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Document Version
Accepted author manuscript

Published in:
Proceedings of the 48th Annual Hawaii International Conference on System Sciences, HICSS-48

DOI:
10.1109/HICSS.2015.15

Publication date:
2015

License
Unspecified

Citation for published version (APA):
Razmerita, L., & Kirchner, K. (2015). Collaboration and E-collaboration: A Study of Factors that Influence Perceived Students' Group Performance. In T. X. Bui, & R. H. Sprague Jr. (Eds.), *Proceedings of the 48th Annual Hawaii International Conference on System Sciences, HICSS-48* (pp. 33-42). Article 7069663 IEEE. https://doi.org/10.1109/HICSS.2015.15

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Article in proceedings (Post print version)

This article was originally published in *System Sciences* (HICSS), 2015 48th Hawaii International Conference on , vol., no., pp.33-42, 5-8 Jan. 2015.

DOI: 10.1109/HICSS.2015.15

Uploaded to Research@CBS: September 2015

Available at: http://research.cbs.dk/en/publications/collaboration-and-ecollaboration%28bc034a4b-4637-4ce0-b2e2-a86effa6557f%29.html

Collaboration and e-collaboration: A study of factors that influence perceived students' group performance

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Abstract

Understanding student's perception of collaboration and how collaboration is supported by ICT is important for its efficient use in the classroom. This article aims to investigate how students perceive collaboration and how they use new technologies in collaborative group work. Furthermore, it tries to measure the impact of technology on students' satisfaction with collaboration outcomes. In particular, the study aims to address the following research questions: Which demographic information (e.g. gender and place of origin) is significant for collaboration and e-collaboration? and Which are the perceived factors that influence the students' group performance?

The findings of this study emphasize that there are gender and cultural differences with respect to the perception of e-collaboration. Furthermore, the article summarizes in a model the most significant factors influencing group performance.

1. Introduction

Collaboration will continue to become more important for learning and working in the 21st century. For the new generation of students (also referred to as the digital natives, the millennials or the net generation) who have grown up with collaborative technologies, it has become natural to adopt collaboration in different forms, including co-creation [1].

Modern pedagogy emphasizes that teaching and learning need to consider student-centered methods based on collaboration and interactions with peers that are associated with active learning, and less based on traditional instructions and lectures. The literature emphasizes that teachers are not only presenters of wisdom but that their role is more one of a facilitator of learning. Learning needs to become more ludic and teaching methods need to be redesigned in order to engage and motivate the pragmatic and less patient students of the 21stst century [2]. Naturally, new technology and social media can be used "to foster robust collaboration among learners in management education"[3]. While many studies have already shown the potential use and benefits of new technologies and social media, less attention has been paid to learners' perception of effectiveness [4, 5] and their approaches to collaboration [6]. Furthermore, understanding learners' perceptions regarding the use of Information and Communication Technology (ICT), including social media, is both important and critical for higher education [5]. This article aims to examine how the students use the new technology in collaborative group work and also tries to measure its impact on the perceived group performance. The study follows up on previous research [7] in which perceived factors that influence the satisfaction with collaboration and e-collaboration was evaluated and discussed.

However, we still need an answer to the question what can be gained by using new ICT inside the classroom as improved learning outcomes and students' satisfaction is not guaranteed. Active participation of students in collaborative problem solving using ICT may lead to confusion. In addition, it places a responsibility on them to manage their focus and attention [8].

The study presented in this article was conducted at Copenhagen Business School in an elective course *Web Interaction Design and Communication: New Forms of Knowledge Sharing and Interaction*. The course enrolls both Danish bachelor students and exchange students from universities from all over the world. Within the class, group work is a very important teaching method used along with various assignments during the semester. Group work is a means to solve tasks collaboratively but also to share and exchange ideas through negotiation of meaning and a way to learn through peer interaction. Students work in groups on a selected topic of interest and develop their preliminary research ideas collaboratively and also collect data in groups. At the end of the course, groups present their research results and receive feedback on their work. This preliminary research in groups represents a springboard for their individual research projects. The aim of group work is to help students to develop their preliminary research on a selected topic of interest through co-creation and at the same time to use collaboration to foster learning, creativity and innovation of their projects.

The course uses Podio, as a social media enhanced platform, for managing course-related materials, communication, sharing information and interaction with the students. Podio is an app-based platform built on cloud technology that may be used as a "complete work platform for enterprise" [9] or it may be customized as a learning environment. It is designed in a manner similar to typical social network applications, but it allows easy customization through apps. Thus its users can build their own tailored workspaces. Podio was adopted as a learning environment because it is better at supporting communication through status updates, interaction and collaborative work. Furthermore, in Podio students can build dedicated group workspaces where they can share knowledge, interact or even construct knowledge through conversations and interactions using both synchronous and asynchronous communication tools.

Some groups merely assign tasks to group members in order to collect data and prepare the presentation to be delivered at the end of the semester; other groups collaborate through discussions, brainstorming, sharing of ideas and enter into real collaborative processes that may lead to knowledge building. Collaboration may also take place by as face-to-face interaction or through any other e-collaboration tools or social media.

On the basis of an empirical study conducted along three semesters, this paper aims to investigate gender differences and differences in cultural background in collaboration and e-collaboration. In addition, the study examines the students' perceptions of collaborative work, the factors that impact their group performance, as well as the role and usage of collaborative technology or social media (henceforth e-technology) for their group work. Few studies have reported on how students learn and experience technology[4]. Furthermore, little is known about what technologies are adopted by students for group work and collaborative work.

This paper aims to address the following research questions: Which demographic information (e.g. gender and place of origin) is significant for collaboration and e-collaboration? and Which are the perceived factors that influence the students' group performance?

The two research questions have been answered on the basis of data collected using a survey-based approach among students. It was analyzed using Spearman's Rho for measuring correlations. Our paper is structured as follows: the next section presents a literature review of collaborative learning, group collaboration and e-collaboration using social media. Section 3 introduces our research method and data collection, while section 4 presents our data analysis and the main results. We discuss our findings in section 5 and conclude on these findings and outline future work in section 6.

2. Related Work

In recent years, many studies have reported on the successful use of social media and computer-supported collaborative work for teaching and learning. Collaborative group work offers many potential advantages for supporting learning, creativity and classwork. According to Stahl [10] computer-supported collaborative learning consists of multiple levels across time, space and scale – from individual learning to small-group interaction related to a large-scale socio-cultural context. In the following subsections we report on related studies.

2.1 Factors Influencing Collaborative Learning

Collaborative learning is a teaching method where students work together in small groups to solve a common task [11]. It can improve learner performance if learners discuss a problem and suggest potential solutions [12]. According to Dillenbourg [13], in collaborative learning, interaction among people, which should trigger learning mechanisms, is expected to occur but there is no guarantee that the expected interactions will actually take place.

Previous studies have found that group work performance, including learning and satisfaction, depend on many variables, including interest in the subject, relations to peers, gender differences, age, individual differences, and cultural backgrounds; see among others [14, 15]. In a previous study, it was reported how students form groups in a heterogeneous classroom and a method was proposed as to how to assign students to groups based on certain criteria [14]. The method requires specific data about the students' profiles, topics of interests and their level of knowledge. The group formation methodology relies on other studies' finding that heterogeneous groups perform better in terms of both creativity and learning. In a meta-analysis of undergraduate courses, it was found that group activities improve the attitude toward learning, increase persistence and result in greater academic achievement [16].

Numerous studies have shown that students' engagement and active participation are factors that influence general learning processes positively. Therefore students' engagement through different pedagogic activities is a constant preoccupation of teachers when designing learning activities associated with course work and new ways to teach using social media. Students' engagement is often related to motivation (intrinsic and extrinsic) and it is related to both internal and external factors that may change during the course. While extrinsic motivation is correlated with external factors such as goals, fears, and praise, intrinsic motivation arises from internal factors such as curiosity related to a subject or task and enjoyment. Students' engagement may result in the desired social interaction [17] and participation both inside and outside the classroom.

In order to understand such team collaboration, group dynamics and group behavior have to be consid-

ered [18]. Group dynamics can be described by means of factors such as: participation, communication, collaboration, trust and cohesion [19]. Furthermore, group behavior is influenced by team member familiarity, which leads to a positive attitude toward communication and collaboration within the group [20]. Venkatesh et al. [5] reviewed the literature and found that students' learning experiences depend on several factors including their knowledge of ICT, the teaching methods they are exposed to, their learning strategies, the way they regulate their learning, and their perception of the benefits of ICT.

A study reported in [21] found that team dynamics, team acquaintance and instructor support have a major influence on teamwork satisfaction. From the students' point of view, establishing team commitment, having clear and frequent communication within the team, using interactive software and synchronous meetings, are all important factors for teamwork satisfaction.

2.2 E-collaboration and Social Media

Online collaboration or e-collaboration is a computer-mediated form of collaborative learning, including multilevel interaction, resource sharing and developing competencies for real-world situations [22].

McConnell [23] identifies three aspects of online group collaboration: the process of group work (measured by the ability to develop in-depth discussions, questioning and contributing to group work), social presence (openness between group participants) and outcomes and products of group work. Tseng et al. [21] found that trust among team members and organizational practices are factors that are able to explain satisfaction with online collaboration.

A study of e-collaboration [24] reported that social loafing within teams can diminish team potency assessments, perception of technology usefulness and thus behavioral usage intentions and team performance. Social loafing is defined as a reduction of motivation and effort when individuals work in groups as opposed to when they work individually. Team members loaf if they feel that their contributions are not essential for the end result of the group or if their work is not assessed. Another study of online learning collaboration identified a number of critical challenges, among which: instructor support and encouragement, unambiguous instructions, team commitment and clear and frequent communication [18].

Social media comprising Web 2.0 technologies support the synergetic articulation of personal into collective knowledge which may lead to knowledge creation and innovation within teams and organizations [25]. The article classifies the main social media technologies according to the level of interaction and the level of control. Certain tools like blogs and microblogs are more individualistic and have a high level of control while others like wikis support collaboration and collaborative work (when the level of interaction is high). However, certain conditions (among others the network effect) need to be met in order to favor collaborative processes and such synergetic articulation of knowledge. In several studies the use of social media for collaborative learning was investigated, e.g. among others in [26, 27, 28] or using a social bookmarking tools and a wiki system [29].

Homola and Kubincova [30] give a comprehensive review of social media applications in educational environments. They list several benefits of using social media in the classroom such as: improved motivation, the development of analytical thinking, collaboration, teamwork and communication skills. As the teachers cannot assume that students are familiar with every Web 2.0 tool the understanding of the student needs as well as pedagogical guidance are crucial in the classroom.

A report based on a literature study found lack of time, resistance strategies and skepticism as factors that contribute to whether or not social media will make a difference in the learning outcome[27].

A study conducted by [28] aimed at investigating benefits and challenges of collaborative learning and work using Social Media for foreign language learning. While certain benefits of using new technology for teaching are undeniable, some students felt rather distracted and confused by the new teaching methods, and questioned the usefulness of new technology and social media as compared with traditional teaching methods. "Some students perceive the ownership of ideas blurred in Social Media and the fact that students are assessed individually may lead to frustrations and lack of willingness to collaborate or cooperate". Beyond ownership issues, other issues reported in the study were: lack of trust in their capabilities, lack of interest, or the issue that students are not particularly willing to "invade each other's turf" when it comes to correcting, discussing or making changes to language through collaborative editing and group work.

In the classroom, social media changes learners from passive content consumers to active participants [31]. Students use social networking sites in their academic life for communicating with classmates about course-related topics, coordinating their study groups and collaborating on assignments [32]. A study of more than 600 students found that social media encouraged students to interact with their peers so that they got to know their peers better and developed a positive relationship with them [33]. This is essential for the creation of collaborative learning communities. Nevertheless, low-engaged students may still fail to increase their level of engagement with the support of social media.

2.3 Gender and Cultural Differences in Collaboration and e-collaboration

Several studies have investigated whether collaboration and e-collaboration is influenced by social dif-

ferences like gender, age or culture. We have surveyed articles reporting on gender and cultural differences, as age difference is not significant and does not play a role in student teams.

Based on a literature review, Kimbrough et al. [34] found that in previous research different studies had contradictory findings. In studies reporting on gender differences regarding the internet, some studies found that men are more active on the web than women, while other studies did not find gender differences. Nevertheless, all studies reported differences in motivation [35]. A study investigating gender differences in collaborative learning via online social networks using social network analysis, based on a quantitative survey, found that female students were more engaged in online communities, while male students were more likely to control the information flow [28].

The results of another study conducted in China [36] showed that team collaboration facilitated by social networks differs greatly between men and women when looking at information technology usage and other factors. Men showed more commitment, a more positive attitude, and anticipated emotions and group norms while women regarded the effects of social identity and negative anticipated emotions as more significant when collectively participating in social network facilitated team collaboration. As men are generally more "self-confident in their behavior and focus more on positive implications of their involvement, they are more likely to be influenced by positive anticipated emotion" [36].

Among the greatest challenges in multicultural student group work are: free-riding, insufficient language skills and students not communicating properly [37]. Using a questionnaire and in-depth interviews, Kimmel and Volet [38] examined students' attitude toward learning and interacting in culturally diverse groups. They found limited interaction between peers from different cultural backgrounds. Students considered working with peers having the same background less stressful and more fun. Especially local students did not want to mix with international ones due to different working styles. Nevertheless, culturally diverse groups had a more positive attitude towards mixing than non-diverse groups, and they managed to establish a beneficial group climate.

3. Research Method and Data

This study employs a survey research design. Based on the literature review, a specially constructed questionnaire was developed. The survey focused on students' perception of collaboration, e-collaboration and group performance. The questionnaire consisted of 13 questions covering different aspects of collaboration, including satisfaction, evaluation of end results of collaboration, possible factors influencing collaboration, means of collaboration and e-collaboration.

Most of the questionnaire items used a 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). In order to collect a richer set of data and to address some additional issues not covered by the closed questions, a few open questions were included. For each of them, recurring responses were categorized and counted. Additionally, the survey included some questions about the tools used for collaboration and these answers included both dichotomous values and open text.

The data was collected using a survey distributed at the end of the students' Web Interaction Design course, which ran as an elective course and consisted of eight lectures of three hours. A short overview of the purpose of the data collection was provided so that students could understand the underlying objectives of the questionnaire and the study. Data presented within this study was collected in three semesters: fall 2011, spring 2012 and fall 2012.

4. Data Analysis and Findings

The survey was distributed to 140 students, 41 students in fall 2011, 40 students in spring 2012 and 39 users in fall 2012. The students were not given any incentives to fill in the questionnaire. Over the three semesters, 63 valid answers were collected. This accounts for a 45% response rate from the total number of students. Out of the 63 respondents who filled-in the questionnaire, 22 were male (35%), 29 were female (46%) and 12 respondents (19%) didn't disclose their identity and therefore we don't know their gender.

In our sample we had seven responses from Danes and 43 non-Danes, and 13 anonymous respondents who did not provide their place of origin. Because the group of non-Danes exchange students consisted of students from many different countries from around the globe, we decided to consider them as one group.

Data was analyzed using SPSS. Spearman's Rho method was applied for finding correlations between the Likert scale-based ordinal variables. This measure of correlation provides information about the strength and direction of correlation. In order to find differences in demographic features like gender and place of origin, we used T-Test to see the differences between independent samples.

Table 1. Overview of Collaboration Factors (Likert scale coded from 1-Strongly agree to 5-Strongly disagree)

Survey	Item	Mean	SD
General collaboration	Enjoy collaboration with peers	1.86	0.780
	Collaboration effect on learning and inspiration	2.3	1.010
	Equal contribution of team	2.3	1.200

	members		
	Evaluation of end result of collaboration (group performance)	2.43	0.797
	Evaluation of overall satisfaction with collaboration	2.0	0.810
Collaboration challenges	Social loafing	3.95	0.991
	Lack of coordination	3.90	1.043
	Lack of trust	4.56	0.667
	Conflict	4.46	1.010
	Different backgrounds of team members	4.21	0.985
	Cultural differences in the team	4.05	1.007
e-collaboration	Usage of e-collaboration tools	1.85	0.910
	Prefer social interaction	2.39	0.918
	Difficult to use	3.98	0.940
	Not fun	3.75	0.960
	No benefits	4.18	0.866
	No need	4.25	0.830
	Help to advance project ideas	2.46	0.997

Table 1 presents an overview of the different factors measured as ordinal variables considered in the survey. The independent variables were grouped into three clusters of items, namely "general collaboration", "collaboration challenges" and "e-collaboration" . The main results of the data analysis are presented below.

In relation to the collaboration challenges, the mean values suggest that the teams did not experience major challenges; however, lack of coordination and social loafing seem to be greater challenges for group work than lack of trust, conflict, different backgrounds and cultural differences.

For collaborating within their group, students mainly used Podio (which was the platform used in the course) and Facebook for group level e-collaboration [7] Furthermore email, Skype and google docs were selected as means of communication. According to students' answers email was used less and less, while Facebook gained importance over time as a tool to support collaboration.

Figures 1-4 present descriptive statistics and details of the findings of the study on the main questions addressed in this study. An overview of the distribution of answers with regard to satisfaction of collaboration is presented in Figure 1. As can be seen, 50% of the students evaluate their satisfaction with the overall group collaboration as good and about 27% think it is very good.

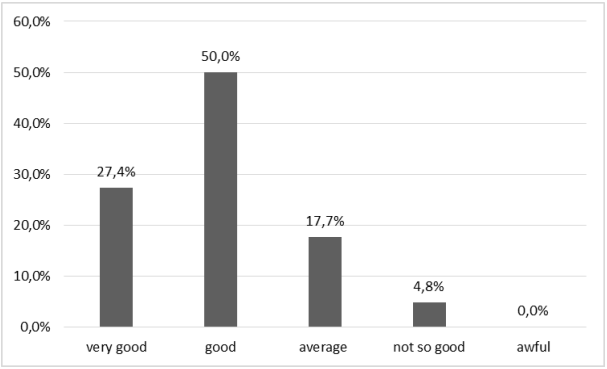

Fig. 1. Overall satisfaction with collaboration (n=63)

An evaluation of the students' group performance was also included in the survey. The self-assessed data provided by the students on the end results of their collaboration is presented in Fig. 2 based on a 5 point Likert scale. The majority of students (84.1 %) rate the end results of group work as very good or good. Due to the anonymity of data collection, we could not compare the group performance as perceived by the students with the actual group performance (which could be measured by the grades the individual students have received).

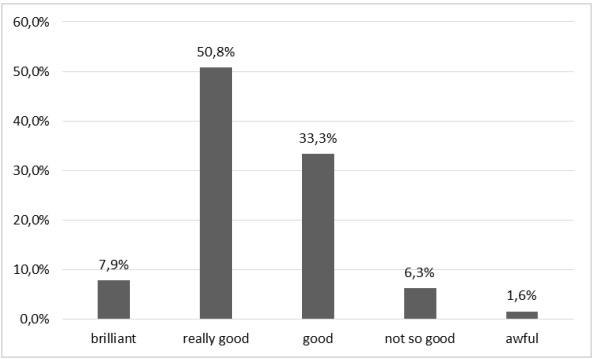

Fig. 2. Evaluation of group collaboration end results (group performance)

Figure 3 shows for what purposes these e-collaboration tools were used. Most students used them for coordinating and exchanging ideas and sharing knowledge, while only 34.9% of students used e-collaboration for virtual social interaction. The degree to which students should coordinate activities or collaborate in their groups is not prescribed. The students can decide how often they meet, how they meet, what tools they use to collaborate and what tasks they collaborate on. But in general, students seem to like to use e-collaboration possibilities, because coordination and information exchange will be easier.

One student commented: "I believe it just makes it easier to keep ideas flowing through the entire project. There is no need to meet to express different ideas."

Another student answered: "It is easier to work with people and to interact with them as everybody can connect when they want to and get all the information."

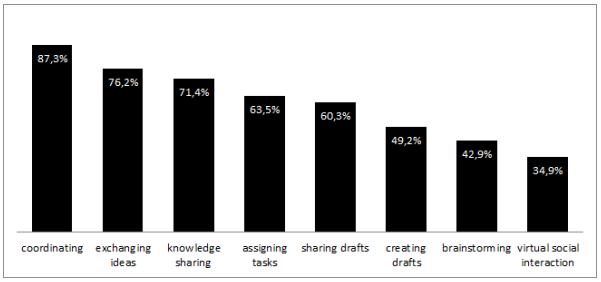

Fig. 3. Usage and purpose of e-collaboration in group work (n=63)

The answers to the multiple choice question: How can social media enhance collaboration? are presented in Figure 4. In terms of perceived benefits for using social media, 93.7% of the students think they can save time, and that social media tools facilitate knowledge sharing Furthermore, social media tools enhance the effectiveness of group work. Respondents used these tools for integrating ideas and completing their group work.

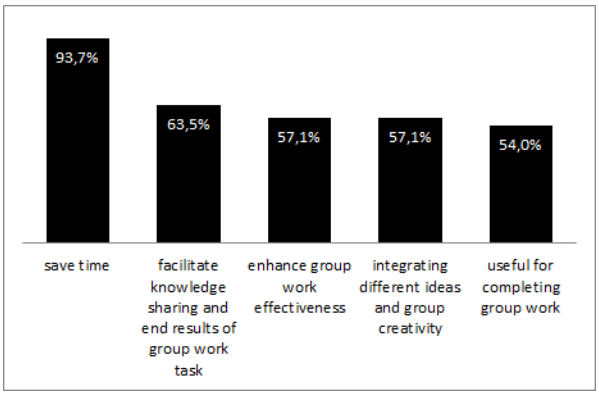

Fig. 4. Social Media enhances collaboration (n=63)

Generally students liked the possibilities of social media for group work. One student wrote as an additional comment for the Podio tool: "We can just write ideas straight [on] the page and get other people's views." Another one preferred the ubiquitous access to such environments: "As a student you are really busy. So it is difficult to get everybody to the same place at the same time."

Additionally, some drawbacks of social media collaboration were mentioned as compared with traditional face-to-face collaboration. Students have to write a lot of text to explain their ideas to others in writing. Furthermore, they need to learn how to use the tool first. Response times can also be longer than with face-to-face collaboration.

Students share ideas, but they need to wait for the others to connect online and comment on their suggestions. One student pointed out: "I could instantly feel that the first group I joined would have been a disaster, because the others were so wired and unfocused. Since I did not know anyone in this class, finding a good group was quite stressful."

Although social media and e-collaboration in general can support collaboration, some problems still remain open. Furthermore, even if the use of social media saves time, it does not solve the perceived lack of time by students owing to overlapping course assignments or exams: "Although we could perhaps work on e-collaboration tools like Podio, we had no time."

For some students, Podio seems to be too complex and it was stated that it is: "difficult to get started on a platform with a lot of features – I would prefer simpler features for the group work".

4.1 Differences in relation with Gender

In order to answer our research question as to whether satisfaction with collaboration and e-collaboration differs among male and female students, we undertook a further data analysis. We used a T-Test to find differences between male and female students regarding the variables listed in Table 1. We identified three significant differences shown in Table 2.

Table 2. Significant results from T-Test for male and female students

Variable	Mean (male)	Mean (female)	Significance of T-Test
e-collaboration: no fun	4.1	3.48	p=0.021
e-collaboration: no benefits	4.55	3.97	p=0.015
e-collaboration: no need	4.1	3.48	p=0.015

These differences show that male students have a more positive attitude towards e-collaboration than female students.

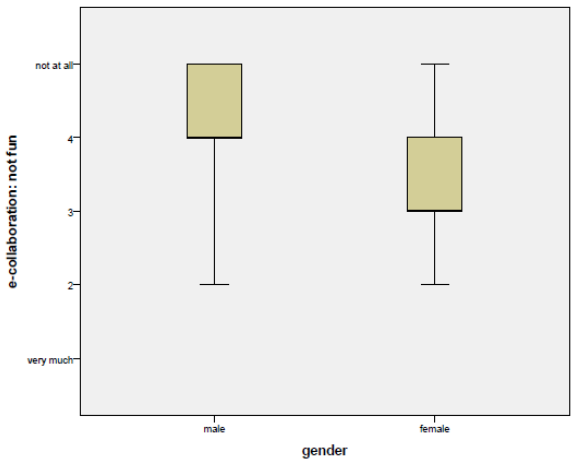

Fig. 5. Boxplot for gender differences for variable e-collaboration: not fun

Figure 5 presents the gender differences for the variable e-collaboration: not fun in a boxplot. The bottom and top of the box mark the first and third quartiles of the data, while the band marks the second quartile (the median). The whiskers mark the 1.5 times interquartile range. As can be seen in Fig. 5, the median and typical values for the male students are higher (4 and above) than for female students (median < 3).

4.2 Differences in relation with the Place of Origin regarding e-collaboration

We also investigated whether the place of origin of students played a significant role in relation to collaboration and e-collaboration. In order to find differences between Danish and non-Danish students, we used T-Test and found the following significant differences (see Table 3 below).

Table 3. Significant results from T-Test for Danish and non-Danish students

Variable	Mean (Danish)	Mean (non-Danish)	Significance of T-Test
e-collaboration: no need	3.43	4.39	p=0.020
e-collaboration: no benefits	3.71	4.34	p=0.050
Challenges: cultural differences	3.14	4.07	p=0.034

Interestingly, Danish students considered cultural differences as a bigger challenge than non-Danish students (see figure 6).

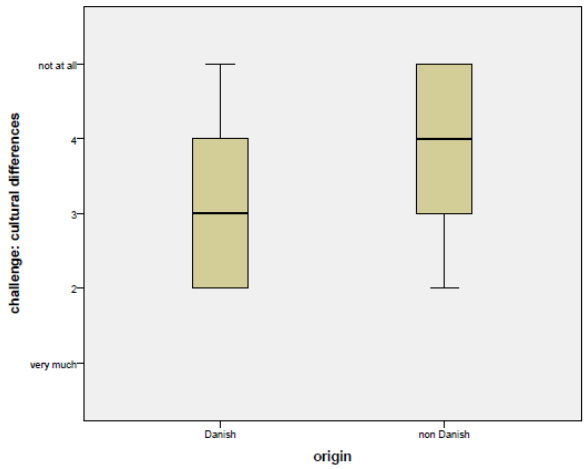

Fig. 6. Boxplot for differences in place of origin for variable challenge: cultural differences

Regarding e-collaboration, non-Danish students (who are exchange students) on the whole regarded e-collaboration more useful and beneficial than Danish students. These results may be due to the fact that exchange students are more open to meeting new people and interacting across cultures as they are in a foreign country.

4.3 Factors Influencing Group Performance

The factors influencing the end result of collaboration have been calculated using Spearman Rho. The major influencing factors are presented in Fig. 7, which includes Spearman ρ value and p-value significance.

For the research question: Which factors influence the students' group performance?, we found that the more students enjoyed collaboration with their peers and thought that their collaboration influenced learning and inspiration processes, the better the students rated the group performance. Out of the 18 variables presented in Table 1, the model includes eight significant factors. All these factors have a Spearman Rho between 0.484 and 0.325 which points to a medium influence. The most important factors are to enjoy collaboration with peers and the effect of this collaboration on learning and inspiration, while the equal contribution of all team members and the further development of project ideas play a less important role.

Apart from social loafing and lack of coordination (measured from 1-very much to 5-not at all), a factor that has a negative influence on the group performance (end results) is the negative perception of usefulness of e-collaboration.

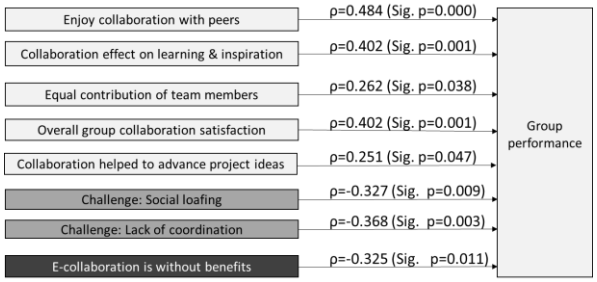

Fig. 7. Influencing factors on the group performance

An intriguing finding is that despite the fact that e-collaboration is positively perceived by students, e-collaboration does not play a significant role for the perceived group performance. This might be explained by the research setting and the fact that students had the freedom to use or not to use e-collaboration. E-collaboration was an option but not a requirement and this might explain the conflicting results.

5. Discussion

Students in Denmark are used to working in groups and are not graded based on the basis of course participation, group work or presence. They have the freedom to participate in class or to self-study at home during the semester and, even if they don't attend classes, they are still allowed to take the exam. This study has highlighted that the most important factors that influence

their group collaboration are the enjoyment of collaboration with peers, the effect on learning and inspiration, as well as the equal contribution of team members. Challenges like social loafing, lack of trust and lack of coordination negatively influence collaboration.

Students can choose to collaborate face to face or through technology. The course did not prescribe any specific type of collaboration. While e-collaboration did not play a significant role for satisfaction with collaboration [7] and group performance, it appears that a negative attitude towards e-collaboration influences perceived group performance.

Although the teams were mixed, comprising students from different nations and from different study programs, the cultural differences and differences owing to different backgrounds did not seem to play a statistically significant role either on the degree of satisfaction or on the evaluation of the end result. The mean value of other factors considered in the study (presented in Table 1) indicate that they did not experience conflicts; they did not experience difficulties due to the fact that their groups consisted of individuals with different backgrounds or experience challenges as a result of cultural differences. Furthermore the enjoyment of working with peers and an equal contribution from team members positively influences team work and group performance.

Some findings similar to our work can be found in the literature. Although we also found, as reported in [21], that interactive software is useful for collaboration, we have only limited insights into e-collaboration. This is because the students could choose the type of collaboration themselves and also caused by limitations of the questionnaire. Furthermore, the students could select both real face-to-face interaction and e-collaboration.

The students in our study used social media for e-collaborating for various activities (see Fig. 3) including getting to know their group members better on the basis of their Facebook profiles and to coordinate work. Similar benefits of social network applications results were found in [32] and [33]. The present study shows that in the course of the three semesters students tended to coordinate more and more using social network applications instead of email.

In our study, trust was not found to be an important factor for the perceived group performance (end results). Nevertheless, trust is a significant factor in relation to perceived collaboration satisfaction [7] and trust is an important factor for group work [21].

We did not investigate the role of the course instructor for the success of the collaboration (as reported in [18]). Although it is considered an important factor and we agree that teachers/professors play a major role in creating the conditions for successful collaborative work, our study focused on the collaborative learning groups themselves.

In relation to different attitudes of male and female students, we found that male students have a more positive perception of e-collaboration as compared with their female colleagues. However despite these gender differences identified in our study, e.g. Chan et al. [35] found that female students were more engaged in online collaboration.

Regarding the cultural differences we found Danish local students more concerned about cultural differences in collaboration and the value of e-collaboration than non-Danish students. A similar result reported in [38] found that local students are more cautious mixing with students from other countries than international exchange students.

Our analysis on cultural differences is nevertheless limited, because we did not take into account the place of origin so that we could not compare attitudes of students with different cultural backgrounds in more detail.

6. Conclusions and Future Work

The present study aimed to shed light on factors that influence collaboration performance in the classroom and reports on how students collaborate using various technologies for group work. The study aims to test some of the claims made about the net generation [1] and to better understand how they use and collaborate using new ICT and social media. Drawing on previous studies and theory, a questionnaire was designed to evaluate collaboration and the usage of collaboration technology for group work.

As already pointed out, to our knowledge and according to the literature investigated, not many studies discuss collaboration, factors influencing group performance as a result of collaborative work, including collaborative technology and social media collaboration within the classroom. The study also sheds light on gender and cultural differences in collaboration and e-collaboration.

Despite the fact that students use various collaboration technologies for different purposes and different tools including social media (see Figure 3), e-collaboration does not seem to be an influencing factor for group performance (see Figure 7).

Based on the data analysis, the study proposes a model of collaboration performance presented in Figure 7. The model includes eight significant factors that influence perceived group performance.

In a nutshell, perceived group performance is positively correlated with advancement of project ideas, learning and inspiration but also with satisfaction of group collaboration, joy of collaborating with peers and equal contribution of team members. Among the significant factors that challenge group performance are: social loafing, lack of coordination and a negative perception of usefulness of e-collaboration technology.

According to our findings, despite being heterogeneous with different backgrounds (coming from different study programs and countries), digital native students did not experience conflict and seemed to be

quite satisfied with their collaboration end results (group performance). Students do not think that e-collaboration is difficult, but rather fun and they experience much benefit from e-collaboration. They also think that e-collaboration is very much needed, although there are differences between male and female students' attitudes as well as between Danish and non-Danish students.

It is often assumed that social media will be adopted naturally by the digital natives as they use it regularly for leisure activities; however in a classroom context or work-related context [9] it is important to provide clear guidelines and even training on how a SM platform can be used effectively. Students perceive the open-ended possibilities of Podio too complex, and some of them prefer to replace its collaborative group work facilities with applications they know: like Facebook, Google docs, Prezi that.

The study highlights significant differences in relation to gender and place of origin for collaboration. These differences need to be investigated further and need to be addressed for successful class group work. Females tend to have a less positive attitude towards e-collaboration and therefore this needs to be considered to foster the collaborative processes.

The present study included only a limited number of respondents over the three semesters. In order to consolidate and extend our findings more data will be collected and analyzed in the future. In addition, it would be interesting to compare results across different courses using group work and collaborative technology. The questionnaire has been extended to 22 questions and includes further information about the students' backgrounds and place of origin. Some of the questions have been reformulated in order to obtain ordinal answers instead of dichotomous answers (yes/no) to enable a better statistical analysis in the future. We also wish to include the assessment of the group presentation and the project grade as measure of their learning outcomes. However, as the projects are individual, it is difficult to differentiate between group and individual learning. Finally, we plan to further investigate extended student profiles (including cultural differences, background) and their impact on group composition, collaboration satisfaction and group performance.

7. References

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