not always the biggest.

The leadership of global companies need to make a decision on how to foster the inclusive design of their international products: do they want to support the creation of localization teams that are specifically focused on individual markets, or even create teams similar to Google's *Next Billion User* group, which has the charter to design specifically for a person's first encounter with the Internet.

My dissertation research indicates that significant changes are necessary for product teams to go beyond essential localization and start creating inclusive global products. Leadership teams need to adjust their strategies to include and treat culture in product development and design as a matter of social inclusion.

6.3 Limitations

The dissertation research only covers a small part of the agenda needed to design for culture. My work has focused explicitly on globally available, mature products that are maintained and optimized by HCI focused engineering teams. Future practice-focused research should expand the investigation of cultural adaptation for emergent users, how to investigate, learn from and scale cultural insight for new product development (NPD), but also tackle information on how to create and adapt artificial intelligence in a cross-cultural context (among others).

Chapter 7

CONCLUSION

With this dissertation, I have sought to contribute to the HCI community with practitioners' views on cultural adaptations to UI and UX design of global web-based products. I did this through interviews, a survey, and by embedding myself in product teams of two major technology companies to gain access often unavailable to other researchers. I identified challenges practitioners face, gaps, and barriers to the information flow between practice and research specific to cross-cultural design.

This dissertation research advances knowledge of the use of cultural adaptation to global web-based products. In Chapter 3, I examined the three questions a) Do practitioners culturally adapt their product's design, and if yes, what aspect of culture do they consider? b) What challenges do practitioners face when culturally adapting the design of their products? c) Do practitioners use academic research that informs cultural adaptations, and if not, what information do they rely on instead? I investigated these questions through interviews with practitioners, inquiring about their experience with adapting the design and user interaction of globally available products for different locales, the challenges they face, and the insights used to inform their decisions. I verified the findings through a survey with a wider audience.

Through thematic analysis, I found that practitioners mostly solve local users' problems and difficulties by making the product functional and avoiding or fixing cultural mismatches. Implementation of locale-specific changes to improve the user experience, as suggested with academic research guidelines, were rare. The roadblocks to improving the product and making it easier for cultural groups to use are formidable: (1) challenging technical aspects do not allow for easy adjustment to the user interface and interaction design, making it an uphill battle if arguing for investing in broader localization efforts; (2) efforts directed to the home market are considered more impactful to revenue metrics and are therefore prioritized;

an unknown or lower-than-expected return on investment (ROI) makes it challenging to prioritize cultural adaptations for user interaction; (3) practitioners rely on perceived market experts for feedback and are neither aware of nor motivated to seek academic research on cultural adaptations to user interaction. More encouragingly, when exposed to culturally-informed design guidelines during the interview, practitioners anticipate artifacts and tools stemming from cross-cultural research in academia to be helpful for ideation and analysis of experiment results and telemetry.

Based on my personal work experience and informal interviews with product owners for e-commerce localization in Booking.com and Managing Editors at Microsoft involved in the development for the AI Cortana, Microsoft's intelligent assistant, I answer question d) What is the use and usefulness of cultural dimensions in product development? I further provide context to questions c) Do practitioners use academic research that informs cultural adaptations, and if not, what information do they rely on instead? I found that the use of cultural models in industry is limited, and designers often rely on personal experiences and knowledge. However, when applied in controlled experiments, design decisions derived from cultural models have shown to improve significantly the success metrics for e-commerce companies. For experiment analysis, practitioners found it challenging to reconcile the sometimes-contradictory links between cultural dimensions and UI design.

I analyzed the findings in Chapter 5 and made three high-level contributions relevant to the development of globally inclusive products: (1) Differentiation between Essential Localization and Cultural Adaptation; (2) An understanding from a technical and business perspective of the challenges that practitioners face when considering updates for culturally-specific user interactions; (3) An analysis of the information flows between Applied Research and Design practice.

Chapter 6 discusses the importance of culture in product development as a matter of social inclusion and addresses questions on why it is challenging to adapt products for culture in practice. I offer next steps, including opportunities for researchers to address concrete challenges, focus areas for educators, and call out the responsibility for leadership teams to foster inclusive product development for users often located in more than 200 markets.

In closing, my dissertation research provides novel insights on how the industry does

cultural adaptation. The results of this dissertation expand the knowledge on how practitioners use academic research, point out gaps and barriers to the knowledge flow, and detailed insights on the challenges practitioners are facing. The results are a starting point to discuss how researchers and practitioners can better prepare and provide culture inclusive products for the current audience using our global technology products and for future customers joining from around the world.

Chapter 8

APPENDIX

Cultural dimension	Low Score	High Score	Reference
Power Distance	Different access and navigation possibilities; nonlinear navigation	Linear navigation, few links, minimize navigation possibilities	[64, 19, 108]
	Data does not have to be structured	Structured data	[64]
	Most information at interface level, hierarchy of information less deep	Little information at first level	[65, 19]
	Friendly error messages suggesting how to proceed	Strict error messages	[65]
	Support is only rarely needed	Provide strong support with the help of wizards	[65]
	Websites often contain images showing the country's leader or the whole nation	Images show people in their daily activities	[65, 39]
Individualism	Traditional colors and images	Use color to encode information	[65]
	High image-to-text ratio	High text-to-image ratio	[39]
	High multimodality	Low multimodality	[46]
	Colorful interface	Monotonously colored interface	[6]
Masculinity	Little saturation, pastel colors	Highly contrasting, bright colors	[31, 107]
	Allow for exploration and different paths to navigate	Restrict navigation possibilities	[1]
	Personal presentation of content and friendly communication with the user	Use encouraging words to communicate	[21, 31, 48],
Uncertainty Avoidance	Most information at interface level, complex interfaces	Organize information hierarchically	[19, 23, 47, 65, 62, 113]
	Nonlinear navigation	Linear navigation paths / show the position of the user	[19, 9, 28, 59, 65, 62]
	Code colors, typography & sound to maximize information	Use redundant cues to reduce ambiguity	[65]
Long Term Organization	Reduced information density	Most information at interface level	[63, 65]
	Content highly structured into small units	Content can be arranged around a focal area	[65]

Table 8.1: Relationships between cultural dimensions and UI design [83]. This table was presented to participants of the interview study to understand if applied research and tables like this are of benefit and can be used in the product development process

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