Audio vs chat: Can media speed explain the differences in productivity?

Löber, Andreas ; Grimm, Sibylle ; Schwabe, Gerhard

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AUDIO VS CHAT: CAN MEDIA SPEED EXPLAIN THE DIFFERENCES IN PRODUCTIVITY?

Löber, Andreas, University of Zurich, Binzmühlestrasse 14, 8050 Zurich, Switzerland, loeber@ifi.unizh.ch

Grimm, Sibylle, Bachstrasse 17, 4658 Däniken, Switzerland, s_grimm@access.unizh.ch

Schwabe, Gerhard, University of Zurich, Binzmühlestrasse 14, 8050 Zurich, Switzerland, schwabe@ifi.unizh.ch

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Keywords: Media Choice Theories, Audio, Chat, Experiment

1 INTRODUCTION

During the last years chat based instant messaging has become a part of the normal communication culture. While IRC-style chat has been part of a niche communication form for dozens of years, instant messaging chat was first adopted by teens and private users (Grinter and Palen 2002, Nardi et al. 2000) and is now rapidly becoming a mainstream communication medium even in business environments (Muller et. al. 2003). The same is becoming true for Voice over IP enabled audio communication. Skype, a program merging the advantages of instant messaging with high quality VoIP has been downloaded over 200 million times. Furthermore internet providers are starting to sell transparent VoIP, which is usable with ordinary telephones.

But these new technologies require new communication choices. The possibility to communicate with a large number of people at the same time creates new challenges to communication design and media choice. We (Löber et al. 2006) conducted an experiment observing groups of four using chat or audio communication to work on tasks of uncertainty or equivocality. We noticed a significant difference in productivity between the groups using audio or chat. The first task was characterized by the problem of uncertainty. The information needed to resolve this uncertainty was distributed inside the group and had to be shared. Chat using groups showed at least as much productivity as audio groups while finishing slightly faster. The second task was characterized by the problem of equivocality. The groups had to find a common understanding of the task and its context. Groups using audio showed significantly more productivity than chat groups. To further explore this difference we analysed the communication protocols of the groups, trying to understand why these differences occurred. We also consulted the established media richness theory and the theory of media synchronicity to formulate hypotheses. These hypotheses are tested with the available experimental data. The second part of the paper discusses the findings of this experiment, giving both a quantitative and qualitative insight into when audio or chat is the right communication media.

2 LITERATURE OF MEDIA CHOICE

2.1 Theories of media choice

One of the most used theories in the area of media choice is the media richness theory by Daft and Lengel (1986). It is based on the premise of a rational selection of media. Media-richness is differentiated along 4 factors (Daft et al. 1987): language variety, multiplicity of cues, personal focus and feedback. Different communication channels have different levels of media-richness and can be ranked. Communication tasks are characterized by two factors: uncertainty and equivocality. The media richness theory postulates that the right amount of media-richness (and not automatically the highest level available) is helpful. Tasks of uncertainty require the exchange of information without a need for explanation. Hence they should be accomplished using a communication medium with a low grade of media-richness. Tasks of equivocality require the communication parties to arrive at a joint understanding of the task and its factors. Thus the communication media should provide a high level of media richness. Media richness theory is a well established theory on media choice. The media richness theory and also the extending symbol-interactionism-framework (Trevino, Daft and Lengel 1990) narrow the aspect of communication speed to the availability and immediacy of feedback.

The theory of media synchronicity by Dennis and Valacich (1999) extends the media richness theory by describing media along five distinct characteristics: immediacy of feedback, symbol variety, parallelism, rehearsability and reprocessability. The theory postulates, that there is no distinct ranking possible, because the media differentiate between these dimensions and no media has the highest values on all dimensions. The theory also expands the task centric view of the media richness theory by arguing that groups are part of a social and organizational system and must perform three functions:

production, group well-being and member-support. Production is the actual activity of performing the task. Group well-being is an activity concerning the social structure, such as assuming roles. Member-support pertains to help for individual group members. According to the media synchronicity theory, there are two basic communication processes, which every group enters at least once while working on a task: conveyance and convergence. Conveyance is the exchange of information and distribution to the group members. This is normally done using a low media synchronicity. Convergence is the development of a shared understanding of the task or information. It is important to come to an understanding of each other's views. This is normally done using high synchronicity media. The theory of media synchronicity extends the narrow viewpoint of the media richness theory of communication speed by the aspect of parallelism, which is defined as being nearly mutually exclusive to the speed of feedback. Therefore there is no integrated view of communication speed. We will partially use the theory of media synchronicity to interpret our results.

Most of the other media choice theories focus around the perceived usage and acceptance of communication media, such as the social-influence model (Fulk, Schmitz and Steinfield 1990), critical-mass-theory (Markus 1990), technology-acceptance-model (Davis 1986) and channel-expansion theory (Carlson and Zmud 1994, 1999). These theories ignore the speed of communication altogether in favour of social aspects of media usage. Only the model of task-oriented media choice by Picot and Reichwalds (1985) incorporates a distinct "speed and convenience" characteristic, which consists of the communication speed and ease of use available to send messages and get feedback.

2.2 Related research on media choice

There is a wide range of research into media choice but hardly any conclusive results. In the 90ties there was a great number of empirical studies which showed no significant results on a meta level. Fjermestad and Hiltz (1999) examined more than 230 articles and observed that most don't show any significant results in the comparison between FtF and CMC Groups. Only 20 % of the experiments showed significant results. More recent studies such as Powell et al (2004) or Weber (2003) also show an inconclusive picture. Also, according to Dennis et al. (1999), there is a trend to focus on the perception of the media users. Research into the media use and the conditions, under which each media is most effective, are seldom. Most previous research is centered on dyadic (i.e. two people communicating with each other) groups. Valacich et al (1994) observed dyadic groups working on a task of uncertainty and a task of equivocality. The audio groups performed significantly better on the task of equivocality, which is in accordance to the media richness theory. But they also performed better on the task of uncertainty, which is contrary to the theory. Both the decision quality and the time of the audio groups were better than those of the chat groups. Kinney and Watson (1992) also observed that dyadic chat groups took significantly longer to finish tasks with both high and low equivocality than audio groups. This result is backed by Suh (1999), whose results show that the chat groups took longer than the audio groups on tasks of equivocality and uncertainty while delivering the same level of quality. All those researches neglect the postulation of the media synchronicity theory (Dennis & Valacich 1999), that written communication scales better than audio communication due to the inherent parallelism available with chat communication. Therefore these results are only partially valid for larger groups. The study of Bos et al. (2002) observes tasks of equivocality, where audio groups of three persons performed significantly better than the chat groups. No research was done into tasks of uncertainty. Graetz et al (1998) found that groups of four using chat communication took significantly longer to solve problems of information sharing than groups using audio. This task was not a clean-cut task of uncertainty due to hidden profile challenges incorporated into the experimental design. This creates an integrated problem of equivocality, which has to be resolved by coming to a mutual understanding of the problem. Therefore the experiment observed a task of mixed properties. Valacich et al. (1993) compared groups of five using audio communication with groups using an EMS system, which provides additional structuring to text chat. They also examined the communication logs to gather additional data about the group communication process. They used an independent rater to create a list of all ideas. The idea quantity was then measured by counting the occurrences in the

logs. Three judges were asked to rate each unique idea. The EMS-supported chat groups created significantly better and more ideas and comments for a task of equivocality. This structuring is helpful for the combined work on a problem but (not yet) available in normal chat programs and therefore limited in the insights offered for the problem.

2.3 Experiment

We conducted (Löber et al. 2006) an experiment in November 2004, comparing the performance of groups of four using audio and chat communication. We based the experiment on the media richness theory, which claims, that these two media should be appropriate for different types of tasks. Thus we observed the productivity of the communication groups working on two tasks with different levels of uncertainty and equivocality. The media richness theory postulates, that chat communication, which is a media with lean media richness, is appropriate for tasks of uncertainty. Audio communication is supposed to support richer communication than chat and should therefore be more appropriate for tasks of equivocality. Thus we expected chat groups to perform better than audio groups working on the task of uncertainty, while the audio groups should outperform the chat groups working on the task of equivocality. The experiment showed that for tasks of uncertainty chat groups were at least as productive as audio groups. The chat groups identified the same number of guilty suspects of a murder case as the audio groups, while finishing slightly faster. The audio groups showed a significantly higher productivity at the task of equivocality than the chat groups by reaching higher quality for the designs in shorter time.

The two different tasks were:

Murder mystery experiment

In the murder mystery experiment the participants are tasked to identify the guilty murderer from a group of three suspects. There is a total of 24 information pieces, from which 9 give crucial information (also called clues), which are required to correctly identify the suspect. Every group member receives a booklet describing the setting and a different set of information pieces, requiring the group to communicate their information to each other. Therefore the task is, according to the media richness theory, characterized by high uncertainty (the missing information pieces of the other group members) and low equivocality (the task can be completed by exchanging all information).

Automatic post office of the future experiment

The “automatic post office of the future” experiment tasks the participants with designing an automatic post office of the future. This design has to be functional, understandable and practicable. According to the media richness theory this task shows a low degree of uncertainty (all required information is known beforehand), but a high degree of equivocality due to the ambiguous nature of the task, requiring not only the communication of information but also of priorities and requirements.

Both tasks incorporate the exchange of information between group members. Also there is a clear difference in quality between pieces of information. The murder mystery task has 9 critical information pieces, which are required for the optimal solution of the task. Therefore they are more important than the other 15 non-critical information pieces. The design task also features information pieces which are more important than others in the form of core ideas and thoughts. Further information about the experimental setup can also be found in chapter 4.3.

Thus the two tasks cover the different types of communication as defined by the media richness theory. They also treat the two basic communication processes as defined by the theory of media synchronicity: conveyance (murder mystery task) and convergence (design task). Therefore they should give insight into the effects of media choice on everyday communication.

3 HYPOTHESES

3.1 Factors influencing group work productivity

Based on these observed differences in productivity we tried to identify factors influencing the productivity of the communication process. Nunamaker et al. (1991, p 46) formulated a set of process gains and losses, which influence the results of group work. While these are focused on EMS-supported groups several factors also influence groups working with audio or chat communication and are presented here in an adapted and expanded version.

Gains:

More Information: The group has access to more information than any one member alone. Therefore they can base their decision on a broader data base.

More Precise Communication: The members of the group need to structure their ideas before communication because otherwise the other group members won't understand their point. Therefore they need to externalize their knowledge. This need does not arise while working alone, leaving the quality of the output often to unstructured thoughts.

Rational Behaviour: Group members can help each other focus on the task at hand by giving each other feedback and commentaries.

Losses:

High Effort: Task-oriented communication with several members is exhausting, especially when the familiarity with the input device is limited. Also the aspect of symbol variety of the theory of media synchronicity has to be taken into account due to the narrowing of the communication possibilities by some media.

Information Overload: Information overload occurs when group members are presented with more information than they can handle at a given time. Thus they can't keep up with the stream of data.

Failure to Remember: Members forget the contribution of others, thereby narrowing the overall information of the group. This factor also corresponds to the (missing) rehearsability characteristic of the theory of media synchronicity.

Blocking: Blocking summarizes several problems with one common core: the medium stops the communication members in their work. Air time fragmentation only allows one group member to contribute at the same time, while attenuation blocking might result in members forgetting their ideas while waiting for their turn. Concentration blocking describes the problem that group members concentrate on their ideas and their presentation, neglecting to listen to the ongoing communication. Attention blocking describes the challenge that group members must focus exclusively on the communication to avoid missing vital information. The blocking aspect is a negative embodiment of missing parallelism as defined by the theory of media synchronicity.

3.2 Hypotheses

Our experiment showed a clear difference in productivity for the task of equivocality. Because the difference occurred between groups using different media it has to be dependent on inherent characteristics of the media. The better performance of the audio groups is in accordance to the media richness theory. But the theory fails to explain the results of the task of uncertainty. According to the theory chat groups should have outperformed the audio groups. Therefore another factor has to influence the productivity. Thus we postulate that the speed of communication is also responsible for the increase in productivity. This factor is a hitherto largely unresearched variable, which is not incorporated in any of the established media choice theories (see chapter 2.1). But beyond the limited

regard in the literature we believe that the speed of communication is very important to the productivity of the distributed group, because it influences heavily the gains and losses of group work as presented in chapter 3.1. Two chances for process gains rely directly on the speed of communication. The amount of information for the whole group requires the transmission of this information to all group members. Also the amount of precise communication is influenced and limited directly by the available speed of communication. Furthermore the speed of communication greatly influences the process losses. The availability of a fast medium lowers the effort of the group members regarding the communication process, while increasing the chance of information overload. With an increase in communication speed more information is transmitted in a given time, resulting in a higher risk of forgetting the information. Higher speed of communication resolves the process losses incurred by blocking issues. Thus communication speed influences nearly all gains and losses of the communication of groups. Therefore is clearly important to identify the ability of the two media regarding their speed of communication.

To identify the speed of communication we have to measure the total amount of information communicated by the media in a given time period. This should provide better indications than the subjective view of the users. Therefore we observed the results in productivity of the experiment, where audio groups performed well on both tasks. While the chat groups were slightly faster in the murder mystery experiment the audio groups identified the same number of correct suspect. The media richness theory postulated that the chat groups should be more productive regarding the murder mystery task due to a better media fit. This was not supported by the data. In conjunction with the clearly higher productivity of the audio groups regarding the design task this leads us to postulate that audio is overall the faster medium for communication regarding groups of four.

Thus we postulate Hypothesis **H1:** Audio groups transfer more useful information than chat groups in the same amount of time

But not all information transmitted is of equal importance. While it is technically possible to transmit huge amounts of data in a fraction of a second this won't increase productivity. Instead the right amount of important, understandable information is fundamental. Brilliant ideas and crucial information help the other group members to perform better, while bickering and redundancy hampers the productivity. Thus the relative speed, which identifies the amount of important information in a time period, is very important for the productivity of the group. Based on the assumption that audio communication is faster than chat communication we further propose that the total amount of useful information communicated is higher for audio than for chat.

Thus we postulate Hypothesis **H2:** Audio groups transfer more critical information than chat groups in the same amount of time

While the higher speed of communication enables the audio groups to perform better than the chats groups regarding the task of equivocality they did not show this higher productivity regarding the task on uncertainty. The chat groups identified the same number of suspects in the murder mystery task as the audio groups while using a media with slower communication capabilities. The murder mystery requires a structured exchange of information to solve the problem. The exchange of information has to be a transparent process and the information needs to be analysed and evaluated (does this information help us find the suspect or not) and remembered. Therefore there is a high necessity for a cooperative, efficient communication process. The slower speed of the chat media requires more effort and takes a longer time. The users therefore enter more focused information to limit wasting their effort. Thus the ratio between the amount of critical information and the amount of all communication should show this higher task-focus of the chat groups.

Therefore we postulate Hypothesis **H3:** Chat groups have a higher ratio of critical information to overall information than audio groups

Together these three hypotheses describe the possible process gains occurring during the communication of the group working on the task. They contribute to an explanation why audio groups

were able to perform better than chat groups working on the design task and why chat groups showed equal results to audio groups concerning the murder mystery task.

4 METHODS, DESIGN AND EXPERIMENT

4.1 Methods

The experiment was conducted using a two different media (audio and chat) and two different tasks, which were selected to cover most aspects of communication. Therefore two different tasks with different levels of uncertainty and equivocality were chosen. In order to profit from previous research experiences, avoid further fracturing of the sparse empirical data and to facilitate the comparison in meta-studies two established tasks were used. The murder mystery experiment by Stasser and Steward (1992) and the post office of the future experiment by Olson et al (1993).

4.2 Design

Murder mystery experiment

The murder mystery experiment requires the transmission of 9 critical information pieces (out of 24 given clues) to identify the murderer without fail. These clues are in the form of several pages of suspect interviews, maps and letters. All group members received a full set of the non-critical clues. 3 group members also received 3 additional critical clues, which were the critical information pieces and which were not available to any other member. All group members were allowed to read all information for 25 minutes, in which they were not allowed to speak to each other. The information was translated to German to prevent undue problems with English. Afterwards the group members were led to their rooms, where they could spend up to 30 minutes communicating to solve the problem. They were also encouraged to finish as fast as possible. It was also pointed out, that identifying the correct suspect was more important than finishing the task as fast as possible.

Automatic post office of the future experiment

All participants of this experiment were given a slightly adapted and translated task sheet based on the tasks sheets of Olson (1993), tasking them to design an automated post office. The groups were given 45 minutes to read the instructions and complete the design task. The murder mystery task requires the groups to think about a complex logical problem and analyse the available data. The post office task is characterized by an open-ended question, requiring the groups to agree on priorities. Both experiments have about the same complexity and allow the same time for the problem solving process.

4.3 Experiment

General setup

The experiment was conducted as a 2x2 factorial experiment with the media (audio and chat) and the task (as described in 3.2) as factors. All groups consisted of 4 members with 10 groups for every combination. The participants were students, which were paid 25 Franks (16 Euros). The group members were split in different rooms, where a notebook with a mouse was available. All users were able to use the Netmeeting virtual Whiteboard. The chat groups used the chat feature of Netmeeting, while the groups using audio were equipped with high quality headsets and Skype.

Gathering of Data

All conversations of the treatment groups were saved as either html (chat) or mp3 (audio) files to allow later examination. 2 chat logs and 2 audio logs of the criminal mystery case were lost due to hardware failure. The output of the murder mystery task groups was a binary value, which indicated

whether the groups identified the correct suspect or not. This decision is a true/false decision which did not require special interpretation. As shown in (Grimm 2006), the count of critical information communicated was established by noting the occurrence and timestamp of the moment that the information is mentioned. Since there is a fixed list of critical information (the 9 critical clues to the identity of the murderer) there was no need for a rating. The output of the design task groups was rated by five experts in system design without knowledge of the treatments in a similar way as the experiment by Valacich et al. (1993). The experts first collected a list of all occurring feature proposals by brainstorming. Then they voted on the importance of each item, creating 4 groups (critical features, important additional features, additional features and marginal features). Then they assigned points based on the availability of the required service (for further information see Anonymous 2006). The raters showed a high interrater agreement with a value of 0.713 points on the Krippendorff's alpha scale. A later check by rerating showed only minimal changes. The count of the critical information pieces in the design task is the number of critical features incorporated into the design. Each critical information piece is counted only once, since the information was communicated to the group and the reprocessability is a key feature of a communication medium.

The amount of information transmitted is counted as the number of information pieces. These information pieces are based on the speech act theory by Austin (1962). Due to the high amount of audio disturbances due to the mixing of four audio streams a robust method for quantification had to be found. This problem was enhanced further by the fact that due to the compression used by audio systems the voices of the group members become similar. Therefore we decided to err on the side of caution. We counted every turn taking of the audio groups. Utterances were not counted. Since every turntaking symbols the end of a speech act this number has to be smaller than the real number of speech acts, because one turn taking of course could include a multitude of speech acts. But hypothesis 1 postulates, that the number of audio information pieces is larger than the number of chat communicated information pieces. A lessening of the number of audio information pieces will therefore not create a falsely significant result. For the chat groups every message has been counted as a speech act, including all the used emoticons. We decided to include emoticons because they carry a wider range of information than utterances and are important for sharing emotions inside the group. Without counting these emoticons, there would be even less information pieces in the chat groups, which would again lead to a stronger significance. The ratio of critical information to overall information pieces is calculated by dividing the number of critical information transmitted with the number of all information pieces. The number represents the mathematical chance of an information piece carrying critical information. Due to the nature of the medium some chat messages might be shorter than comparable audio messages. This might increase the number of chat messages in comparison to the audio messages. This might inflict on hypotheses 1 and 3. Hypothesis 1 postulates, that the number of the audio information pieces is higher than the number of chat information pieces. A slight lessening in the number of audio information pieces will therefore not create a false significant result. Hypothesis 3 postulates, that the ratio of critical information pieces to the overall number of information pieces is higher for chat than for audio. A slight lessening in the number of audio would therefore raise the ratio for the audio groups and thus not create a false significant result. To prevent critical errors we checked the word count of random samples of 4 groups using audio and 4 groups using chat. The results showed the same characteristics as those based on the speech acts.

Statistical methods used

While the sample size is only 10 groups per treatment the group composition of 4 members helps the stability of the results. Due to the sample size we conducted all comparative statistical using the Mann-Whitney U-Test. For ranked correlation tests we used Spearmans rho-test for ranked correlation. All tests were conducted using a one-tailed significance level of 5 %.

5 RESULTS

Hypothesis 1: Audio groups transfer more information than chat groups in the same amount of time

Audio groups transferred significantly more information pieces than chat groups in the murder mystery task (Mann-Whitney U=1.0, n=16, p<0.01). Audio groups transmitted a mean value of 330 information pieces, while chat groups only transmitted an average value of 116 information pieces in the given time. Audio groups also communicated significantly more information pieces than chat groups in the design task for the automatic post office of the future (Mann-Whitney U=10.0, n=20, p < 0.01). Audio groups transmitted a mean value of 459 information pieces, while chat groups communicated an average value of 191 information pieces in the given time. Thus hypothesis 1, which states that audio groups transmit more information than chat groups is fully supported by the data.

Hypothesis 2: Audio groups transfer more critical information than chat groups in the same amount of time

While working on the murder mystery task, the audio groups transmitted significantly more critical information (Mann-Whitney U=12.5; n=16, p=0.019) than the chat groups. Out of a total of 9 critical clues, audio groups communicated an average of 3.63 clues in the given time, while chat groups only communicated a mean of 2.13 clues. Audio groups working on the design task showed a nearly significant increase in communicated information pieces when compared to the chat groups (Mann-Whitney U=28.5, n=20, p=0.0525). While the audio groups communicated 6.14 critical features, the chat groups only averaged at 5.18 critical features in the given time. Thus hypothesis 2, which states, that the audio groups transmit more critical information than the chat groups is weakly supported by the data.

Hypothesis 3: Chat groups have a higher ratio of critical information to overall information than audio groups

Chat groups transferred a significantly higher ratio between critical information and all information pieces (Mann-Whitney U=15.0, n=16, p=0.0415). Chat groups (in average) transmitted one critical information piece in 1.9% of all information pieces, while audio groups communicated one critical information piece in 1.1 %. While communicating on the design task, chat groups showed a significantly better ratio between critical information and overall information pieces (Mann-Whitney U=16.0, n=20, p<0.01). Chat groups transmitted a piece of critical information in an average 3 % of the communication pieces, while audio groups only communicated a critical information piece in a mean value of 1.6 % of the communication pieces. Thus hypothesis 3, which states that chat groups have a higher ratio of critical information to overall information than audio groups is supported by the data.

6 INTERPRETATION

Interpretation of the results with regard to the hypotheses

As postulated by H1 the audio groups communicated significantly faster than the chat groups in both task settings. This can be explained partially by the ability of individual group members to speak faster than typing. Also the faster feedback, higher familiarity and higher symbol variety might be responsible for the increase in numbers. Due to the higher communication speed the audio groups were able to use a part of their communication time for not task-oriented communication. They could have used these moments for the social interactions described by the theory of media synchronicity: group well-being and member-support. This could lead to an increase in productivity especially for the groups working on the task of equivocality, where a functioning group with a joint understanding of the task is required. The audio groups were also able to communicate more critical information pieces during the given time, thus confirming H2, thus showing a higher speed of communication. Thus speed of communication offered by audio outperforms the benefits offered by the rehearsability and reprocessabilty properties of the chat medium. Therefore the audio groups communicated faster than the chat groups regarding the task of equivocality, resulting in higher performance. The level performance of both treatment groups regarding the task of uncertainty shows that the higher speed of communication shown by the audio groups is offset by other media characteristics such as the missing

rehearsability and reprocessability. As postulated by H3, the chat groups were better in communicating this essential information in a compact format, focussing on the task. The effort of writing and the ability to rehearse and reprocess seems to help the group members to focus on the task and formulate core ideas more clearly. This effect balanced the higher communication speed of the audio medium. Social activities such as group well-being and member-support are of less importance to tasks centred on the dissemination of information. By concentrating on communicating the critical information the chat groups could therefore negate the disadvantage of the slower medium.

Overall interpretation

Audio communication is always faster than chat communication. Audio groups are better in communicating the multitude of information which is available inside the group. This leads to better decisions due to a broader base of information. Audio group members are also able to communicate more critical information pieces to their fellow workers, enabling them to work on this information. Regarding the task of equivocality this led to a higher productivity. The design task requires not only the communication of facts but also the creation of a shared understanding of both the task and the context. There is a much higher need for communication than for the murder mystery task. This communication is the key factor for the productivity. Thus audio clearly outperformed the chat groups due to its higher communication speed. Also the higher symbol variety with the ability to transfer voice intonation and audible emotions supported the collaborative work of the audio groups. The chat groups could not compensate this by using the abilities of the chat media for parallelism, rehearsability and reprocessability. These features are of lesser importance in transmitting social clues and non-task-related information. Chat groups communicated more efficiently with a higher ratio of important information to overall information, but were not fast enough to create a shared understanding and task-orientation, resulting in a significantly lower productivity. The audio groups failed to perform better than the chat groups regarding the task of uncertainty. The higher speed of communication failed to provide the users with an advantage in solving the murder mystery task. This indicates, that the faster speed of communication and the higher number of critical information pieces communicated are not solely responsible for the productivity in this task. The chat medium must therefore be able to compensate the higher speed of the audio medium. Chat groups were able to reprocess the information available, looking up information already transmitted. This reduces the amount of redundant communication. Also the ability of the chat medium to rehearse messages send beforehand helps the group members focus their communication on key facts. This is confirmed by the higher ratio of important information to overall information. Also the higher parallelism is able to offset some part of the overall faster communication speed of the audio groups, since the transmission of plain information can be done by all group members at the same time, due to the fact that this information is still available later.

7 CONCLUSION

The experiment showed that media speed can influence productivity. Higher speed of communication can lead to higher performance. But there are several more aspects involved, which can compensate the missing speed communication for slower media. This will require further research to identify and measure the effects of other media characteristics. Focused on the comparison of chat vs audio, the experiment showed clearly that audio groups with four persons are better in communicating information in a given time. This also holds true for critical information, which has to be retained for only a short time. Chat groups are more time efficient than audio groups and also alleviate several typical problems of group communication, such as a missing group memory and high media blockage but are overall not faster. Therefore groups of four should use audio when available. Audio is faster and offers a higher symbol variety than chat. Audio should also be used when social bonding and the creation of a joint understanding of the task is required. Chat should be used only on tasks which are time critical and where the group agrees on a tight work schedule, or for tasks which require a high level of rehearsability or reprocessability. Furthermore the chat using group needs to agree on both the

task and the work process. This recommendation should be adapted to the perceived ability of the group members. For work processes spanning a longer period of time there should be changes in communication media as proposed by the theory of media synchronicity. Phases of convergence should be done using audio communication, while for phases of conveyance chat could be used.

Both communication media are still lacking a structured approach and moderation of the communication process. This trend for support of dedicated phases in communication has been recognized and incorporated into audio and chat software by allowing the assignment of topics to the communication channel. Further research is needed to observe the correlation between structuring and the productivity of new media channels for collaborative work. Further research is also needed to arrive at a detailed, quantified model how group communication processes for audio and chat groups are working.

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