Culture in User Interface design; cross-cultural icon design

Essay

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October 29, 2016

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1. Introduction

“Smombie” – a combination of the words smartphone and zombie – became youth word of the year in Germany in 2015. As anyone can imagine, this word came about because more and more people hold their smartphones in front of their faces and do not pay attention to their surroundings. They acted like some kind of zombies (n.A., 2015). For most people the smartphone is a constant companion. By 2020, the number of smartphone users worldwide is expected to rise from 1.57 billion in 2014 to over 2.8 billion throughout China and the United States are here in the top spots with the highest number of smartphone users (eMarketer, 2014; n.A., 2014).

Considering this development, the question arises whether a user interface can be equally good and understandable to all users. In a study concerning the influence of culture and gender on web pages Simon (2001) discovered in 2001 that it is not feasible to create universal appealing user interfaces. Differences in gender and culture lead to a new strategy that user interfaces are created taking account into the corresponding specifications (Simon, 2001). In addition, studies have shown that users appreciate the consideration of culture when designing a user interface and the efficiency of the application is increased through that (Hsieh, 2014; Ariffin & Dyson, 2015).

Nevertheless, there are possibilities to create cross-cultural user interfaces that increase the usability for all users regardless of their culture. These user interfaces are not perfect for either culture but they maximize the average satisfaction for each culture instead of being perfect for one and bad for the others (Ford & Kotzé, 2005).

This shows that there is the need to integrate cultural differences into the design process but that it is also possible to create cross-cultural user interfaces that consider users from several cultures without changing the general design of an application for each of them.

One of the most important aspects seems to be symbols that are used in icons. Syarief et al. (2003) found out in a study, “*that there exist significant differences between [cultures] […] both in type of presented message or information object presentation and the speed of interpreting message or information*” (Syarief et al., 2003, p. 9). Additionally, Marcus (2006) states, that especially the design of metaphors must be taken into account of culture due to their different interpretation within these. Symbols have different meanings in different cultures, which can lead to a misleading interpretation of a symbol used as an icon depending on the user’s culture (Thissen, 2008). Therefore, the research question to be answered in this essay is: *How can cross-cultural icons be designed for a universal interface even though culture influences the perception of symbols?* To answer this question a literature review is conducted to identify different proceedings for designing cross-cultural icons.

The chapter below contains the theoretical background which includes an explanation of culture as well as the influences of culture on user interface design. After the methodology is described in chapter 3, the results are stated and compared in chapter 4. This is followed by a discussion of the results and the conclusion in chapter 5 and 6.

2. Theoretical Background

In this chapter the theoretical foundations that are necessary for this essay are explained.

2.1 Culture

In this chapter the term *culture* is specified and explained by Hofstede et al. (2010). Before there will be a closer look at two of the cultural dimensions described by him. Afterwards a comparison of the value systems between China and the United States is made.

Culture by Hofstede

Every person learns throughout his/her lifetime „*patterns of thinking, feeling and potential acting*“ (Hofstede et al., 2010, p. 4). Hofstede et al. (2010) call these *mental programs*, analogous to computer programming. These mental programs specify the most probable behavior due to the personal experiences. Basically every person has the possibility “*to react in ways that are new, creative, destructive, or unexpected*” (Hofstede et al., 2010, p. 5). The mental programming of a person has it´s sources in the social environment where he/she collected life experiences in. The learned “*[mental] programs vary as much as the social environments in which they were acquired*” (Hofstede et al., 2010, p. 5). This meaning of culture in the sense of mental programming “*corresponds to a much broader use of the word that is common among sociologists and, especially, anthropologists*” (Hofstede et al., 2010, p. 5).

Hofstede et al. (2010) studied more than fifty countries and developed a method that makes it possible to compare cultures with respect to their national systems of values. As a result of this study, four dimensions of national cultures were identified. These are presented below.

Dimensions of national cultures

Hofstede et al. (2010) noted that “*social anthropology developed the conviction that all societies, modern or traditional, face the same basic problems; only the answers differ*” (Hofstede et al., 2010, p. 29). A very comprehensive data collection through a survey “*about the values of people in more than fifty countries around the world*” (Hofstede et al., 2010, p. 30) of IBM workers gave Hofstede et al. (2010) the opportunity to investigate the “*differences in national value systems*” (Hofstede et al., 2010, p. 30) with respect to these basic problems. The surveyed “*were similar in all respects except nationality, which made the effect of nationality differences in their answers stand out unusually clearly*” (Hofstede et al., 2010, p. 30). The statistical evaluation of the data showed common problems in different areas that have been solved in different ways. These areas provide cultural dimensions “*that can be measured relative to other cultures*” (Hofstede et al., 2010, p. 31). The dimensions identified by Hofstede et al. (2010) are: *Power distance, Collectivism versus Individualism, Femininity versus Masculinity* and U*ncertainty avoidance*. Using these dimensions, the cultural differences can be characterized for each country “*by a score on each of the four dimensions*” (Hofstede et al., 2010, p. 31).

As an example Chinese and American cultures exhibit extreme differences within the dimensions of P*ower distance* and C*ollectivism versus Individualism.* Only these two

are described in more detail due to the limited scope of the essay. Table 1 summarizes the most important facts about these dimensions.

	Power distance	Collectivism versus Individualism
Description	The power distance "*[informs] us about dependence relationships in a country*" (Hofstede et al., 2010, p. 61) as the emotional distance between employees and their boss. Power distance can accordingly be defined "*as the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally*" (Hofstede et al., 2010, p. 61).	The individualist or collectivist orientation of a culture describes "*the role of the individual versus the role of the group*" (Hofstede et al., 2010, p. 90). In collectivist societies "*the interest of the group prevails over the interest of the individual*" (Hofstede et al., 2010, p. 90), in individualistic societies, however, it is the other way around. In this dimension a high index score was given for individualist and a low score for collectivist societies.
Low score	• Limited dependence and low emotional distance between employees and their boss • The boss is approachable for the employee and the employee is allowed to contradict the boss	• Individual is integrated in cohesive in-groups from birth • In-group protects individual "*in exchange for unquestioning loyalty*" (Hofstede et al., 2010, p. 92)
High score	• High dependence between employees and their boss • Employees rarely speaks to boss directly, contradicts very rare	• Loose ties among individuals • From the individual "*is expected to look after him- or herself and his or her immediate family*" (Hofstede et al., 2010, p. 92)

Table 1: Description of the cultural dimensions Power distance and Collectivism versus Individualism (based on: (Hofstede et al., 2010)

In the next paragraph a comparison between the United States and China is performed based on the two recently introduced cultural dimensions.

Comparison: United States and China

In both articles that are compared in this essay the United states as well as China were part of the performed study. Therefore, these countries are compared in the following section regarding their national systems of values. Not to exceed the scope of this Essay this is done based on the recently introduced dimensions *Power distance* and *Individualism versus Collectivism*.

Figure 1 clearly shows that the power distance index in China is twice as high as in the United States. This shows that there is a much higher distance between powerful and less powerful people in China than in the United States. This means, that the unequal

distribution of power is accepted by the Chinese people which is not the case in the United States.[1]

Moreover, it is apparent that there is a very pronounced individualism in the United States whereas the good of the group is in focus in collectivist China. The unconditional loyalty to the group has a very high priority.[2]

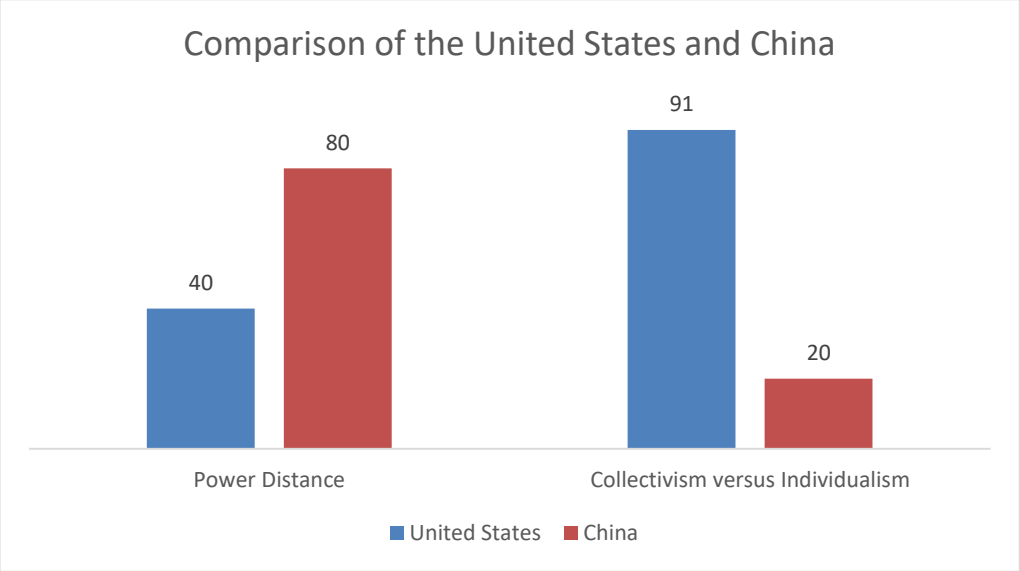

Figure 1: Comparison of cultural form: United States and China (based on: geert-hofstede.com/united-states.html, 2016)

It can be summarized that the national system of values of the United States and China differ greatly. The following section illustrates how culture influences user interface design and why the shown findings should therefore be taken into account.

2.2 Culture and User Interface Design

This chapter describes how cultural influences can be defined in user interfaces with special focus on symbols.

Reinecke and Bernstein (2013) summarize in their article how culture can influence user interface aspects based on different scores of Hofstede´s cultural dimensions[3]. They list "*the influences with regard to high or low dimensional scores compared to the world average*" (Reinecke & Bernstein, 2013, p. 430). They show examples like a colorful interface for an individualistic culture and a monotonously colored interface in a collectivistic culture[4]. Through a list of such examples they show, that there are many differences in preferences against user interface aspects through different cultures (Reinecke & Bernstein, 2013).

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[1] See Table 1

[2] See Table 1

[3] See Chapter 2.1

[4] Cultural dimension *Individualism versus Collectivism*. See Chapter 2.1.

Due to the differentiation of cultural specific features, Thissen (2008) presents a subdivision of intercultural information design in three orders. The first order deals with the cultural coding of signs - so the way in which information is presented. The design of the second order takes account into the different forms of cultural perception, whereby the third order is concerned with the complexity of the culture (Thissen, 2008).

Regarding icon design, the first and second order are most important; therefore, only these are briefly presented below.

As said above, the first order deals with the cultural coding of signs. According to Thissen (2008) cultural-specific characters have an emotional as well as a semantic level. This fact does not only apply for signs in the form of symbols, but also for colors and the reading direction. In particular, symbols and colors can often have very different meanings depending on the culture. It is probable that a presented hand gesture in one culture has an obscene or insulting meaning in another. For example, a flat hand used in the online help of a business software is a great offense in Egypt and other Arab countries: smear camel shit in the face. Also symbolized animal presentations can lead to misunderstandings due to the importance of certain animals in different cultures (Thissen, 2008).

The second order after Thissen (2008) goes beyond the pure drawing plane and tries to define cultural perceptions and behavior patterns. With the aid of the cultural dimensions presented in the previous chapter, it is possible to crystallize the peculiarities of different cultures and thus, to differentiate between cultural characteristics and preferences (Thissen, 2008). Simon (2001) also states that the effectiveness of icons and interfaces depends on cultural differences as identified by Hofstede et al. (2010).

This short overview shows, that culture has a huge influence on the perception of elements in a user interface design and should therefore be observed while designing those. Especially the meaning and therefore the perception on symbols and icons is a very important factor because this can lead to huge misunderstandings. In the following chapter the methodology is described.

3. Methodology

In order to answer the research question, a literature review was carried out. According to Webster and Watson (2002) a literature research consists of an initial search as well as a backward and forward search. This essay does not provide a complete overview about proceedings for designing cross-cultural icons, but rather discusses examples for cross-cultural icon design. Therefore, no backward and forward search was taken through.

The initial search used Google Scholar and special keywords. To identify relevant articles, the following Query was used for searching: “((culture) OR (icon) OR (cross-cultural) OR (smartphone)) AND ((design) OR (user interface design))”.

As a result of this search 16 articles could be identified which two were select for a closer look. These two articles are described in the following chapter.

4. Findings

This chapter presents the results of the literature review carried out. As said in the previous chapter, two articles were identified which are described in the following. Afterwards, the similarities and differences of the conducted studies and their recommended approaches were compared.

4.1 Article Analysis

The articles *Design of icons for use by Chinese in mainland China* from Yee-Yin Choong and Gavriel Salvendy (1998) as well as *Cross-cultural design and evaluation of the apple iPhone* from Michael A. Oren, Utkarsh Seth, Fei Huang and Sunghyun Kang (2009) are described below.

Yee-Yin Choong, Gavriel Salvendy (1998): *Design of icons for use by Chinese in mainland China*

Choong and Salvendy (1998) wanted to "*investigate the impact of cultural differences in cognitive abilities between the American and Chinese users on their performance with icon displays*" (Choong & Salvendy, 1998, p. 417). Therefore, they conducted an experiment with 30 participants from each culture. The results should show the preference of "*the presentation mode of icon displays, which could be alphanumeric elements only, pictorial elements only or a combined mode*" (Choong & Salvendy, 1998, p. 417). During the experiment the participants had to perform several recognition tasks with each of the stated presentation modes.

After describing "*cultural differences and their implications for GUIs*" (Choong & Salvendy, 1998, p. 418) the authors state, that icons are often used to portray objects of interest. Referencing to the fact that Chinese users have "*relatively lower verbal abilities*" (Choong & Salvendy, 1998, p. 420) they assume, that they will prefer a pictorial over alphanumerical presentation mode in contradistinction to American users where they assume it to be the other way around.

The findings of the experiment show, that their hypothesis was right. For American users the "*performance time was shorter if users were provided with an alphanumeric rather than a pictorial presentation mode*" (Choong & Salvendy, 1998, p. 427). Also the combined mode decreased the performance time compared to the pictorial mode. In contrast to this, the Chinese users showed the shortest performance time while using pictorial presentation mode. Furthermore, it "*also was shorter if users were provided with a combined mode rather than an alphanumeric mode*" (Choong & Salvendy, 1998, p. 427).

Based on these results, the authors recommended "*to provide a combined presentation mode when designing GUIs, especially to facilitate better initial performance*" (Choong & Salvendy, 1998, p. 427). They suggest that the "[*performance] with a combined mode can be at least as good or better than performance with either an alphanumeric or a pictorial mode*" (Choong & Salvendy, 1998, p. 427). However, they also give the advice that it will be beneficial to use figural elements in pictorial icons for Chinese users as well as using textual elements in alphanumerical icons for Americans "*if providing a combined mode is not possible due to certain constraints*" (Choong & Salvendy, 1998, p. 427).

Michael A. Oren, Utkarsh Seth, Fei Huang, Sunghyun Kang (2009): *Cross-cultural design and evaluation of the apple iPhone*

Oren et al. (2009) redesigned the iPhone interface with a view to cross-cultural design "*to improve the usability of the iPhone for a global audience*" (Oren et al., 2009, p. 79). An iPhone and a prototype were tested in a study to measure the usability of both systems in China, India and the United States.

The study consisted of seven tasks, which every participant had to solve using the prototype as well as the iPhone. In order to determine the tasks, a survey was conducted to find out what "*features [potential users] […] most commonly use on their cell phones*" (Oren et al., 2009, p. 80). In order to redesign the iPhone and to develop the prototype another survey was conducted to find out how the current iPhone icons are identified in different cultures (China, India, United States).

The results of the user tests showed that "*three tasks resulted in [an] […] improvement for the American group*" (Oren et al., 2009, p. 82), while six tasks resulted in an improvement for Indian participants and four tasks resulted in an improvement for the Chinese group. All in all, "*the American participants still performed better than the Indian and Chinese participants*" (Oren et al., 2009, p. 83) on most of the tasks but "*the difference between the number of extra clicks and time needed for Indian and Chinese participants […] was reduced*" (Oren et al., 2009, p. 82) compared to the American group. Overall, all but 2 out of 16 participants declared to prefer the prototype design over the iPhone interface. The authors therefore indicate "*a remarkable success for [their] […] new design within the American, Chinese, and Indian marketplaces*" (Oren et al., 2009, p. 85).

Even if the results "*showed considerable improvements in terms of fixing general usability issues*" (Oren et al., 2009, p. 85) the authors decided to redesign the tested prototype with focus of elements of the iPhone that were not correctly identified by most of the participants under consideration of the results of the study and survey. A great number of the "*redesigns used the concept of combining two common, easily recognizable icons in order to create one icon that was easy for all three cultures to recognize and interpret*" (Oren et al., 2009, p. 87).

Oren et al. (2009) stated that the applied "*design solutions do not completely solve the cultural bias of the original iPhone and further […] testing and redesign would help to further*" (Oren et al., 2009, p. 87) increase the performance among different cultures. They have not had enough time to confirm the second redesign by conducting another study but they "*[felt] that this was an extremely successful redesign that will*" (Oren et al., 2009, p. 88) help to reduce usability problems by Chinese and Indian users.

In the following chapter, the articles are compared to show differences and commonalities.

4.2 Comparison

Both of the articles deal with cross-cultural design, but in a different manner. These differences - especially the differences in the execution of the research method - are examined in more detail in this chapter.

Table 2 shows a bullet point-like comparison of the articles.

	Choong and Salvendy (1998) *Design of icons for use by Chinese in mainland China*	Oren et al. (2009) *Cross-cultural design and evaluation of the apple iPhone*
Subject of investigation	• Cultural differences in cognitive abilities regarding the performance with icons	• Redesign of iPhone interface to improve the usability for cross-cultural usage
Examined cultures	• China • United States	• China • India • United States
Participants	• 30 Chinese • 30 American	• 5 American • 5 Indian • 6 Chinese

Examined procedure	• Survey and Experiment
	  ○ Performing recognition tasks with different presentation modes
		• Survey and Experiment
		  ○ Performing seven common tasks with iPhone and prototype

Focus	• Presentation mode of icon displays
	  ○ Alphanumeric only
	  ○ Pictorial only
	  ○ Combined
		• Comprehensibility of task execution and icon understanding

Findings	• Order of preference for American group:
	  1. Alphanumeric mode
	  2. Combined mode
	  3. Pictorial mode
	• Order of preference for Chinese group:
	  1. Pictorial mode
	  2. Combined mode
	  3. Alphanumeric mode
		• Improvement in all groups, the performance increased among all cultures:
		  ○ 3 of 7 tasks in American group
		  ○ 6 of 7 tasks in Indian group
		  ○ 4 of 7 tasks in Chinese group
		• Americans still perform better than Chinese and Indian users but the difference is not that high anymore

Recommended Approach	• Provide combined mode to facilitate better initial performance among cultures because the performance with this mode is better than with either of the other modes alone • Figural elements in pictorial icons for only Chinese users • Textual elements in alphanumerical icons for only American users	• Combining two common, easily recognizable icons will be an icon that is well understandable for American, Chinese and Indian users

Table 2: Comparison of articles (based on: (Oren et al., 2009; Choong & Salvendy, 1998)

The recommended approach and the findings in both articles are based on an experiment which was built on the findings of a survey. But it has to be taken into account that the number of participants in the study of Choong and Salvendy (1998) is way higher than in the study of Oren et al. (2009). Because of their small sample, Oren et al. (2009) had to deal with the problem that some participants obviously confused the scaling. For

example, some of them rated the individual tasks as very good and the overall intuitiveness as very bad. Therefore, particular results were skewed because of the small sample size. However, the authors were able to record an improvement of the usability based on other data from this study (Oren et al., 2009). With a bigger sample size, the results may not have been skewed because of the confused participants.

Beyond that, the focus of the studies was similar, but differed slightly. Choong and Salvendy (1998) focused on the presentation mode of an icon (alphanumerical, pictorial, combined) while the focus of Oren et al. (2009) was on the comprehensibility of task execution as well as icon understanding. Nevertheless, both recommended an approach for the design of icons in their conclusion. This recommended approaches were somewhat similar regarding the fact that both recommend a combined version of cultures´ preferences. But as the focus of the studies were different, this must be analyzed further:

- Choong and Salvendy (1998) used three special presentation modes for their study. The results showed that each culture had an order regarding the preferred mode. As table 2 shows, the combination of the alphanumeric and the pictorial mode – the combined mode - is the average preference for both investigated cultures.
- Oren et al. (2009) had an overarching view on icons in their study. While evaluating the experiment they found out, that a combination of common and easily recognizable icons are well interpretable and recognizable for the three investigated cultures.

To sum this up, the combined mode which is recommended in both articles does not mean the same. In the case of Choong and Salvendy (1998) it means the mode that was offered in the experiment which was named *combined mode* and actually was the combination of the other two offered modes, the alphanumerical and the pictorial presentation mode. Therefore, they recommend the combination of figural and textual elements to create this combined presentation mode because investigated cultures performed better using it. Oren et al. (2009), however used the concept of combining icons that are recognizable and interpretable for all investigated cultures. That means they recommended combining existing and well understandable icons from each considered culture.

In the following chapter, the results of the comparison of the articles are discussed.

5. Discussion

The research question[5] described in the introduction was answered during a comparison of two articles identified through a literature research. The findings of this comparison are discussed in the following:

As shown in chapter 2 the national systems of value of China and the United States differ[6] which influences the perception of metaphors and symbols that are used in

[5] See research question in chapter 1: *How can cross-cultural icons be designed for a universal interface even though culture influences the perception of symbols?*

[6] See Chapter 2.1

icons[7]. This is also evident in the findings of both articles described in the chapter above. Although they focused on different aspects of icon design[8], the conducted studies showed that there are obvious differences in the preferred icon design between the investigated cultures. Even if the aim of both articles was not to give guidelines they gave recommendations about how cross-cultural icons can be designed (Oren et al., 2009; Choong & Salvendy, 1998).

Answering the research question

Therefore, the comparison of the articles leads to the result that culture characteristic attributes should be combined to design cross-cultural icons (Oren et al., 2009; Choong & Salvendy, 1998). In this way, the preferred perception of symbols of each culture is integrated in the design process. Of course it is necessary to know about these preferred perceptions beforehand. Therefore, it is unavoidable to conduct cultural specific research regarding preferred icon characteristics as it was also done in the considered articles. Nevertheless, the authors of both articles showed that this procedure works to design cross-cultural icons which are well understandable for all investigated cultures even if they focused on different culture characteristic attributes (Oren et al., 2009; Choong & Salvendy, 1998).

Limitation

Due to the scope of this essay, only two articles were compared. Therefore, the results of this essay are not representative and cannot be generalized. However, it shows that it is possible to create cross-cultural icons that work well for more than one culture. Nevertheless, it is necessary to review more articles to give generalized guidelines on how to design cross-cultural icons.

Furthermore, the compared articles are from 1998 and 2009. Even if the cultural background did not change, it is conceivable that the perception of icons may have changed due to the extremely increased usage of mobile devices in the last years (eMarketer, 2014). As the performed literature research has shown there are not many studies regarding cultural awareness in user interface design. Therefore, one may assume, that many application designs are not aware of cultural differences yet the users have to deal with generalized designs. In this regard, it is conceivable that users have since gotten comfortable with generalized icons and therefore their perceptions have changed. Because of this, new studies must be conducted in order to prove whether this assumption is accurate or not, especially because the investigation of intercultural factors is the most difficult but also unavoidable area of user interface design (Heimgärtner, 2015).

Implication

For companies and developers of applications and services, it is very useful to know, that it is possible to design user interfaces with cross-cultural icons. This means that they can appeal to a broader target group without having to develop different designs for each culture. Therefore, the costs of development would be much lower compared to developing several designs to address a larger group of users.

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[7] See Chapter 2.2

[8] See Table 2

Beyond that, cross-cultural user interfaces can increase the usability and average satisfaction for all users irrespective of their culture, which would encourage users to continue using an application or service (Ford & Kotzé, 2005).

The following concluding chapter contains a brief summary as well as an outlook for future work.

6. Summary and outlook

The focus of this essay was to show, how cross-cultural icons can be designed that work well for different cultures. Cultural differences were identified and it was shown in what way they can indicate the design of user interfaces and especially icons. To answer the research question a literature research was conducted. Two of the articles of this literature research were compared and they showed that cross-cultural icons can be designed through a combination of culture characteristic attributes.

As shown in the chapters above, the cross-cultural design of icons is an important topic that should be investigated further. Therefore, a next step would be to conduct a literature review regarding this topic to make sure that the current state is captured completely.

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