What Contributes to a Team's Effectiveness, and What Can Be Done to Improve It?

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ABSTRACT

Teamwork is an integral part of play, school, and work. Given the importance of working in teams, a plethora of resources have been put into training members to be effective team players, and coaching teams to become successful.

However, when a team is formed, every member has different personalities, attitudes, work ethics, commitments, and skills. Given the complex interplay of factors, it is difficult to pinpoint what the team is lacking, or what the group needs to help it perform at a higher level. This begs the questions of what contributes to a team's effectiveness? How can a team be improved? This paper hopes to explore the factors affecting a team's effectiveness and identify some of the important traits that aid a group's success, thereby allowing for insight into what can be done to improve a team.

This paper approaches the problem using a System Dynamics approach. Using this approach, this paper hopes to gain insights into the factors affecting a team's effectiveness and recommend actions which can be taken to improve team effectiveness.

The main finding of this paper is that the motivation of team members is central to the team's effectiveness. In order to boost the motivation of members, it is important for the team to set the right tone at the start of the project, ensuring that all members clearly understand the group's purpose, roles, and expectations. In addition, groups should take the effort to organise social activities instead of focusing purely on work. By doing so, members will be more motivated to acquire, generate, and implement ideas which contribute to the performance of the team.

1. INTRODUCTION

Katzenbach and Smith (2005) defines a team as 'a small number of people with complementary skills who are committed to a common purpose'. For the purpose of this paper, a 'group' or a 'team' will be used to describe a 'work group'. In a work group, the members are committed to a common goal, which they attempt to achieve by solving problems together.

As Seers et al. (2003) contends, 'self-managed teams constitute one of the most prominent features of post-industrial era organisations.' Organisations are using teams as an effective problem-solving unit, yet it has been noted that team work does not always translate into increased effectiveness (Ashley, 1992). Some groups can come up with revolutionary ideas, while others cannot even agree on how to start working on the project. Due to this disparity, much research has been done to find the golden formula for an effective team.

Many articles ranging from self-help books to research papers have been written on this topic. These generally investigate the individual factors that affect a team's effectiveness (Katzenbach and Smith, 2005), or describe the different stages of development of a team (Tuckman, 1965).

However, given that teams are 'complex systems driven by interactions both among group members and between the group and its embedding contexts' (Arrow, McGrath, and Berdahl, 2000), the effectiveness of a team is not a function of any single variable, but is the result of the complex interplay between the plethora of factors affecting effectiveness. In order to thoroughly examine the factors affecting team effectiveness, one has to appreciate that these factors interact with one another to produce the team in question.

Therefore, this paper seeks to investigate the interplay of factors that contribute to a team's effectiveness and look at what can be done to improve a team.

2. METHODOLOGY

In order to investigate the factors affecting the effectiveness of a team, I will be drawing upon established research on group effectiveness, and my personal experiences as a student working in groups. By using a System Dynamics approach, these areas can be fused to paint a coherent picture of a group.

The System Dynamics approach is beneficial for understanding group effectiveness as it recognises that the performance of a complex system is determined by the interplay between many different factors over time, rather than the direct result of individual factors. In the context of a group, the behaviour and interaction between group members and the resulting effectiveness of a group can be simulated using a modelling program such as Vensim. By targeting each variable in the system, we are able to establish which variables affect the system more than others, allowing us to formulate theories and recommendations on improving group effectiveness whilst checking against established research.

3. STATE OF KNOWLEDGE ASSESSMENT

To delve deeper into the factors affecting effectiveness of a group, I shall be reviewing literature relevant to the field. In the following subsections, I shall discuss five findings from the background research that are critical to this paper.

3.1. Finding 1: Effective teams produce work better than the sum of what each individual member can achieve

Katzenbach and Smith (2005) theorises that groups and teams are differentiated by their performance. Work groups produce results proportional to what the individual members contribute, while teams are able to produce additional 'collective work products' on top of the individual products. Teams do so by 'discussing, deciding, and producing real work together'.

These insights lead us to two important inferences.

Firstly, discussion is involved when producing 'collective work products'. This discussion culminates in the selection of one or more ideas to be implemented, with group members working together to implement these ideas. Therefore, a team's modus operandi can be inferred to be the generation and implementation of ideas in order to achieve their goals.

Secondly, the effectiveness of a team lies in the quality of the work which they produce; higher quality work comprises of an individual component, and a collective one.

3.2. Finding 2: Effective teams are built upon common commitment

Katzenbach and Smith (2005) points to common commitment as the essence of any group. It is with common commitment that groups 'become a powerful unit of collective performance', instead of performing as individuals. This common commitment manifests when groups have a clear sense of purpose, measurable goals to work towards, and a common method of working towards these goals. Common methods include the role of each member, and what each member expects of each other to continue being a member.

From this theme of common commitment, the following points can be inferred.

Firstly, a team's performance is directly impacted by the commitment that each member has towards the project.

Secondly, strong commitment can only be built when each member clearly understands the group's purpose, roles, and expectations that the group has for them.

Relating the theme of common commitment to my personal observations when working in a group, further inferences can be made. For a team member to feel committed, they have to feel valued by the group. When team members do not feel valued, they will generally clam up and stop giving ideas, put in the bare minimum amount of effort for their work, or even disappear from group meetings entirely.

3.3. Finding 3: Teams need to establish their purpose, roles, and expectations

Using several factors that Katzenbach and Smith (2005) lists as essential for a team to establish in order to succeed, this finding builds upon the previous inference that 'strong commitment can only be built when each member clearly understands the group's purpose, roles, and expectations that the group has for them.'

Firstly, teams need to develop their own purpose. While the objective of the project might be handed down, the team has to develop its own personal purpose in order to succeed.

Secondly, teams require mutual accountability from every member. Mutual accountability stems from the common commitment of each member to the project.

Lastly, teams have to set clear rules of behaviour for their members. Behaviour includes personal behaviour during team meetings, method of confrontation and feedback, and the general approach to be taken to solve problems.

These three factors can be distilled into team members understanding their purpose, their roles within the group, and the expectations that the group has on them. These expectations include expected behaviour, work quality and accountability.

3.4. Finding 4: Members in effective teams explore new perspectives from other teams

Pentland's (2012) research has shown that better teams often see members having more interaction with other teams, allowing for 'fresh perspectives' to be brought in. Pentland's research has established that this interaction is the most important factor for a team engaged in creative work.

By examining Pentland's assertion with our definition of a work group, relevant inferences can be made. As mentioned in the introduction, a 'work group' seeks to solve problems through the generation of ideas. Generating ideas, being a creative process, frequently requires new insights. Therefore, for a work group to be effective, members have to venture out to find new perspectives and ideas, thereby increasing the generation of ideas.

3.5. Finding 5: Brainstorming can impede productivity of the group

Diehl and Stroebe's (1987) experiments have shown that working in a group can be less productive than working individually. Further research supports the hypothesis of 'production blocking' (Njistad and Stroebe, 2006) as the pathway for loss of productivity. 'Production blocking' refers to the loss in generation of ideas when members are unable to immediately share their ideas after thinking of them. Diehl and Stroebe (1987) opines that production blocking occurs as the delay between conceptualization and sharing prevents the generation of new ideas as members await their turn to share their first idea.

From this finding, it can be inferred that brainstorming sessions can be a source of productivity loss for the team as the potential to generate more ideas is lost when members wait for their turn to share. When more ideas are shared, there are lesser opportunities for members to speak, resulting in the production block.

4. DYNAMIC HYPOTHESIS

Based on the theoretical findings thus far, it is hypothesised that the motivation of group members is a crucial factor in determining the effectiveness of a group. This is because the motivation of group members contributes to the willingness of the team to acquire new knowledge and share ideas that they have, impacting the generation of ideas and subsequent effectiveness of the team.

In addition, the group's receptivity to ideas shared is another crucial factor in determining the effectiveness of a group. The group's receptivity to ideas is a key factor in determining group members' motivation, as a group works by generating ideas; if ideas shared are not accepted by others in good faith, group members might feel less respected and valued by the group, causing them to lose motivation.

Therefore, it is hypothesised that the motivation of group members and the group's receptivity to ideas shared are key factors in determining the effectiveness of a team.

5. REFERENCE MODE

For this model, the behaviour of a university module project group will be used. The model will be simulated for 13 weeks, the usual length of time that a project group will stay together.

Due to the transient nature of a university module, members in the group are usually not very motivated to put in their maximum effort for the team. Moreover, as the members in the group are usually strangers, the group members do not voice out their discomfort or grievances with the group, choosing to bottle their feelings. As these conflicts are not resolved, the group is stuck in the 'storming' stage of Tuckman's model (Section 3). These small conflicts result in falling levels of motivation as members feel that nothing much can be done to resolve these conflicts.

However, as the project nears completion, group members are driven by the end in sight and the drive to accomplish more in hopes of securing a better grade; a better grade personally benefits every group member. Members become more put

in more effort for tasks assigned and are more motivated.

The accomplishment per week should show an oscillatory behavior due to the 'production blocking' effect described in the state of knowledge assessment (page xx). As group members' get more comfortable with each other and share more ideas, there is an increase in the production blocking effect, causing the total number of generated and shared ideas to decrease. As the number of generated and shared ideas decreases, the production blocking effect is weakened, allowing for more ideas to be generated and shared. This oscillation in the number of ideas shared directly translates to an oscillation in accomplishment per week, given that accomplishment per week depends on the ideas generated.

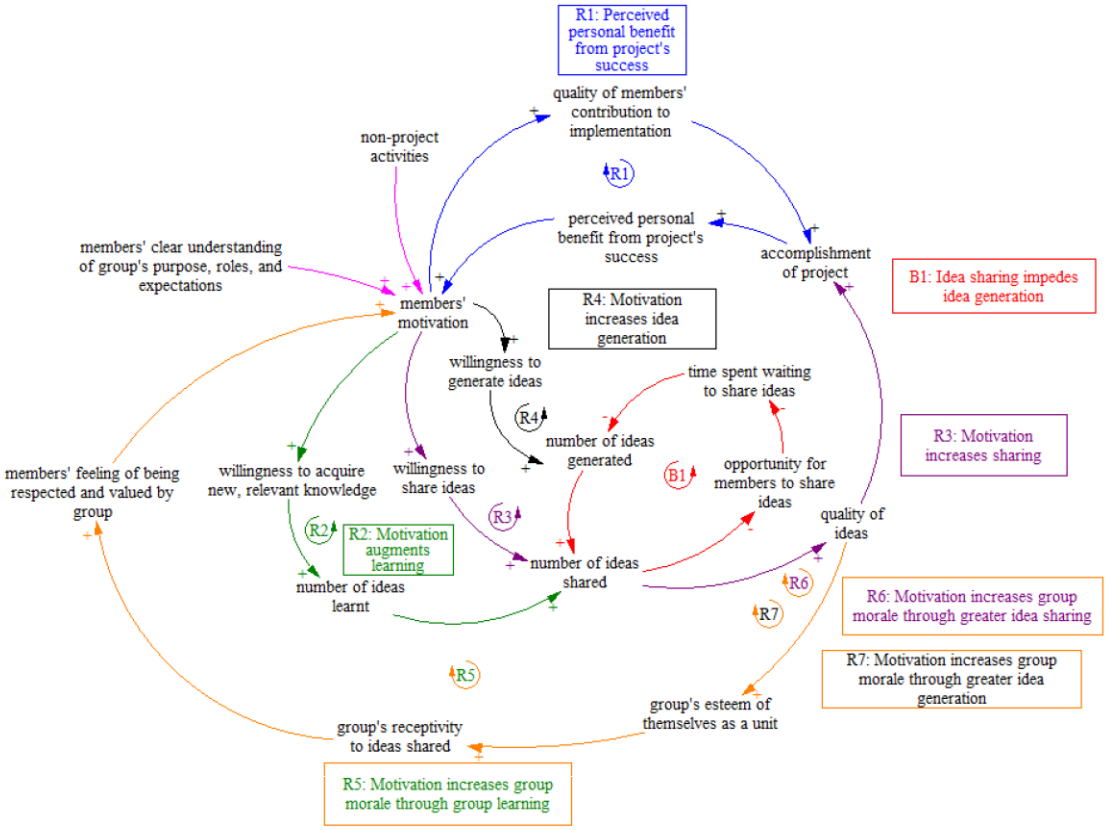

Figure 2: Causal Loop Diagram of the Group Effectiveness Model

Overall, members' motivation should oscillate much less than the group's weekly accomplishment, as the weekly accomplishment is only one factor out of the many affecting members' motivation.

The reference mode behaviour described above is depicted in the following graph:

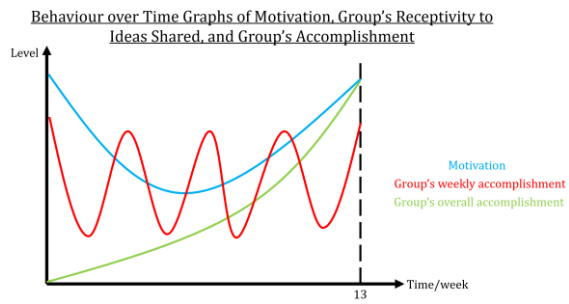

Figure 1: Behaviour over time graph of reference mode

6. CAUSAL LOOP DIAGRAM

The causal loop diagram formulated from the State of Knowledge Assessment is shown in Figure 2 above.

The relationships captured by each loop is summarized in Table 1 below:

Table 1: Summary of loops in Causal Loop Diagram

Loop	Relationship
R1	Motivation and the quality of implementation of ideas
R2 R3 R4	Motivation and the learning, generation, and sharing of ideas
R5 R6 R7	Motivation increases the group's receptivity to ideas, thereby boosting motivation.
B1	Idea sharing impedes idea generation

7. STOCK AND FLOW DIAGRAM

The model of group effectiveness built aims to investigate the factors affecting a group's effectiveness, and the possible changes that can be introduced to improve it. In this model, members' motivation is taken as the main factor affecting the group's performance, as seen from the causal loop diagram in Figure 2. However, four factors affect how motivation changes throughout the course of the project: 1) Members' perceived personal benefit from project's success, 2) Members' feeling of being respected and valued by group, 3) Members' clear understanding of group's purpose, roles, and expectations, and 4) Non-project activity.

By combining the effects of these four factors, the motivation level of the group varies throughout the project. The variation in members' motivation changes three main variables of the group: 1) Members' willingness to acquire new, relevant knowledge, 2) Members' willingness to share ideas, and 3) Quality of members' contribution to implementation.

As established in Section 3.1, the modus operandi of a group is the generation and implementation of ideas in order to achieve its goals. Therefore, by altering the three abovementioned variables, the team's generation and implementation of ideas is effectively altered, thereby changing the effectiveness of the group.

7.1. Calibration of Stocks

While constructing the stock and flow diagram from the causal loop diagram, four main stocks have been selected: 1) Members' Motivation, 2) Members' Expectation of Group's Receptivity to Ideas Shared, 3) Members' Feeling of Being Respected and Valued by Group, and 4) Accomplishment of Project to Date.

For clarity in this paper, these four stocks shall be referred to in [square brackets].

It is important to note that due to the qualitative nature of this research area, the values that are used, be it for the stocks or any variables, cannot be found in literature. They are logically reasoned from the expected behaviour of each variable, and are calibrated to work within the context of this model. Thus, these values are only useful in observing the interaction of feedback loops within this model, and should not be taken out of this context.

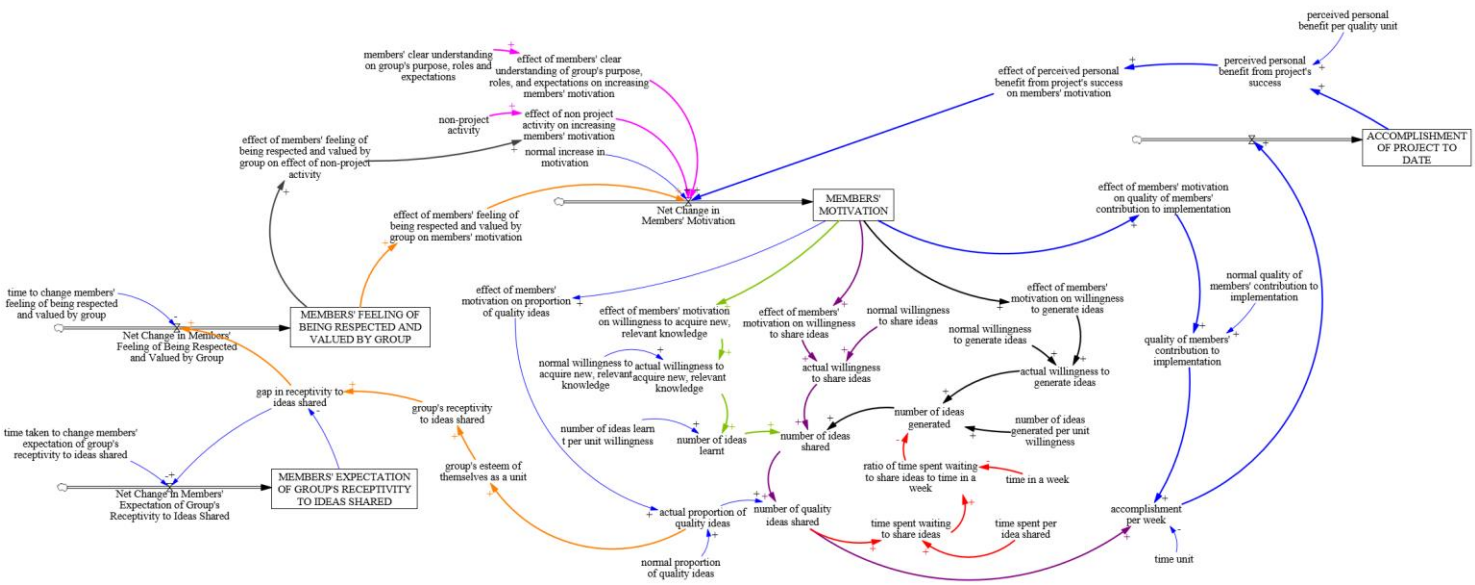

Figure 3: Stock and Flow Diagram of the Group Effectiveness Model

For the model, [Members' Motivation], [Members' Expectation of Group's Receptivity to Ideas Shared], and [Members' Feeling of Being Respected and Valued by Group] were calibrated to range from 0 to 1. This was done as the stocks chosen are qualitative in nature; it is more meaningful to observe the trend of behaviour of the stocks, rather than its real quantitative value.

8. MODEL BEHAVIOUR (BASE RUN)

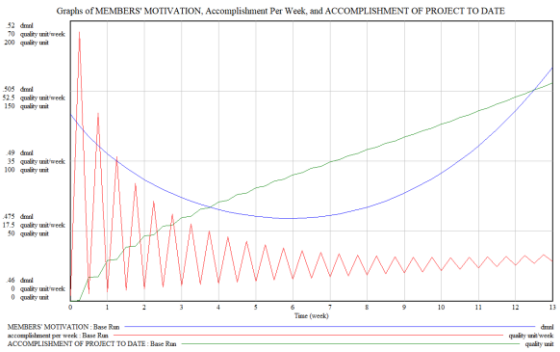

Figure 4: Graph of model's base run behaviour

Comparing the generated graph with the reference mode's behaviour over time graph (Figure 1, page xx), the trends in [Members' Motivation], [Accomplishment of Project to Date], and group's receptivity to ideas shared are very similar.

[Members' Motivation] and group's receptivity to ideas shared show a decrease throughout the entire project length of 13 weeks. However, the group still managed to show an increase in accomplishment as members still desire to finish the project.

9. SENSITIVITY ANALYSIS

In this model, sensitivity analysis shall be conducted on four variables: 1) Members' Clear Understanding on Group's Purpose, Roles, and Expectations, 2) Non-Project Activity, 3) Normal willingness to share ideas, and 4) Members' Feeling of Being Respected and Valued by Group.

For each variable, different values will be input into the model, and the resulting graphs of [Members' Motivation], [Members' Feeling of Being Respected and Valued by Group], group's receptivity to ideas shared, and [Accomplishment of Project to Date] will be compared to investigate the extent of change.

It was found that changing "members' clear understanding on group's purpose, roles, and expectations", "non-project activity", and "members' feeling of being respected and valued by group" caused both [Members' Motivation] and [Accomplishment of Project to Date] to vary. Therefore, they are sensitive variables in the system.

10. POLICY RECOMMENDATIONS AND TESTING

With "members' clear understanding on group's purpose, roles, and expectations", "non-project activity", and "members' feeling of being respected and valued by group" being identified as three sensitive parameters in the system, policies will now be formulated to improve the team's effectiveness by leveraging on these variables.

Three policies shall be formulated and evaluated with the model: 1) Establishment of team's purpose, roles, and expectations, 2) Non-project related, team bonding sessions, and 3) Group workshop before commencement of project.

10.1. Policy 1: Establishment of team's purpose, roles, and expectations

The sensitivity analysis of the variable 'members clear understanding of group's purpose, roles, and expectations' in Section 9 has shown that the establishment of a team's purpose, roles, and expectations are able to increase the motivation of members in the group, thereby contributing to a greater team performance. Therefore, the first policy recommends that groups have a meeting to establish their team's purpose, roles, and expectations before embarking on the project.

To further refine this policy, a time sensitivity analysis will be done using the model. This analysis aims to investigate whether the timing of establishment of team's purpose, roles, and expectations will drastically influence the accomplishment of the project. The simulated increase will be tested at five different time intervals: Week 0-1, Week 3-4, Week 6-7, Week 9-10, and Week 12-13.

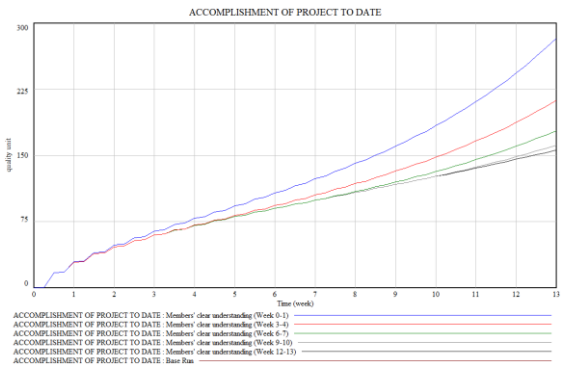

Figure 5: Graph of [Accomplishment of Project to Date] with Policy 1 applied

It is seen from Figure 5 that the group accomplishes more the earlier members clearly understand the group's purpose, roles, and expectations.

From week 6 onwards, it is seen that the final accomplishment does not increase as much for the same increase in members' clear understanding.

It is also noteworthy that the graphs of Base Run and members' clear understanding (Week 12-13) have effectively merged; establishing the team's roles at the last minute is an ineffective policy.

Therefore, it is recommended that group members establish and understand their purpose, roles, and expectations as early in the project as possible. Ideally, it should be done in the first half of the project timeframe.

10.2. Policy 2: Inclusion of non-project activity

The sensitivity analysis of the variable 'non-project activity' in Section 9 has shown that having non-project related activities increase the motivation of members in the group, thereby contributing to a greater team performance.

However, non-project activity is hard to achieve in contexts such as that of a university student, as there are certain weeks in the semester where deadlines take up most of a group members' time. To find out how these busy periods affect the group's accomplishment, three scenarios shall be simulated. In the first (ideal) scenario, the group consistently maximises non-project activity throughout the semester. In the second scenario, there is no non-project activity between weeks 6-7 and 12-13. In the third scenario, there is only non-project activity from week 0-1 and week 12-13.

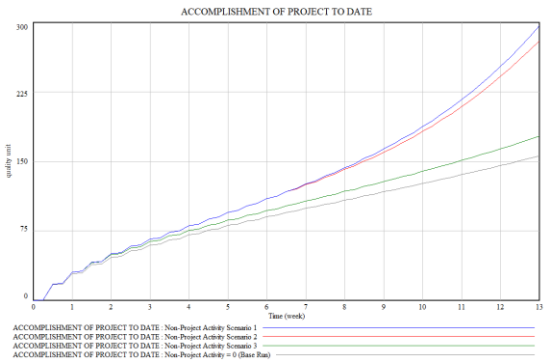

Figure 6: Graph of [Accomplishment of Project to Date] with Policy 2 applied

It was found that the change in accomplishment is not very significant from Scenario 1 to 2. This indicates that the team can take occasional breaks and not suffer significant costs to their accomplishment, should they include non-project activities by default. However, the group's accomplishment is noticeably lower when the group's default mode is to not have non-project activity, and only have it occasionally. Therefore, it is recommended for groups to have non-project activities such as non-working lunches and outings together.

A clear limitation of this policy is that non-project activity is usually regarded as optional by the team members involved. Moreover, given the hectic schedule of most members, it is likely that non-project activities would not be prioritised. Therefore, it can be very difficult to improve the team's effectiveness through non-project activity; taking this route would require members to be committed to the group, which usually only occurs when they are already motivated.

10.3. Policy 3: Group workshop before commencement of project

Building upon Policy 1, a workshop could be conducted for groups before commencing on a project. This workshop would focus on establishing three areas: 1) Team's purpose, roles, and expectations, 2) Members' understanding of team's purpose, roles, and expectations, and 3) Need for respect within the group

By establishing these three areas, Policy 1 is effectively used. In addition, the initial value of [Members' Feeling of Being Respected and Valued by Group] should be higher. With these in place, there should be a significant increase in the group's accomplishment.

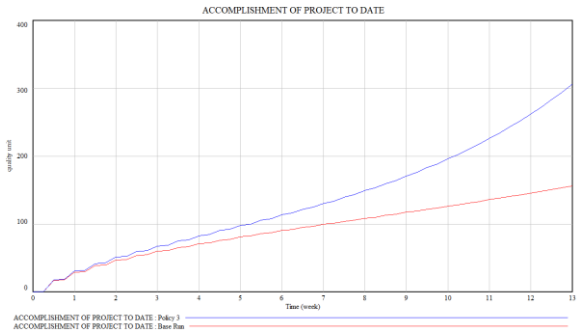

Figure 7: Graph of [Accomplishment of Project to Date] with Policy 3 applied

By assuming a modest increase (from 0.5 to 0.65) in both "members' clear understanding on group's purpose, roles and expectations" and initial value of [Members' Feeling of Being Respected and Valued by Group], the policy causes final [Accomplishment of Project to Date] to be doubled; it also increases at an increasing rate,

while the base run shows a decreasing trend. Therefore, Policy 3 shows great promise in effectively improving a team's performance.

11. CONCLUSION

At the start of this paper, it was hypothesised that the motivation of group members and group's receptivity to ideas shared are crucial factors in determining the effectiveness of a group.

After construction of the causal loop and stock and flow diagrams, it was found that members' motivation is indeed central to the group's effectiveness. In addition, it was found that increasing members' clear understanding on group's purpose, roles, and expectations, non-project activity time, or initial members' feeling of being respected and valued by group are viable methods of increasing motivation, thereby increasing the group's accomplishment.

On the other hand, it was rationalised during the stock and flow construction that the group's receptivity to ideas shared cannot be taken as a single, significant variable affecting the team's effectiveness. Rather, the group's receptivity will have to be compared to the level of receptivity that members expect of the group. It is only when expectations do not meet reality, or when expectations exceed reality, will the motivation and effectiveness of the group change.

After sensitivity analysis and policy testing, it was also found that conducting a pre-project workshop is a potentially viable solution to raising a team's motivation and performance. This workshop would aim to establish the team's purpose, roles and expectations, the members' understanding of these areas, and the need for respect within the group.

However, all these findings are only applicable under the assumptions that group's receptivity to ideas only varies with the group's esteem of themselves as a unit, and that group members have an individualistic slant (Section xx, page xx). Without these assumptions, the model would have many more variables to work with and might produce vastly different results.

The first step to improving this model would be to work on the assumptions stated. A model exploring group's receptivity to ideas shared could be built, and results could be fed into this model to gain a better understanding of the relation between a group's motivation and its accomplishments.

Another area of further development of this project is the investigation of leadership on a group's performance. While leadership was briefly touched upon in this paper, its effects are not fully accounted for.

All in all, a group's working dynamics consists of a complex interplay of a plethora of factors. While this model is only the tip of the iceberg in exploring how a group functions and performs, every small step brings with it new insights and discoveries.

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13. NOTATION

[Square brackets] are used to refer to the four main stocks in the stock and flow diagram.