STUDENTS PERCEPTION OF RISK: TEAM MEMBERS CONTRIBUTION WITHIN COLLABORATIVE PROJECTS

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ABSTRACT

Collaboration is an important aspect of design, supporting ideation and the ability to tackle greater challenges. Teamwork supports the delivery of project goals across academic and professional fields. It has long been suggested that risk plays a defining factor in collaboration. Through analysis of the literature, few papers reported on the perception that students share risk when they collaborate in teams. This research project aimed to investigate if examples of shared risk can be identified in an educational environment? and how might these risks be perceived by students involved in collaborative projects? To fill this knowledge gap, a survey was conducted to collect the opinions of 44 students within the Department of Design, Manufacturing and Engineering Management, University of Strathclyde. This will build an understanding of the design student experience and identify if these students acknowledge they share risk when collaborating within a team. The cohort of students identified that risk is a defining factor among collaborative design within an educational setting. Students identify that teamwork is essential to provide a real-world comparable experience to industry, yet, has an impact on their educational experience and achievement. Recommendations are made to limit the impact of risk on student collaborative projects within an educational environment. The reduction of risk has the potential to improve teamwork aspects including fairer workload distribution.

Keywords: Risk, collaboration, cooperation, student teamwork

1   INTRODUCTION

Collaboration occurs to achieve a greater outcome than working individually. These benefits include appreciations of diverse opinions, adaptability, broader creativity and communication skills within a team. However, with all modes of working challenges exist including conflicting working styles, lack of organisation, limited knowledge, miscommunication and unequal task distribution [1]. Authors have gone as far as to state that the challenges of collaboration "by far outweigh the benefits" [2]. However, with appropriate planning, novel research areas such as Computer-Supported Collaborative Design (CSCD) interested in the use of technology to support collaborative design activities online can support with the identification of the best ways to conduct design activities in a digital environment [3].

1.1 Risk in Collaboration

Qiu [4] defined a "common confusion" of the differences between the terms "Collaboration" and "Cooperation". Authors Dillenbourg et all [5]and Roschelle and Tea-sley [6] stated it was necessary to make a clear separation between both terms to prevent misinterpretation. Collaboration involves the joint engagement of contributors to make a conscious effort to solve a problem collectively. Teams who are cooperating are inclined to work more independently to achieve the end goal of a project [7]. Both Collaboration and Cooperation involve the interaction of people, however this interaction manifests in different ways [8]:

> *"Cooperation is characterized by informal relationships that exist without a commonly defined mission, structure or effort. Information is shared as needed and authority is retained by each organization so **there is virtually no risk**. Resources are separate as are rewards…"*

*"…Collaboration connotes a more durable and pervasive relationship. Collaborations bring previously separated organizations into a new structure with full commitment to a common mission. Such relationships require comprehensive planning and well-defined communication channels operating on many levels. Authority is determined by the collaborative structure. **Risk is much greater because each member of the collaboration contributes its own resources and reputation.** Resources are pooled or jointly secured, and the products are shared."*

As the term *risk* becomes more frequently used, the definition of *risk* has evolved. For example, in 1981 during the first meeting at the Risk Definition Committee of the Society for Risk Analysis (SRA), thirteen varying definitions of risk were generated and defined due to personal interpretation of the term [9]. Barkley [13] stated that "risks are generally understood as uncertainties that seep into a project and deviate from the expected outcome". Whereas Haimes defined risk as "a measure of the probability and severity of adverse effects" [9].

Team based collaboration in academic environments has become an essential part of learning in education [10] [11]. Compared to traditional learning techniques, collaborative learning achieves higher overall results, increased motivation, more positivity and better understanding taught material during collaboration exercises [13]. No collaborative project is without risk.

Lee & Ra [13] identify factors which influence risk in IT projects including lack of trust amongst project members and stakeholders, diversity of team members, communication barriers, and lack of teamwork present in IT projects. If these challenges are not resolved quickly and fully this could have a detrimental impact on the project, with the potential to lead to project delays and possibly project failure. Hence it is important for design students to collectively work together and tackle challenges as they arise to prevent unnecessary complications and setbacks in achieving the sought-after goal of the project [1].

1.2 Risk in students' teams

Designers often generate a multitude of design ideas and concepts meeting user requirements whilst working in a multidisciplinary team. Team-working skills are vital for the evaluation and selection of the most suitable design for a project [14]. As a result, team-working skills, are classed as fundamental when entering the working environment and have become intrinsic to some academic curriculums [10][11] and as an essential requirement for job application for example design graduate schemes [14]. In an educational environment, students thoroughly enjoy groupwork as they find it more engaging, stimulating and overall, more fun, whereas others prefer the traditional methods of learning such as lecturing in a classroom setting. Group collaboration can introduce introduces "extra costs" [11] for example a shared grade when other team members may not contribute fairly to the submission and has been criticised as an "unfair or inappropriate assessment" method [14].

Tucker and Abbasi's [14] conducted a survey of 198 design students, which highlighted positive and negative perceptions and experiences of design student collaboration. The survey established that *Preparation* was the most common theme towards a positive outcome, where 51.7% of students stated they valued team projects as effective groundwork for their future career in the real world. *Development of Skills* was second with 39.02% of participants responding that they find groupwork helps to improve communication, knowledge, confidence and negotiation and are beneficial skills to develop further before entering the workplace. *Unequal workload contribution* was the most responded negative theme. This was characterised as disharmony within the team with a proportion doing the majority of the work and others making limited/no contribution yet gaining free time which can be utilised elsewhere in their academic studies, potentially improving their overall grade.

Mennecke, Bradley and McLeod [11] state that student's negative attitude towards teamwork comes directly from a lack of formal experiences of projects in the real world. Poole [15] suggests that representative experience could be obtained through organisation, training, scheduled meetings and management processes students' perspective may alter positively. The term *real world* is often a conflicting concept, where it can be interpretated as working together in a team in an organisation, institution or industry however this environment details undefined boundaries [16], therefore hindering on the ability to successfully achieve this experience.

Students share risk in teamwork activities as they are collectively graded and share this grade. If one team member does not contribute the team share the risk of a lower grade. Do students consider this in their teams, and do they understand the impact this may have on their degree classifications?

2   METHODOLOGIES

To answer the research question, *do students perceive risk during student projects*, two sub questions were created *what risk do student share?* and *do student perceive a shared risk?* A digital and physical survey was distributed to students studying at Department of Design, Manufacturing and Engineering Management (DMEM), University of Strathclyde. The students were undergraduates in their 3rd,4th and 5th year of study and had 2+ years' experience with group design projects. 44 students completed and submitted the survey.

Questions asked during the survey were:

1.   How do you find the experience of working in a team in general?
2.   Is risk an area of concern prior to collaborating in teams?
3.   Is risk an area for concern whilst collaborating in teams?
4.   Is risk an area of concern after to collaborating in teams?
5.   Have you ever experienced risk as a design student whilst collaborating in a team within an educational setting?
6.   Does risk play a defining factor on teamwork within an educational setting?
7.   Can the group selection process be improved to minimise risk during collaboration?

Questions were designed in two forms to establish the different types of risks individuals might identify when collaborating in teams. Those with a simple binary response and those with a subjective response to capture arrange of opinions and possible concerns.

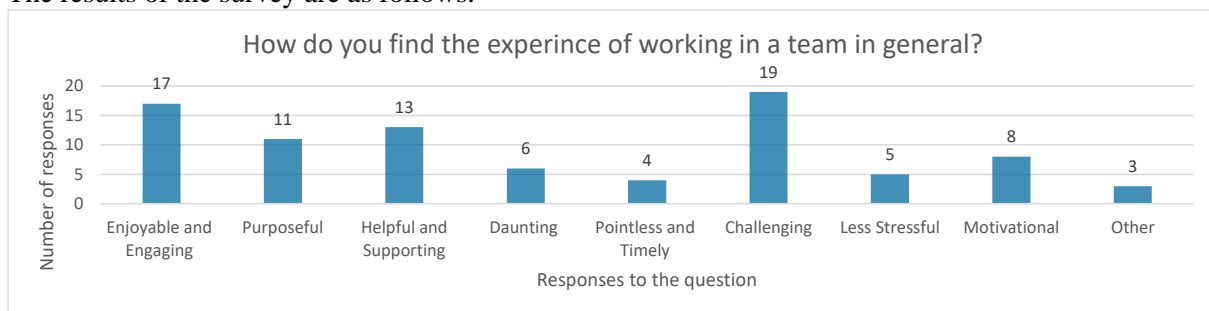## 3   RESULTS

The results of the survey are as follows:

Figure 1. Results to the question on the experience of working in a team

Question One asked *How do you find the experiences of working in a team in general?* The results are displayed in *Figure 1*. Each student was able to select multiple answers to describe how they found working collectively in a team, in order to reflect a more complete expression of their thoughts and experiences. Interestingly, the answer selected most frequently was that students find teamwork *Challenging* with 43.18% of the results. Challenging can be considered as a negative experience. However, in second place and in contrast, 38.60% some students stated they find working in a team *Enjoying and Engaging*. Additionally, 29.54% of students deemed working in a team to be *Helpful and Supporting* compared to working individually. In addition, some of the students sampled, selected the option, *Other*, where they were able to comment and state how working in a team made them feel.

Question Two asked *Is risk an area of concern prior to collaborating in team?* The results are displayed in *Figure 2*. 59.09% of students who completed the survey stated they either *Strongly Agree* or *Agree* that risk is an apprehension before commencing collaboration. Whereas only 18.18% of students stated that they *Disagree* or *Strongly Disagree* that risk is a concern prior collaborating. The remaining 22.72% of students were neutral and selected that they *Neither Agree nor Disagree* with the question asked.

Question Three asked *Is risk an area for concern whilst collaborating in teams?* The results are displayed in *Figure 2*. The results clearly show that most students believe risk to be an area of concern whilst collaborating in teams with 95.00% of students having selected either *Strongly Agree* or *Agree* to this question. In comparison to question two above, where respondents provided a spread of results concerning risk, question three produced a clear and unequivocal response that students identified risk *whilst* collaborating in teams. Prior to working in teams some students anticipated that the positive benefits of teamwork may help cancel or neutralise possible risks that may occur. However, once in a team student experience indicated that any potentially benefits are negated by the risks experienced. This result shows that students do acknowledge that there are significant risks whilst working in teams.
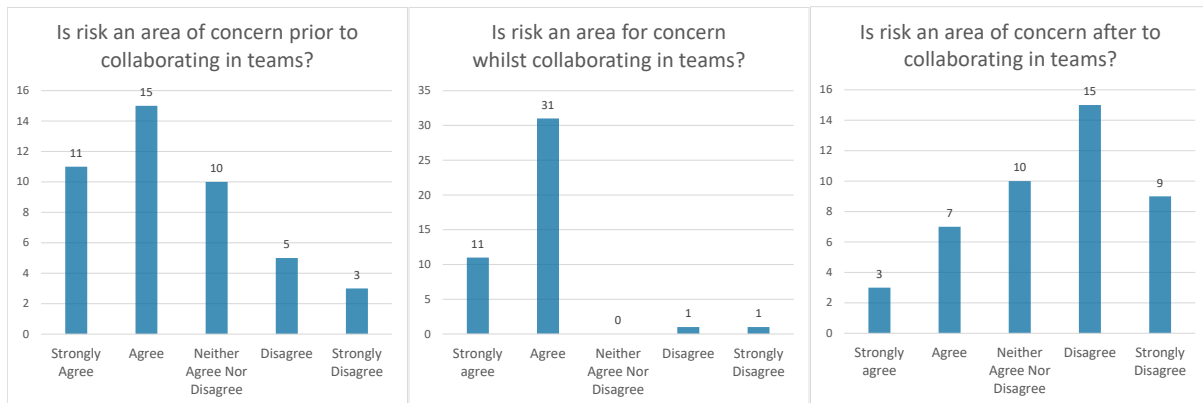
Figure 2. Changes in perception of risk across the project timeline

Question Four asked *Is risk an area of concern after collaborating in teams?* The results are displayed in *Figure 2*. 54.54% students responded reflecting that once the work has been completed and submitted to the university, their concerns regarding risk are less evident.

It may be considered that once a group project has been submitted, student focus moves to the next topic with many students no longer reflecting on the risk of the project completed and possibly do not reflect on the experience of working in that group project until the project is graded by the university.

However, 22.72% of the responses state that they *Strongly Agree* or *Agree* that risk is a consideration after collaborating in teams. This highlighted that some students continue to be concerned on the possible impact of collaborating within teams, and potentially worry about the grade outcome. Interestingly a similar 22.72% of students *Neither Agree nor Disagree* with the question asked, and it might be considered that they are indifferent as they realise, they can no long influence the outcome of the grade, or their focus has simply moved on to their current workload.
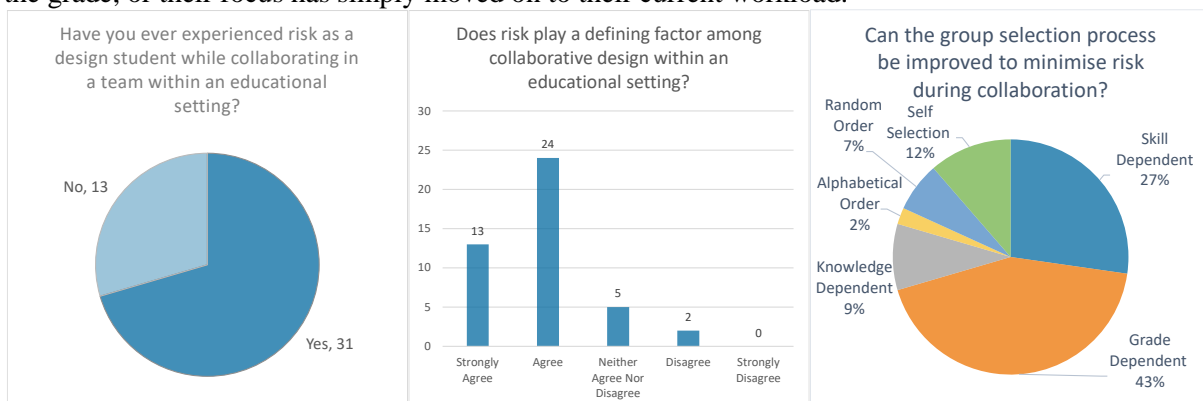

Figure 3. Results to questions on experience of risk, if risk is a defining factor and minimising risk

Question Five asked *Have you ever experienced risk as a design student whilst collaborating in a team within an educational setting?* The results are displayed in *Figure 3* and display that 70.45% of students who took part have experienced risk whilst collaborating in a team within an educational setting. In contrast, the remaining 29.55% say they have not experienced risk in a team.

Question Six asked *Does risk play a defining factor among collaborative design within an educational setting?* The results are displayed in *Figure 3* including that 84.09% of students sampled believe that risk is a defining factor among collaborative design within an educational setting. This is a significant result which has helped to answer the original research question. The results of this question have helped emphasis that students do recognise that they share risk in collaborative projects.

Question Seven asked *How can the group selection process be determined to minimise risk during collaboration?* It was important to understand if the current method of group selection, *Random Order*, within the department of DMEM was the preferred selection method to help minimise risk during collaboration for the students. It was recognised (*Figure 3*) that 43.18% of students indicated that group selection being *Grade Dependent* would be their desired method. This is a significant percentage given that six selection methods were provided as possible answers. Interestingly, the second most preferred

group selection option was the current method of group selection *Random Order* with 27.27% of students indicating this was their preferred method of group selection to minimise risk.

4   DISCUSSIONS

The survey revealed that student's acknowledgement risk during collaborative design projects. 84% of students surveyed believe that risk is a defining factor of collaborative design within education, interestingly the students who completed the survey only focused on their own individual risk and they did not extend the possible of risk to the group as a whole.

Question One highlighted a range of reflections (Figure 1), both positive and negative, on the group composition. For example, *when given a group who do not cooperate* and if you are *in a good group, it can mean you are usually less stressed*. It may be concluded that students have a positive attitude towards teamwork, if they perceive the group members to be a team player.

Questions Two, Three and Four (Figure 2) revealed that students have different perceptions of risk before, during and after projects. Prior to a project beginning, students agree that risk is an area of concern. There is apprehension of team members prior to starting based on previous experiences and reputations. This could be because a project was not as successful as it could have been, all going to plan, or because of breakdowns in cooperation and communication to complete a task on time. Also, prior knowledge of academic ability could have an influence on perception of the team member.

There was a stronger corelation that risk is a concern during projects and less so for before or after. This is to be expected as students have little control over the risk before or after, but they do have the ability to influence the risk during projects and mitigate this risk. After collaborating the trend was towards risk not being a concern. This is the period of marking and assessment, yet students do not have any influence over the outcomes post-submission. The work is complete and beyond the students control at this stage, yet they have been the ones to prepare the work for assessment.

One third of students reported that they had not experienced risk as a design student whilst collaborating in a team within an educational setting. For those who have not experienced risk when collaborating in a team the following was suggested as potential reasons: If a team member had limited experience or skills working in group projects, if they have been fortunate to always experience positive teamwork experience (i.e., never had a bad team member), if the respondent did not fully understand what risk is within the context of student teamwork, if the student has always performed better in teamwork and achieved better grades, they were always in the role of team leader and had control over the coordination and achievement of the team.

It is surprising to have such variation in the number of students who have experienced risk (Figure 3) and who believe it to be a defining factor and brings into question the definitions of collaboration by [8]. Perhaps risk is present but is not perceived by the students. This raises questions about why the risk was not perceived, and if risk were perceived would it have influenced the way the team conducted their collaborative projects?

There is variation of the types of risks experienced by students. However, common themes are *communication*, *achieving a poor grade*, *unequal distribution of workload* and *unreliable and unresponsive team members*. It was evident that each participant has different perspective on which risks are most challenging to them yet there are common risks that apply to all students. Only the risks indicated by the participants were considered, no other risks were introduced as this may have directed participant responses. Likewise, the researcher's opinion of risk was not included as it too may have introduced bias, and in fact the researcher was considered as a safe space for open discussion.

For the department involved in the study to change the way group members are assigned to groups based on the outcomes of the survey would be a risky experiment and it is unclear how future student would perform and respond to such a policy. *Grade Dependent* assignments as apposed *Random* assignments would allow a recognition of the risk present in group assignments.

5   CONCLUSIONS

This research investigated the views of 44 Design Engineering students using a survey to determine if students share risk when they collaborate in teams. The primary outcome was the understanding that 84% of students sampled believe that risk is a defining factor for collaboration. Risk played differing roles at different stages of the design process which may lead to mitigation strategies in future research. Also, a minority of students have either never experienced risk as part of their projects or did not identify risk, this should be further investigated to determine if risk plays an influence on achievement.

This research has determined that selective assignment of team members based on grade from previous projects was a preferred method of team assignment. This method brings challenges to implement and may be contested by students who are assigned to lower achieving teams. However, it is an interesting suggestion which would be a change to the norm for most institutions. A future study could consider academic perception of risk in this area and contrast with the information collated in this paper.

REFERENCES

[1] Green B. N. and Johnson C. D. Interprofessional collaboration in research, education, and clinical practice: working together for a better future, *Journal of Chiropractic Education*, vol. 29, no. 1, pp. 1–10, Mar. 2015, doi: 10.7899/JCE-14-36.

[2] McMahon M. and Bhamra T. Mapping the journey: visualising collaborative experiences for sustainable design education, *International Journal of Technology and Design Education* 2016 27:4, vol. 27, no. 4, pp. 595–609, Mar. 2016, doi: 10.1007/S10798-016-9365-0.

[3] Brisco R., Whitfield R. I. and Grierson H. A novel systematic method to evaluate computer-supported collaborative design technologies, *Research in Engineering Design*, vol. 31, no. 1, pp. 53–81, Jan. 2020, doi: 10.1007/s00163-019-00323-7.

[4] Dillenbourg P., Baker M. J., Blaye A. and O'Malley C. The evolution of research on collaborative learning, in *Learning in Humans and Machine: Towards an interdisciplinary learning science*, E. Spada and P. Reiman, Eds. Oxford: Elsevier, 1995, pp. 189–211. Accessed: Mar. 03, 2022. [Online]. Available: https://telearn.archives-ouvertes.fr/hal-00190626

[5] Sykes C., Moerman L., Gibbons B. and Dean B. A. *Re-viewing student teamwork: preparation for the 'real world' or bundles of situated social practices?*, vol. 36, no. 3, pp. 290–303, Sep. 2014, doi: 10.1080/0158037X.2014.904784.

[6] Roschelle J. and Teasley S. D. The Construction of Shared Knowledge in Collaborative Problem Solving, *Computer Supported Collaborative Learning*, pp. 69–97, 1995, doi: 10.1007/978-3-642-85098-1_5.

[7] Holliman R. and Scanlon E. Investigating cooperation and collaboration in near synchronous computer mediated conferences, *Computers & Education*, vol. 46, no. 3, pp. 322–335, Apr. 2006, doi: 10.1016/J.COMPEDU.2005.11.002.

[8] Mattessich P. W. and Monsey B. R. *Collaboration: what makes it work*. Amherst H. Wilder Foundation, 1992.

[9] Haimes Y. Y. *On the Complex Definition of Risk: A Systems-Based Approach, Risk Analysis,* vol. 29, no. 12, pp. 1647–1654, Dec. 2009, doi: 10.1111/J.1539-6924.2009.01310.X.

[10] Steenkamp A. L. A Standards-Based Approach to Team-Based Student Projects in an Information Technology Curriculum, in *Proceedings of the International Academy for Information Management (IAIM) Annual Conference: International Conference on Informatics Education Research (ICIER),* 2002, pp. 54–62. Accessed: Mar. 03, 2022. [Online]. Available: https://eric.ed.gov/?id=ED481738

[11] Mennecke B., Bradley J. and McLeod M. Making Project Groups Work II: The Impact of Group Process Training and Role Assignment on the Performance and Perception of Information Systems Project Teams, in *Proceedings of the 13th Annual Conference of the International Academy for Information Management,* 1998, pp. 110–121. Accessed: Mar. 03, 2022. [Online]. Available: https://eric.ed.gov/?id=ED431423

[12] Fowler R. R. and Su M. P. Gendered risks of team-based learning: A model of inequitable task allocation in project-based learning, *IEEE Transactions on Education*, vol. 61, no. 4, pp. 312–318, Nov. 2018, doi: 10.1109/TE.2018.2816010.

[13] Ra P. and Lee O.-K. (Daniel). Identifying Risks in IT Projects for Developing Economies, *PACIS 2015 Proceedings*, Jan. 2015, Accessed: Mar. 03, 2022. [Online]. Available: https://aisel.aisnet.org/pacis2015/46

[14] Tucker R. and Abbasi N. Bad Attitudes: why design students dislike teamwork, *Journal of Learning Design*, vol. 9, no. 1, pp. 1–20, Apr. 2016, doi: 10.5204/JLD.V9I1.227.

[15] Amano I. and Poole G. S. *The Japanese University in Crisis, Higher Education* 2005 50:4, vol. 50, no. 4, pp. 685–711, 2005, doi: 10.1007/S10734-004-6372-Y.

[16] Sykes C., Moerman L., Gibbons B. and Dean B. A. *Re-viewing student teamwork: preparation for the 'real world' or bundles of situated social practices?*, vol. 36, no. 3, pp. 290–303, Sep. 2014, doi: 10.1080/0158037X.2014.904784.