Project-02: Identifying Key Attributes that Influence Leadership Selection in Collaborative Design Teams

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1 Abstract

This study investigates the dynamics of leadership perception within design teams, focusing on two key research questions. The first question examines the congruence between an individual's self-perceived leadership and that perceived by their team members. The second question identifies common leadership attributes among team leaders. To address these questions, a modified leadership survey was employed, gathering data from three different teams. However, some data was discarded due to non-significance as determined by the Kruskal-Wallis H test.

Findings for the first research question revealed that team members generally rate leadership higher than the individuals rate themselves. Regarding the second question, three clusters of questions identified the leaders in each team based on their leadership attributes. The study found that adaptability to new ideas, responsiveness, and proactivity in task completion were the most commonly correlated characteristics among the perceived leaders. Moreover, all leaders demonstrated high communication skills, albeit with varying emotional intelligence and decision-making skills.

The research also presents a leadership attributes chart to visualize team dynamics. This innovative methodology is crucial for identifying leadership within teams without designated formal roles. In summary, the identified key characteristics of perceived leaders provide insights into team leadership dynamics and offer a foundation for future research to enhance the significance of the data collected.

2 Background

The importance of leadership in team performance is well-established, with a direct link to a team's success highlighted in various studies. Goleman [1] emphasizes the critical role of leadership in team performance. A notable issue in leadership dynamics is the often-observed discrepancy between leaders' self-perception and the perception of their team members [2]. These discrepancies can significantly affect team dynamics, communication, and overall effectiveness.

This research delves into understanding the emergence of discrepancies between self-reported leadership and team perceptions of leadership in the context of a design task. The study is particularly relevant in settings where a formal team leader is not explicitly designated, such as in the Design Decision-Making class. Leadership perception can still be explored in such scenarios through personal attributes like communication, emotional intelligence, and decision-making skills [3].

The research also examines the influence of various leadership styles on team perception. These styles include agility, adaptability, responsiveness, initiative, and strategic thinking. Existing literature shows a complex relationship between leadership styles and team outcomes. For example, Somech [4] found that participative leadership positively affects team reflection and innovation but may negatively impact in-role performance in diverse teams.

In hierarchical team structures with defined roles like a project manager and team leader, the impact of leadership is more straightforward [5] [6]. However, there is less research on

the effects of perceived leadership in collaborative teams without formal leadership roles. This research hypothesizes that when an individual is perceived as a leader, their decisions carry more weight, influencing team dynamics and the design process.

In summary, this background encapsulates the pivotal role of leadership in team performance, the discrepancy between self-perception and team perception of leadership, and the impact of leadership styles on team dynamics, especially in non-hierarchical team settings.

3 Research Questions

RQ1: How does an individual's self-assessment of their team leader decsision correlate with their team members' decision?
RQ2: What are the leadership attributes that influence one's decision of a team leader?

4 Methodology

In order to study leadership and its relevant attributes within teams, a survey-based, in-situ experiment was chosen. Initially, the individuals from two design project groups were chosen as participants. However, after limited responses and a decision that individual data was just as important as group data, a third group was polled. Team and individual demographics were not considered in participant selection as the personality attributes were chosen as the variable of interest. The participants were asked to answer questions about each of their teammates and themselves.

The survey was designed with two main "blocks" as follows:

1. Asks participants to rate each individual (including themselves) in their team in a few key characteristics of interest that we identify. (Leadership will not be mentioned as our interest at this point).

2. Asks participants to rate each individual on how much leadership they showed/how much of a leader they were during the project. (Based on their own perception).

The first block was completed for each teammate and was broken down into two more parts to gather attribute data. The first of these parts was designed based on a published Leadership Trait Questionnaire (LTQ) with 14 statements for participants to rank their agreement with on a Likert scale of 1-5. Each of these statements featured a certain quality or attribute and were then grouped into three categories for our analysis: communication, decision making, and emotional intelligence. The director of the Engineering Leadership Development department, Paul Mittan, was consulted for expert advice on the experiment. He recommended studying intent listening as a leadership attribute and explained the connection he has witnessed between strength of leadership and the ability of a team to make decisions. The second part of this first block featured five questions on leadership "style" where participants ranked each other on a spectrum from negative five to five, where

each end of the spectrum represented an extreme of the style like “authoritative” versus “agile”.

The second block of the survey polled the participants on their perception of leadership within the group. This block was intentionally placed at the end of the survey and leadership was not mentioned until this point to maintain a ”blind” study design and avoid bias in the answers to the attribute-focused questions. In this section, participants were first offered the opportunity to list what team members they felt were the leader or leaders of the group, if any. The next question asked participants to distribute one hundred points across all team members in terms of who was a leader in the group. This was used as the quantitative data to establish the team’s perceived leader for our analysis.

This experimental procedure provided enough data for analysis, but it did have some major limitations. The first is that the one to five scoring method for the LTQ questions produced poor data. Nearly every participant selected four or five out of five for the attributes, which greatly limited the significance of the data. In the future, a different scale will be chosen. Another issue that may have compounded with the inefficiency of the scale was the privacy of the survey. Some participants expressed concerns about the privacy of their responses about other team members and in this case, shared classmates. It is also quite possible that even unspoken concerns about this privacy led to a lack of complete honesty in responses and a tendency to rank teammates higher knowing other classmates would be viewing the data. One challenge with the current method was that the experimenters needed to view the names to connect the responses about a certain participant for the comparison of self- versus team-perception. In the future, an automated system or a third party would be used to group the responses and then output the data anonymously for analysis.

5 Analysis Techniques

Although all survey questions were distributed at once, there are different types of scales used within each question. The Leadership Trait Questionnaire (LTQ) uses a Likert scale ranging from 1 to 5, while the Leadership Attribute Question uses a range from -5 to 5. Since each research question uses different sets of data within the survey, the analysis plan consists of two parts, each related to one of the research questions.

For RQ1, the objective was to calculate the average LTQ survey results of all participants’ ratings towards each participant. This was done to gain insights into how participants were perceived by their peers in terms of their leadership qualities. To ensure the validity of the findings, it was important to establish statistical significance across all participants within the LTQ section of the survey. This was particularly crucial given the averaging techniques being used on the original data. To achieve this, a Kruskal-Wallis H test was conducted between each member within their respective groups. This test allowed for a verdict to determine if each dataset was statistically significantly different from the others, making statistical analysis plausible. Across all the data points collected from three teams, it was observed that one team did not pass the test. This means that the failed team members’ ratings of each other were not statistically different to warrant further analysis. As a result, the failed team was excluded from the analysis moving forward, leaving two teams and a total of 7 participants.

Once statistical significance was determined, box plots and scatter plots were used to compare the mean, median, and range of each condition (self versus perceived). These visual representations provided a clearer understanding of the data distribution. By analyzing the central tendencies and spread of ratings, it was possible to identify any patterns or discrepancies between participants' self-perceptions and how others perceived them. On the other hand, the scatter plot was particularly useful for comparing individual-level self and team perceived leadership scores, which the box plot cannot capture due to its aggregation technique.

Moving on to RQ2, the first step was to identify the leader within each team. This was crucial for the rest of the analysis, as all future analyses were conducted solely on the perceived team leader of each team. To determine the leader, each member was asked to distribute 100 points among all members of the team at the end of the survey. The points allocated to each individual were then aggregated to identify the person with the highest score within that team, who was then designated as the leader for analysis purposes. In the event of a tie, the person with a higher team-perceived LTQ score was selected as the leader. This approach ensured an objective selection of the leader without explicitly asking the participants who they considered as the leader.

After identifying the leaders from each team, their survey results for the second half (rated from -5 to 5) were combined and visualized in a bar chart. The purpose of this visualization was to identify any similarities in dimensions among the leaders. By comparing their ratings on different dimensions, insights into their common leadership styles could be gained. In addition, within the LTQ survey, there were predetermined dimensions related to specific questions. The score of each leader on these dimensions was plotted on a triangular radar chart. The goal was to identify strong dimensions that were similar across all three leaders. This chart provided a unique and comprehensive view of their leadership attributes visually, and the different sets of survey questions used for the radar plots provided a different perspective on each leader's leadership attributes during analysis.

During the data analysis for RQ2, the triangular radar plot caught the team's interest. This plot had the potential to be applied to all team members, providing a holistic view of the team's interaction with each other. The triangular plot captures whether each individual within the team has similar leadership styles, indicating a more dynamic leader relationship, or if a few people stood out against the rest, indicating a more traditional leadership relationship. This finding opened up new possibilities for further analysis and exploration of the team dynamics within the research project.

6 Results

The investigation into how individuals perceive their leadership capacities as opposed to how their team members perceive them yielded thought-provoking results. The Kruskal-Wallis H test was pivotal in sifting through the data, leading to the exclusion of one team from the analysis due to non-significant variance in their responses. A significant observation was the discrepancy between individual self-perceived leadership and the perception of their team members. It was consistently noted that team members rated the leadership qualities of individuals higher than the individuals rated themselves. This pattern suggests a common

tendency among team members to undervalue their leadership capabilities. Their overall scores are shown in the Figure 1 and 2.

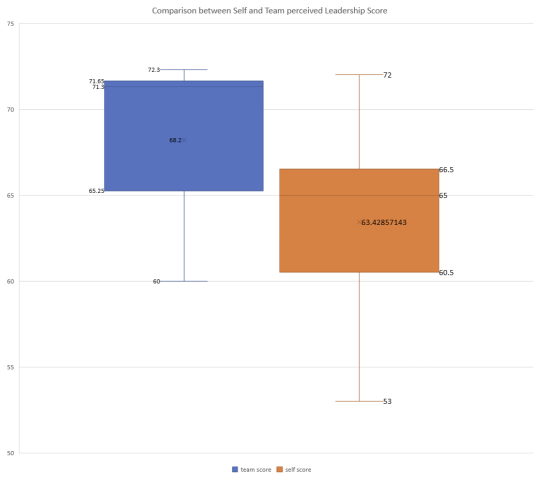

Figure 1: Self vs. Team Perceived Leadership Scores

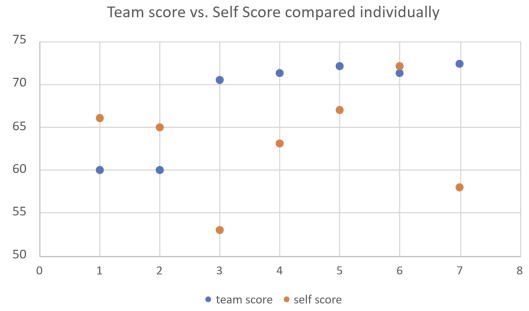

Figure 2: Individual Comparisons Between Team and Self Perceived Leadership Scores

Another critical aspect of the research focused on identifying common leadership attributes among team leaders. Through the analysis of data from each team, the research indicated that adaptability to new ideas, responsiveness, and activeness in task completion were the most prevalent and correlated traits among the three perceived leaders, as shown in the Figure 3. Furthermore, all the identified leaders demonstrated high communication skills, although there were variations in their levels of emotional intelligence and decision-making skills, as shown in the Figure 4. This finding underscores the importance of these attributes in perceived leadership within team settings.

The research also revealed variations in leadership attributes among team members, as shown in the Figure 5 and 6. In some teams, certain leadership qualities were more pronounced, whereas in others, the attributes were more evenly distributed among members. This diversity in leadership dynamics within and across teams highlights the complex nature of leadership in collaborative environments and suggests that leadership is not a one-size-fits-all quality but rather a set of attributes that can vary significantly depending on the team and its members.

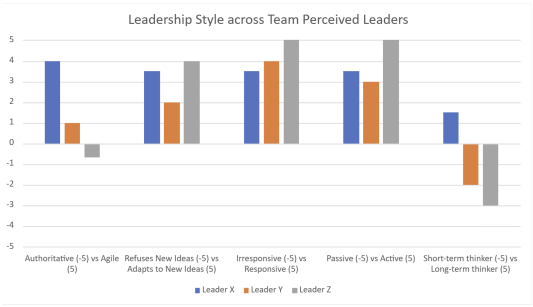

Figure 3: Comparative Leadership Styles Among Team-Perceived Leaders

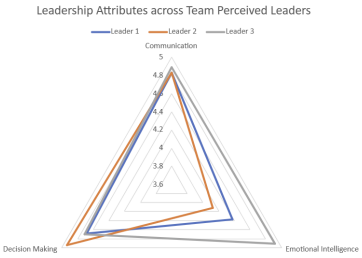

Figure 4: Comparative Leadership Attributes Across Team Perceived Leaders

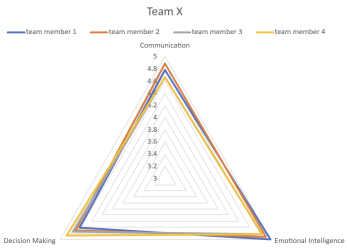

Figure 5: Leadership Attributes for Team X Members

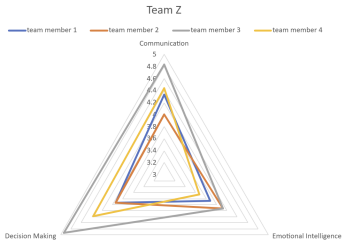

Figure 6: Leadership Attributes for Team Z Members

7 Conclusion

In conclusion, the exploratory study on leadership perception within design teams has yielded significant insights. The investigation into the alignment between self-perceived and team-perceived leadership revealed that individuals tend to underrate their leadership abilities compared to the higher evaluations they receive from team members. Concerning the leadership attributes shared among team leaders, the research identified adaptability, responsiveness, and a proactive approach to task completion as the most common and correlated traits across perceived leaders.

All leaders showcased strong communication skills, although there was a noticeable variance in their emotional intelligence and decision-making capabilities. The application of a modified leadership survey facilitated the extraction of these findings, despite the necessity to discard some data following the Kruskal-Wallis H test due to its lack of significance. The study also introduced a leadership attributes chart, which proved to be an effective visual tool for depicting team dynamics.

This methodological approach is useful for pinpointing leadership qualities in teams lacking formal hierarchical structures, bridging the gap in current leadership studies.

References

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A Appendix: Modified Leadership Survey

The below link leads to a PDF copy of the Qualtrcs survey we circulated with the studied teams:
Survey file link