

What Causes the Differences in Communication Styles? A Multicultural Study on Directness and Elaborateness

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Abstract

With the aim of designing a Spoken Dialogue System which adapts to the user's communication idiosyncrasies, we present a multicultural study to investigate the causes of differences in the communication styles *elaborateness* and *directness* in Human-Computer Interaction. By adapting the system's behaviour to the user, the conversation agent may appear more familiar and trustworthy. 339 persons from Germany, Russia, Poland, Spain and the United Kingdom participated in this web-based study. The participants had to imagine that they are talking to a digital agent. For every dialogue turn, they had to read four different variants of the system output and indicate their preference. With the results of this study, we could demonstrate the influence of the user's culture and gender, the frequency of use of speech based assistants as well as the system's role on the user's preference concerning the system's communication style in terms of its *elaborateness* and its *directness*.

Keywords: Spoken Dialogue System, User Adaptation, Communication Idiosyncrasies

1. Introduction

For humans, speech is the most intuitive and most natural way to communicate. Therefore, scientists and engineers aim to realise methods and systems that enable not only interpersonal communication but also interaction with machines through natural spoken language. Today, we are able to communicate with various computer applications via speech. However, the usability and acceptance of Spoken Dialogue Systems is rather low and in public opinion, such systems often fall into disrepute (Hempel, 2008).

For Human-Human Interaction, it has been shown that people adapt their interaction styles to one another across many levels of utterance production when they communicate, e.g. by matching each other's behaviour or synchronising the timing of behaviour (Burgoon et al., 2007; Niederhoffer and Pennebaker, 2002; Brennan, 1996; Pickering and Garrod, 2004; Nenkova et al., 2008). Moreover, various studies suggest to adapt Spoken Dialogue Systems to the user in a similar way (Cassell and Bickmore, 2003; Forbes-Riley et al., 2008; Stenchikova and Stent, 2007; Reitter et al., 2006; Mairesse and Walker, 2010). By adapting the system's behaviour to the user, the conversation agent may appear more familiar and trustworthy and the dialogue may be more effective. Therefore, current research focuses on user-adaptive Spoken Dialogue Systems, e.g. (Honold et al., 2014; Ultes et al., 2015; Casanueva et al., 2015). Pragst et al. (2015) specifically focus on the adaptiveness of Dialogue Management to the cultural background and the emotional state of the user.

Our aim is to design a Spoken Dialogue System which adapts to the user's communication idiosyncrasies. According to various cultural models for Human-Human Interaction (Hofstede, 2009; Elliott et al., 2016; Kaplan, 1966; Lewis, 2010), different cultures prefer different communication styles. Moreover, Burleson (2003) presents a study of culture and gender differences in close relationships, emotion and interpersonal communication. Empirical research assessing gender, ethnic and cultural differences is

reviewed. It is shown that social constructionist theories, like the different cultures view of gender, anticipate differences among social groups. These differences influence forms and functions of social relationships, the character of emotional experiences and the uses to which communication is put.

However, it is unclear which cultural idiosyncrasies found in Human-Human Interaction may be transferred to Human-Computer Interaction as it has been shown that there exist clear differences in Human-Human Interaction and Human-Computer Interaction (Doran et al., 2003). Miehle et al. (2016) showed that communication idiosyncrasies found in Human-Human Interaction may also be observed during Human-Computer Interaction in a Spoken Dialogue System context. Moreover, cultural differences between Germany and Japan have been identified. However, not all results are consistent with the existing cultural models for Human-Human Interaction and the authors infer that the communication patterns are not only influenced by the culture, but also by the dialogue domain and other user states and traits.

In order to obtain a more detailed view, the study described in the work at hand is composed broader and investigates more different cultures. In addition, five European cultures are examined whose communication styles are much more alike than the German and Japanese communication idiosyncrasies investigated by Miehle et al. (2016). Moreover, the aim of this work is to identify what causes the differences in communication styles except for the user's cultural background. Therefore, we explore not only the influence of the user's culture but also of the gender, the frequency of use of speech based assistants as well as the system's role. To investigate this, we designed and conducted a user study with 339 participants from Germany, Russia, Poland, Spain and the United Kingdom. For three different dialogues, the study participants had to indicate their preference concerning the system output in every dialogue turn. For the system's output we varied the two communication

styles *elaborateness* and *directness* as Pragst et al. (2017) shows that these dimensions influence the user's perception of a dialogue and are therefore valuable possibilities for adaptive Dialogue Management. With the findings of our study, we demonstrate which dimensions cause the differences in the communication styles *elaborateness* and *directness* in Human-Computer Interaction.

The structure of the paper is as follows: In Section 2., the experimental setting for the multicultural user study will be described. Afterwards, the evaluation results will be presented in Section 3., before concluding in Section 4.

2. Experimental Setting

We have designed a multicultural user study to investigate what causes the differences in the communication styles *elaborateness* and *directness* in Human-Computer Interaction. To do this, We created three dialogues where the digital agent assumed three different roles. For every dialogue step, we formulated four options of how the agent talks to the user:

- direct, elaborate (D, E)
- direct, concise (D, C)
- indirect, elaborate (I, E)
- indirect, concise (I, C)

As described by Pragst et al. (2017), *elaborateness* refers to the amount of additional information provided to the user and *directness* describes how concretely the information that is to be conveyed is addressed by the speaker. If the user, for example, asks the digital agent called Kristina whether she can tell him about today's weather, the four variations of the system output look as follows:

- It will be cloudy mostly and it might rain during the afternoon. (D, E)
- It will rain. (D, C)
- I would propose to take an umbrella. A scarf and gloves would be good as well. (I, E)
- You should take an umbrella. (I, C)

This example shows that in the concise version of a system utterance only the requested information is given to the user, while the elaborate version of the same utterance results in giving a more detailed weather forecast. Moreover, the direct option gives an accurate description of the weather, whereas the indirect approach to answering that question is the advise to take an umbrella. In this case, the weather is not stated directly but can be inferred from the given information.

The study has been conducted on-line. The participants had to imagine that they are talking to a digital assistant. They were shown the three dialogues, including the user input and different options for the system output. An exemplary dialogue turn (as it has been presented to the study participant) can be seen in the following:

YOU: Kristina, can you tell me about the weather today?

KRISTINA: I would propose to take an umbrella. A scarf and gloves would be good as well.

KRISTINA: It will be cloudy mostly and it might rain during the afternoon.

KRISTINA: You should take an umbrella.

KRISTINA: It will rain.

For each dialogue turn, the participants had to read the four different variants of the system output carefully and decide afterwards which one they prefer. All descriptions and all dialogues have been provided in the participants' mother tongues (German, English, Polish, Russian and Spanish). The translations have been made by native speakers who were instructed to be aware of the linguistic features and details of the differences to assure equivalence in the translations. Moreover, the quality of the translations has been assured by the use of backward translations.

In the following, we describe the three dialogues as well as the group of participants.

2.1. Description of the dialogues

The application of our digital agent Kristina is to help people in European countries get health-related information. For the user study, we have created three dialogues where Kristina assumed three different roles.

In the first dialogue, the agent took the role of a social companion. The dialogue is chat-oriented and Kristina and the user make small talk about the weather and the user's mood. The study participants had to imagine that they are talking to Kristina about the weather as they want to go swimming later on.

For the second dialogue, the participants had to put themselves in the shoes of a parent who asks Kristina for help to bathe their baby. Kristina assumed the role of an expert providing the user with facts and descriptions regarding baby care. In contrast to the first dialogue, this one is task-oriented with the purpose of information retrieval.

During the third dialogue, Kristina acted as a personal assistant. The users had to imagine that they are looking after Eugene who is in need of care and ask Kristina about his sleeping habits. Kristina retrieved useful information about the sleeping routine of the care recipient Eugene from personal profile data and provided it to the user.

2.2. The study participants

Altogether, 339 persons from Germany, Russia, Poland, Spain and the United Kingdom participated in the user study. They have been recruited and paid using the Clickworker Survey Service¹ where the target group can be defined according to demographic data. The participants were aged between 18 and 55 years, 166 of them have been male (48.97%), 173 have been female (51.03%). The participants' detailed gender and age distribution is shown in Table 1. It can be seen that the number of participants is evenly distributed among the five different cultures. Moreover, the average age of the ten different groups ranges between 25.44 and 30.75 years.

¹www.clickworker.com

Culture	Gender	#Participants	Average age
German	male	32	30.75
	female	34	30.62
English	male	35	29.26
	female	35	30.09
Polish	male	34	27.09
	female	34	29.24
Russian	male	33	28.42
	female	35	28.83
Spanish	male	32	25.44
	female	35	28.94

Table 1: The participants' gender and age distribution.

The participants were asked how often they use a speech based assistant like Apple Siri, Google Assistant or Microsoft Cortana. The results are shown in Table 2. It can be seen that 35.69% stated that they use speech based assistants a couple of times a month, 27.73% indicated that they never use such systems, 24.78% use them several times a week and only 11.80% use them every day.

Usage	#Participants	%
every day	40	11.80
several times a week	84	24.78
a couple of times a month	121	35.69
never	94	27.73

Table 2: The participants' frequency of use of speech based assistants.

3. Evaluation results

In this section, the results of our user study are described. For the evaluation of the results, we do not take into account the first and the last dialogue turn of every dialogue as these system outputs have been used for greeting and leave-taking in order to have complete dialogues for the survey. This results in three dialogues, the first one contains four system utterances, the second one three utterances and the third one five utterances.

The overall evaluation results can be seen in Table 3. The first part ("All") as well as Figure 1 show the average across all twelve utterances and all ten user groups shown in Table 1. It can be seen that 50.64% selected the direct and elaborate (D, E) version of the system utterances, while 16.25% selected the direct and concise (D, C) version, 22.64% selected the indirect and elaborate (I, E) version and only 10.47% selected the indirect and concise (I, C) version. Isolating the two dimensions *directness* and *elaborateness*, we get the result that 66.89% selected the direct (D) version of the system utterances, while only 33.11% chose the indirect (I) version. Moreover, 73.28% selected the elaborate (E) and 26.72% the concise (C) version of the system utterances. This indicates that the participants tend to prefer the direct and elaborate variations. Furthermore, the *elaborateness* of the system has a greater influence on the user's preference than the *directness*.

Following the same approach, we investigated the influence of the system's role (second part in Table 3 containing the rows "Dialogue 1", "Dialogue 2" and "Dialogue 3") as well as the user's culture (third part in Table 3 containing the

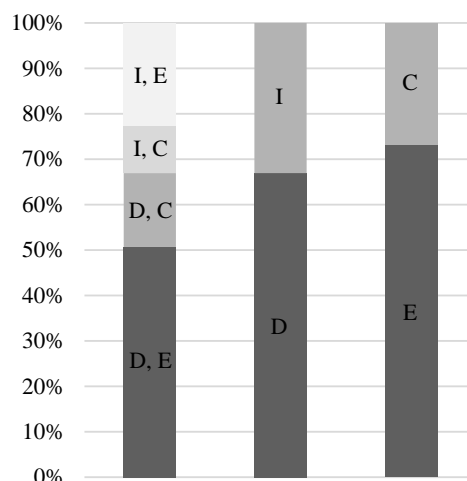


Figure 1: The overall evaluation results, averaging across all twelve utterances and all ten user groups.

rows "German", "English", "Polish", "Russian" and "Spanish"), gender (fourth part in Table 3 containing the rows "male" and "female") and frequency of use of speech based assistants (last part in Table 3 containing the rows "every day", "several times a week", "a couple of times a month" and "never"). In the following, the detailed discussion of the results will be presented.

3.1. Influence of the system's role

First of all, the influence of the system's role is examined. As described in Section 2.1., the digital agent called Kristina assumed three different roles during the dialogues. The results concerning the *elaborateness* are shown in Figure 2, those concerning the *directness* are depicted in Figure 3. In Dialogue 1, where the agent's role was the social companion, 72.86% chose the elaborate and 74.41% chose the direct versions of the system utterance. This leads to significantly more direct choices than the average over all three dialogues (66.89%). In Dialogue 2, where the agent acted as an expert, 86.14% chose the elaborate and 51.33% chose the direct versions of the system utterance. This means that the elaborate options have been chosen significantly more often than the average over all three dialogues (73.28%). Moreover, the direct options have been chosen significantly less often than the average over all three dialogues (66.89%). In Dialogue 3, where the agent assumed the role of an assistant, 65.90% chose the elaborate and 70.21% chose the direct versions of the system utterance. This means that the elaborate options have been preferred significantly less often than the average over all three dialogues (73.28%). Moreover, the direct options have been chosen significantly more often than the average over all three dialogues (66.89%).

We can conclude that the system's role significantly influences the user's preference in the system's communication style. The largest differences to the average over all three dialogues occur when the system acts as an expert (Dialogue 2). In this case, the elaborate and indirect options have been selected most often.

Group	Style	#Part.	%
All	direct, elaborate	2060	50.64
	direct, concise	661	16.25
	indirect, elaborate	921	22.64
	indirect, concise	426	10.47
Dialogue 1	direct, elaborate	797	58.78
	direct, concise	212	15.63
	indirect, elaborate	191	14.09
	indirect, concise	156	11.50
Dialogue 2	direct, elaborate	438	43.07
	direct, concise	84	8.26
	indirect, elaborate	438	43.07
	indirect, concise	57	5.60
Dialogue 3	direct, elaborate	825	48.67
	direct, concise	365	21.53
	indirect, elaborate	292	17.23
	indirect, concise	213	12.57
German	direct, elaborate	370	46.72
	direct, concise	148	18.69
	indirect, elaborate	165	20.83
	indirect, concise	109	13.76
English	direct, elaborate	421	50.12
	direct, concise	143	17.02
	indirect, elaborate	193	22.98
	indirect, concise	83	9.88
Polish	direct, elaborate	399	48.90
	direct, concise	158	19.36
	indirect, elaborate	179	21.94
	indirect, concise	80	9.80
Russian	direct, elaborate	420	51.47
	direct, concise	124	15.20
	indirect, elaborate	172	21.08
	indirect, concise	100	12.25
Spanish	direct, elaborate	450	55.97
	direct, concise	88	10.95
	indirect, elaborate	212	26.37
	indirect, concise	54	6.72
male	direct, elaborate	978	49.10
	direct, concise	342	17.17
	indirect, elaborate	450	22.59
	indirect, concise	222	11.14
female	direct, elaborate	1082	52.12
	direct, concise	319	15.37
	indirect, elaborate	471	22.69
	indirect, concise	204	9.83
every day	direct, elaborate	237	49.38
	direct, concise	83	17.29
	indirect, elaborate	111	23.13
	indirect, concise	49	10.21
several times a week	direct, elaborate	500	49.60
	direct, concise	168	16.67
	indirect, elaborate	231	22.92
	indirect, concise	109	10.81
a couple of times a month	direct, elaborate	715	49.24
	direct, concise	232	15.98
	indirect, elaborate	346	23.83
	indirect, concise	159	10.95
never	direct, elaborate	608	53.90
	direct, concise	178	15.78
	indirect, elaborate	233	20.66
	indirect, concise	109	9.66

Table 3: The overall evaluation results.

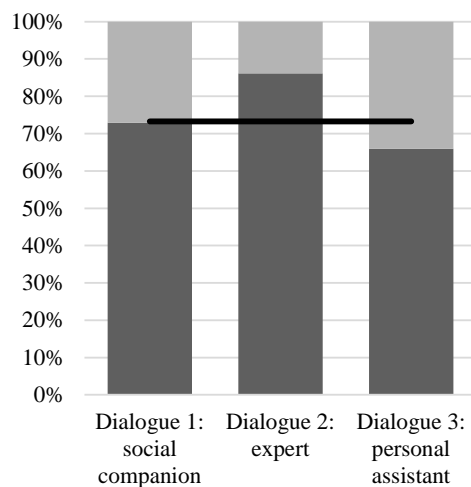


Figure 2: In Dialogue 2, the elaborate options (dark) have been chosen significantly ($p < 0.001$) more often than the average over all three dialogues (black line). In Dialogue 3, the concise options (light) have been chosen significantly ($p < 0.001$) more often than the average over all three dialogues. In Dialogue 1, there is no significant difference to the average over all three dialogues.

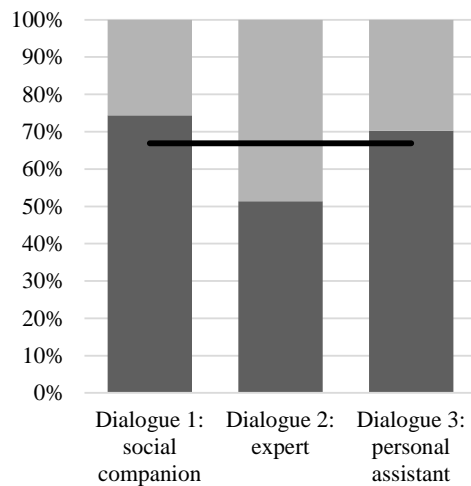


Figure 3: In Dialogue 1, the direct options (dark) have been chosen significantly ($p < 0.001$) more often than the average over all three dialogues (black line). In Dialogue 2, the indirect options (light) have been chosen significantly ($p < 0.001$) more often than the average over all three dialogues. In Dialogue 3, the direct options (dark) have been chosen significantly ($p < 0.05$) more often than the average over all three dialogues.

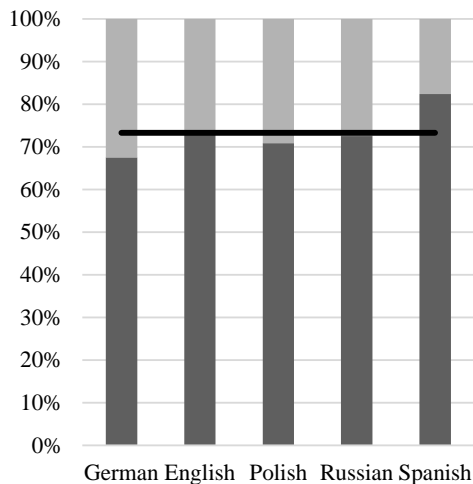


Figure 4: Among all cultures, the elaborate versions (dark) of the system utterances have been chosen significantly ($p < 0.001$) more often than the concise versions (light). Moreover, there are significant differences to the average (black line) for German ($p < 0.05$) and Spanish ($p < 0.001$). There are no significant differences to the average for English, Polish and Russian.

3.2. Influence of the user's culture

In this section, the influence of the user's culture is discussed. As described in Section 2.2., a total of 339 persons from five different cultures participated in the study.

The results concerning the *elaborateness* are shown in Figure 4. It can be seen that the participants of all cultures selected the elaborate versions (dark) of the system utterances significantly more often than the concise versions (light). This shows that all five cultures prefer an elaborate communication style. However, there are small differences among the investigated cultures. While the German participants selected the elaborate options significantly less often than the average (73.28%), the Spanish participants selected the elaborate options significantly more often than the average. The results concerning the *directness*, which are depicted in Figure 5, show that the participants of all cultures selected the direct versions (dark) of the system utterances significantly more often than the indirect versions (light). This indicates that all five cultures prefer a direct communication style. Moreover, there are no significant differences to the average (66.89%).

This leads us to the conclusion that there is no difference between the investigated European cultures concerning the *directness* of the system's output. In contrast, there are indeed significant differences on the user's preference of the system's *elaborateness*.

3.3. Influence of the user's gender

In the following, the influence of the user's gender is investigated. As described in Section 2.2., altogether 166 male and 173 female persons participated in our study.

The results are depicted in Figures 6 and 7. It can be seen that both the male and the female participants selected the elaborate and direct versions (dark) of the system utterances

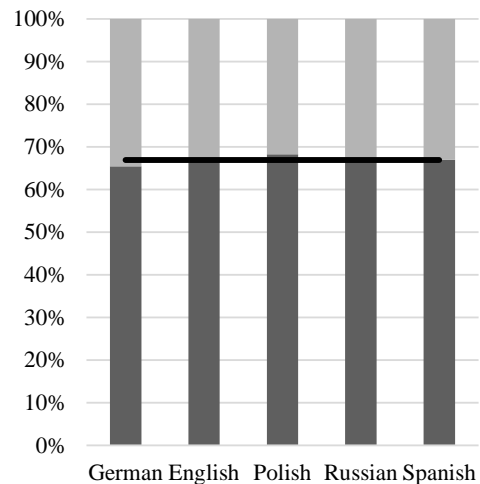


Figure 5: Among all cultures, the direct versions (dark) of the system utterances have been chosen significantly ($p < 0.001$) more often than the indirect versions (light). There are no significant differences to the average (black line).

significantly more often than the concise and indirect versions (light) and that there are no significant differences to the averages. Moreover, no significant difference between the two groups could be found concerning the system's *directness* whereas the women selected the elaborate options significantly more often than the men. This leads us to the conclusion that the gender does not influence the user's preference concerning the *directness* of a system utterance. In contrast, the gender seems to influence the preference concerning the *elaborateness*. Even if both genders prefer the elaborate options over the concise options, the female participants selected the elaborate options significantly more often than the male participants did.

3.4. Influence of the user's culture and gender

In Sections 3.2. and 3.3., the participants' culture and gender have been considered separately. In the following, we will examine whether there are gender differences within the cultures.

The results concerning the *elaborateness* are shown in Figure 8. The German female participants selected the elaborate options significantly more often than the German male participants did and the Polish female participants selected the elaborate options significantly more often than the Polish male participants did. These results support the conclusion drawn from the results depicted in Figure 6 that the gender may influence the user's preference concerning the *elaborateness* of the system utterances. In contrast, there are no significant differences between men and women for English, Russian and Spanish, what leads us to the conclusion that it depends on the culture whether there are gender differences concerning the *elaborateness*.

The results concerning the *directness*, which are depicted in Figure 9, show that there is a significant difference between men and women for Spanish: the Spanish female participants selected the direct options significantly more often than the Spanish male participants did. There are no sig-

nificant differences between men and women for German, English, Polish and Russian. This shows that in some cultures the gender may indeed influence the user's preference concerning the *directness* of the system utterances and that the conclusion drawn from the results depicted in Figure 7 are not valid for all cultures.

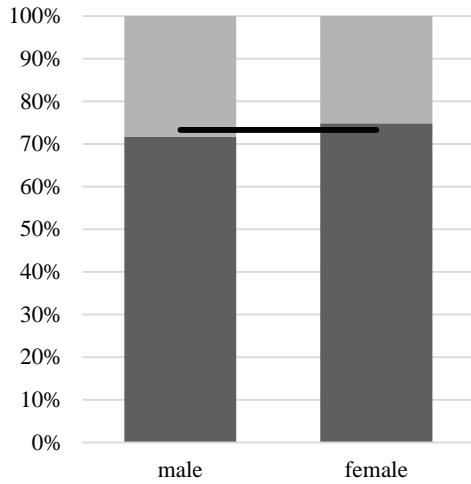


Figure 6: Both the male and the female participants selected the elaborate versions (dark) of the system utterances significantly ($p < 0.001$) more often than the concise versions (light). Moreover, there is a significant ($p < 0.05$) difference between the two groups. There are no significant differences to the average (black line).

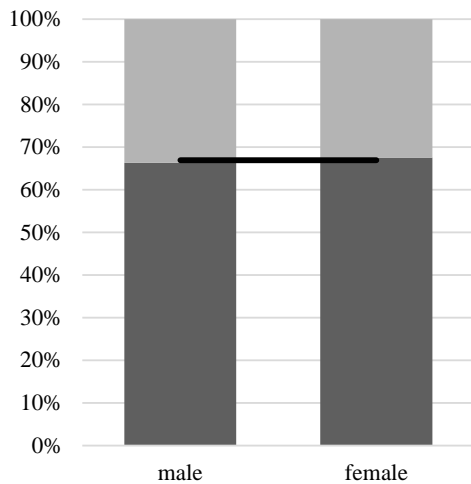


Figure 7: Both the male and the female participants selected the direct versions (dark) of the system utterances significantly ($p < 0.001$) more often than the indirect versions (light). There is no significant difference between the two groups and there are no significant differences to the average (black line).

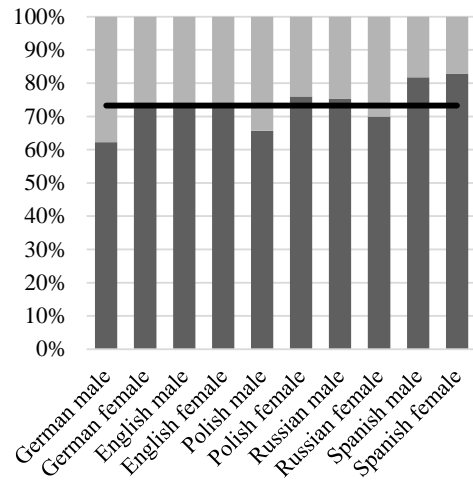


Figure 8: Among all cultures and genders, the elaborate versions (dark) of the system utterances have been chosen significantly ($p < 0.001$) more often than the concise versions (light). Moreover, there are significant differences between men and women for German ($p < 0.005$) and Polish ($p < 0.005$). There are no significant differences between men and women for English, Russian and Spanish.

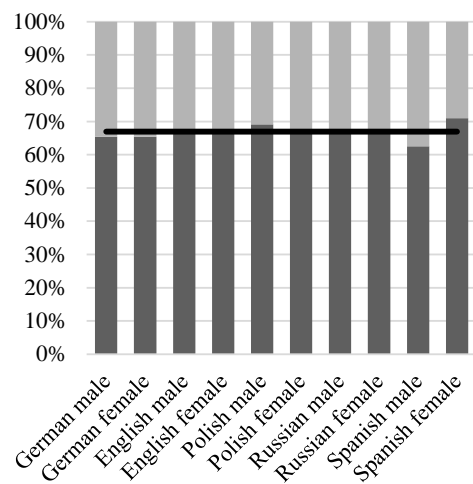


Figure 9: Among all cultures and genders, the direct versions (dark) of the system utterances have been chosen significantly ($p < 0.001$) more often than the indirect versions (light). Moreover, there is a significant difference between men and women for Spanish ($p < 0.05$). There are no significant differences between men and women for German, English, Polish and Russian.

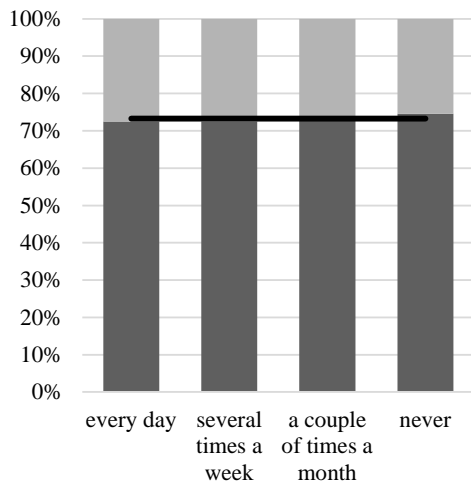


Figure 10: Among all four groups, the elaborate versions (dark) of the system utterances have been chosen significantly ($p < 0.001$) more often than the concise versions (light). There are no significant differences to the average (black line).

3.5. Influence of the user’s frequency of use of speech based assistants

In this section, the influence of the user’s frequency of use of speech based assistants like Apple Siri, Google Assistant or Microsoft Cortana is discussed. As described in Section 2.2., the study participants had to rate how often they use a speech based assistant on the following scale:

- every day
- several times a week
- a couple of times a month
- never

The results concerning the *elaborateness* are shown in Figure 10, those concerning the *directness* are depicted in Figure 11. It can be seen that among all four groups, the elaborate and the direct versions (dark) of the system utterances have been chosen significantly more often than the concise and the indirect versions (light). Moreover, for both the *elaborateness* and the *directness*, there are no significant differences to the averages. Therefore, we conclude that the user’s frequency of use of speech based assistants does not influence their preference in the system’s communication style.

3.6. Summary of the findings

Summing up the results of the user study which have been described in Sections 3.1.-3.5., we conclude:

- The system’s role significantly influences the user’s preference in the system’s communication style.
- There is no difference between the investigated European cultures concerning the *directness* of the system’s output.

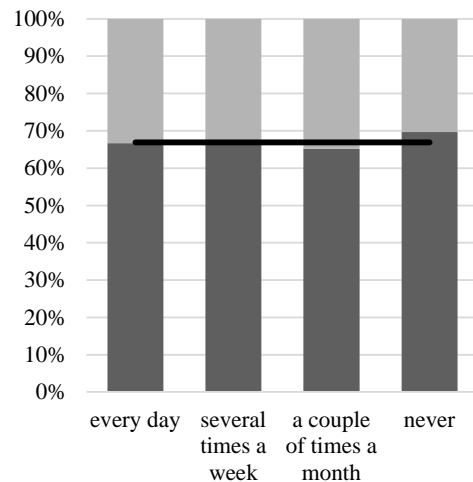


Figure 11: Among all four groups, the direct versions (dark) of the system utterances have been chosen significantly ($p < 0.001$) more often than the indirect versions (light). There are no significant differences to the average (black line).

- In contrast, there are cultural differences on the user’s preference of the system’s *elaborateness*.
- It depends on the culture whether there are gender differences concerning the *elaborateness* and *directness* of the system utterances.
- The user’s frequency of use of speech based assistants does not influence their preference in the system’s communication style.

4. Conclusion and Future Directions

In this work, we presented a multicultural study investigating what causes the differences in the communication styles *directness* and *elaborateness* in Human-Computer Interaction. Our aim was to explore the influence of the user’s culture and gender, the frequency of use of speech based assistants as well as the system’s role. Therefore, we created three dialogues with different options for the system output and conducted a user study with 339 participants from Germany, Russia, Poland, Spain and the United Kingdom. The study participants had to indicate their preference concerning the system output in every dialogue turn. With the results of this study, we have shown that the system’s role significantly influences the user’s preference in the system’s communication style. Moreover, we recognised differences among the cultures even though five European cultures were examined whose communication styles are very alike. We also showed that it depends on the culture whether there are gender differences concerning the user’s preference in the system’s communication style and that the user’s frequency of use of speech based assistants has no influence on the user’s preference in the *directness* and *elaborateness* of the system.

In future work, we have to identify how the different dimensions that cause the differences in the communication styles *elaborateness* and *directness* may be implemented in the

Dialogue Management to design a Spoken Dialogue System which adapts its behaviour to the user's communication idiosyncrasies.

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