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Usefulness and Usability of a Multilingual Electronic Meeting System

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Usefulness and Usability of a Multilingual Electronic Meeting System

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Abstract- Communication in multilingual meetings is difficult, and interpersonal barriers increase with the number of languages used in the discussion. In this paper, we show how participants in pseudo-oral and electronic, multilingual meetings were able to comprehend previously prepared comments in up to five languages, but the electronic meetings took much less time. In addition, there were no significant differences between the two types of meetings in terms of ease of use or usefulness, which leads us to the conclusion that for certain sets of languages and topics, an electronic meeting with machine translation is a viable alternative to the more traditional, oral setting.

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I. INTRODUCTION

About one quarter of Americans can hold a conversation in a second language, and the incidence of multilingualism is even higher in some parts of the world, such as Europe (McComb, 2001). Yet, there is a growing need for meeting interpretation as international communication continues to increase (House & Rehbein, 2004). For example, the Directorate General for Interpretation at the United Nations provides interpreters for about 50-60 meetings per day, and meetings with up to 23 languages can be held with the aid of 69 interpreters (Fügen, et al., 2007). Interpreters and translators in the United States held about 31,000 jobs in 2004, and the demand has increased faster than the average for all occupations (Collegegrad, 2010).

In the past decade, technology has made the work of interpreters and translators easier (Sert & Açıkgoz, 2006). Now, people are using free, Web-based machine translation (MT) such as Google Translate and Yahoo!Babelfish to quickly obtain the gist of Web pages and email, and several multilingual Internet communities have arisen in which each participant communicates in his or her own native language (Yamashita & Ishida, 2006). In addition, groups are now engaging in face-to-face, multilingual discussions through electronic

meeting systems that automatically translate among all the participants' languages (Aiken, 2008).

However, much is unknown about how multilingual groups behave and how electronic meeting participants perceive machine translation. In particular, there has been no direct comparison of a traditional, human-interpreted, oral meeting with an equivalent, electronic discussion integrating MT. In this paper, we provide a background of oral and electronic multilingual meetings and then describe an experiment in which groups in simulated oral meetings are compared with groups in electronic discussions to determine the relative efficiency and effectiveness of each technique. The paper concludes with limitations and directions for future research.

II. BACKGROUND

There are at least 11 million business meetings in the United States every day, and about 37% of the average employee's time is spent in these sessions (Infocom, 2010). However, traditional, oral meetings have long been perceived as unproductive and unpleasant. For example, in one study (Wainhouse Research, 2010), 92% of attendees reported valuing meetings as providing opportunities to contribute, but 91% admitted to daydreaming during the discussions, and 39% have actually slept.

Electronic meeting systems have been developed to increase the productivity of group work. Using this technique, group members often can exchange typed comments simultaneously and anonymously while all text is automatically recorded in a transcript, and numerous studies with this technology have demonstrated that people can generate more ideas in less time, participate more, and are more satisfied with it (Nunamaker, et al., 1991). However, the vast majority of research with electronic meetings has taken place using a single language, typically English, and multilingual groups have been relatively ignored in comparison (Aiken, et al., 2002; Briggs, et al., 1998).

Traditional, oral, multilingual meetings have been supported by human interpreters who listen in one language and utter the equivalent in another, neither simultaneously or consecutively after the main speaker has verbalized a group of words or sentences. However, human interpretation can be expensive and fees have ranged from US \$20 per hour (Ku & Flores, 2005), up to 300 to 400 Euros (US \$423 to \$564) per hour (Fügen, et

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al., 2007). In addition, scheduling an interpreter for a particular language pair (e.g., Vietnamese to German) at a specific time and location could be difficult.

In addition, human interpreters are not perfect, and errors rise steadily as time goes on (Al-Khanji, et al., 2000; Moser-Mercer, et al., 1998). For example, interpreter accuracy usually holds level for about 30 minutes, and then falls 10% for every 5 minutes afterward due to fatigue (Fügen, et al., 2007). As a result of these limitations, some researchers have investigated how electronic meetings can be used to assist groups that do not share a common language.

Although multilingual, electronic meeting systems were first developed in the early 1990s (Aiken, et al., 1994), only recently has there been a burst of growth in this field of research as MT quality has increased dramatically. Translation comprehension in these electronic discussions often suffers in comparison with that of oral meetings (Aiken & Ghosh, 2009), but the majority of MT users understand its limitations and are in general, impressed by the translation quality achieved (Yang & Lange, 2003). As a consequence, groups of up to 40 people at once using 40 different languages have used the technology successfully (Aiken, et al., 2010).

III. THEORETICAL MODEL

Many variables have been proposed over the years to measure an information system's quality, including data currency, response time, turnaround time, data accuracy, reliability, completeness, system flexibility, and ease of use (Legris, 2003). However, no theoretical model has been specifically designed for evaluating a multilingual information system's usefulness.

Prior studies of multilingual meetings have focused primarily on how well the group members comprehended the translations of comments, but few if any have compared this with the group's required understanding (Aiken, 2008). That is, a measure of text comprehension is relatively worthless without some criteria for success, and required comprehension can vary based upon the importance, complexity, and urgency of the information (Aiken, et al., 2011). Thus, it is this relative comprehension success (or failure) which could influence a user's perceptions of the meeting technique's usefulness.

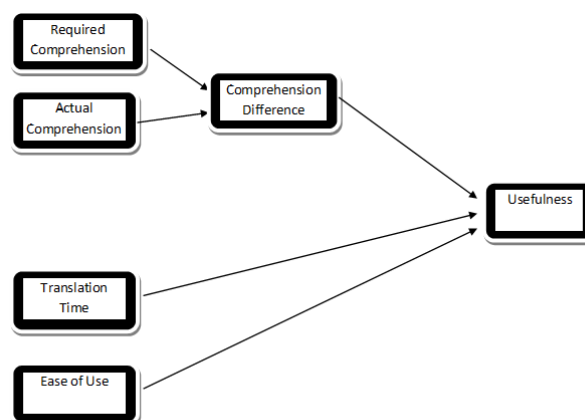
The time taken to translate or interpret meeting comments also affects the productivity and satisfaction of group members (Korth & Silberschatz, 1997). Even though machine translation of comments in an electronic meeting might be relatively worse than human interpretation in an oral meeting, the reduction in translation and comment submission time might offset the limitation of poor quality (O'Hagan & Ashworth, 2002). For example, because of the stress and time demands on human linguists in a meeting, some have

suggested that an acceptable accuracy for interpretation is only 80%, while text translation needs to be at least 99% accurate (Fügen, et al., 2007). If translations are fast and accurate in a multilingual, electronic meeting, group members might be more likely to think the system is useful (Chuan-Chuan & Lu, 2000; Wixom & Todd, 2005).

A system's ease of use is another factor that can influence its perceived usefulness (Segars & Grover, 1993). Oral meetings are natural and people are comfortable with speaking, but they might find the burden of taking turns and waiting for comments to be written on a board to be frustrating. On the other hand, in an electronic meeting, group members must learn how to use the software, and typing is less natural than speaking. But, if the meeting takes less time with acceptable translation quality, the technique might be perceived as easy to use and useful.

Based upon this prior research, we develop the theoretical model shown in Figure 1. Here, a comprehension difference is derived based upon group members' required and actual comprehension, which in turn, influences the meeting technique's perceived usefulness. Two other factors (translation time and ease of use) also affect this perception.

Figure 1: Multilingual meeting theoretical model



Thus, comprehension and translation time as well as perceptions of ease of use and useful can vary between oral and electronic, multilingual meetings, and including more languages within the discussion could exacerbate these differences. The translation quality in some additional language pairs could be much worse (e.g., Hungarian to Vietnamese), but oral meetings with a large number of languages might take much longer as interpretations must be made between each language combination.

IV. EXPERIMENT

An experiment was conducted with small groups averaging about eight people, a size large

enough for the full benefits of an electronic meeting to be achieved (Aiken & Wong, 2003; Dennis, & Williams, 2005). Eighty-five undergraduate, business students (52% male) at a large university in the Southern United States participated in the study. The students had very little or no prior experience with electronic meetings.

In order to keep the comprehension comparison between the two meeting types fair, the same set of comments were used by all groups. That is, simulated, oral meetings were used in which the group facilitator simply wrote comments and translations on a board at the front of the room, as if they were spoken and then translated. Although these groups were only simulated, they are designated 'oral' meetings throughout the remainder of this paper. In the electronic meetings, group members copied and pasted non-English comments from a MS Word file into the Polyglot user interface.

Seven random comments written in English from a previous electronic meeting focused on ways to solve the parking problem on campus were used:

1. Parking lots are too far from the business school.
2. Due to the parking problem, I was late to my morning class.
3. Doctoral students should get preferred parking.
4. I wish the school could secure some space only for PhD students.
5. The solution to the entire issue is to make everyone ride bicycles.
6. We should prevent freshmen from parking on campus.
7. Just assign me a parking place, and forget everyone else.

These comments were translated, and groups exchanged these comments in either three languages (English, German, and Spanish) or five (English, German, Italian, Spanish, and Swedish). The students were randomly assigned to four electronic meetings (sizes: 8, 7, 7, and 9), or six oral meetings (sizes: 9, 9, 8, 9, 9 and 10). In each electronic meeting, one group member was assigned one comment to contribute (translated to a foreign language). Because a few groups had more than 7 participants, some were idle.

A total of five minutes was allocated for each of the electronic meetings because a previous study (Aiken, 2002) indicated that this time was more than adequate for a person to contribute a comment with this technique. After they submitted the comments, the group members switched the language setting to English and evaluated the automatic translations. In each 3- language, oral meeting, the facilitator took about 11 minutes to write the 21 sentences on the board and about 18 minutes to write the 35 sentences in the 5 language meetings. After meeting, the students completed a questionnaire to express their feelings about the meetings.

V. RESULTS

Cronbach's alpha values were calculated to test the reliability of the two categorical variables, and ease of use (0.911) and usefulness (0.935) each met the minimum criterion of 0.7 (Cronbach, 1970; Nunnally, 1978).

Some of the means and standard deviations (Mean/Std Dev) in the 3-language experiment varied greatly between Electronic (E) and Oral (O). Examples of this include: Actual comprehension - E (86.57/11.93) vs. O (60.81/12.48); Required Comprehension - E (80.28/5.52) vs. O (57.58/3.97); Compreh diff1 - E (6.29/6.41) vs. O (3.23/8.51); Req. Comp(No Translation) - E (60.28/32.58) vs. O (31.32/31.19); Req. Comp (5 mins late) - E (85.22/17.74) vs. O (52.14 vs. 31.44).

Some of the 3-language experiments were very similar in means between sessions. Examples include: Ease of Use - E (4.87/1.06) vs. O (4.11/0.33); Usefulness - E (4.75/1.06) vs. O (4.51/0.70); Time preference - E (4.71/1.01) vs. O (4.57/0.28). Similar results exist in the 5-language meetings for the same measures.

There was a significant difference between the electronic and oral meetings in regards to required comprehension in the 3- language treatment. In addition, there was a significant difference between the electronic and oral meetings using three and five languages in actual comprehension. Those in the oral meetings indicated that they understood substantially less; perhaps because they were confused by the text written in so many different languages on the board.

Using three and five languages, the electronic group comprehension was higher than the required comprehension overall, required comprehension when the alternative was no translation, and comprehension when the alternative was information five minutes late. However, the oral group members' comprehension using three languages was only slightly higher than the three required comprehension criteria. Using five languages, the oral groups' comprehension was lower than two of the required comprehension benchmarks.

Oral groups took significantly more time than the electronic. Both types of groups wanted translations quickly. In addition, there were no significant differences between the oral and electronic groups or between the 3- and 5- language groups in terms of ease of use, and there were no significant differences between the oral and electronic groups or between the 3- and 5- language groups in terms of usefulness.

In addition to comparisons between the meeting types, we conducted a correlation analysis to investigate the relationships among the variables. Those who comprehended the discussion more felt the meeting technique was easy to use and useful, but

surprisingly, they also required less comprehension in the discussion.

Students in the longer, oral meetings comprehended the discussions less, and required less understanding. Further, they thought the meeting technique was less easy to use and useful. As we expected, those who thought the meeting technique was easy to use also thought it was useful. Finally, students who expected translations quickly thought the technique was not easy to use or useful. This might be due to strong feelings among oral group members who were less satisfied with their technique.

VI. CONCLUSION

This research investigated simulated oral and electronic meetings using three or five languages. Results show that participants in the electronic groups were able to understand the foreign comments translated to English better than those in the simulated-oral groups, and better than that required. Oral group comprehension was lower than that required in some cases.

With five languages, the oral meeting technique was not perceived to be easy to use, but the electronic technique was easy to use and useful in all cases. Finally, the electronic meetings took significantly less time. Therefore, we conclude that for these groups, languages, and topic, electronic, multilingual meetings can be used effectively and efficiently.

The first limitation of this study is the fact that only a small subset of European languages was used (English, German, Italian, Spanish, and Swedish), and students evaluated only the translations to English. Comprehension of translations between other languages (e.g., Croatian to Chinese) could be different.

Second, group members in the pseudo oral meetings did not actually say anything because the text needed to be identical between the treatments and participants might have behaved differently in this simulated environment.

Fourth, some results could have been affected by members' dissatisfaction with the overall process. For example, oral-group members' reported comprehension was lower than expected, perhaps because of their frustration with the long meeting time.

Finally, only one facilitator was used to write comments on the board in the simulated oral meetings. More facilitators writing simultaneously in different languages could reduce the amount of time needed in these meetings, but there also could be more confusion.

Future research should focus on a comparison of electronic groups with actual, oral groups using a variety of languages and topics to determine in which cases the technology is most beneficial.

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