Enhancing Project Success for Interdisciplinary Student Teams: A Belbin's Roles Perspective

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ABSTRACT:

This thesis explores the dynamics of interdisciplinary student teams, focusing on how Belbin's Team Roles can improve team effectiveness and project success. Using semi-structured interviews and data analysis, the study highlights "Role Flux," where team members adapt to various roles based on project needs and personal capabilities, enhancing flexibility and responsiveness.

Key findings reveal that roles like Coordinator, Team worker, Plant, Monitor Evaluator, and Completer Finisher are crucial for successful collaboration, while Specialist and Resource Investigator are often redundant in interdisciplinary teams. The study further emphasizes the benefits of interdisciplinary collaboration, such as enhanced creativity, role awareness, and professional growth, alongside the challenges of role imbalances and varying work styles. By applying Belbin's framework, this research concludes that interdisciplinary student teams can improve collaboration, leverage diverse strengths, and achieve better project outcomes through adaptability and structured role distribution.

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1. INTRODUCTION

Learning within interdisciplinary student teams refers to the process through which individuals from diverse academic backgrounds come together to collaborate, exchange knowledge, and solve complex problems by leveraging their unique expertise and perspectives (Stalmeijer et al., 2007). Although there a various positives aspects to learning and working within interdisciplinary teams, such as solving complex issues which cannot be tackled by only one discipline, personal and professional growth by interacting and gaining knowledge from different disciplines, networking opportunities, there are also challenges, such as integrating every perspective into the product, creating agreements across all disciplines, dealing with feedback and criticism, and communication across the different disciplines (Abdallah Shanableh et al., 2022).

In today's dynamic and complex world, interdisciplinary collaboration has become increasingly essential for addressing multifaceted challenges and driving innovation through various disciplines (Karzenbach & Smith, 2003). Within educational settings, the integration of interdisciplinary approaches not only cultivates diverse perspectives but also fosters holistic learning experiences for students (McGrath, 1984).

The goal of interdisciplinary teams is understanding that effective interdisciplinary collaboration is more than just adding individuals from diverse disciplines. This does not guarantee team synergy, collaboration or project success. Instead, it also needs deliberate efforts to construct teams with complementary skill sets, personalities, and working styles (Belbin, 2012). By applying Belbin's Team roles Theory, educators and team leaders can strategically compose interdisciplinary student teams that exhibit balanced role distribution, hereby enhancing the team's capacity to navigate complex challenges and achieve desired outcomes which would therefore lead to project success. Since a project is more often than not a means to an end, it is reasonable to expect either failure towards the end goal or success. Project success can be determined from two different perspectives, the means (project itself) or the ends (what the project intended to achieve) (Bannerman, 2008). Defining when a project will be a failure or success is dependable on the actors of a group, or it could even be down to the individuals defining success personally (Bannerman, 2008). This thesis explores the utilization of Belbin's Team Roles theory as a framework for assembling interdisciplinary student teams with the requisite roles to ensure project success.

1.1 Problem Statement

The problems which are being faced by today's society are far too complex to be solved by a team which is comprised by a single discipline (Jaskyte, Hunter, & Mell, 2023). Interdisciplinary teams are comprised of a variety of disciplines working together to achieve a goal, or a specific project (Øvretveit, 1996).

Despite the growing emphasis on interdisciplinary collaboration within educational settings, the effectiveness of interdisciplinary student teams in achieving project success remains variable. While the integration of diverse perspectives is valuable, the composition and dynamics of these teams often lack the strategic alignment necessary for optimal performance (McGrath, 1984). This deficiency can lead to challenges such as role ambiguity, communication breakdowns and suboptimal usage of team members' strengths (Ancona & Calwell, 1992). These challenges are problematic as team members do not know which tasks they aim to complete, as well as whose responsibility certain tasks, which may lead to a decrease in work quality and team synergy.

1.2 Research Question

To tackle the challenges within interdisciplinary student teams, we need to understand which combination of roles is necessary for project success of students in higher education. Project success in this case will be defined as achieving the attempted goal of a project. Such as, attaining a certain grade, or achieving a certain result for the project (Lim & Mohamed, 1999)

This research will be carried out under the following research question:

Which team roles are necessary within interdisciplinary student teams to achieve project success?

1.2.1 Research objective:

The objective of this research is to examine the effects of Belbin's Team Roles theory within the context of interdisciplinary student teams, considering the unique dynamics and challenges associated with academic student projects. This research aims to investigate the impact of unbalanced role distributions on project success while developing practical guidelines and strategies for educators and team members to facilitate the formation and management of interdisciplinary student teams based on Belbin's Team Roles Theory.

1.3 Contribution

Collaboration among interdisciplinary student teams has become increasingly prevalent, especially as educational institutions recognize the value of diverse perspectives in fostering innovation and problem-solving. However, the effectiveness of such collaboration heavily depends on clear role allocation and efficient communication. Interdisciplinary teams hold unique potential for generating innovative ideas and addressing complex problems through the integration of various viewpoints and expertise (van Knippenberg & Schippers, 2007). Nonetheless, differences in disciplinary backgrounds can present challenges, as individuals bring distinct approaches and operational methods. This study addresses these complexities by developing specific guidelines and strategies based on Belbin's Team Role Theory to support the structured formation and management of interdisciplinary student teams.

A significant contribution of this research is to the field of team creation and team management in educational settings. By clarifying the necessary roles and combinations within interdisciplinary student teams, this research provides educators and team leaders with actionable insights to construct teams that maximize role diversity and effectiveness. This contribution is especially relevant to preparing students for real-world professional environments, where interdisciplinary collaboration is increasingly common. Through these guidelines, students not only gain awareness of how diverse disciplines intersect but also learn how to navigate the complexities of teamwork, thus equipping them for the multifaceted demands of future professional roles.

As the literature review section will explore, while existing research investigates Belbin's Team Role Theory in interdisciplinary contexts, there remains a substantial gap in understanding its application within interdisciplinary student teams. This study seeks to fill this gap by identifying which roles are crucial for project success and examining how these roles interact within the context of interdisciplinary student teams. By understanding role dynamics and combinations, this research aims to enhance collaboration, productivity, and outcomes within student teams, ultimately contributing to both educational practices and broader team-management methodologies.

2. LITERATURE REVIEW

2.1 Theoretical Framework

A team is often defined as a group of individuals working collaboratively toward shared objectives. Each member of the team typically brings a unique set of skills and perspectives, which collectively contribute to the achievement of the team's goals. Teams can range from homogenous groups, where members share a similar background and expertise, to heterogeneous or interdisciplinary teams, which are composed of individuals from diverse academic or professional fields. In the context of interdisciplinary student teams, the latter form is most common, as students come together from different disciplines to collaborate on projects, bringing in varying methods of thinking, problem-solving approaches, and domain-specific knowledge (Borrego, Foster, & Froyd, 2014).

The roles that individuals play in a team are crucial for effective collaboration. These roles help to distribute responsibilities, clarify contributions, and structure interactions within the group. According to Belbin's Team Roles theory, every individual has a natural inclination toward a specific role or set of roles within a team, and these roles are essential for the overall functioning and success of the group (Belbin & Brown, 2012). Belbin identifies nine roles, each contributing a distinct set of strengths: the Plant, Monitor Evaluator, Coordinator, Shaper, Resource Investigator, Implementer, Teamworker, Completer Finisher, and Specialist. These roles can be broadly categorized into action-oriented, social, and thinking roles. Belbin's theory emphasizes the importance of having a balanced team where multiple roles are represented, allowing for effective idea generation, coordination, execution, and analysis (Belbin & Brown, 2012).

2.2 Interdisciplinarity and Its Challenges

Interdisciplinary collaboration within teams is fundamental in modern day education and research, aiming to address complex problems that require diverse areas of expertise. Interdisciplinary teams have great levels of diversity; moreover, diversity within interdisciplinary teams has been recognised as both a challenge and a catalyst for innovation (Cummings & Kiesler, 2007). Van Knippenberg and Schippers (2007) state that heterogenous teams can generate more innovative solutions which stem from the varied perspectives and areas of expertise.

Literature regarding interdisciplinary teams has a glaring focus on the compositions of such teams, as well as the interaction between the different disciplines involved in specific interdisciplinary teams. Stalmeijer et al., (2007, page 04) stated that 'greater diversity has shown to increase likelihood of debilitating conflict within teams'. These conflict may stem from misunderstanding of each other's expertise, or varying ways of communicating which negatively interact with each other.

2.3 Interdisciplinary Student Teams

Interdisciplinary student teams, which bring together individuals from diverse academic backgrounds to work on common projects, have become increasingly common in educational settings. These teams reflect the complexity and dynamic changes of professional environments, where interdisciplinary collaboration is often essential for innovation and problem solving (Borrego & Newswander, 2008). Such teams make use of the varying perspectives and skills of their members, facilitating a richer learning experience and development of more comprehensive solutions (Repko, 2012). However, such student teams also face significant challenges, such as varying levels of expertise or different terminology.

The dynamics within interdisciplinary student teams can be compared to those in professional interdisciplinary teams, as both groups must navigate similar obstacles to guarantee successful collaboration. Students participating within interdisciplinary teams often struggle with role ambiguity, conflict resolution, and the integration and comprehension of diverse viewpoints (Edmondson & Nembhard, 2009). Effective team performance in these settings depends on the ability to foster mutual respect, clear roles and a shared vision (Salas, Cooke & Rosen, 2008). These challenges experience by interdisciplinary student teams highlight the importance of structured team roles, and effective collaboration across these roles, which can guide interdisciplinary student teams toward their goals (Wuchty, Jones & Uzzi, 2007). It is therefore important to realise which role each member serves within the team, in order to increase the effectiveness of such team towards achieving project success.

2.4 Belbin's team Roles in Interdisciplinary Teams

Belbin's Team Role Theory, developed by Dr. Meredith Belbin in the 1970's identifies 9 distinct team roles that groups members naturally adopt when working in teams. These roles include Plant, Resource Investigator, Coordinator, Shaper, Monitor evaluator, Team worker, Implementer, Completer Finisher and specialist (Belbin, 2012). Each role is characterized by specific behavioral tendencies, strengths and weaknesses.

Belbin's Team Role theory offers valuable information into improving team composition within interdisciplinary teams. By identifying and leveraging individual team roles, teams can enhance collaboration effectiveness and maximize project success through the following mechanisms (Belbin, 2012):

Role allocation: Assigning team members roles based on their strengths and preferences, which enables a more balanced distribution of tasks and responsibilities. Prevent role ambiguity conflicts, and ensures equal contribution.

Complementary skills: Belbin's theory highlights the importance of diversity in teams. By leveraging this diversity interdisciplinary teams can approach problems from multiple angles, leading to more robust solutions. Effective collaboration is facilitated as team members appreciate each other's contributions.

Role flexibility: Belbin acknowledges that individuals can showcase multiple varying roles depending on context. This flexibility allows team member to adapt their behaviors to suit the needs of the team, and the task at hand.

Self-awareness and team awareness: The theory encourages self-awareness among team members regarding their preferred roles and collaboration styles, as well as awareness about your team members' preferred roles and collaboration styles. This in turn facilitates more effective collaboration, as team members can tailor their interactions to ensure clarity and understanding.

The research question intends to identify the optimal combination of Belbin's Team Roles within interdisciplinary student teams to increase likelihood of project success in higher education settings. It explores the significance of assigning roles according to members' strengths and preferences, as well as leveraging the diversity of skills within the team to approach challenges from various perspectives.

Belbin's Team Role theory offers valuable insight into creating a more understanding environment in which members of an interdisciplinary team can thrive based on their role, and their skills. By fostering self-awareness, and team awareness, interdisciplinary teams can overcome challenges and achieve their objectives more efficiently (Belbin, 1993).

The theory proposes that successful teams are comprised of individuals who fulfill specific roles, each contributing unique strengths and skills to the team's objectives (Belbin, 2012). Research on interdisciplinary teams has explored the application of Belbin's theory, revealing its ability to enhance team performance. An example is a study by Druskat and Wheeler (2003), which found that teams with a diverse mix of Belbin's roles demonstrated higher levels of creativity and problem solving ability. Within diverse teams come diverse roles. This is why it is important to have clear role expectations and effective communication among members is of utmost importance (Van Knippenberg et al., 2007).

2.5 Role Ambiguity and Its impact on Team Dynamics

Role ambiguity and role clarity are crucial factors which influence team dynamics and performance. Role ambiguity refers to the lack of clear expectations or understanding regarding one's role within a team, whilst role clarity being the opposite of role ambiguity. Role ambiguity can have detrimental effects on the way a team functions. When team members are uncertain about their roles, it can lead to confusion and frustration, and reduced motivation (Morrison, 2011). This ambiguity may result in duplicated efforts, conflicts over responsibilities, and overall inefficiency within the team (Morrison, 2011).

Conversely, role clarity has been associated with improved team performance and satisfaction. Teams with clearly defined roles tend to experience higher levels of cohesion, communication, and task coordination (Marks et al., 2001), When individuals understand their responsibilities and how they contribute to the team's goals, they are more likely to feel engaged and motivated (Hackman & Oldham, 1976). Moreover, role clarity plays a crucial role in diminishing interpersonal conflicts within teams. When expectations are clearly communicated, and understood, misunderstandings and disagreements are less likely to arise (Griffin et al., 2007). This creates a positive team environment which leads to collaboration and productivity.

Interdisciplinary teams have been researched, and it has been noted that they follow specific challenges which are unique to interdisciplinary teams. Challenges such as clarity of vision, respecting and understanding team roles as well as appropriate task allocations (Nancarrow et al., 2013). However, a limited amount of research has been done about the formation of interdisciplinary student teams, specially from a the Belbin's team role theory framework. This study aims to investigate the effects of applying Belbin's framework to the formation of interdisciplinary student teams in order to ascertain which roles are the most necessary for students' project success.

3. METHODOLOGY

3.1 Research Methods

In order to collect data and generate results regarding the necessary team roles in order to guarantee project success within interdisciplinary student teams, this research adopted a qualitative approach, specifically through semi-structured interviews with students who worked within interdisciplinary student teams. Semi-structured interviews are effective for exploring complex experiences as they allow flexibility while also maintaining question consistency (Kvale & Brinkmann, 2015). The focus of the analysis was on student teams. Participants were recruited through coordination with students of interdisciplinary modules during the fourth quarter of the academic year, which ensured the perspectives are recent and fresh.

3.2 Sampling

For the interviews a sample of 4 interdisciplinary student teams were selected, of that sample 2 members of the interdisciplinary student team were interviewed. This makes a total of 8 interviews for this study. The questionnaire contained 20 questions. The student teams were selected through the following criteria:

- Participated in an interdisciplinary student team in Q4 of the 2023-2024 academic year in order to guarantee a recent outlook towards the individuals participation within the interdisciplinary student team
- All member of the team must be undergraduate students
- Team consisted of at least 3 different disciplines
- Teams consisted of students from the University of Twente
- Team are representative of various different disciplines within the University of Twente.

With these criteria we aim to guarantee a large mix of disciplines within teams and at the same time making sure that the experiences are fresh, which will enhance the reliability and validity of the findings (Patton, 2015).

3.3 Data Collection

In order to gather data through the use of interviews a set of specific topics have been set, under which a set of questions based on the topics were asked to the interviewee, this is to ensure every topic has been covered. The topics which were covered are Belbin's team role for interviewee meaning: ascertaining which role they play within their team, and which other roles are present, they were also asked about which roles they believe are necessary and which ones can be missed for project success. They were asked about their satisfaction of working within interdisciplinary teams, as well as ideal improvements. Interviewees were handed a form which guarantees that answers may be used for research, as well as the fact that answers were provided consensually. In order to ensure the validity of the interviews, there was a list of questions which were asked to every participant. However, it must be noted that within semi-structured interviews flexibility is allowed, this helped the interview become a conversation and not a checklist. To mitigate this issue, a list of follow up questions was be crafted which the interviewer can choose from depending on the demands of the situation (Babbie, 2019). The data collected through the interviews was used to generate results which were analyzed in order to generate an answer to the research question.

3.4 Data analysis

Interviews were recorded and transcribed to ensure that the data was accurate. Data analysis involved the coding of the transcript to transform the unstructured data into structured data based on categories created through themes and patterns (Braun & Clarke, 2006). This method allows for systematic identification of recurring themes, which enhanced the depth and reliability of the analysis. If any interview answers are deemed as unusable/unnecessary said data instances will be removed (Delve, 2020).

The student teams were categorized according to which discipline each member of the team followed, as well as under which discipline the project they worked together in falls. The disciplines which were represented within the interdisciplinary student teams are, computer science, international business administration, communication science, psychology and business information technology.

3.4.1 Overall Process

3.4.2 Coding process

The coding process for analyzing the semi-structured interviews involved using the software Atlas.ti to systematically organize and interpret recurring themes across participant responses. This software enabled a breakdown of the interviews into distinct categories or codes that highlighted various aspects of team dynamics within interdisciplinary student teams. The primary themes identified were Benefits of Interdisciplinarity, Role Flux, Role Conflict, Necessary Roles, Redundant Roles, and instances where specific team roles were mentioned. By categorizing responses according to these themes, the coding process allowed for an efficient sorting of information that aligned with each category's focal point. This thematic organization was instrumental in extracting meaningful insights from each category, enabling the formulation of conclusions presented in the results section. The use of Atlas.ti in this way not only streamlined the analysis but also provided a structured approach to identify patterns and draw connections between recurring themes across interviews, thereby strengthening the overall findings of the study.

4. RESULTS

The results section of this thesis presents the findings from the investigation into the dynamics of interdisciplinary teams and the application of Belbin's team roles to enhance their ability to achieve project success. Through a series of interviews, and data analysis, several key themes emerged that provided information on how team roles are effective or ineffective for project success within interdisciplinary student teams. These findings are organized into different sections created from the major themes which were apparent within the interviews. The information gathered from participants provides a comprehensive understanding about the way interdisciplinary teams work and how Belbin's Team Roles theory can support these kinds of teams working towards project success.

4.1 Preferred Role combination

Based on participants insights, the optimal combination of roles for interdisciplinary teams includes a balance of strategic, creative and operational functions. The ideal mix involves: a *coordinator* to oversee and unify the team's efforts, a *team worker* to ensure smooth collaboration and resolve conflicts, a *plant* to create innovative ideas and creative solutions, a *monitor evaluator* to provide critical assessments and maintain strategic direction, a *resource investigator* to introduce new insights and external perspectives when necessary, and lastly a *combination of implementer and completer finisher* roles to ensure that plans are executed effectively and tasks are completed with high quality. This balance allows the interdisciplinary teams to leverage diverse strengths and adapt to various challenges, enhancing the overall performance and success within interdisciplinary team project.

4.2 Benefits of interdisciplinary student teams as expressed by participants

The participants in this study pointed out numerous benefits of working within interdisciplinary teams, emphasizing the advantages that arise from bringing together individuals from diverse academic disciplines. This section explores these benefits as identified by the participants.

4.2.1 Diverse levels of creativity and knowledge

One of the primary benefits noted by participants is the inclusion of diverse levels of creativity and knowledge into the team. Interdisciplinary student teams bring together individuals with varied expertise, allowing for an exchange of ideas and innovative solutions. This diversity enhances the team's ability to think outside the box and approach problems from different angles, which creates a more dynamic and creative working environment, which was viewed positively among participants.

4.2.2 Awareness of Roles and Collaboration

Participants found that working in interdisciplinary teams enhances awareness of individual roles and responsibilities. This awareness improves collaboration, as team members from different fields need to clearly define their roles to avoid confusion and maximize each person's strengths. By recognizing each member's contributions, teams foster mutual respect and efficient role distribution, ultimately increasing the chances of project success.

4.2.3 Socializing beyond own circle

Students appreciated the opportunity to engage with peers from different academic backgrounds, which broadened their social and professional networks. By working with people outside their usual circles, participants were exposed to different ways of thinking and problem-solving, enhancing creativity and inclusivity. Participant 1 reflected:

"It was great to work with people I wouldn't normally work with, it opened my mind to new ideas."

This showcases how the participant viewed socializing beyond their own circle as a positive experience.

4.2.4 Interdisciplinary learning

Interdisciplinary teams provided participants with valuable learning experiences. Collaborating with individuals from different disciplines helped them gain new skills and insights, making them more versatile in their problem-solving. Through hands-on collaboration and discussions, participants learned alternative approaches to tasks, which contributed to personal and professional growth. As stated by participant 8:

"The most rewarding aspect is the opportunity to learn from different perspectives and approaches. Working with students from various disciplines allows me to gain insights that I wouldn't have encountered otherwise, enriching my knowledge and problem-solving skills"

This showcases the positive impact interdisciplinary learning has amongst students who participate within such projects. Highlighting that participating in such teams creates new knowledge and insights as well as helps develop students problem-solving skills.

4.2.5 Tackling complex challenges

The combined expertise in interdisciplinary teams enables them to tackle complex challenges more effectively. Participants emphasized that each team member brings specific knowledge that contributes to different aspects of a problem. For instance, technical students handle data analysis, while creative members focus on design solutions. This collaboration from diverse fields allows teams to devise innovative solutions and improve project outcomes. Participant 6 describes this in the following quote:

"Our team's mix of expertise really helped us tackle complex problems. The technical students took on the data analysis, while the creative folks focused on the design aspects. Bringing in skills from different fields let us come up with solutions that were both innovative and practical"

4.3 Necessary and Redundant roles

In the context of Interdisciplinary student teams, participants identified certain Belbin team roles as necessary for effective collaboration and team success, while others were perceived as

less critical. This section delves into the roles that were consistently highlighted as necessary and those that were deemed redundant. Additionally, it explores the participants 'views on the optimal role combination for achieving project success.

4.3.1 Necessary roles

Several roles were mentioned consistently as necessary for the effective functioning of interdisciplinary student teams. These include (1) *coordinator* - recognized for their ability to manage team dynamics and facilitate communication; (2) *team worker* - valued for fostering cooperation and supporting team cohesion; (3) *plant* - appreciated for their creativity and problem solving skills; (4) *completer/finisher* - noted for their attention to detail and ability to ensure task completion; (5) *monitor evaluator* - important for their objective analysis and strategic planning; (6) *implementer* - essential for translating ideas into actionable plans; and (7) *resource investigator* - valued for their ability to bring in new information and opportunities.

These roles are essential because interdisciplinary student teams combine diverse expertise, and each role brings a distinct skill set that increases collaboration and project outcomes. For example, the coordinator ensures that the varied perspectives are harmonized, the plant brings innovative solutions, and the completer/finisher guarantees that ideas are executed with precision. Each role compensates for potential gaps in knowledge or skills across disciplines, ensuring a balanced approach to problem-solving and project completion.

4.3.2 Redundant roles

Some roles were considered redundant in interdisciplinary student teams, as the diversity of expertise within the team may naturally cover those functions. For example, the *Resource Investigator* might be unnecessary if the team already has a member with strong research skills or access to external sources. In such cases, the team doesn't need a dedicated role to scout for external resources because members are either well-connected or self-sufficient in gathering information. Similarly, the *Specialist* role is seen as redundant because the interdisciplinary nature of the team implies that each member already brings specialized knowledge from their field, making it unnecessary to assign someone solely for expertise in a niche area.

Participants highlighted that some roles were not always necessary, depending on the team's composition. The *Resource Investigator*, while valued by some, was not considered essential by others, especially in teams where all members contributed equally to research and external networking. When team members already had the necessary connections or knowledge, this role was perceived as superfluous. The *Specialist* was mentioned as redundant by all participants, as its limited applicability in the broader team context was evident. In interdisciplinary teams, where members already bring diverse expertise, an additional person solely dedicated to specialized knowledge was seen as unnecessary.

The *Completer Finisher*, though valued by some for their thoroughness and attention to detail, was regarded by the majority as non-essential, particularly in fast-paced projects that prioritize rapid progress over perfection. In such scenarios, the meticulousness provided by this role was sometimes seen as less critical.

The *Implementer*, responsible for turning ideas into actionable plans, was necessary in certain contexts where the team lacked members with strong organizational skills. However, in teams with multiple members who naturally focused on practical execution or where the team worked highly collaboratively toward shared goals, this role became redundant. This is especially true in interdisciplinary student teams, where collaboration and shared responsibility are often emphasized, reducing the need for a dedicated implementer.

4.3.3 Interpreting overlap

The overlap of roles in both necessary and redundant categories indicates a dependency on the context of the interdisciplinary student team. For example, the completer finisher and implementer roles are crucial when the team is in the later stages of the project, focusing on finalizing details and ensuring that tasks are executed efficiently. In these phases, the precision and practical skills these roles provide are indispensable for meeting deadlines and delivering high-quality results. However, in the early stages of the project, when brainstorming and creative thinking are the primary focus, these roles may be less critical or even redundant.

Additionally, in highly collaborative teams, where all members contribute to task execution and attention to detail, the implementer or completer finisher roles might be seen as redundant because other members naturally take on those responsibilities. This suggests that the value of certain roles fluctuates based on the project's phase, team dynamics, and the distribution of skills across the team members. In some cases, interdisciplinary student teams may already have members with overlapping skill sets, making specialized roles less essential.

4.4 Role Flux

A key finding from the interviews conducted for this thesis is the concept of "Role Flux," where participants indicated that team members frequently adopt multiple roles within interdisciplinary teams. This role flexibility allows team members to adapt dynamically based on the project's needs, which enhances the team's overall effectiveness. Unlike rigidly defined roles, role flux enables students to transition between roles as circumstances require, highlighting the versatility required for project success in interdisciplinary settings.

In interdisciplinary student teams, several roles were consistently recognized as essential for effective team functioning, including the *Coordinator, Team Worker, Plant, Completer Finisher, Monitor Evaluator, Implementer, and Resource Investigator*. The roles commonly undertaken by team members were found to be dynamic, creating new combinations depending on project requirements. For instance, the Coordinator and Monitor Evaluator roles often overlapped because both require skills in managing team dynamics and providing strategic oversight. Participants with strong leadership and analytical skills frequently alternated between coordinating team communication (Coordinator) and offering objective assessments of team progress (Monitor Evaluator). This fluidity allowed members to effectively guide team interactions and ensure balanced decision-making, addressing the team's immediate needs.

Similarly, an interplay was observed between the Shaper and Team Worker roles. While the Shaper drives the team toward goals, the Team Worker promotes cohesion and cooperation. In practice, a team member focused on harmony (Team Worker) could take on the Shaper's assertive approach when the project's progress required more direction. This shift illustrated the adaptability needed to ensure forward momentum, particularly when team members encountered challenges or stalled progress. Participant 3 noted:

"I undertake various roles depending on the needs of the team, and my teammates do as well within interdisciplinary teams."

Another example is the frequent pairing of Completer Finisher with Coordinator responsibilities. When a project required a high degree of organization and focus on quality, a team member initially focused on detail and completion (Completer Finisher)

would step into the Coordinator role to organize tasks and ensure timelines were met. Participant 1 expressed this concept:

"During group projects, I take up the role of Completer Finisher; however, sometimes I also become a Coordinator when needed."

The concept of role flux thus underscores two main characteristics of interdisciplinary team roles: dynamic combinations and transitional flexibility. Roles dynamically combine depending on project demands, allowing teams to approach problems holistically by pairing complementary strengths in creative, strategic, and execution-oriented roles. Moreover, roles are subject to transition, where team members adopt different roles as required throughout the project lifecycle. This often occurs out of necessity rather than comfort, enhancing the team's adaptability to shifting project needs.

Participants also emphasized that this fluid role adoption allows members to leverage personal strengths and compensate for weaknesses within the team. For example, participants with leadership skills would often step into a Coordinator role during discussions, then transition back to their primary role once the need was met. This fluid transition, was described by participant 5 as:

"stepping into different roles beyond my main role depending on what's needed,"

Overall, these findings emphasize the value of adaptability within interdisciplinary student teams. This flexibility and openness to role flux equips interdisciplinary student teams with the tools to meet project demands, and increase the probability of project success.

4.5 Conflicts within interdisciplinary student teams and solutions

Participants in the study highlighted several conflicts encountered while working in interdisciplinary teams, along with practical solutions to these challenges. One common conflict was the imbalance of roles within the team. Some participants felt that certain roles were overrepresented or underrepresented, leading to inefficiencies and frustration. The diversity of disciplines brought varying working styles and expectations. Participants noted that these differences in disciplines often led to misunderstandings and conflicts regarding work processes and timelines. Additionally, participants frequently experienced conflicts due to differing understandings and opinions about topics. This was particularly challenging when team members came from vastly different academic backgrounds, each bringing unique perspectives that sometimes clashed. Another challenge was the struggle to confidently express one's opinion when surrounded by diverse perspectives, which sometimes led to internal conflict and hesitation in contributing to discussions. participant 5 explained:

"It is difficult sometimes, you are in a room full of people who think differently, and it can feel intimidating to speak up, or share something when you are not sure they will understand where you are coming from"

To address these conflicts, participants emphasized the importance of open communication. By creating an environment where team members could freely express their concerns and viewpoints, many conflicts could be resolved more effectively. Several participants highlighted the benefits of holding in-person meetings to discuss issues. Face-to-face interactions helped in clarifying misunderstandings and building stronger interpersonal relationships, thus decreasing conflicts. Participant7 shared:

"When we met in person, it was easier to explain where I was coming from. You could see people's reactions, and that made it easier to reach an agreement.".

Encouraging team members to ask for help when needed was another solution. This approach helped in decreasing knowledge gaps and ensuring that all team members were on the same page, thereby reducing conflicts arising from miscommunication or lack of understanding. Participant 5 noted:

"Once I realized it was okay to ask for help, things got so much smoother".

Regular group meetings where everyone's opinions were taken into account were seen as crucial. This practice ensured that all team members felt heard and valued, leading to more harmonious and productive teamwork. A team member commented, "In our meetings, even if you disagreed with something, you had the chance to explain your side. That really helped keep things from becoming bigger problems.". Finally, seeking and providing feedback from all group members was identified as a key strategy. This not only helped in resolving ongoing conflicts but also in preventing future ones by continuously improving the team dynamics and processes. Participant 2 reflected:

"The feedback sessions were important. You got to hear what was working and what wasn't, and we adjusted things before they turned into bigger issues."

4.6 Improvements for enhancing project success

Participants provided various suggestions as to how one could enhance the effectiveness on Interdisciplinary student teams in order to achieve project success, with a focus on team roles as well as role distribution. A prevalent recommendation for improvement was ensuring that team members are knowledgeable about their own roles as well as the roles of their team members before starting to work on the project. This understanding was explained to be crucial for smooth collaboration and effective role performance. Participants also emphasized the importance of a clear distribution of roles among team members. They noted that clearly defined roles help in avoiding confusion and overlapping of responsibilities, and thus creating a higher level of efficiency and productivity within the team, as everyone is conforming to their own tasks within their roles. Lastly, an improvement which was mentioned by various participants was raising awareness about the importance of team roles. Participants believed that understanding the significance of each role within the team would lead to better appreciation and utilization of individual strengths, creating a more cohesive and effective team dynamic. Participant 7 highlighted

"Once we understand the importance of each role, you can appreciate what everyone bring to the project, it is easier to work toegether".

To summarize, the results of this study reveal key insights into the dynamics of interdisciplinary student teams and the effectiveness of Belbin's team roles in enhancing project success. Participants consistently highlighted the benefits of interdisciplinary collaboration, such as increased creativity, diverse knowledge sharing, and the ability to tackle complex challenges. The identification of necessary roles, such as the coordinator, team worker, and plant, highlight the importance of role diversity in fostering effective teamwork. Meanwhile, certain roles, like the resource investigator and specialist, were viewed as redundant due to the interdisciplinary nature of the team covering these functions naturally. The concept of "role flux" emerged as a significant finding, with participants indicating that flexibility in roles allows team members to adapt to the evolving needs of the project. Finally, the study also

identified common conflicts within interdisciplinary teams and provided solutions such as open communication, regular feedback, and clear role distribution to mitigate these challenges and improve team performance. These insights underscore the value of structured role allocation and adaptability in interdisciplinary student teams, ultimately enhancing their potential for project success.

5. DISCUSSION

This following section will conduct a discussion about the results which have been provided by the participants within the semi-structured interviews. In this discussion, the findings from the research provide valuable insights into the dynamics of interdisciplinary student teams and how applying Belbin's Team Roles can improve their project success. The concept of "Role Flux" emerged as a key factor, highlighting the adaptability of team members who often assume multiple roles based on the project needs. This flexibility was seen as vital for navigating complex challenges and providing project success. Additionally, while certain roles like coordinator, team worker, and plant were consistently viewed as essential, others such as specialist and resource investigator, were perceived as redundant. The benefits of interdisciplinary student team work ranged from increased creativity to problem solving, but conflicts such as role imbalances and differing work styles also surfaced. Practical solutions such as open communication and clearer role distribution were suggested to mitigate this issues. Overall the research underscores the importance of adaptability, Role clarity and collaboration to maximize the potential of interdisciplinary student teams.

5.1 Practical Implications

The findings from this study have several practical implications for enhancing the effectiveness of interdisciplinary student teams within higher education settings. A key takeaway is the importance of clear role distribution among team members. Ensuring that each member understands their role and those of their peers from the outset helps prevent confusion and overlapping responsibilities. This clarity fosters a more efficient and productive team dynamic, as individuals can focus on their specific tasks, knowing how their contributions align with the overall project objectives.

Raising awareness about the importance of team roles is equally crucial. Institutions and facilitators should emphasize the significance of each role within the team to ensure that individual strengths are appreciated and utilized effectively. This awareness can be fostered through an initial workshop focused on team dynamics and role identification. During this session, team members can clarify their responsibilities and understand the unique value they bring to the group. Such early engagement ensures that everyone is aligned regarding their roles, which promotes smoother collaboration as the project progresses.

A significant insight from this study is the flexibility required in role assignment, particularly as teams evolve over time. Under certain circumstances, the combination of roles can shift based on the phase of the project or specific needs that arise in other words "role flux." This means that while some students may play the same roles throughout the project, others might step out of their comfort zones to take on different roles when required. For example, a student who typically excels in creative problem-solving might temporarily adopt a leadership or organizational role if the situation demands it. This adaptability helps smaller teams, where some roles may be underrepresented, respond more effectively to changing project needs.

This concept highlights the detachment between the formal role a team member plays and the actual contribution they make during the project. Flexibility in role assignments allows team members to move beyond rigid expectations and engage in tasks that best serve the team at a given time. By promoting a culture of adaptability, interdisciplinary student teams can leverage the diverse skills of their members to address emerging challenges dynamically.

Finally, fostering open communication and regular feedback is vital to mitigating conflicts and enhancing collaboration. This can be achieved by creating structured feedback sessions where team members reflect on their own and others' performance, ensuring that all perspectives are considered. These sessions, held at key stages of the project, allow the team to reflect on their progress and make necessary adjustments. In-person meetings and group discussions, where everyone's opinions are valued, can further strengthen team cohesion and productivity.

5.2 Theoretical Implications

The findings of this study contribute significantly to the theoretical understanding of team dynamics and role functionality within interdisciplinary student teams, particularly in light of Belbin's Team Roles Theory. This research introduces the concept of "role flux" — the fluidity and adaptability of roles within teams — as a pivotal element for project success in interdisciplinary contexts. Although Belbin's framework posits fixed team roles to optimize productivity and cohesion, this study challenges the rigidity of these categories, demonstrating that interdisciplinary student teams benefit from more dynamic role adoption, where roles adapt in response to the evolving needs of the project. In such teams, fluidity is not only beneficial but often necessary to meet the demands of diverse perspectives and skill sets.

While Belbin's model has traditionally emphasized stable role assignments, the findings of this research suggest that interdisciplinary student teams require greater flexibility in role transitions, challenging the model's foundational assumption of fixed role categories. The adaptive nature of "role flux" identified here implies that successful interdisciplinary collaboration may depend more on members' ability to interchange roles like Coordinator, Teamworker, Plant, and Monitor Evaluator depending on the immediate project demands rather than solely adhering to their primary role. For example, the Coordinator, vital for managing team dynamics and harmonizing viewpoints, becomes critical in interdisciplinary settings where differences in thinking styles and methods are more pronounced. However, the ability to flex between Coordinator and Monitor Evaluator roles allows team members to offer both direction and objective analysis, depending on the specific stage of the project. This fluidity suggests a need for revisiting Belbin's role theory to account for the nuanced demands of interdisciplinary collaboration.

The findings also highlight roles that emerged as necessary within interdisciplinary student teams, particularly the Coordinator, Teamworker, Plant, Monitor Evaluator, and Completer Finisher. These roles align well with the requirements of interdisciplinary projects, where cohesion, creativity, and strategic oversight are paramount. However, some roles, such as the Resource Investigator, which primarily seeks external opportunities, and Implementer, focused on routine execution, were found to be less critical in certain interdisciplinary settings. This insight into "redundant roles" underscores that some of Belbin's roles may offer limited utility in interdisciplinary contexts, especially when teams rely heavily on adaptability and role fluidity to address complex problems. This suggests a need to reevaluate the application of each role within Belbin's model,

questioning the extent to which all roles are equally valuable across different team contexts.

Furthermore, this research advances the theoretical discourse on team role dynamics by emphasizing role flexibility as a practical necessity rather than an optional attribute. By challenging the static assignment of roles, this study suggests that Belbin's model could benefit from incorporating the concept of "role combinations" — dynamic, context-dependent blends of roles. Teams that adapt roles based on project demands or the strengths of individual members foster a more responsive and resilient team structure, echoing the findings of Stalmeijer et al. (2007) on the importance of adaptability within interdisciplinary teams.

Additionally, the emphasis on role awareness and conflict resolution strategies within interdisciplinary teams provides insights into conflict resolution theory. Effective interdisciplinary collaboration requires structured communication, regular meetings, and inclusive decision-making, which were shown to mitigate conflicts stemming from differing academic approaches. These strategies extend existing models of team conflict resolution by adding practices specifically tailored for interdisciplinary contexts, where diverse methodologies often lead to greater challenges in establishing common ground.

In conclusion, the findings of this study not only challenge traditional assumptions within Belbin's Team Roles framework but also propose an expansion that accommodates role fluidity, dynamic combinations, and adaptability as core components of effective interdisciplinary student teamwork. These theoretical implications enrich our understanding of how team roles function in diverse, collaborative settings, encouraging educators and team leaders to foster environments that support fluid, adaptable role dynamics. By incorporating these insights, educators and practitioners can enhance interdisciplinary student team performance, preparing future professionals to succeed in collaborative, diverse work environments..

5.3 Limitations

5.3.1 Limited Scope of Sample
The study explored teams only within a single university, which restricts the generalizability of the findings. The experiences and dynamics observed might be unique to the specific academic environment and cultural context of this university. Expanding the research to include multiple universities and diverse institutional settings could provide a more comprehensive understanding of interdisciplinary team dynamics.

5.3.2 Over-Representation of Social Sciences
There was an over-representation of participants from social sciences, which might have skewed the results. The emphasis on social sciences could lead to biased perceptions and interpretations of team roles and dynamics. Future research should aim for a more balanced representation of disciplines to capture a wider range of experiences and insights.

5.3.3 Small sample size
The sample size of interdisciplinary student teams for the research was 4 teams. A sample size of 4 teams involving a total of 8 individuals limits the research as it reduces the ability to generalize findings, may not capture the full diversity of interdisciplinary team dynamics, and increases the risk that unique team characteristics could skew the results. This small sample size also limits statistical validity, making it harder to draw definitive conclusions about trends or broader implications. The small sample size is based all on one university, and one country. Therefore, results are not guaranteed to be consistent

among foreign universities, a larger sample size including more variation would solve this problem.

5.3.4 Varying Understanding of Team Roles
Participants demonstrated varying levels of understanding regarding the meaning and implications of team roles. This inconsistency could affect the accuracy and reliability of the findings, as different interpretations of team roles might lead to divergent responses and conclusions. Providing participants with standardized definitions and examples of team roles before data collection could help address this issue. Therefore the limitation is that there was not enough time to explain roles thoroughly to participants.

5.3.5 Limited Longitudinal Insight
The research captures a snapshot of team dynamics at a particular point in time, lacking longitudinal insight into how roles and team interactions evolve throughout a project. Longitudinal studies could offer deeper understanding of the development and adaptation of team roles over time, providing more robust and actionable insights..

6. CONCLUSION

This thesis set out to investigate the dynamics of interdisciplinary student teams within higher education settings, as well as how Belbin's Team Roles can enhance their effectiveness and success. Through semi-structured interviews and data analysis, several key findings emerged that provide valuable insights into how interdisciplinary student teams functions as well as how to optimize this type of teams.

Firstly, the concept of Role flux was a significant discovery, highlighting that individuals within interdisciplinary student teams often adopt multiple roles based on the project's needs as well as the individual personal abilities and characteristics. This fluidity allows team members to make use of their strengths and adapt to dynamic requirements of the project, which in turn allows them to contribute greater flexibility and effectiveness.

Belbin's Team roles theory already acknowledges individuals may take on different roles at different times, depending on the situation. According to Belbin (1981), a single person can indeed fulfill multiple roles either simultaneously or sequentially, depending on the context and needs of the team. However, what my findings add to this established understanding is the extent to which this Role Flux becomes essential in interdisciplinary settings, where the diverse skill sets required make such flexibility a necessity rather than an exception. In practice, this adaptability not only fills gaps left by the absence of certain roles, but also ensures that student team members can respond more fluidly to evolving project challenges. The literature supports this, however the findings of this research paper, extend the understanding of how interdisciplinary student teams, specifically, require even more frequent-role switching due to the complexity of their projects.

Through this research, a definitive answer was found to the research question. As participants identified specific team roles deemed necessary as well as mentioned the roles which were found to be redundant. Roles such as coordinator, Teamworker, Plant, Monitor Evaluator and completer finisher were seen as essential for assuring successful collaboration and project completion. However, it must be mentioned that participants believed multiple of these roles could be fulfilled by a single person, as mentioned earlier within the "Role Flux" discussion. In contrast, roles like specialist and resource investigator, were considered less critical, because of the interdisciplinary nature of the student teams often meant each member already brought specialized knowledge and skills to the table rendering the role of specialist as unnecessary. Moreover, the collaborative

environment of these interdisciplinary student teams created strong research and network opportunities, which diminished the role of resource investigator, whose role is to seek out external information, thus making these roles not necessary for project success. These findings underscore the importance of context in determining the value of different roles.

The benefits of interdisciplinary student teams were clearly articulated by the participants, placing an emphasis on the diverse levels of creativity and knowledge, increased awareness of roles, and the social and professional growth that comes from collaborating with individuals who come from different academic backgrounds. These benefits enable teams to tackle complex challenges more effectively and create a more inclusive and innovative working environment. However, the study also identified several conflicts inherent within interdisciplinary student team collaboration, such as role imbalances, differing working styles, and varying opinions. Participants made suggestions for practical solutions in order to tackle such challenges; Solutions such as open communication, regular in-person meetings and inclusive decision making.

Finally, participants provided creative insights into improving the effectiveness of interdisciplinary teams. They stressed the importance of clear role distribution, awareness of the significance of team roles, as well as ensuring team members are knowledgeable about their own roles and the roles of other team members. These improvements can lead to smoother collaboration, better utilization of individual strengths, and therefore lead to a more successful project outcome.

To conclude, this research highlights the complexities and potential of interdisciplinary student teams within higher education settings. By gaining understanding and applying Belbin's Team Roles, interdisciplinary student teams can navigate the challenges of interdisciplinary collaboration more effectively, making use of the diverse skills and perspectives to achieve greater success. The findings highlight the need for adaptability, clear role definitions and open communication to enhance team dynamics and project outcomes within such settings.

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