**THE RELATIONSHIP BETWEEN TRUST,
COMMITMENT AND SCHEDULE OVERRUN**

by

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in partial fulfillment of the requirements for the degree of
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ABSTRACT

Trust and commitment are vital factors influencing engineering team performance. The objective of this thesis is to examine the effect of trust and commitment on the schedule overrun of engineering teams responsible for completing software development related tasks and how team longevity and task newness affect trust and commitment in engineering teams. This study focuses on the trust-commitment-performance relationship at the engineering task level, not at the project level. The author developed a research model and five hypotheses anchored around this model. The Spearman rank order correlation tests and structural equation modelling were used to examine 44 responses to a questionnaire. Results indicate that: high commitment decreases schedule overrun; trust increases commitment; trust does not directly reduce schedule overrun; team longevity affects trust; and task newness does not affect trust or commitment. The results of this research further suggest that, to reduce the cost of schedule overruns at the task level, project managers need to invest time and money in activities designed to increase trust and commitment within engineering teams.

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1 INTRODUCTION

This research examines the trust-commitment-schedule overrun relationship at the engineering team level. The objective of this thesis is to investigate how trust and commitment affect schedule overrun and how team longevity and task newness affect trust and commitment within engineering teams.

Trust is the willingness to accept vulnerability based on positive expectations about another's intentions or behaviours (Rousseau et al., 1998). Commitment is a sense of duty and resolve to follow through and achieve selected goals (Bowen et al., 1994). For team members, commitment involves linking personal success, status, and esteem to achieving project goals (Bowen et al., 1994).

This research is the first to examine the relationship between trust, commitment and schedule overrun in engineering teams that are part of large software development project organizations in large telecommunications companies. This writer's focus is on the engineering team level, not the large development project level. Typically, engineering teams undertake chunks of a large development project. The word "task" describes activities undertaken by an engineering team that is a component of a development project. For software development teams, tasks may include new feature development, integration and testing of new features, and developing the infrastructure required to support feature development.

Schedule overrun is an important problem faced by organizations that develop software (Brooks, 1975). Schedule overruns result in missed market opportunities

(Carmel & Becker, 1995); lower profits (Gibbs, 1994); increased costs (Pressman, 1982) and delays in other dependent projects (Van Genuchten, 1991). This research is relevant because it offers to reduce the costs associated with late task completion in engineering teams.

This research makes three contributions. First, it examines the trust-commitment-performance relationship at a finer-grain level of analysis than other research studies. The existing literature focuses on the project level of analysis. This research focuses on a component of the project: the engineering team.

The second contribution this research makes is that it identifies the observable trust and commitment behaviours that can be used to reduce schedule overrun.

The third contribution this research makes is that it highlights the importance of trust and commitment as factors which impact schedule overruns and are not well recognized in the software engineering literatures.

The thesis is organized into seven sections. Section 1 is the introduction. Section 2 is the literature review. Section 3 provides a research model and develops five hypotheses. Section 4 describes the data collection method and data analysis strategy. Section 5 contains the results obtained testing the hypotheses. Section 6 discusses the results. Finally, Section 7 presents the conclusions, limitations and suggestions for future research.

2 LITERATURE REVIEW

This section is organized into five parts. The first part identifies the empirical studies on longevity and newness. The second part reviews the empirical studies that examine the relationship between trust and commitment. The third part examines the relationship between trust, commitment and performance. The fourth part of this section examines performance measures. Finally the fifth part identifies the key lessons learned from reviewing the literature.

2.1 Longevity and Newness

Longevity

Team longevity is the length of time the team members have worked together (Katz, 1982; Pelled et al., 1999; Sethi & Nicholson, 2001).

Katz (1982) investigated the communication behaviors and performance of 50 R&D project groups that varied in terms of group longevity. His results revealed that project groups became increasingly isolated from key information sources both within and outside their organizations with increasing stability in project membership. Such reductions in project communications were also shown to affect adversely the technical performance of project groups. In his research, it was clarified that group longevity was not the length of time the project had been in existence, but the average length of time the project members had interacted with each other.

Pelled et al. (1999) examined how team longevity moderates the relationship between team diversity variables and conflict in work groups. The findings suggest that after a period of time, group members may become too familiar with the different perspectives in a diverse group. If a group member has an idea, he or she may be able to anticipate other members' criticisms and consequently, either frame the idea to make it more acceptable or avoid expressing the idea altogether. In this study, team longevity was used as a moderator. Test results showed that the positive associations between diversity variables and both (task and emotional) conflicts were weaker in groups with greater longevity.

Sethi and Nicholson (2001) examined charged behavior, a construct comprised of dimensions such as enjoyment, commitment, open information sharing, challenging ideas, and cooperation. They tested a series of hypotheses concerning how charged behaviour affects product performance and how charged behaviour, in turn, was influenced by team structural characteristics such as physical proximity and team longevity. They proposed that team longevity is positively related to charged behavior. Using data from 141 development teams of large consumer product firms, structural equations models were used to examine the antecedents and consequences of charged behavior. One of the results showed that team longevity is not positively related to charged behavior.

Barczak and McDonough III (2003) examined the role of trust and project commitment in new product development teams and stated that given the temporary nature and diversity of new product development teams, future research may wish to explore whether the extent to which team members know each other and the length of

time the team has been together affects the trust-commitment-performance relationship.

Newness

Garcia and Calantone (2002) defined a model for measuring the newness of a project. Project newness can be measured at a macro level (i.e., market, technology perspective) and at a micro level (new to the firm, new to the customer). The newness of innovations can be labelled “radical”, “really new”, and “incremental”. Radical innovations are innovations that cause marketing and technological discontinuities at both the macro and micro level. Incremental innovations occur only at a micro level and cause either a marketing or technological discontinuity but not both. Really new innovations cover the combinations between these two extremes.

Callahan and Lasry (2004) explored the acquisition of customer input and its importance in the development of a very new product. Focusing on how firms manage their interfaces with customers during the new product development, product newness was measured by the perspective of “New to the firm” including market and technology newness.

Griffin (1997) examined 274 completed and 69 ongoing product and service developments projects. Her results showed that the number of months spent in product development increases with higher product complexity and higher level of product newness. Complexity and newness were used as control variables.

Tatikonda and Montoya-Weiss (2001) examined the relationship among organizational process factors, product development capabilities, critical uncertainties, and operational/market performance in product development projects. Data from a sample comprised of 120 completed projects for assembled goods was analysed. The findings showed that: 1) Organizational process factors were associated with the achievement of operational outcome targets for product quality, unit cost, and time-to-market; 2) Achievement of operational outcomes aided the achievements of market outcomes; 3) These relationships are robust under conditions of technological, market and environmental uncertainty. For technological uncertainty, the study by Tatikonda and Montoya-Weiss (2001) defined level of technology novelty as the task-related characteristic internal to the development effort that contributes to uncertainty. Product and process technology novelty were the two aspects of technology novelty. Six constructs of newness (newness of the technologies to the company) related questions were used to test technological uncertainty.

Eisenhardt and Tabrizi (1995) contrasted two theoretical models for firms' achieving fast adaptation through product innovation. They concluded that compression strategy was appropriate when product development is a predictable or certain process, one that can be planned out as a series of discrete steps. In contrast to the compression strategy, experiential strategy was appropriate to product development with high uncertainties and required being flexible and willing to rapidly shift in order to adapt to the uncertain environment. In the Eisenhardt and Tabrizi (1995) study, data from 72 product development projects in 36 large PC, minicomputer, mainframe and peripheral companies were examined. 24 mainframe and microcomputer products development projects were grouped into a certain product category and the other 48 personal

computers and peripheral products were grouped into an uncertain product category. Their results indicated that using an experiential strategy comprised of multiple design iterations, extensive testing, frequent project milestones, a powerful project leader, and a multifunctional team accelerates product development. The use of compression strategy is comprised of supplier involvement, use of CAD, and overlapping development steps is only appropriate for mature industry segments. Their results suggest that planning and rewarding for schedule attainment are ineffective ways of accelerating pace in development projects.

Pelled et al. (1999) examined how task routineness affects the relationship between diversity and task conflict, and in turn, performance. The study stated that task routineness is a key task feature that warrants attention. Task routineness was defined as the extent to which a task has low information proceeding requirements, set procedures, and stability. Task conflict was defined as a condition in which group members disagree about task issues, including goals, key decision areas, procedures and the appropriate choice for action. One of the results indicates that functional background diversity was more likely to trigger task conflict when tasks were routine than when tasks were non-routine.

Vegt et al. (2000) used responses to a questionnaire from 114 technical consultants and reported that individual-level task interdependence and job complexity were positively related to individual job satisfaction, team satisfaction, job commitment, and team commitment. Task interdependence was defined as the extent to which group members must exchange information and resources or actually work together to complete their jobs. Perceived job complexity reflects a team member's belief that the

work being done is intrinsically interesting and challenging because it is characterized by high level of variety, significance, identity, feedback, and autonomy (Hackman & Oldham, 1980)

2.2 Trust and Commitment

Trust

Rousseau et al. (1998) suggested that trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviours of another. In their research, Rousseau et al. (1998) stated that risk and interdependence are the conditions that must exist for trust to arise. Trust would not be needed if actions could be undertaken with complete certainty and no risk (Lewis & Weigert, 1985). Risk and interdependence are necessary conditions for trust, and variations in these factors over the course of a relationship between parties can alter both the level and, potentially, the form that trust takes (Rousseau et al., 1998).

Trust guides action by suggesting behaviors and routines that are most viable and beneficial under the assumption that the trusted counterpart will not exploit one's vulnerability (McEvily et al., 2003).

Ruppel and Harrington (2000) suggested that the establishment of trust within the organization is a worthwhile effort in organizations where innovation is desired.

McKnight et al. (1998) stated that the most critical time frame for organizational participants to develop trust is at the beginning of their relationship. Trust may be high

when members of organizations barely know each other. Some other researches have stated that trust develops gradually over time (Blau, 1964; Rempel et al., 1985; Zand, 1972).

Jones and George (1998) analysed the way that trust evolves in organizations and how it influences cooperation and teamwork. They proposed that trust was determined by the interplay of individuals' values, attitudes, moods and emotions. Using the perspective of symbolic interactions, they examined how trust evolved and changed over time. Two distinct states of trust were described: conditional trust and unconditional trust. They stated that although the presence of conditional trust allows a group to work toward a common goal, the existence of unconditional trust could fundamentally change the quality of the exchange relationship and convert a group into a team. It takes time, effort and considerable resources to build and maintain unconditional trust. The study also indicated that trust could also dissolve or disappear over time.

Commitment

Bowen et al. (1994) described commitment as a sense of duty and resolve to follow through and achieve selected goals. For individual team members, commitment involves linking personal success, status, and esteem to accomplishing project goals (Bowen et al., 1994). According to Meyer and Allen (1991), there are three types of commitment: 1) Attitudinal commitment, which means people have emotional attachment to the organization and they are willing to stay within the organization; 2) Continuance commitment, which indicates that people are attached to the profit of staying with the organization and cannot afford the cost of leaving; 3) Normative

commitment, which means people feel they have obligation to stay. Among all three commitments, attitudinal commitment is the one that has been studied the most.

Lencioni (2002) stated that, in the team context, commitment is a function of: clarity and buy-in. Before a decision is made, team members freely express their different opinions. Once a decision is finalized, the team will move forward with complete buy-in from every team member, including those individuals who voted against the decision.

Trust and Commitment

Ruppel and Harrington (2000) stated that trust is especially critical to the evolution of employee commitment in times of change or innovation.

Geyskens et al. (1996) examined the trust and commitment relationship at the firm level. Responses to a questionnaire sent to automobile dealers in the United States and the Netherlands showed that a high level of trust increases the affective commitment for channel partners.

Hosmer (1994a & 1994b) examines the need for morality in managers. Hosmer (1994a & 1994b) argues that trust leads to commitment, which in turn leads to innovative effort. He suggests that trust and commitment result in enthusiastic cooperation and innovation. Mutual trust will allow people to express new ideas without concern over negative consequences if their new ideas fail. Based on responses to a questionnaire by information technology managers, Hosmer (1994a & 1994b) concluded that a positive relationship between trust and commitment exists.

Jones and George (1998) argue that trust leads to a set of behavioral expectations among people. Trust allows people to manage the uncertainty or risk associated with their interactions, so that they can jointly optimize the gains that will result from cooperative behavior.

Nooteboom (2000) explored how coordination affects innovative performance. He found that the forms of coordination used for inter-firm relations largely determine firms' innovation outcomes and that coordination forms include trust, evasion, integration under unified administrative control, and formal contracting. When trust is compared with other means of coordination, trust was found to be economical, more flexible, and requires little monitoring. Another advantage of trust is that it might be already in place when the relationship starts. Trust can exist at the start due to kinship, experience gained in previous mutual contact, and reputation. The limitation of using trust to coordinate is that if it is not present, it takes time to establish.

Pearce et al. (2000) examined trust and commitment in particular organizations and found that the perception difference in personal practice mediated the relationship between political system and employee's trust in one another, their perception of co-worker shirking, and their organizational commitment. In their study, five items were used to measure trust in co-workers and six items were used to measure organizational commitment.

Bailetti et al. (2003) examined the importance of senior managers' behaviours to the commercial success of fast development projects. After reviewing the product development literature, 13 policies and 65 senior managers' behaviours that improve

development speed were identified. Using data from 34 projects (17 successful projects and 17 unsuccessful projects), ANOVA tests were performed to identify those behaviours that distinguish successful from unsuccessful software development projects.

2.3 Trust, Commitment and Performance

Zaheer et al. (1998) examined the data from a sample of 170 buyer-supplier inter-firm relationships in the electrical equipment manufacture industry. The result showed that inter-organizational trust was positively related to performance but interpersonal trust was not.

Bowen et al. (1994) listed ownership and commitment as one of the critical elements for the success of development projects. They found that the quality and level of effort expended on a development project – and thus the degree of success ultimately achieved – was tied directly to the extent of ownership and commitment exhibited by those involved. If individuals are not committed, or do not feel they own their work; they simply will not reach the level of effort required for outstanding success.

Barczak and McDonough III (2003) examined the relationships between trust, commitment and performance within new product development project domain. Data from project leaders and team members from 41 new product development projects were used. The result showed that trust has direct positive impact on commitment and that trust is related to market performance only through project commitment. This means that trust only influences the market performance of a new product to the extent

that it contributes to generating commitment to the project, however commitment contributes only to market performance and not project speed.

To test whether commitment mediates the relationship between trust and performance, Barczak and McDonough III (2003) used the procedure recommended by Baron and Kenny (1986). First, the mediator (commitment) was regressed on the independent variable (trust); secondly, the dependent variable (performance) was regressed on the independent variable; thirdly, the dependent variable was regressed on both the independent variable and the mediator. To provide evidence of the mediation, three conditions needed to be met in the above regression: 1) Trust must be related to commitment; 2) Trust must be related to the dependent variable performance; 3) The relationship between trust and the performance variables is not significant when the effect of commitment is controlled.

2.4 Performance Measurement

To measure the performance of new product development teams, Ancona and Galdwell (1992) used managerial performance ratings and team-member performance ratings. Managerial performance ratings include two factors: 1) Ratings of quality of technical innovations, ability to resolve conflict, and efficiency clustered together; 2) Adherence to schedules and adherence to budgets. Team member- rated performance was comprised of six dimensions: efficiency, quality, technical innovation, adherence to schedules, adherence to budget, and work excellence.

Eisenhardt and Tabrizi (1995) examined the relationship between organization processes and fast development within the computer industry. Development time was used as the performance measurement for the projects. The relative development time (delay time divided by the average development time for projects in the same category) was used to measure performance at the project level.

Barczak and McDonough III (2003) used both market performance and development speed to measure project performance. The result showed that trust is related to new product market performance only through project commitment and neither trust nor commitment had any effect on product speed.

Callahan and Moretton (2001) examined the factors that reduce development time in software development organizations. They argue that short development time allows a firm to successfully compete in the market. Being late to the market can mean significantly lower revenues and dramatically lower profits. Duration was used as the performance measurement, which was the square root of the interval between the point in time at which personnel were first assigned to analyse software product requirements and the release of the product to customers.

In the research conducted by Bailetti et al. (2003), sales and profit projection were used as a performance measurement. Successful development projects were those that met or exceeded sales or profit projections.

Gopalan (1995) examined the reasons for schedule overrun in software development projects. Schedule overrun was measured as the number of weeks by which the actual

duration of the development project exceeded the estimated duration. Eleven reasons for schedule overruns were identified and a questionnaire was used to gather data from 41 project leaders and senior software engineers involved in software development projects. His result showed that the three main reasons for schedule overrun are: 1) Incorrect estimation of development time; 2) Changes in specifications; and 3) Inability to detect problems early.

Smith (1996) examined how prototype management practice affects three project outcomes: Project duration, schedule overrun and project manager's satisfaction that the software met customer requirements. Smith used the same schedule overrun measure used by Gopalan' (1995).

2.5 Lessons Learned from the Literature Review

Four key lessons were learned from the literature review.

First, previous research has examined the relationship between trust, commitment and performance at the project level and typically focused on project development time as the performance measurement. Typically, the samples were comprised of development projects undertaken by small teams (less than 50 people). Previous studies do not examine the relationship of trust, commitment and performance at the engineering team level, when the team is a component of very large development projects.

Secondly, empirical studies examined the trust, commitment and performance relationship using samples from multiple industries. They did not focus on this relationship within one industry such as telecommunications.

Thirdly, while team longevity and task newness has been frequently used in previous studies, their relationship with trust and commitment has not been studied.

Fourthly, prior research traditionally uses attitude scales to measure trust and commitment. While behaviour scales have been used to study senior managers' behaviours that distinguish successful from unsuccessful development projects, they have not been used to study the relationship between trust, commitment and performance.

3 RESEARCH MODEL AND HYPOTHESES

3.1 Research Model

The objective of this research is to examine how the presence of trust and commitment affects schedule overrun in software development teams and how team longevity and task newness affect trust and commitment in these teams.

Based on the literature review, the research model shown in Figure 1 was developed. The model describes how team longevity and task newness affect trust and commitment, how trust affects commitment, and how trust and commitment affect schedule overrun.

Figure 1. Research Model Used to Examine the Relationship among Trust, Commitment, and Schedule Overrun

The highlights of the model shown in Figure 1 are four:

- High trust and high commitment levels shorten schedule overrun.
- High levels of trust lead to high levels of commitment.

- Team longevity and task newness increase trust and commitment levels.
- Schedule overrun is an important measure of software development team efficiency.

3.2 Hypotheses

The existing literature is at the base of this writer's development of five hypotheses centred on the research model shown in Figure 1.

Team longevity

Group development research highlights the important role that time plays in a group process (Sethi & Nicholson, 2001). Team longevity is the time that team members have worked together on previous projects. People need time to establish trust in others through socialization and shared experiences (Jones & George, 1998; Katz, 1982). Trust develops gradually over time (Blau, 1964; Rempel et al., 1985; Zand, 1972). Time is required for the interactions between team members that eventually lead to unconditional trust to take place. This writer expects that a high level of team longevity leads to high level of trust among team members. Therefore,

Hypothesis 1a: Team longevity is positively related to trust.

Project commitment must be built and inculcated over time after the project starts (Bowen et al., 1994). Once a project starts, group members need time to share each other's perspective and arrive at a common understanding of the group's tasks (Katz,

1982). Teams with a shared mission, generate higher level of commitment than those in which this is missing (Bowen et al., 1994).

After an engineering team has been formed, members need to spend time getting to know one another. During this initial phase, their relationships are marked by guarded exchanges. With the passage of time, members develop the norms and strategies that regulate and stabilize the internal dynamics of each other's information and perspectives (Sethi & Nicholson, 2001).

When team members have worked together over long periods, the time spent in the initial phase marked by guarded exchanges and the time required to create a clear view of project goals that is shared by group members may be shorten. This writer expects that a high level of team longevity leads to high level of commitment. Therefore,

Hypothesis 1b: Team longevity is positively related to commitment.

Task newness

Task newness is used to describe the level of uncertainty of the task to the team that is responsible for completing it. If the task is something that the team has undertaken before, task newness is low. Engineering teams view routine tasks as being low in task newness. On the other hand, if task completion involves high uncertainty, the engineering teams will view the non-routine task as one that entails a high level of task newness.

Task newness can be a major source of uncertainty in product development (Tatikonda & Montoya-Weiss, 2001). Where there is uncertainty, there must be trust for an engineering team to complete a task efficiently. The higher the task uncertainty, the higher the level of trust required to complete tasks (Jones & George, 1998). Trust would not be needed if actions were undertaken in no-risk situations (Lewis & Weigert, 1985). When tasks are well defined and straightforward, group members have little need to exchange opinions or challenge each other. For this reason, trust relationships often do not get established.

Teams undertaking unfamiliar tasks will need to exchange opposing opinions and preferences (Pelled et al., 1999). The newness of the task means that team members must overcome risks and uncertainties. Task newness results in the interdependence among group members (Vegt et al, 2000). This requires group members to exchange information and resources and work together to complete tasks (Brass, 1985; Kiggundu, 1983; Thompson, 1967). These interdependences and exchanges may lead to the establishment of trust among team members (Rousseau et al. 1998). This writer expects task newness to be associated with development of a high level of trust. Therefore,

Hypothesis 2a: Task newness is positively related to trust.

Frequent and extended personal interaction with co-workers can also increase the team's commitment to task completion. Working together to get a job done fosters camaraderie and friendship and can thereby heighten the feelings of belonging and attachment of the group to task completion (Campion et al., 1993; Campion et al.,

1996; Johnson & Johnson, 1989; Thomas, 1957). This writer expects task newness to lead to a higher level of commitment. Therefore,

Hypothesis 2b: Task newness is positively related to commitment.

Trust and Commitment

Prior research studies conclude that trust is positively related to commitment (Brockner et al., 1997; Barczak McDonough III, 2003). A high level of trust contributes to team members' expectations that other team members will do their jobs well and work toward common goals. In high trust situations, team members are more likely to have positive attitudes toward the completion of task goals and be more involved in task completion (Barczak & McDonough III, 2003). This writer expects that a high level of trust leads to a high level of commitment. Therefore,

Hypothesis 3: Trust is positively related to commitment.

Trust and Schedule Overrun

Trust is the one of the cornerstones of an effective team (Smith & Blanck, 2002). Trust within a team is related to positive outcomes (Bahattacharya, Devinney & Pillutla, 1998). The success of everything the team undertakes depends on developing trust (Smith & Blanck, 2002).

The development of trust enables employees to work together more effectively (Mayer & Davis, 1995). Trust promotes more efficient decision-making by simplifying the acquisition and interpretation of information (McEvily et al., 2003). By reducing

efforts and investments in taking precautions against potential losses, trust liberates resources that can be put to better use (McEvily et al., 2003).

Higher levels of trust increase the likelihood that one will take a risk with a partner (e.g. cooperate and share information) and/or increase the amount of risk that is assumed. Risk taking behaviours, in turn, lead to positive outcomes (Dirks & Ferrin, 2001). In social units such as work groups, cooperation and information sharing are expected to lead to high unit performance (Larson & LaFasto, 1989).

This writer examined the question on whether trust affects performance directly or does it affect performance via commitment. The results reported by Barczak & McDonough III (2003) suggest that trust affects performance via commitment. A high level of trust is not enough to reduce development time in projects. Trust provides the conditions under which certain outcomes, such as commitment, are likely to occur (Dirks & Ferrin, 2001). Trust leads to commitment (Hosmer, 1994a; Hosmer, 1994b). However, unless commitment exists, it is unlikely that trust alone will lead to good team performance. Teams with a high level of commitment enable their organization to achieve high new product success rates and faster cycle times (Donnellon, 1993). Based on the results reported by Barczak & McDonough III (2003), this writer expects that trust affects schedule overrun via commitment. Therefore,

Hypothesis 4: Trust affects schedule overrun via commitment.

Commitment and Schedule Overrun

Commitment is one of the critical elements of outstanding development teams (Bowen et al., 1994). The degree of success achieved on development projects can be tied directly to the extent of ownership and commitment that is exhibited by those involved (Bowen et al., 1994). Committed employees may be more likely to engage in “extra-role” behaviours, such as creativeness and innovativeness (Katz & Kahn, 1978). Team members who are emotionally attached to the team have intrinsic motivations to discover newer and superior ideas for the new product development (Sethi & Nicholson, 2001).

A team with high level of commitment will speed up decision-making. Even when the main design fails, the team is able to quickly switch to alternative designs since the members are willing to make changes to meet team goals. The quick decision-making and team flexibility save time and reduce schedule overruns. This writer expects that a high level of commitment reduces schedule overrun. Therefore,

Hypothesis 5: Commitment is negatively related to schedule overrun.

3.3 List of Hypotheses

The hypotheses examined in this research are:

Hypothesis 1a: Team longevity is positively related to trust.

Hypothesis 1b: Team longevity is positively related to commitment.

Hypothesis 2a: Task newness is positively related to trust.

Hypothesis 2b: Task newness is positively related to commitment.

Hypothesis 3: Trust is positively related to commitment.

Hypothesis 4: Trust affects schedule overrun via commitment.

Hypothesis 5: Commitment is negatively related to schedule overrun.

4 METHOD

4.1 Unit of Analysis

The unit of analysis is a 5-8 person engineering team responsible for completing a software development task within a large software development project organization.

4.2 Time Period

To be included in the sample, software development tasks had to be completed after January 2003. The questionnaire was sent out in January 2004.

4.3 Sample Selection

Convenience sampling techniques were used. At the start, the researcher called co-workers and friends working for other companies to ask them to complete the questionnaire. At the end of the phone conversation, the researcher asked to be recommended to other software engineers who had been part of teams that had completed tasks after January 2003. Despite the fact that the research was not based on a strictly defined random sample, the respondents were chosen in a way that simulated random selection, according to whether someone in the company happened to know another engineer willing to complete the questionnaire. Thus, the sample was not confined to one large company or business unit but it expanded to engineering teams across three companies.

4.4 Respondents

One software designer per engineering team answered the questionnaire. Project managers and team leaders were not asked to complete the questionnaire. This writer was interested in capturing the perceptions of members of engineering teams who did not have management responsibilities.

4.5 Measurement of Variables

Trust

The level of Trust was measured in two ways: one used attitude scales such as those used in Pearce et al. (2000) and Barczak and McDonough III (2003) and the other used observable behaviour scales such as those used in Bailetti et al. (2003) and Kouzes and Posner (1997 & 2002).

Respondents were asked to provide information about the existence of trust within their engineering task teams. Level of Trust was measured as the average of the respondents' scores in six constructs. Each construct used the 7-point scale shown below:

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

The six trust constructs used in this research were slight modifications of those used by Pearce et al. (2000) and Barczak and McDonough III (2003).

Eleven observable trust behaviours were measured. Respondents were asked to rate the frequency in which team members engaged in a trust behaviour using the scale:

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

The eleven trust behaviours were obtained from Barczak and McDonough III (2003), Jones and George (1998) and Lencioni (2002).

Commitment

Commitment level was also measured in two ways: one used an average of nine ratings obtained using attitude scales such as those used in Pearce et al. (2000) and Barczak and McDonough III (2003) and the other used ten ratings obtained using observable behaviour scales such as those used in Bailetti et al. (2003) and Kouzes and Posner (1997 & 2002).

Respondents were asked to provide information about the existence of commitment within their engineering task teams. Level of Commitment was measured as the average of the respondents' scores in nine constructs. Each construct used the 7-point scale shown below:

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

The nine commitment constructs used in this research were slight modifications of those used by Pearce et al. (2000) and Barczak and McDonough III (2003).

Ten observable commitment behaviours were measured. Respondents were asked to rate the frequency in which team members engaged in a behaviour using the scale:

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

The ten commitment behaviours were obtained from Bowen et al.(2003), Barczak and McDonough III (2003), Jones and George (1998), Lencioni (2002), Sethi (2001) and Wallace (1995).

Schedule Overrun

Schedule overrun was measured as the number of weeks by which the actual duration of the development project exceeded the estimated duration (Gopalan, 1995).

Team Longevity

Team longevity was measured by the number of months the team had been together prior to the start of the task (Sethi & Nicholson, 2001).

Task Newness

Task newness was measured by asking respondents to answer: “How new was the task to the team?” using the scale below:

1 Not New At All	2	3	4 Moderately New	5	6	7 Very New

4.6 Questionnaire and Data Collection

A seven-page questionnaire developed by this writer was used to collect the data for this research. An initial version of the questionnaire was pre-tested on two software engineers during face-to-face interviews. The two engineers were asked to assist in the final refinement of questions and statements to assure that they were as clear and unambiguous as possible. The questionnaire was modified based on the feedback received from the two engineers who tested the questionnaire.

The final questionnaire was sent out with a cover letter, (Appendix A) and was approved by Carleton University Research Ethics Committee in early January 2004.

Cover letter

The cover letter introduced the researcher and the thesis supervisor and provided detailed instructions.

Questionnaire

The questionnaire was divided into four sections.

Section 1 asked for task related information;

Section 2 asked for data on trust and commitment using attitude scales;

Section 3 asked for data on trust and commitment using behaviour scales, and

Section 4 asked for the respondent's e-mail address if he/she wanted to receive a copy of the research result.

Task Data

Section 1 of the questionnaire sought information pertaining to the task undertaken by the engineering team. *The description of the task* (question 1) was used to ensure that two respondents do not provide data on the same task. *The number of the team members* (question 2) was used to ensure that the team size was between 5 and 8. *The planned duration and actual duration of the task* (question 3) were used to calculate the schedule overrun. The reply to: *How long the team was together before the task started?* (question 4) was used as the value for the team longevity variable. The reply to *the newness of the task* (question 5) was used as the value for the task newness variable.

Trust and commitment as attitude constructs

Section 2 of the questionnaire includes statements related to level of trust and commitment. The averages of statements 1 to 6 were used to measure the trust variable and question 7 to 15 were used to measure the commitment variable.

Trust and commitment as behaviour constructs

Section 3 of the questionnaire includes statements on trust and commitment behaviours the respondent observed during the time the team worked together on the task. Statements 1 to 11 describe trust behaviours and statements 12 to 21 describe commitment behaviours.

Request for a copy of the results of the study

Section 4 of the questionnaire provided a space for respondents to provide their e-mail address if they were interested in receiving a copy of the research findings,

4.7 Data Collection Method

The researcher contacted potential respondents by phone or e-mail before the questionnaires were sent out. A questionnaire was sent to an engineer only once he/she had confirmed that they would complete the questionnaire.

E-mail was used to send and receive the questionnaires.

All responses were checked for completeness. Incomplete responses were followed-up with the respondents.

4.8 Data Analysis

4.8.1 Descriptive Statistics

The SPSS software was used to provide descriptive statistics for all the variables. To decide whether or not a variable was normally distributed, its Kurtosis and Skewness statistics were examined. A variable was considered to be normally distributed when its skewness was less than twice the standard error and its kurtosis was within the +2 and -2 range...

4.8.2 Correlation Tests

If the variables were normally distributed, Pearson correlation tests would be used, and if the variables were not normally distributed, Spearman bi-variate correlation tests would be conducted.

The following correlation tests were performed:

- Correlation (two tailed) between the two exogenous variables: team longevity and task newness
- Correlation between the two endogenous variables: trust and commitment (one tailed given that we posited that trust affects commitment)
- Correlations between the two exogenous variables and the endogenous variables (one tailed)
- Correlations between the endogenous variables and schedule overrun (one tailed)

Two variables were correlated if the significance level of the correlation coefficient was $P < .10$.

4.8.3 Structural Equation Models for Trust and Commitment as Attitude Constructs

When measures of trust and commitment levels were obtained using attitude constructs, the results of the correlation coefficient tests were used to build the structural equation model for the relationships shown in Figure 1.

The AMOS software available through SPSS was used to calculate the regression estimates of the structural equation models and the goodness of fit statistics.

4.8.4 Structural Equation Models for Trust and Commitment as Behaviour Constructs

When measures of trust and commitment levels were obtained using behaviour constructs, schedule overrun was first regressed against the 11 statements of trust behaviours and then against the 10 statements of commitment behaviours using the stepwise procedure with forward selection. The focus of each stepwise regression procedure was to include a behaviour, one at a time, for the purpose of accounting for the largest additional amount of schedule overrun variance with each new behaviour added to the equation.

The results of the stepwise regressions were used to build the structural equation model to capture the relationships in Figure 1. .

The AMOS software available through SPSS was used to calculate the regression estimates of the structural equation models and the goodness of fit statistics.

4.8.5 Hypotheses Acceptance

To test each of the five hypotheses, this writer examined the Spearman correlation coefficients presented and the regression estimates in the structural equations models.

Based on the use of attitude scales, a hypothesis is supported when the results from the Spearman's correlation analysis and the results obtained for the structural equation models support the hypothesis at $P < .10$.

In this research, the results obtained using behaviours statement are not used to test the acceptance of the hypotheses. These results reflect experimentation of the trust, commitment and schedule overrun relationship when the trust and commitment constructs are replaced by behaviour scales.

5 RESULTS

5.1 Sample

The sample for this study is comprised of 44 questionnaires completed by engineers who were members of software development teams. These teams completed technical tasks after January 2003.

The 44 respondents were all employees of three large suppliers of telecommunications equipment and worked in Ottawa. The sample was comprised of 28 questionnaires completed by employees who, as of January 15, 2004, worked for Nortel Networks, 5 by employees who worked for Cisco, and 11 by employees who worked for Alcatel Networks.

The researcher contacted 92 people and 65 agreed to complete the questionnaire. Thus, 65 questionnaires were sent out by e-mail. A total of 47 of the 65 questionnaires sent out were completed and returned and 44 of the 47 questionnaires were usable. The response rate for the survey was 72.3%. This writer suggests that the reason for the high response rate was that questionnaires were not sent out unless an engineer agreed to complete it.

The three reasons most frequently given for not responding to the questionnaire were:

- Too busy to complete the questionnaire
- Unable to obtain schedule related information
- Not comfortable describing the trust and commitment of his/her co-workers

5.2 Exogenous Variables

The model in Figure 1 includes two exogenous variables: team longevity and task newness. The Spearman correlation coefficient for the team longevity and task newness association was -.218 with $P < .154$ (two-tailed). The results indicate that team longevity and task newness are not correlated at $P < .10$.

5.3 Trust and Commitment Information Obtained Using Attitude Scales

This section provides the results obtained when measuring trust and commitment levels using conventional attitude scales. Descriptive statistics are provided for the variables in Figure 1 (trust and commitment) which are measured using traditional attitude scales. The correlation coefficients are then provided for trust and commitment and the two exogenous variables and for trust and commitment and schedule overrun. The results of the Spearman correlation tests are then used to specify structural equation models and the AMOS software is used to obtain the regression estimates for these models. Finally, the AMOS and correlation results are applied to decide whether or not to support the five hypotheses.

5.3.1 Descriptive Statistics

Table 1 provides the descriptive statistics for the variables in the research model shown in Figure 1. Table 1 shows the results on the commitment variables when measured using conventional attitude scales. Task newness is the only variable in

Table 1 that is normally distributed. Its Skewness statistics are less than twice the standard error and its Kurtosis statistic is within +2 and -2.

Table 1. Descriptive Statistics for Variables in Figure 1 with Trust and Commitment Measured with Conventional Attitude Scales (N=44)

	Min.	Max.	Mean	Standard deviation	Skewness	Std. Error	Kurtosis	Std. Error
					Statistics		Statistics	
Team Longevity	0	48	9.66	10.790	1.587	.357	2.724	.702
Task Newness	1	7	4.25	1.542	-.481	.357	.216	.702
Trust	3.17	7	6.03	.773	-1.626	.357	3.813	.702
Commitment	3.44	7	5.72	.809	-1.304	.357	1.284	.702
Schedule Overrun	-14	30	3.52	7.132	1.824	.357	6.382	.702

5.3.2 Correlation Coefficients

Endogenous variables

The Spearman correlation test was used to test the strength of the association between the two endogenous variables in Figure 1: trust and commitment. These two variables were measured using conventional attitude scales. In Figure 1, this writer theorized that trust affects commitment, thus, one tailed test was used. The Spearman correlation coefficient for the trust-commitment association was .597 with $P < .000$. The correlation is significant at the .01 level (one-tailed).

Exogenous and endogenous variables

Table 2 provides the results of the one-tailed Spearman rank order correlation tests for the two exogenous variables team longevity and the two endogenous variables, trust and commitment.

Table 2. Spearman Correlation Coefficients for Team Longevity, Task Newness, Trust and Commitment (N=44)

	Trust	Commitment
Team Longevity	.419 (.002***)	.151 (.164)
Task Newness	-.092 (.276)	.021 (.446)

* p < 0.10 (one tailed)
** p < 0.05 (one tailed)
*** p < 0.01 (one tailed)

Table 2 indicates that the correlation between team longevity and trust is significant at the .01 level (one-tailed).

Endogenous variables and schedule overrun

Table 3 provides the results of the Spearman correlation tests for two associations: 1) Trust and schedule overrun and 2) Commitment and schedule overrun. Given that the direction of the association has been predicted, the one-tailed tests are used.

The results in Table 3 show that both correlation coefficients are negative and significant at the .10 level.

Table 3. Spearman Correlation Coefficients between Trust, Commitment, and Schedule Overrun (N=44)

	Trust	Commitment
Schedule Overrun	-.284 (.062*)	-.389 (.009***)

* p < 0.10 (one tailed)
 ** p < 0.05 (one tailed)
 *** p < 0.01 (one tailed)

5.3.3 Structural Equation Models

AMOS was used to examine the models that capture the interactions between the variables in the research model shown in Figure 1. The goodness of fit of each model was evaluated using the following criteria:

- The probability of the model, P, must be greater than .05
- The TLI index of the model must be greater than .95
- The RMSEA of the model must be less than .06

Model 1

The first structural equation model, Model 1, is shown in Figure 2. It is identical to the research model shown in Figure 1. It was specified as shown below. A → indicates a link in a path. The direction of the link is from the variable on the left of the arrow to the variable on the right of the arrow.

Model 1 was specified as:

Team longevity → Trust

Team longevity → Commitment

Task newness → Trust

Task newness → Commitment

Trust → Commitment

Trust → Schedule overrun

Commitment → Schedule overrun

Given that team longevity and task newness are not correlated and that trust is specified as affecting commitment, there is no need for specifying correlations among the two exogenous or the two endogenous variables.

Figure 2. Model 1

Table 4 shows the results for Model 1 obtained using the AMOS software.

Table 4. Results of Using AMOS to Obtain Regression Estimates for Model 1

Model 1		Regression	p
Links in paths		estimate	
Chi-square = 4.045 Degrees of freedom = 3 Probability level = .257 TLI = .657 RMSEA = 0.194	Team longevity → Trust	.426	.002***
	Team longevity → Commitment	-.060	.632
	Task newness → Trust	.092	.501
	Task newness → Commitment	.140	.217
	Trust → Commitment	.669	.000***
Squared multiple correlations Schedule overrun = .398 Trust = .190 Commitment = .454	Trust → Schedule overrun	-.103	.512
	Commitment → Schedule overrun	-.559	.000***
* p < 0.10			
** p < 0.05			
*** p < 0.01			

The TLI and the RMSEA for Model 1 did not meet the criteria specified for this research. The model's TLI is less than .95 and the RMSEA is greater than .06.

Model 2

To improve the fit of the model to the data, Model 2 was developed, by eliminating the links in Model 1 that were not significant at $P < .10$. Figure 2 shows Model 2. Inspection of Table 4 shows that four links in Model 1 were not significant at $P < .10$:

Team longevity → Commitment

Task newness → Trust

Task newness → Commitment

Trust → Schedule overrun

Model 2 was specified as:

Team longevity → Trust

Trust → Commitment

Commitment → Schedule overrun

Figure 3. Model 2

Table 5 shows the results obtained from using the AMOS software to calculate the regression estimates of Model 2.

Table 5. Results of Using AMOS to Obtain Regression Estimates for Model 2

Model 2		Regression	p
Links in paths		estimate	
Chi-square = 1.163	Team longevity → Trust	.403	.004***
Degrees of freedom = 3	Trust → Commitment	.641	.000***
Probability level = .762	Commitment → Schedule overrun	-.620	.000***
TLI = 1.079			
RMSEA = .000			
Squared multiple correlations			
Schedule overrun = .384			
Trust = .162			
Commitment = .411			
* p < 0.10			
** p < 0.05			
*** p < 0.01			

The goodness of fit statistics for Model 2 met the criteria defined for this research. The probability level of Model 2 was greater than .05, the TLI was greater than .95, and the RMSEA was lower than .06.

Model 3

Support for hypothesis 4 (i.e., Trust affects schedule overrun via commitment) required the testing of two models. The results obtained from utilising AMOS to calculate the regression estimates of Models 3 and 4 were used to test hypothesis 4.

Model 3 was used to test whether or not trust affected schedule overrun directly or via commitment. Model 3 was developed by adding the Trust → Schedule overrun link to Model 2. Figure 4 shows structural equation Model 3.

Support for hypothesis 4 existed if, in Model 3:

- The regression estimate for trust in the Trust → Schedule overrun link was not significant at $P < .10$
- The regression estimate for trust in the Trust → Commitment link was significant at $P < .10$
- The regression estimate for commitment in the Commitment → Schedule overrun link was significant at $P < .10$

Model 3 was specified as follows:

Team longevity → Trust

Trust → Schedule overrun

Trust → Commitment

Commitment → Schedule overrun

Figure 4. Model 3

Table 6 shows the results obtained using the AMOS software to estimate the regression coefficients for Model 3. The goodness of fit statistics for Model 3 met the stated criteria. The probability level of Model 3 is greater than .05, the TLI is greater than .95 and the RMSEA is less than .06.

Table 6 shows that trust influences schedule overrun through commitment. The regression estimate for trust in the Trust → Schedule overrun link is not significant at $P < .10$. However, the regression estimate for trust in the Trust → Commitment link is positive and significant at $P < .01$ and the regression estimate for commitment in the Commitment → Schedule overrun is also positive and significant at $P < .01$.

Table 6. Results of Using AMOS to Obtain Regression Estimates for Model 3

Model 3		Regression	
		estimate	p
Chi-square = .731 Degrees of freedom = 2 Probability level = .694 TLI = 1.082 RMSEA = 0.000	Team longevity → Trust	.403	.004***
	Trust → Schedule overrun	-.102	.510
	Trust → Commitment	.641	.000***
	Commitment → Schedule overrun	-.554	.000***
Squared multiple correlations			
Schedule overrun = .390			
Trust = .162			
Commitment = .411			
* p < 0.10			
** p < 0.05			
*** p < 0.01			

Model 4

Model 4 examines whether or not a bi-directional relationship existed for trust and commitment. Figure 5 shows Model 4. This writer reasoned that support for hypothesis 4 existed if:

- The regression estimate for Trust → Commitment was significant at $P < .10$ and
- The regression estimate for Commitment → Trust was not significant at $P < .10$.

Model 4 was developed by adding the Commitment → Trust and the Task newness → Commitment links to model 2. Model 4 is as follows:

Team longevity → Trust

Trust → Commitment

Commitment → Trust

Task newness → Commitment

Commitment → Schedule overrun

Figure 5. Model 4

Table 7 provides the results of using the AMOS software to calculate the regression estimates for Model 4. The goodness of fit statistics for Model 4 met this writer's criteria. The probability level is greater than .05, the TLI is greater than .95 and the RMSEA is less than .06.

The results in Table 7 illustrate that the two-way relationship between trust and commitment does not exist. The relationship is unidirectional as predicted: trust affects commitment. The regression estimate for trust in the Trust → Commitment link is positive and significant at $P < .01$, while the regression estimate for commitment in the Commitment → Trust link was not significant at $P < .10$.

Table 7. Results of Using AMOS to Obtain Regression Estimates for Model 4

Model 4		Regression	p
Links in paths		estimate	
Chi-square = 4.630 Degrees of freedom = 5 Probability level = .463 TLI = 1.015 RMSEA = .000	Team longevity → Trust	.362	.007***
	Trust → Commitment	.485	.064*
	Commitment → Trust	.241	.419
	Task newness → Commitment	.152	.192
	Commitment → Schedule overrun	-.622	.000***
Squared multiple correlations			
Schedule overrun = .387			
Trust = .386			
Commitment = .418			

* p < 0.10
** p < 0.05
*** p < 0.01

5.3.4 Result of Testing Hypotheses

Table 8 shows the results of testing the five hypotheses. To test the hypotheses the Spearman correlation coefficients presented in Tables 2 and 3 were examined, as were the regression estimates in the structural equations models 2, 3, and 4 shown in Tables 5, 6 and 7.

A hypothesis is supported when the results from the Spearman's correlation analysis and the results obtained for Models 2, 3 and 4 support the hypothesis at $P < .10$.

Table 8. Results of Testing Hypotheses

Hypothesis	Test Outcome	Rationale
Hypothesis 1a Team longevity is positively related to trust	Supported	Table 5 shows that the regression estimate for Team longevity in the Team longevity → Trust link in Model 2 is positive and significant at $P < .01$; Table 2 shows that the correlation coefficient for Team longevity and Trust is positive and significant at $P < 0.01$.
Hypothesis 1b Team longevity is positively related to commitment	Not Supported	Correlation coefficient for Team longevity and Commitment in Table 2 is not significant at $P < 0.1$.
Hypothesis 2a Task newness is positively related to trust	Not Supported	Correlation coefficient for Task newness and Trust in Table 2 is not significant at $P < 0.1$.
Hypothesis 2b Task newness is positively related to commitment	Not Supported	Table 7 shows that in Model 4 the regression estimate for Task newness in the Task newness → Commitment link is not significant at $P < .1$; correlation coefficient for Task newness and Commitment in Table 2 is not significant at $P < 0.1$
Hypothesis 3 Trust is positively related to commitment	Supported	Tables 5, 6 and 7 show that the regression estimate for Trust in the Trust → Commitment link in Models 2, 3 and 4 are positive and significant at $P < .10$.

Hypothesis 4 Trust affects schedule overrun via commitment	Supported	Table 6 shows that in Model 3 the regression estimate for Trust in the Trust → Commitment link is positive and significant at $P < .01$ while the regression coefficient for Trust in the Trust → Schedule overrun link is not significant at $P < .10$; Table 7 shows that in Model 4 the regression estimate for Trust in the Trust → Commitment link is positive and significant at $P < .10$ while the coefficient for Commitment in the Commitment → Trust link is not significant at $P < .10$.
Hypothesis 5 Commitment is negatively related to schedule overrun	Supported	Tables 5, 6 and 7 show that the coefficients for Commitment in the Commitment → Schedule overrun links in Models 2, 3 and 4 are negative and significant at $P < .10$.

5.4 Trust and Commitment Behaviours Statements

This section discusses the results obtained when using statements of trust and commitment behaviours as the endogenous variables to examine the relationship among trust, commitment and schedule overrun. The descriptive statistics for the 11 statements describing trust behaviours and the 10 statements describing commitment behaviours are provided. The behaviours that affect schedule overrun using two stepwise regressions are then identified. The Spearman correlations between the trust and commitment variables found to affect schedule overrun and the exogenous variables are then discussed. The results of the stepwise regressions and Spearman

correlations tests are used to specify structural equation models and the AMOS software is used to obtain the regression estimates for them.

5.4.1 Descriptive Statistics for Trust and Commitment Behaviour Statements

Table 1 in section 5.3.1 provided the descriptive statistics for the two exogenous variables and Schedule overrun. Table 9 provides the descriptive statistics for the 21 statements on trust and commitment behaviour and Table 10 shows how the variables shown in Table 9 relate to the statements used in Section 3 of the questionnaire. The questionnaire is included as Appendix B.

Table 9 shows that eight variables are normally distributed, six trust behaviours and two commitment behaviours. Their Skewness statistics are less than twice the standard error and their Kurtosis statistics are within +2 and -2. The names of the variables that are normally distributed are: Apologized, Discourage politics, Learn from others, Exchange knowledge, Seek help, Know others, Challenge freely and Call to action. Table 10 provides the statements in Section 3 of the questionnaire to which these names correspond.

Table 9. Descriptive Statistics for Trust and Commitment Behaviours (N = 44)

	Minimum	Maximum	Mean	Standard deviation	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
Statements of trust behaviours								
Apologized	0	7	4.20	2.397	-.709	.357	-.697	.702
Admit mistakes	0	7	4.34	1.952	-.839	.357	-.070	.702
Discourage politics	0	7	3.68	2.438	-.358	.357	-1.167	.702
Believe others	3	7	5.70	1.047	-.765	.357	.410	.702
Rely on others	3	7	5.93	1.065	-.947	.357	.243	.702
Learn from others	3	7	5.70	1.002	-.524	.357	-.075	.702
Treat as equals	3	7	6.09	1.030	-.857	.357	.143	.702
Exchange knowledge	4	7	6.05	.914	-.667	.357	-.332	.702
Accept feedback	1	7	6.02	1.285	-.2.181	.357	6.005	.702
Seek help	4	7	5.73	.949	-.269	.357	-.775	.702
Know others	0	7	4.00	1.614	-.556	.357	.436	.702
Statements of commitment behaviours								
Put extra effort	2	7	5.52	1.131	-.868	.357	1.052	.702
Cooperate	2	7	5.82	1.147	-1.565	.357	3.834	.702
Participate in decisions	2	7	5.61	1.061	-1.230	.357	2.373	.702
Seek common good	0	7	4.66	1.829	-1.425	.357	1.746	.702
Perform to achieve goals	0	7	4.91	2.311	-1.235	.357	.371	.702
Share views	2	7	5.80	1.193	-1.050	.357	1.217	.702
Change behaviours	0	7	4.66	1.656	-1.034	.357	.598	.702
Challenge freely	2	7	5.07	1.149	-.620	.357	.181	.702
Call to action	3	7	5.55	.926	-.415	.357	.181	.702
Accept decisions	0	7	5.32	1.974	-1.417	.357	1.582	.702

Table 10. Relating the Variable Names Given in Table 9 to the Behaviour Statements Used in Section 3 of the Questionnaire Included in Appendix B

Name used in Table 9	Behaviors statement in questionnaire
Trust Behaviors	
Apologized	Team members quickly and genuinely apologized to one another when they said or did something inappropriate or possibly damaging to the team.
Admit mistakes	Team members openly admitted their weaknesses and mistakes.
Discourage politics	Team members discouraged political behaviours on the team.
Believe others	Team members believed what other members said.
Rely on others	Team members relied on other team members to do what they said they would do.
Learn from others	Team members learned from other team members.
Treat as equals	Team members treated other team members as equals.
Exchanged knowledge	Team members freely exchanged knowledge with other team members.
Accept feedback	Team members accepted questions and feedback on their areas of responsibility.
Seek help	Team members sought help from other team members.
Know others	Team members knew about one another's personal lives and were comfortable discussing them.
Commitment Behaviours	
Put extra effort	Team members put extra effort beyond what was minimally required.
Cooperate	Team members demonstrated cooperative behaviours.
Participate in decisions	Team members participated in decision making.
Seek common good	Team members subjugated personal need and ego for the greater common good.
Perform to achieve goals	Team members accepted team goals as the basis for performance evaluation.
Share views	Team members shared a clear mission with other team members
Change behaviours	Team members changed behaviours to accomplish goals rather than stick to "conventional behaviours".
Challenge freely	Team members challenged others' and the team's ideas freely.
Call to action	Team members ended discussion with clear and specific resolutions and calls to action.
Accept decisions	Once a decision was finalized, team members would move forward with the team although they might have voted against the decision.

5.4.2 Identifying the Endogenous Variables

Tables 11 and 12 show the results of regressing schedule overrun against the 11 statements of trust behaviours and the 10 statements of commitment behaviours using the stepwise procedure with forward selection.

Table 11 shows that two statements of trust behaviours were entered as explanatory variables:

- Treat as equals denotes the original statement “Team members treated other team members as equals”
- Accept feedback denotes the original statement “Team members accepted questions and feedback on their areas of responsibility”

Table 12 shows that one statement of commitment behaviour was entered as explanatory variable:

- Call to action denotes the original statement “Team members ended discussions with clear and specific resolutions and calls to action”

Table 11. Results of Regressing Schedule Overrun Against Trust Behaviors Using the Stepwise Procedure with Forward Selection

Independent variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Adjusted R square
	B	Std. Error	Beta			
(Constant)	56.121	11.371		4.935	.000	.245
Treat as equals	-4.943	1.967	-.361	-2.513	.016**	
Accept feedback	-3.520	1.577	-.321	-2.231	.031**	.311

* p < 0.10

** p < 0.05

*** p < 0.01

Table 12. Results of Regressing Schedule Overrun Against Commitment Behaviors Using the Stepwise Procedure with Forward Selection

Independent variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Adjusted R square
	B	Std. Error	Beta			
(Constant)	25.135	5.762		4.362	.000	.239
Call to action	-3.901	1.025	-.506	-3.806	.000***	

* p < 0.10

** p < 0.05

*** p < 0.01

5.4.3 Correlation Coefficients

Endogenous variables

The Spearman correlation coefficients for the two trust behaviours and the commitment behaviour are shown in Table 13. The table shows that the three are correlated at $P < .10$.

Table 13. Spearman Correlation Coefficients for Endogenous Variables (N=44)

	Accept feedback	Call to action
Treat as equals	.305 (.044**)	.472 (.001 ***)
Accept feedback		.271 (.075*)

* $p < 0.10$ (one tailed)

** $p < 0.05$ (one tailed)

*** $p < 0.01$ (one tailed)

Exogenous and endogenous variables

Table 14 provides the results of the one-tailed Spearman rank order correlation tests for the two exogenous variables: team longevity and task newness and the three endogenous variables: Treat as equals, Accept feedback and Call to action.

Table 14 shows that Call to action, a commitment behavior, is correlated with both exogenous variables at $P < .10$.

Table 14. Spearman Correlation Coefficients for Team Longevity, Task Newness, Treat as Equals, Accept Feedback and Call to Action (N=44)

	Treat as equals	Accept feedback	Call to action
Team longevity	.159 (.152)	-.025 (.436)	.269 (.039**)
Task newness	.024 (.437)	-.026 (.433)	.212 (.084*)

* p < 0.10 (one tailed)
 ** p < 0.05 (one tailed)
 *** p < 0.01 (one tailed)

Endogenous variables and schedule overrun

Table 15 provides the correlation coefficients for the three endogenous variables and schedule overrun. Call to action is correlated with schedule overrun at $P < .05$.

Table 15. Spearman Correlation Coefficients for Endogenous Variables and Schedule Overrun (N=44)

	Treat as equals	Accept feedback	Call to action
Schedule overrun	-.180 (.121)	-.040 (.399)	-.311 (.020**)

* p < 0.10 (one tailed)
 ** p < 0.05 (one tailed)
 *** p < 0.01 (one tailed)

5.4.4 Structural Equation Models

AMOS was used to calculate the regression estimates of the relationships shown in Figure 1. The behaviours identified in section 5.4.2 are utilised instead of the trust and commitment variables obtained on the attitude scales.

Model 5

Model 5 shown in Figure 6 uses the same structure that Model 2 does, but replaces the variable trust for two statements of trust behaviors and the variable commitment for one statement of commitment behaviors.

Table 13 shows that the Spearman correlation coefficient that measures the association between Treat as equals and Accept feedback is .305, which is significant at $P < .05$. Therefore, in Model 5, I specified a correlation adjustment between these two variables. This was denoted as Treat as equals $\leftrightarrow$ Accept feedback. The $\leftrightarrow$ indicates that the two variables are correlated.

Table 14 shows that the two exogenous variables are correlated to Call to action and not to the two trust behaviours. Team longevity $\rightarrow$ Call to action and Task newness $\rightarrow$ Call to action links therefore, were added into Model 5 and did not include links from the two exogenous variables to the two trust variables.

Figure 1 posits that level of trust affects level of commitment. Treat as equals $\rightarrow$ Call to action link and the Accept feedback $\rightarrow$ Call to action link therefore, were added to Model 5.

Table 15 shows that schedule overrun is correlated with Call to action and the two trust statements. Therefore, this writer included the Call to action → Schedule overrun to Model 5.

Model 5 was specified as follows:

Team longevity → Call to action

Task newness → Call to action

Treat as equals → Call to action

Accept feedback → Call to action

Call to action → Schedule overrun

Treat as equals ↔ Accept feedback

Figure 6. Model 5

Table 16 provides the results obtained by using the AMOS software to estimate the regression estimates for Model 5. The goodness of fit statistics for Model 5 was very close to meeting the goodness of fit criteria. The probability level was greater than

.05. However, the TLI of Model 5 was .944. It was not greater than .95. The RMSEA for Model 5 was equal to .06, not less than .06.

Table 16. Results of Using AMOS to Obtain Regression Estimates for Model 5

Model 5		Regression	p
Links in paths		estimate	
Chi-square = 10.410	Team longevity → Call to action	.122	.300
Degrees of freedom = 9	Task newness → Call to action	.165	.162
Probability level = .318	Treat as equals → Call to action	.420	.002***
TLI = .944	Accept feedback → Call to action	.273	.273
RMSEA = .060	Call to action → Schedule overrun	-.500	.000***
Squared multiple correlations			
Schedule overrun = .250			
Call to action = .401			

* p < 0.10

** p < 0.05

*** p < 0.01

Results in Table 16 show that:

- The regression estimates for the two exogenous variables posited to affect Call to action are not significant at $P < .10$.
- The regression estimate for Treat as equals in the Treat as equals → Call to action link is positive and significant at .01 while the regression estimate for Accept feedback in the Accept feedback → Call to action is not significant at .10.
- The regression estimate for Call to action in the Call to action → Schedule overrun link was negative and significant at $P < .01$

Model 6

To examine the association between the two trust statements and schedule overrun, Model 6 was developed by adding two links to Model 5: Treat as equals → Schedule overrun and Accept feedback → Schedule overrun. Figure 7 shows Model 6.

Model 6 was specified as follows:

Team longevity → Call to action

Task newness → Call to action

Treat as equals → Schedule overrun

Accept feedback → Schedule overrun

Treat as equals → Call to action

Accept feedback → Call to action

Call to action → Schedule overrun

Treat as equals ↔ Accept feedback

Figure 7. Model 6

Table 17 provides the results of using AMOS to obtain the regression estimates for Model 6. The goodness of fit statistics fit the criteria. The probability level is greater than .05, the TLI is greater than .95 and the RMSEA is less than .06.

Table 17. Results of Using AMOS to Obtain Regression Estimates for Model 6

Model 6		Regression estimate	p
Links in paths			
Chi-square = 7.647 Degrees of freedom = 7 Probability level = .365 TLI = .967 RMSEA = .046 Squared multiple correlations Schedule overrun = .295 Call to action = .401	Team longevity → Call to action	.122	.300
	Task newness → Call to action	.165	.162
	Treat as equals → Schedule overrun	-.189	.239
	Accept feedback → Schedule overrun	-.132	.384
	Treat as equals → Call to action	.420	.002***
	Accept feedback → Call to action	.273	.042**
	Call to action → Schedule overrun	-.330	.039**

* p < 0.10

** p < 0.05

*** p < 0.01

Results in Table 17 show that:

- The regression estimates for Treat as equals and Accept feedback in the links pointing to schedule overrun are not significant at $P < .10$.
- The regression estimates for the two exogenous variables posited to affect Call to action are not significant at $P < .10$.
- The regression estimates for Treat as equals and Accept feedback in the links pointing to Call to action are positive and significant at .10.
- The regression estimate for Call to action in the Call to action → Schedule overrun link was negative and significant at $P < .01$

6 DISCUSSION OF RESULTS

The objective of this research was to examine whether a team's levels of trust and commitment affect schedule overruns and whether team longevity and task newness affect trust and commitment.

The literature in this area was utilised in developing a research model and five hypotheses. Levels of trust and commitment were measured in two different ways: attitude scales and behaviour scales. However, the hypotheses were tested using attitude scales only. Behaviour scales were used to experiment with the trust, commitment, and schedule overrun relationship.

6.1 Team Longevity and Task Newness

Hypotheses 1 and 2 suggested that team longevity and task newness are positively related to levels of trust and commitment in a team. Based on the literature this writer reasoned that team longevity and a high level of task newness would increase levels of trust and commitment. The results of hypothesis 1a suggested that team longevity is positively related to the level of trust. This result supports the statement of "Trust develops gradually over time" (Blau, 1964; Rempel et al., 1985; Zand, 1972).

Sethi and Nicholson (2001) found that team longevity is not related to charged behaviour. Given that level of commitment is one of the main components of charged behaviour, results for hypothesis 1b, which indicates that team longevity is not related to commitment, support the research finding by Sethi and Nicholson (2001).

The results of this study do not provide strong support for Hypotheses 1b and 2. There was little evidence that task newness affected levels of trust and commitment.

The results of this study do not support the assertion made by Lewis and Weigert (1985) that “Trust would not be needed if actions were taken under complete certainties and no risks.”

6.2 High Trust Increases Commitment

Hypothesis 3 suggested that level of trust is positively related to level of commitment. Based on the literature trust is expected to increase commitment.

The results of this study provide strong support for Hypothesis 3. The regression estimates for trust in the Trust → Commitment links for models 2, 3 and 4 were positive and significant at $P < .10$.

6.3 High Trust Is Not Enough To Reduce Schedule Overrun

Hypothesis 4 suggested that trust affects schedule overrun indirectly via level of commitment. In other words, trust does not directly affect schedule overrun and a two-way relationship between trust and commitment does not exist.

The results of this research provide strong support for Hypotheses 4. The regression estimate for trust in the Trust → Schedule overrun link in Model 3 was not significant at the $P < .10$. However, the regression estimate for trust in the Trust → Commitment link was significant at $P < .10$ and the regression estimate for commitment in the Commitment → Schedule overrun link was significant at $P < .10$.

These results support findings reported by Barczak and McDonough III (2003), where the researchers examined the trust, commitment and performance relationship in the context of new product development projects. Their study showed that once commitment is included in regression with performance as the dependent variable and trust as the independent variable, the regression coefficient for trust was not significant.

6.4 High Commitment Shortens Schedule Overrun

Hypothesis 5 posited that a team's level of commitment is negatively related to schedule overrun. Results from this study provide strong evidence that this is the case. Results show that high level of commitment reduces schedule overrun.

6.5 Obtained Similar Results

Traditional attitude scales and behaviour statements were used to measure trust and commitment. Similarities and differences in the results are discussed below.

The results obtained for Model 2 shown in Table 5 and Model 5 shown in Table 16 are similar for four reasons. In Models 2 and 5, the regression estimates for trust are positive and significant when they are included in the links that point to commitment. Table 16 shows that for Model 5, Treat as equals and Accept feedback, the links Treat as equals → Call to action and Accept feedback → Call to action are positive and significant at $P < .10$. Similarly, Table 5 shows that in Model 2 the coefficient for trust in the Trust → Commitment link was also positive and significant at $P < .10$.

Results between Models 2 and 5 are similar as well because the regression estimates for trust, when it is part of the trust-schedule overrun links, are not significant at $P < .10$. The regression estimates for Treat as equals and Accept feedback in the links with schedule overrun shown in Table 16 are not significant at $P < .10$. Similarly, Table 5 shows that the regression estimate for Trust in the Trust → Schedule overrun link is not significant at $P < .10$.

In Models 2 and 5, the regression estimates for commitment were negative and significant when it was included in the links pointing to schedule overrun. Table 16 shows that the regression estimate for Call to action in the Call to action → Schedule overrun link was negative and significant at $P < .05$. In Model 2, as shown in Table 5, the regression estimate for Commitment in the Commitment → Schedule overrun link was also negative and significant at $P < .01$.

No relationship between task newness and trust and commitment was found in any of the measurements.

The results differ for the relationship between team longevity and trust. In Model 5, results suggest that there is no relationship between Team longevity and the two trust statements. The results for Model 2 shown in Table 5 indicate that there is a relationship between team longevity and trust. Table 5 shows that the regression estimate for team longevity in the Team longevity → Trust link was positive and significant at $P < .01$.

The use of attitude scales or behaviour scales did not yield significantly different results.

7 CONCLUSIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

7.1 Conclusions

In this study, this writer examined the relationship between trust, commitment and schedule overruns in the context of software development teams undertaking tasks that were part of large development projects in telecommunications companies.

Results indicate that:

- High level of trust increases commitment
- High level of team commitment reduces schedule overrun
- High level of trust among team members does not necessarily reduce schedule overrun, however trust reduces schedule overrun indirectly through members' commitment
- Team longevity affects the level of trust, but does not affect the level of commitment
- Task newness does not affect the level of trust or commitment

Similar results are obtained when attitude and behaviour scales are used to measure trust and commitment.

The results of this research suggest that software development managers can reduce the cost of schedule overruns by increasing activities that build trust among members of software development teams and increase their commitment toward task completion.

7.2 Limitations

This study has five important limitations. The first one is the size of the sample and its focus on three telecommunications companies. A larger sample comprised of questionnaires from respondents working in industries other than telecommunications and in cities other than Ottawa would have been preferable.

The second limitation is the lack of multiple responses per team. The views of all team members versus those of one member per team would have been preferable.

The third limitation is that the sample was not drawn randomly from the population of software development projects undertaken in Ottawa. Instead, convenience sampling was used. This limits the inferences that can be made from the results.

The fourth limitation is the lack of a theoretical framework that identifies the exogenous variables associated with the trust-commitment relationship. Team longevity and task newness were chosen because they are frequently used in the literature. A well-developed theory that relates them to trust, commitment and schedule overrun, however, does not exist.

The fifth limitation is that the structural equation model was not used to prove the structural validity of trust and commitment. The researcher assumed that the constructs for trust and commitment published in the literature are valid.

7.3 Suggestions for Future Research

This writer suggests three areas for future research. The first one is the examination of whether the trust-commitment-schedule overrun relationship is dependent on task type (i.e. developing new modules, adding features, integrating modules). For example, it would be important to study the strength between commitment and schedule-overrun decreases based on task type.

The second suggestion for future research is to partition the sample, based on two levels of task newness and examine if the trust-commitment-schedule overrun relationships for the highly unfamiliar versus the moderately unfamiliar sub-samples are similar.

The third suggestion for future research is to identify the exogenous variables that affect a team's level of trust and commitment when undertaking engineering tasks with schedule overrun as the performance measure.

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Appendix A Letter of Information

January 9, 2004

Dear Sir/Madam:

I am a graduate student enrolled in the M. Eng. in Telecommunications Technology Management program offered by the Department of System and Computer Engineering, Carleton University. I am writing a thesis titled "The Relationship Between Trust, Commitment And Schedule Overrun". Professor A.J. Bailetti is my supervisor. I seek your cooperation in providing data for my thesis. I ask that you complete the attached questionnaire and return it to me. My e-mail address is yfang3@connect.carleton.ca. My address is: Chris Fang, Department of Systems and Computer Engineering, 1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6.

It takes less than 15 minutes to complete the questionnaire. It does not require the disclosure of sensitive data. I assure you that the data you provide will be kept confidential. Only my supervisor and I can access such data. Information from individual responses will not be divulged. Responses to the questionnaire will be saved in my personal computer, which is password protected and only I can access it. When the research is complete, which is expected to be in March 2004, the data will be deleted permanently.

Please first identify a software development task (e.g., developed new features A and B, integrated and tested new features, developed infrastructure to support feature development), which your group/team completed in the last 12 months. Then provide

answers focusing on the task completed by your team, not the overall project of which the task was a part.

You are entitled to decline answering any question(s) in such questionnaire. At any time, you may withdraw from this study and have data withdrawn without reprisal. The time and effort you take to participate in this research study is appreciated, but you may not benefit from your participation in the study. After the study, a copy of research results will be sent to you by e-mail upon request.

I will present the results to faculty members and students in the graduate program offered by Carleton University and their research associates.

Should you have any questions about this research study or wish to withdraw from it, feel free to contact the researcher at +1 613 831-9511, or yfang3@connect.carleton.ca by e-mail. My supervisor, Dr. A.J. Bailetti, can be reached at +1 613 520-2600 Ext. 8398, or Tony.Bailetti@sce.carleton.ca by e-mail.

This research has been reviewed and received ethics clearance through the Carleton University Research Ethics Committee. Should you have any concerns or questions about your involvement in this research study, please contact:

Carleton University Research Ethics Committee

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Tel: +1 613 520-2517

Thanks very much for your time and co-operation.

Yijian (Chris) Fang
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Tel: +1 613 831-9511

Appendix B Questionnaire

Section 1 Task Data

1. Describe the software development task undertaken by your team

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2. Number of team members that completed the task _____

3. Planned duration of the task (Number of weeks) _____

Actual duration of the task (Number of weeks) _____

4. Number of months the team was together before the task started?

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5. How new was the task to the team? (Please check the space underneath the number)

1 Not New At All	2	3	4 Moderately New	5	6	7 Very New

Section 2: On the next pages are 15 statements describing your views about your team. Please read each statement carefully. Then look at the rating scale and answer how strongly you agree or disagree with the statement.

1. I could rely on other members of my team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

2. There was a "team spirit" in my team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

3. I had confidence in the other members of my team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

4. Members of my team showed a great deal of integrity.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

5. I was considerate of other members' feelings.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

6. I felt comfortable sharing task related problems with other members in my team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

7. I was very glad to be part of this team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

8. I was proud to tell others I was part of this team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

9. I knew what my peers were working on and how they contributed to the collective good of my team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

10. I found that my values and the team's values were very similar.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

11. I was willing to put in a great deal of effort beyond that normally expected in order to help this team be successful.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

12. I would have accepted almost any type of job assignment in order to keep working for this team.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

13. My team really inspired me to perform at my best.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

14. I felt that I had the power to make a difference.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

15. I felt a sense of responsibility and authority.

1 Strongly Disagree	2 Disagree	3 Will not go along	4 Probably will go along	5 Will go along	6 Agree	7 Strongly agree	0 Don't Know

Section 3: On the next pages are 21 statements describing team members' behaviours. Please read each statement carefully. Then look at the rating scale and decide how frequently team members engaged in the behaviour described. In selecting each response, please be realistic about the extent to which team members actually engaged in the behaviour. Do not answer in terms of how you would like to have seen the team members behave or in terms of how you think team members should have behaved. Answer in terms of how the team members typically behaved, on most days and with most people during the project.

1. Team members quickly and genuinely apologized to one another when they said or did something inappropriate or possibly damaging to the team.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

2. Team members openly admitted their weaknesses and mistakes.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

3. Team members discouraged political behaviors on the team.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

4. Team members believed what other team members said.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

5. Team members relied on other team members to do what they said they would do.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

6. Team members learned from other team members.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

7. Team members treated other team members as equals.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

8. Team members freely exchanged knowledge with other team members.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

9. Team members accepted questions and feedback on their areas of responsibility.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

10. Team members sought help from other team members.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

11. Team members knew about one another's personal lives and were comfortable discussing them.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

12. Team members put forth extra effort beyond what was minimally required.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

13. Team members demonstrated cooperative behavior.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

14. Team members participated in decision-making.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

15. Team members subjugated personal need and ego for the greater common good.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

16. Team members accepted team goals as the basis for performance evaluation.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

17. Team members had shared view of what the team's mission was.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

18. Team members changed behaviours to accomplish the team's goals.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

19. Team members challenged others' and the team's ideas freely.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

20. Team members ended discussions with clear and specific resolutions and calls to action.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

21. Once a decision was finalized, all team members moved forward with the decision although some might have voted against the decision.

1 Never	2 Rarely	3 Seldom	4 Occasionally	5 Often	6 Frequently	7 Always	0 N/A

Section 4: Request for a copy of the findings

Would you like to receive a copy of the research findings? Yes ____ No ____

If Yes, please provide your e-mail address: