

# **Software Project Team Dynamics**

## **A study of enablers and barriers to successful teams**

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### **Abstract**

Team dynamics is the term used to define how people work and interact together in teams. Positive team dynamics are those that enable and contribute to high performing successful teams. Negative team dynamics are the dynamics that create barriers preventing teams from achieving their full potential. Teamwork is more effective with the existence of positive team dynamics and will encourage a better working environment with satisfied, fulfilled employees, who will in turn be more productive. Participation in a team should be of benefit to team members on both a personal and professional level.

The absence of the positive dynamics can lead to a decrease in performance, preventing teams from achieving their full potential. If team members feel that being part of the team is not meeting their personal development needs or that their contribution to the team's success is not relevant, then this will lead to a decrease in their level of motivation and commitment, which will in turn lead to a reduction in their level of productivity. When the individual roles of the team have not been clearly defined, this will lead to confusion and a sense of aimlessness.

The objective of this research was to identify the positive and negative team dynamics, as well as the internal and external team dynamics. In the context of this research, teams are referring to those that exist within software/IT organisations. Team dynamics is the term used to define how people work and interact in small groups. Positive team dynamics are the dynamics, which contribute to high-performing, successful teams and Negative team dynamics are the dynamics, which prevent teams from reaching their full potential. These team dynamics have been investigated and methods of dealing with them and preventing them have been identified.

This paper describes a research study which investigated the dynamics of software/IT teams. The positive dynamics, which contribute to high-performing successful teams, are investigated to show how they make teams more productive and more successful, and the negative dynamics which create barriers to this success are also investigated, and the ways they prevent teams from achieving their full potential were identified.

### **Keywords**

Software Project Management, Software Teams, Team Management, Team Dynamics

## 1. INTRODUCTION

The objective of this research was to explore the positive and negative team dynamics, as well as the internal and external team dynamics that are in play in software development / IT organisations. Team dynamics is the term used to define how people work and interact in small groups. Positive team dynamics are the dynamics, which contribute to high-performing, successful teams, will be identified in this research. Negative team dynamics are the dynamics, which prevent teams from reaching their full potential. These negative team dynamics will be investigated and methods of dealing with them and preventing them will also be identified. The internal team dynamics, which exist between team members within the team, and their impact on team performance will also be investigated as well as the external team dynamics, which are the dynamics, which exist outside of the team. Even though these external team dynamics are beyond the team's control, they nonetheless impact on the team's performance.

The basis of every software/IT organisation is a team, be it a management team, a development team, a trouble-shooting team or a testing team. [1] found that 85% of companies with 100 or more employees use some type of teams. [2] defined a team as "a small group of people with complimentary skills, who are committed to a common purpose, performance goals and approach, for which they hold themselves mutually accountable". Software/IT organisations are under more pressure than ever before to become more productive and more cost effective. The use of teams has been shown by [3] to increase speed, productivity, problem-solving ability and organisational learning. [4] stated that a team is more than just a collection of people.

Cohen and Bailey [1] identified four types of teams in organisations today

- Work teams - are the type of team most people think about when discussing teams. They are continuing work units responsible for producing goods or providing services. Membership is usually full-time, and well defined.
- Parallel teams - people from different work units or jobs to perform functions that the regular organisation is not equipped to perform well. Parallel teams (such as trouble-shooting teams, task forces and quality improvement teams) literally exist in parallel with the formal organisational structure.
- Project teams - produce one-off products such as a product or service and thus, are time limited. Project team tasks are non-repetitive in nature and when a project is completed, the members either return to their functional units or move on to the next project.
- Management teams - are responsible for the overall performance of their business units, and are composed of managers responsible for each sub-unit. Management teams coordinate and provide direction to the sub-units under their jurisdiction, and are responsible for the overall performance of their sub-unit.

The foundations of the team and team dynamics are laid down during team-building. To remain competitive, organisations must focus on forming and maintaining high-performing, successful teams. [5] defined 4 stages of small group formation and [6] found that teams undergo the same four stages of evolution as follows:

- Forming - Where members get to know each other
- Storming - Conflict and disagreement about rules and procedures
- Norming - Establishment of rules and social relationships
- Performing - Work, completion of task

According to [7] a team should not be viewed as the end product of a team-building activity. Instead she found that a team should be viewed as a dynamic entity, always changing in response to its circumstances and environment. She found that the team-building activity should be viewed merely as kicking off a process that should be continued when the team returns to its real-life work environment, otherwise the team would regress to its original state.

## 2. POSITIVE AND NEGATIVE TEAM DYNAMICS

Team dynamics is the term used to define how people work and interact together in teams. Positive team dynamics are those that enable and contribute to high performing successful teams. Negative team dynamics are the dynamics that create barriers preventing teams from achieving their full potential.

Teamwork is more effective with the existence of positive team dynamics. This will encourage a better working environment with satisfied, fulfilled employees, who will in turn be more productive. High performing teams are teams that organise themselves to perform their tasks, develop social relations and have leaders who provide direction.

Social facilitation is the term used by [8] to describe the fact that when people are working in the presence of others, this leads to an increase in productivity. Participation in a team should be of benefit to team members on both a personal and professional level. [2] found that being a member of a team should help develop an individual's social and interpersonal skills. [4] found that working on a team with individuals with different levels of expertise and skills, should also help broaden an employee's skills. When a team member feels that the task they have been assigned is compatible with their expertise and that the task is a worthwhile contribution to the team, this will lead to increased levels of self-worth and motivation. It is also important that each member of the team knows and understands their role and knows what the team expects from them.

The absence of the positive dynamics outlined above will lead to a decrease in performance, preventing teams from achieving their full potential. If team members feel that being part of the team is not meeting their personal development needs or that their contribution to the team's success is not relevant, then this will lead to a decrease in their level of motivation and commitment, which will in turn lead to a reduction in their level of productivity. When the individual roles of the team have not been clearly defined, this will lead to confusion and a sense of aimlessness.

The main team dynamics are:

- **Personal Development** - It is important for every individual to be given the opportunity for personal development and an important aspect of every job is the opportunity to learn and develop new skills. [2] found that being a member of a team has a positive influence on personal learning and development, as most of us have the potential to learn the new skills required for a team because our sense of accountability to the team.
- **Motivation** - Our level of motivation depends on how driven we are to achieve. [9] found that the need for achievement is the mental driving force within us and that motivation is associated with high levels of productivity. Having all of the necessary skills is not necessarily the highest priority when selecting members for a team. [10] found that having enthusiasm and motivation to work and learn new skills are just as important as having the required talents and skills. He found that this enthusiasm would inspire motivation in other team members.
- **Morale/Self-Worth** - Being a member of a team is beneficial to most people. [7] found that being a member of a team leads to a rise in self-awareness, self-appreciation, self-worth and self-confidence. She found that the extent to which the team allows the individual to feel good is the extent to which the individual feels good about the team.
- **Empowerment** - is where management gives its employees more authority, control, power and responsibility. Team members will feel empowered when they feel they have control over their work, their performance appraisal and their career path. [11] found that empowerment consists of a sense of self-determination, personal meaning, competence and perceived impact.
- **Commitment** - Teamwork cannot succeed without the commitment of every member of the team, commitment to both the team and the goals of the team. If team members feel that what they are doing is not of benefit to the team, then their level of commitment will be quite low. [12] found that team members display commitment to the team by their sense of loyalty and dedication to the team as committed team members are willing to devote their time and energy and make personal sacrifices for the project.
- **Trust** - is a vital factor for effective teamwork, trust between team members themselves and trust between team members and management. [13] found that the existence of trust reduces the need for monitoring, increases organisational behaviour and improves team effort and motivation.
- **Stress** - High levels of stress can lead to an inability to cope, and health problems, leading to an increase in the level of absenteeism, which is detrimental to productivity. [14] found that high performing team members are most at risk from burnout due to stress, as they are often given the most challenging tasks because of their ability and drive.

### 3. INTERNAL AND EXTERNAL TEAM DYNAMICS

Internal team dynamics are the dynamics that exist between team members within the team itself. [4] found that the internal social relations that build social cohesion within a team provide mutual support for team members to perform their tasks. He found that team members needed to communicate well, work cooperatively together and provide emotional support for each other. He also found that teams with high levels of social cohesion are more effective.

Each member of the team needs to know and understand the goals of the team to help keep them focused and productive and to prevent them from becoming aimless. [15] found that teams can only exist within a communication structure that encourages the sharing of information. They also found that open communication encourages more participation from all members on decision-making, which will increase the sense of ownership of the product.

It is important to all of us to have a sense of belonging. Members of effective teams have a strong sense of belonging to the team. Effective teams have a strong level of social cohesion within the team. Conflict, which isn't necessarily always a bad thing, must be dealt with appropriately. Interdependency between team members encourages the spirit of teamwork. Project managers should encourage social activities that build a team spirit within a team. Support from management is vital to a team's success. When team members see that management is willing to invest in the team, this will lead to an increase in team-spirit, resulting in increased performance. It is also important that each team member feel that his or her effort and work are recognised and rewarded accordingly, within a fair appraisal system.

External team dynamics are the dynamics that exist outside of the team, and thus are beyond the team's control, but nonetheless impact on the team's performance. If the work environment is of a substandard quality, e.g. old Porto cabins, overcrowding, poor lighting and ventilation, this will reflect management's unwillingness to invest in the team. This will lead to a decrease in morale within the team, with a reduction in their commitment, motivation and hence performance. When the economy is going through a recession, or consumer demand changes, this will force many organisations to restructure and downsize. This will create an atmosphere of fear and uncertainty among employees with regard to their job security and future within the organisation. This will cause employees to become distracted from their tasks.

The main internal team dynamics are:

- Cohesion - Effective teams have been found to have a high level of social cohesion (an interpersonal bonds that tie the team members together). [1] found that the existence of a high level of cohesion within a team, led to increased levels of productivity.
- Communication - Good communication is a key element of teamwork as it encourages the sharing of information and knowledge. [15] found that members must be willing to listen carefully to each other and share the unique knowledge and skills for which they were selected.
- Goals - It is important that every member of the team knows and more importantly, understands the goals. [10] found that a group of people must not only work as a team where every member works for his/her own advantage, but every member should work as part of a team where he/she is working towards a shared goal.
- Decision-making - within teams tends to be easier and the decisions made tend to be better informed than those made on an individual basis. It is better to involve all team members in decision making, as this will encourage input from different levels of expertise and skills, rather than having just one member making the decision.
- Team-spirit - includes the day-to-day interaction with other team members and the sense of fun that exists. [16] found that initially members often feel uneasy about being part of a team because they fear rejection and worry about inclusion in the group.
- Interdependence - is a key aspect to teamwork. Interdependency exists between members of a team when each member needs to interact with the other members in order to complete their task. [1] found that this facilitates the building of relationships and social cohesion within the group and also enables the transfer in knowledge.
- Conflict - is a part of everyday life and is usually caused by different values, goals or expectations and can have both a positive or negative impact on productivity and team effectiveness. In the past, the emphasis was on avoiding conflict, but today this emphasis has moved towards managing conflict.
- Performance and Reward - When team members feel that their work and effort are recognised, valued and rewarded accordingly, this will lead to an increase in motivation and thus, productivity.

The main external team dynamics are:

- Management Support - For teamwork to be successful, commitment to the team is required not only from each member of the team, but also from management. If a lack of management support is evident to team members from say an unwillingness to invest in required training or facilities or unfair reward systems, this will lead to a lack of motivation from the team leading to poor team performance
- Job-security - [17] found that when an organization is letting go employees, individuals tend to react with fear through behaviour that involves undermining a team mates' efforts and credibility, and taking the credit for somebody else's work.

#### 4. THE STUDY

A series of case studies were completed to explore the positive and negative team dynamics, as well as the internal and external team dynamics that are in play in software development / IT organisations. Information was gathered by initially using a questionnaire, which was formulated to ensure coverage of each of the team dynamics previously discussed. The team dynamics focused on in the questionnaire include: motivation, morale/self-worth, empowerment, commitment, trust, stress, cohesion, communication, goals, team-spirit, interdependence, conflict, performance & reward, management support and job security.

The objective of the questionnaire was to establish what engineers working in the software/IT industry, felt were the positive team dynamics that they considered contributed toward high levels of productivity and success in teams. It also set out to determine how they felt these dynamics could be achieved, based on their experience. Another objective was to establish what engineers felt were the negative team dynamics that created barriers to achieving this level of productivity and success. The questionnaire also sought to support or contradict the research findings as briefly described above.

The questionnaire was then used as the basis for subsequent face-to-face interviews. These interviews were held off-site and lasted 2-3 hours each. The interviews were then followed up with telephone conversations to clarify points that arose during analysis. A total of 24 people from 3 organizations were selected to take part in these case studies.

The interviews were carried out to gather in-depth information from the teams involved in the case studies, based on the questionnaire. The interviews were held in off site settings in an informal environment to promote open discussion on the different aspects of team dynamics. Having the interviews off-site prevented disruptions due to work commitments, such as phone-calls and meetings, but also promoted the provision of more honest feedback from the engineers, who felt more at ease to do this on 'neutral territory'.

##### 4.1 Case Study 1

This involved a systems requirements team in the software development division of a telecommunications organization, who employed 400 engineers in total in this location, with approximately 50,000 engineers in total worldwide. The focus for this team is the implementation of customer requirements and the latest developments in technology. The team has 8 members who are all senior engineers with between 8-15 years experience each.

Because this team consisted of senior engineers, they felt it quite important to be allowed the freedom to carry out tasks in the manner they themselves felt most appropriate, and felt it vital to their role to be trusted to perform to a high standard without monitoring or supervision. Varied and challenging work, and recognition of their ability and skills were by far the strongest factors in their level of job-satisfaction. Due to their level of experience they knew it was vital to have goals clearly defined, from the beginning of a project, and to constantly monitor and report progress in relation to these goals. They also felt that good communication skills were essential to the success of the project, due to the rapid changes in technology and ever-changing customer demands.

##### 4.2 Case Study 2

This involved a test team in the software test division of a telecommunications multinational organization, employing approximately 150 engineers in total in this location, with approximately 40,000 engineers in total worldwide. The focus for this team is the test of software produced by the software division, and then delivering it to customer sites. The team has 10 members who are all engineers with 7-12 years experience each.

This team also consisted of senior engineers, and from experience had seen that clearly defined and communicated goals ensured that all members of a team knew what needed to be done and when to do it. They felt that varied and challenging work was the strongest motivating factor, which led to increased levels of enthusiasm and motivation. They also felt that more flexible working hours and increased time off work to be more effective rewards than money.

##### 4.3 Case Study 3

This involved a senior management team in the software development division of a multinational telecommunications organization, employing approximately 300 engineers in total in this location, with

approximately 80,000 engineers in total worldwide. The focus for this team is the management of software projects, making deliveries to customer sites. The team has 6 members who are all managers with 10-20 years experience each.

The members of this team were all senior managers, who had many years experience dealing with engineers and their needs. Because of this, they had very strong people skills, and their focus was very much on how to meet employees' needs in order to increase their level of job-satisfaction, thereby ensuring their commitment to the organization. They also felt that this also increased productivity and efficiency.

## 5. ANALYSIS AND RESULTS

The data collected was analysed to investigate similarities in the findings from the different teams. The analysis also attempted to validate findings from research as to which dynamics enable high performing successful teams, and which create barriers to success. This section will provide a high-level review of this analysis.

With respect to goals, it was found that clearly defined goals keep the team focused and motivated to achieve these goals. It was found that regular feedback is essential to keep the team focused on achieving their goals and leads to an increase in motivation, productivity and performance. It was also found that it is important to relate each team members' personal goals to the overall goals of the organization, to enable a better understanding of each member's contribution to the overall organization. These findings concur with research.

In relation to job-satisfaction, it was found that that job-satisfaction has a positive impact on the level of commitment, and that challenging and varied work was rated as being the most important factor influencing job-satisfaction, which supports research findings. All case studies involved senior engineers/managers and none reported salary as the most important factor, which also supports research findings. It was also found that management support results in an increase in the level of self-confidence, confirming research findings.

All 3 cases studies indicated that when personal development needs are met, this resulted in an increase in the level of commitment, which is in accordance with research findings. They also found that a fair and equitable performance and appraisal system has a positive impact on the level of commitment to remain with the organization and that organizations that provide both a technical and a management career path, have a higher level of commitment to remain with the organization, which supports research findings.

In relation to the nature of work, it was found that the assignment of challenging tasks results in an increased sense of recognition, which leads to higher levels of motivation, as reported in research. It was also found that the assignment of a complete task from beginning to end, results in an increased sense of ownership and thus responsibility, and the assignment of a variety of tasks results in an increase in levels of motivation supporting research findings.

Although none of the case studies mentioned stress, the data reported that a person-job fit results in an increase in motivation, job-satisfaction and efficiency, all of which have been shown to have a positive impact on productivity, thereby supporting research findings. The data reported from the 3 case studies also supports research findings that strong relationships/bonds with a team leads to a strong sense of cohesion within the team.

But, the use of psychometric tools when assigning roles/tasks was not supported by these case studies, which contradicts research. Also, it was found that teams made up of members with different KSAs (Knowledge, Skills and Abilities) might have a positive impact on the team, which also contradicts research findings that teams made up of members with similar KSAs are more effective.

## 6. CONCLUSIONS

The objective of this research was to identify the positive and negative team dynamics as well as the internal and external team dynamics, to identify which contribute to high performing, successful teams, which are essential to remain cost-effective in today's economic climate.

The following findings supported the research:

- Clearly defined goals keep the team focused and motivated and it is important to relate each team members' personal goals to the overall goals of the organization. Regular feedback is essential to keep the team focused on achieving their goals and leads to an increase in motivation, productivity and performance.

- Job-satisfaction has a positive impact on the level of commitment with challenging and varied work rated as being the most important factor influencing job-satisfaction.
- The fulfilment of personal development needs, the possibility of both a technical and a management career path as well as a fair and equitable performance and appraisal system, results in an increase in the level of commitment.
- The assignment of challenging and varied tasks results in an increase in levels of motivation, and the assignment of a task from beginning to end results in an increased sense of ownership.
- A person-job fit results in an increase in motivation, job-satisfaction and efficiency.
- Strong relationships/bonds with a team leads to a strong sense of cohesion within the team.

All of the above supported research findings, but the following did not:

- The use of psychometric tools when assigning roles/tasks was not supported.
- Teams made up of members with different KSAs might have a positive impact on the team, which also contradicts research findings that teams made up of members with similar KSAs are more effective.

The reason that the use of psychometric tools was not supported may be due to the fact that these are relatively new tools to this country, and thus their benefit may not have yet been proven in the workplace. The research data provided on these tools came from Great Britain and the United States, who both make more use of organizational psychologists, when assigning roles and tasks. This is not common in Ireland yet, as the organizations that took part in the case studies use the latest technology and methodologies and none were using these tools. This view is supported by [18] who found that just 28% of organizations in Ireland use psychometric testing during recruitment, compared to 48% in the United Kingdom.

The case studies found that teams made up of members with different KSAs might have a positive impact on the team, which contradicts research findings. This may be due to the fact that the engineers involved in the case studies had a minimum of 7 years experience. Mature people are often more open-minded to differing values and cultures and are more willing to embrace different viewpoints. This may not have been the result if the case studies involved more junior engineers.

## 7. LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

There are two limitations which merit particular discussion. Firstly, the teams involved in the case studies were all made up of senior employees with at least 7 years experience. A more varied level of experience should have been represented in order to get a more balanced viewpoint. Secondly, the three organizations selected for the case studies were all multinational organizations, involved in the telecommunications industry. Even though the data collected is valid, it would have been better to have other sectors of the software/IT industry represented also. With this in mind, an enhanced version of this study taking these factors into account, would be of merit.

This research, even with the limitations described above in mind, has supported research findings (as described above) with the exception of the use of psychometric tools and teams made up of members with similar KSAs. Future research should be carried out to counter the limitations described above. This should involve case studies with teams made up from a cross section of levels of experience, from trainee engineers, junior and senior engineers and up to management. The organizations taking part in the case studies should also be involved in different sectors of the software/IT industry, and not just be limited to telecommunications.

There are a number of areas for further research, such as:

- The use of organizational psychologists, for the assignment of roles and tasks within a team. Comparisons could be made between teams that were assigned roles/tasks in the traditional manner, compared to those that used psychologists.
- The changes in dynamics within a team that are maturing. These could be compared with the dynamics of a more junior team. This would be very relevant in countries such as Ireland, whose population are ageing.
- Methods of maintaining a challenging work environment, and keeping the work as varied as possible. Because challenging and varied work was indicated in this research as the most important factor in job satisfaction, further research could identify ways of providing and maintaining this challenge.

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