



Communication in innovation teams

Willemoës, S.; Mikkonen, J.; Løje, H.

Published in:

Book of Proceedings for the 52nd Annual Conference of the European Society for Engineering Education

Link to article, DOI:

[10.5281/zenodo.14256905](https://doi.org/10.5281/zenodo.14256905)

Publication date:

2025

Document Version

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Willemoës, S., Mikkonen, J., & Løje, H. (2025). Communication in innovation teams. In J. D. Zufferey, G. Langie, R. Tormey, & B. V. Nagy (Eds.), *Book of Proceedings for the 52nd Annual Conference of the European Society for Engineering Education: Educating Responsible Engineers* (pp. 2366-2373). SEFI. <https://doi.org/10.5281/zenodo.14256905>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

COMMUNICATION IN INNOVATION TEAMS

DOI: 10.5281/zenodo.14256905

S. Willemoës

Ballerup, Denmark

J. Mikkonen

DTU

Ballerup, Denmark

ORCID: 0000-0001-8283-1083

H. Løje¹

DTU

Ballerup, Denmark

ORCID: 0000-0003-3843-451X

Conference Key Areas: *Engineering skills, professional skills, and transversal skills
Educating the whole engineer: teaching through and for knowing, thinking, feeling
and doing*

Keywords: *teamwork, interdisciplinary, communication*

ABSTRACT

The quality of communication in innovative teamwork is often a challenge both for students and for professionals and it can have a great effect on the work culture in the team. Often the teams are not able to solve the challenge in the team with the tools they have available. In this study, data has been collected from two innovative teams – a business case with an innovative team in a large global company and a case with a group of students taking a large innovation course at the university. Based on interviews with the teams members from the two cases different tools for communication have been developed and tested. The solutions consists of a list of recommendations and the presentation of three solution designs "Gif-Fun", "Challenge Road" and "Quest Canvas".

¹ Løje, Hanne halo@dtu.dk

1. INTRODUCTION

1.1 21st century skills & Interdisciplinary

The 21st century skillset is generally understood to encompass a range of competencies, including critical thinking, problem solving, creativity, meta-cognition, communication, digital and technological literacy, civic responsibility, and global awareness (for a review of frameworks, see Dede, 2010; Trilling, B. and Fadel, C. 2009). According to Dede (2010), the current workforce is not equipped to deal with the challenges of the 21st century and blames schools “classrooms today typically lack 21st century learning and teaching”. Meaning students are expected to master the skillset during the beginning of their lives, if not, at the beginning of their professional lives.

To meet the need for 21st century skills, Expert in Teams (EiT), an interdisciplinary course at the Norwegian University of Science and Technology (NTNU), was developed (Veine et al., 2023; Sortland and Løje, 2019). NTNU's Experts in Teamwork course is compulsory in all master's programs and programs of professional study at NTNU and is offered to 2,500 students each year. About 100 members of the teaching staff are involved, and 200 learning assistants are employed each year (Sortland and Løje, 2019). EiT's method supports the learning of 21st century skills, in a facilitated active participatory setting. Meaning the teams learn as they go, supported by facilitators who are in turn supported and so on. The proverbial “village” (of help and support) is formed around each team member in what they literally call villages, where the teams have their bases (Veine et al., 2023).

In EiT students from different study programs are placed in interdisciplinary teams and the idea is that they will make use of different viewpoints and different competences to solve case problems for the involved companies.

1.2 Challenges with teamwork

The frustration from team members lacking 21st century skills can adversely affect productivity and well-being, leading to breakdowns in communication and hindering equal contributions from each team member (Oakley et al., 2004).

Tuckman (1965) presents a strategy model for team management, from team formation/building, conflict resolution and team performance. It can be difficult to know when to intervene in team dynamics and using Tuckman's model, it becomes clearer when a team needs support.

Expecting 21st century skills from the participants of teamwork, will invariably weigh differently on every individual, especially on the newer generations whom we already expect a lot, maybe too much, of today. A significant percentage of Millennials and Zoomers, the generation of most of the team members in the study, suffer from perfectionism and hold themselves to an incredible standard.

So while 21st century skills are desired, the reality is that people, in the described cases, were not equipped to handle anyone's, but their own needs. In the realm of innovative endeavors and within the collaborative framework of teams, the cultivation of constructive, open, empathetic, and reflective communication is a crucial factor (Veine et al., 2023). The challenges encountered in the collaborative sphere are not uncommon, with individuals grappling to establish themselves in teams, actively

engage in the collective problem solving, while fostering a sense of inclusion. This study sought to explore the prospect of enhancing communication within innovation teams, unravelling the optimal timing and methodology for such improvements.

1.3 Wicked Problems

People are complicated, as individuals and in groups. Wicked problems mean that if a solution is implemented, it would immediately change how the participants experienced the developing conflict, and as such, mitigate the possible findings for further development. Thus, making iterations and development difficult.

The wickedness of the problem is also pressed upon by today's levels of feelings of inadequacy permeating the millennials and Gen Z's (Hjortkjær, C. (2024) who are described as lacking 21st century skills. Hjortkjær sees the decline in self-esteem, rise in feelings of inadequacy, accompanied by a perfectionist mindset, as the crisis of this generation.

1.4 Communication in teams

In this paper, we will investigate how the quality of communication in innovative teams affects work culture and conflict management. In the study, two distinct cases serve as important illustrations of the complexities surrounding communication in innovative teams. The first case delves into the dynamics of an innovative team of university students in a course at the university, the second a corporate innovation team in a global company with over 10.000 employees.

1.5 Conflict – how to handle conflict

Expect in Teams methodology demands facilitators observing the group dynamics over an extended period. The conflict is then facilitated, and the conversation is monitored, which means that someone has the power to tell you off if you're behaving out of line with constructive collaborative guidelines.

This is necessary if you want to teach people how to handle conflicts, because it forces them to deal with the conflict and their active role in it. As seen (preliminary observations, (Willemoës, 2023) in the innovation teams, the only force maintaining the demand to deal with the situation was, for the students, a deadline for a delivery. But the innovation team didn't work like that, and deliveries were more personalised, meaning nobody had to adhere to constructive collaborative guidelines. When they didn't, it didn't negatively impact anything beyond the relationship of the people within the conflict, resulting in the rejected party becoming bitter and uncooperative.

The behavior described in the cases is not new to humanity or even impossible to understand, and in fact many theorists have come up with a litany of explanations and solutions. The behavior poses a problem because it is complex, multifaceted and not easily solved. Such is a problem described as "wicked problems" by Vermaas et al., (2020).

Initial observations highlighted the rapid formation of cliques within the groups, resulting in difficulty faced by individuals on the periphery with having their voices heard and opinions respected. This dynamic detrimentally impacted the overall workflow of the teams. Specifically, the lack of constructive conflict management, which is transducent to constructive teamwork, was noted "There is no constructive conflict management as seen in the theory of Tuckman, Brené Brown or EiT, in which open dialog, empathy and reflection are needed." (Willemoës, 2023)

So, the study posed the question "How can innovative teams optimise their ability to achieve flow in the face of conflict without neglecting each other's emotions, using gamification and the Expert in Teams methodology/approach?" Based on the findings, three design solutions were then developed and tested. When unable to add constructively to psychological safety within a team, the collaboration opportunities within the team diminishes.

2. METHODOLOGY

The university team was formed by pairs of students banding together and then finding a spot in a bigger formation of 6 people. The students had initially taken personality tests, but these hadn't been discussed or used in any meaningful way. The team was part of the course innovation pilot, which is a compulsory course for Bachelor of Engineering programmes at DTU.

The business team was formed, as most professional teams do, by employment, although a core group of team members had been employed a significantly longer time than the rest of the team.

The results were collected and analyzed as part of an exam project by Willemoës, 2023.

The empirical foundation of the study was established through 1:1 interview, observations of individuals and group dynamics, providing a comprehensive understanding of the communication, within the two innovation teams.

The interviews consisted of a total of 12 1:1 interview. 1 group interview with the university team, 1 group observation session with the business team and a spontaneous 1:1 interview within the business team.

The spontaneous 1:1 interview with the business team output was field notes. The planned sessions semi-structured interview guides had been prepared and voice recorded, with one exception being the group with the business team which was not recorded.

Semi-structured interviews formed the empirical foundation of the study, utilising Thematic Analysis formulated 3 overarching themes and 3 key problems. Solidifying the solution design with a combination of a problem tree and brainstorming.

The dataset then underwent a comprehensive Thematic Analysis, which led to the identification of eight different codes: Authority/Leadership, Personality Type, Maturity, Expectations, Psychological Safety, Conflict Management Skills, Motivation and Mood/Productivity. The eight codes crosswise formed three overarching themes: Personal Development, Project Execution and Power.

The scope was reduced to the Project Execution and, as much as possible, the Power theme.

Three key problems were identified: inner resistance towards interpersonal closeness, social exclusion or rejection of team members, and a discernible lack of workflow cohesion. The intricate relationship between these key problems and the essential 21st-century skills was unmistakable, with conflicting parties exhibiting a notable deficit in the skillset.

Theorists Brené Brown and Tuckman are, with EiT the underlying foundation of the solution design. With Brené Brown's shame research it is possible to take psychological safety into account when designing for people, using Tuckman's model for group development in teamwork a timeframe for the solution design is scoped for the forming and storming phase and lastly EiT's framework for facilitating innovative teamwork highlights what's currently lacking, corroboration wise, from the situations within the two teams.

In the last phase, Gamification was used to shape the 3 solution designs. The result was three concepts "Gif-fun", "Challenge Road" and "Quest Canvas".

3. RESULTS

The 3 solution designs are initial iterations of potential solutions, and will require iterative development, in collaboration with future struggling teams, to solve any of the observed problems.

Gif-fun is an icebreaker exercise to any team meeting, attempting to relax everyone towards the proverbial collaborative table. The goal of the exercise is to make the other team members laugh, resulting in a larger willingness to open up to each other. Gif-fun serves as preparation for the storming phase were the team needs psychological safety and willingness to be open in order to progress to the norming phase.

Challenge Road serves as a whistleblower system and an anonymous way to ask for help, within and outside of the team, with methods from conflict management.

The participant is guided through a binary questionnaire which ends with targeted advice for seeking help inside or outside the team and informing the participants of possible solutions. The goal is to empower the team members who are being ignored or disregarded, by empowering team members who do not feel psychologically safe, included or seen, in a safe and supportive and acknowledging social and racial bias. When the team enters the storming phase, support is needed to constructively enter the norming phase.

Quest Canvas (Figure 1) serves as a project management tool for enhancing team spirit, encourage praise, support, and transparency within the team.

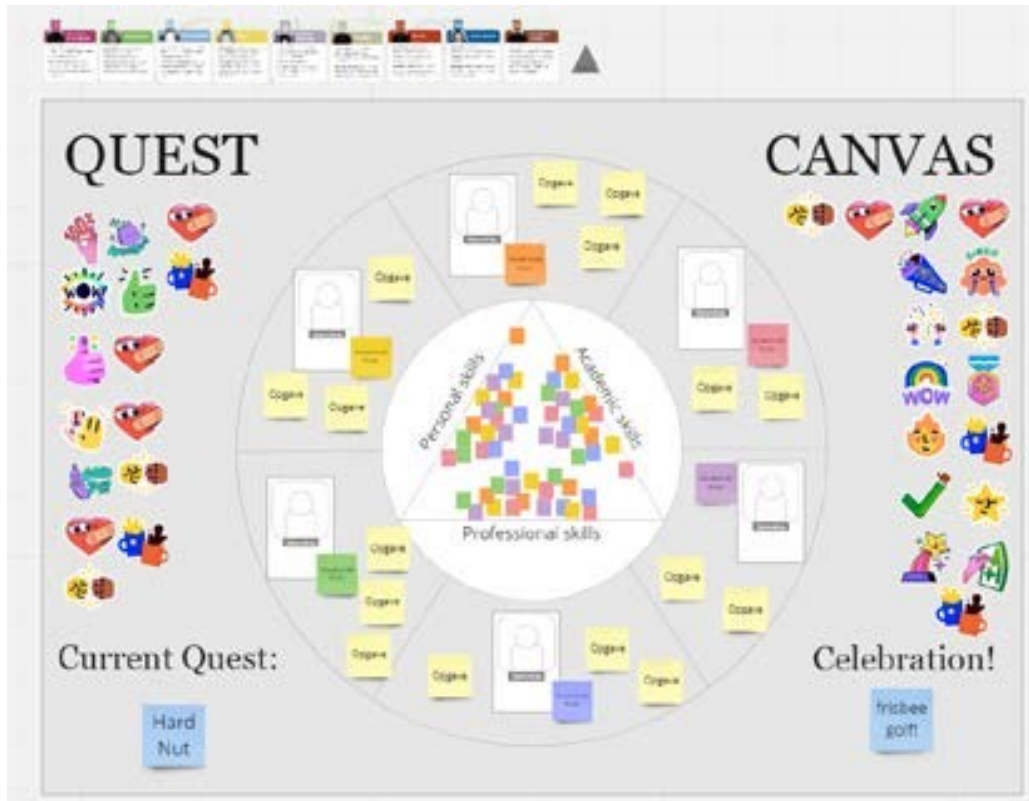


Figure 1: First iteration of Quest Canvas (Willemoës, 2023)

The Quest Canvas (Figure 1) proposed by the study (Willemoës,, 2023) provides an addition to the project management toolset. On the canvas is a circle with a space for each team member. The team member space holds a profile card, tasks and current role within the team. In the center of the team circle, is a “skills triangle” dividing every members skills into 3 categories “Personal”, “Academic” and “Professional”. On the left and right sides of the canvas are celebration stickers, the current focus of the project and how to celebrate the next important milestone within the team. The profile cards can be customized with personality tests and fun exercises (e.g. everyone draws themselves as superheroes)

All three designs are attempts at mitigating aspects of wicked problem theory, for the least invasive and subconscious solution as possible.

The solution designs were tested with another innovation team from the university. Feedback from Gif-fun was positive, though some unintentional consequences were identified such as too much “downtime” looking for gifs and unfunny gifs not landing with the team resulting in awkward silence. Quest Canvas was presented but would have to be tested for a time to form the basis for iteration. Feedback from Challenge Road were complicated to iterate on, the teams were so small that anonymity was practically impossible. Giving and receiving feedback in a group was difficult as the members weren’t trusting each other’s reactions to be constructive. One of the testers said she would withdraw socially and psychologically from a team “as much as she was forced to” in order to, function within the team, to deliver on time. The feedback further stresses that psychological safety is key in collaboration and complicated to achieve, without outside facilitation.

4. SUMMARY AND ACKNOWLEDGMENTS

The attempt to improve communication in innovative teams serves the purpose of facilitating innovation but does so by improving relationships within the team. The 3 solution designs attempt just that, within the confines of the situations described.

Psychological safety within the teams is key for constructive communication and sharing ideas, and everyone needs to approach the proverbial table for that to become possible. Thank you to the 3 teams who talked about their struggles and wishes in the hopes that it will get better when collaborating in high intensity teamwork.

The study is only based on two teams, but it shows that when subgroups form within a team, open and constructive communication suffers. Next step will be to iterate on the concepts, through more testing and interviews. Forming a framework for self-facilitation and collaboration.

The work presented is in the early stages. In future studies a broader testing of the tools in diverse educational settings could be required. Furthermore, collecting more feedback from users in different contexts to further develop guidelines and to show how the tools meet diverse needs.

REFERENCES

- Braun, V., and Clarke, V. (2012). Thematic analysis. *In APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological.* (pp. 57–71). American Psychological Association. <https://doi.org/10.1037/13620-004>
- Dede, C. (2010). Comparing frameworks for 21st century skills. *In J. Bellance, & R. Brandt (Eds.), 21st century skills: Rethinking how students learn* (pp. 51-76). Bloomington, IN: Solution Tree Press.
- Trilling, B. and Fadel, C. (2009). *21st Century skills: Learning for life in our times*, San Francisco, Jossey-Bass.
- Veine, S., Anderson, M. K., Skancke, L. B. and Wallin, P. (2023). Educating learning assistants as facilitators: Design challenges and Experiences of Practice. *Journal of Experiential Education*, 46 (4), 491-521
- Sortland, B. and Løje, H. (2019). Implementing 21st century skills in education at NTNU and DTU. *Proceedings of the 47th SEFI Annual Conference 2019*, pages: 270-277, 2018, Brussels. Presented at: 47th SEFI Annual Conference, 2019, Budapest, Hungary.
- Oakley, B., Felder, R. M., Brent, R., and Elhajj, I. (2004) *Turning student groups into effective teams*
- Tuckman, Bruce W (1965). Developmental sequence in small groups *Psychological Bulletin*. 63 (6): 384–399.
- Hjortkjær, C. (2024). *Utilstrækkelig* (1.edition). Klim.

Willemoës, S. L. V. (2023). Improving communication in innovation teams, Forbedring af kommunikation ved innovationssamarbejde. DTU Department of Engineering Technology and Didactics.

Vermaas, P. E., and Pesch, U. (2020). Revisiting Rittel and Webber's Dilemmas: Designerly Thinking Against the Background of New Societal Distrust. *She Ji: The Journal of Design, Economics, and Innovation*, 6(4), 530–545.
<https://doi.org/10.1016/j.sheji.2020.11.001>