Team Transformational Leadership, Trust, Satisfaction, And Commitment: The Testing Of A Structural Equation Model In Software Development Teams

Shih-Yi "Clark" Hsu, (E-mail: shihyi@nova.edu), Lan Yang Institute of Technology
Bahaudin G. Mujtaba, (E-mail: mujtaba@sbe.nova.edu), Nova Southeastern University

ABSTRACT

This paper studied the relationship among team transformational leadership, team trust, job satisfaction, and team commitment of the team members in software development teams in the United States of America. A total of 5,375 surveys were distributed and only 69 respondents completed the online survey. Based upon 65 validated respondents, this study conducted a confirmatory factor analysis and evaluated the direct and indirect weights of path coefficients among the latent variables at 5% level of significance. The results using path analysis indicate that team transformational leadership is strongly positively related to team empowerment (r= .86, p= .00) and team trust (r= .82, p= .00) in software development teams while team empowerment (r= .27, p=. 55) and team trust (r= .29, p= .55) are not related to job satisfaction in software development teams. There is a slight positive relationship between team job satisfaction and the team commitment (r= .18, p= .04).

INTRODUCTION AND THEORETICAL FOUNDATION

*S*awyer and Guinan (1998) indicate that team-level social processes in software development teams are positively related to the quality of software products. Hence, information system project team leaders need to understand not only the techniques and methodologies known as Computer Aided Software Engineering (CASE) tools, but also the ongoing group dynamics within teams. There is very little management related research aimed on software development teams. Previous research indicates that human relationships are more important than technological aspects in terms of performance in software development teams (Guinan, Cooprider, & Faraj, 1998; Howard, 2001; Rasch & Henry, 1992). This research studied the relationship among team transformational leadership, team trust, job satisfaction, and team commitment of the team members in software development teams in the United States of America.

In order to understand the role of teamwork in the software development process, researchers have adopted models from organizational behavior science, such as leader-member exchange and group dynamics. The model developed in this study depicts teamwork as relationships among team transformational leadership, empowerment, trust, job satisfaction, and commitment.

Organizational behavior is the core of the behavior approach to management (DuBrin, 2002). The early scholars in the behavior school were Henry G. Gantt and Hugo Munsterberg (George, 1972). They believed the study of management should focus on the center of human behavior and interpersonal relations.

There were three major key movements in organizational behavior: the Hawthorne studies, the human relation movement, and the contingency approach to management and leadership (DuBrin, 2002; Sweeney & McFarlin, 2002). The study of contingency approach "is derived from the four studies of leadership styles" (DuBrin, p. 10). This approach argues that, "there is no single best way manage behavior" in order to effectively manage people (Sweeney & McFarlin, 2002, p. 6). It all depends on the interaction between various managers and workers, and internal and external circumstances (Sweeney & McFarlin, 2002).

Teamwork And The Group Dynamics

The definition of the group dynamics is "the social process by which people interact face-to-face in small groups" (Newstrom & Davis, 2002, p. 285). The founder of the group dynamics movement is Kurt Lewin (Graham, 2002). He discovered that the group controlled through leadership rather than force, ensured discipline through internal pressure, pooled thinking, respected the individual, and allowed all its members to participate in deciding on things that directly affected them in their work.

Walker Royce (1998, p. 43) indicated, "Teamwork is much more important than the sum of the individual" part since a nominal engineering team can succeed under a well-managed project. In addition, Leung Ho Tsoi (1999) concluded that "The success of a software project relies very much on a good management and control system which allows the development to satisfy the project objectives" (p. 597). Scott and Townsend (1994) reported that team process skills – (a) communication, (b) leadership, (c) goal setting, (d) cross training, (e) problem solving/decision making, (f) conflict resolution are the essential elements for successful teamwork.

Group has appeared in countless organizations, corporations, and human societies. A collection of people in organization is called a group. However, there are two types of group: formal and informal (Maurer, Shulman, Ruwe, & Becherer, 1995). According to Maurer et al. (1995), "Formal groups are those that give legitimacy by the organization; informal groups tend to more social in nature." Bradford and Cohen (1998) pointed out that "Group members represent the areas for which they are held accountable…The emphasis in groups is to run efficient meetings with the aid of strong leadership that focuses discussion" (p. 129).

"Group" is a general word in the research literature which includes all forms of teams and work group (Guzzo & Dickson, 1996). On the other side, according to researchers, project teams are time limited; in general, they produce one-time outputs, such as a new products or service to be marketed by the company, a new information system, or a new plant (Cohen & Bailey, 1997, p. 242).

Cohen and Bailey (1997) classified effectiveness of teams into three major facets from 54 journal articles between 1990 and 1996: quality of products (performance), member attitudes (employee satisfaction, commitment, and trust), and behavior outcomes (absenteeism, turnover, and safety). In order to assist and guide management, this study focused on the individual or group levels of the member attitudes in the real software industry.

Team members and leaders must play their roles if they are to be high-performing. Brown and Dobbie (1999) described the roles of a team leader as follows:

1. Coordinate the activities of the team (tracking progress, scheduling work).
2. Motivate the team.
3. Ensure the team communicates effectively.
4. Interface with supervisor; arrange meetings with client when necessary.
5. Set agendas for meetings (p. 282).

Brown and Dobbie further described the roles of a team member as follows:

1. Help to set the team goals (project goals, task allocations).
2. Help the team move towards these goals.
3. Accomplish tasks given to them.
4. Meet deadlines.
5. Attend team meetings.
6. Contribute to developing a productive atmosphere within the team (p. 282).

LEADERSHIP AND COMMITMENT

Leadership is defined as "the process of guiding and directing the behavior of people in the work environment" (Nelson, 2000, p. 384). The influence process of leadership in an organization involves a great deal of downward influence (top-down direction) between a leader and followers (subordinates) (Pearce & Conger, 2003). After reviewing 13 different perspectives of leadership, Bass (1990) concluded that the roles of leadership can be seen as "the focus of group processes, as a personality attribute, as the art of inducing compliance, as an exercise of influence, as a particular kind of act, as a form of persuasion, as a power relation, as an instrument in the attainment of goals, as an effect of interaction, as a differentiated role, and as the initiation of structure" (p. 20). Leadership is a process of interacting between people (a leader and followers) and context, and producing outcomes (such as trust, customer satisfaction, high quality products) (Murphy, 1941).

During 1970s, Leader-Member Exchange (LMX) was revived and renamed (from VDL –Vertical Dyad Linkage Theory) by Dansereau, Graen, and Haga (1975), Graen and Cashman (1975), and Graen and Wakabayashi (1994). Leaders develop two different types of exchange relationships with their followers over time: in-group and out-group relationships. Unlike traditional leadership model, leaders apply almost similar styles to all of the followers. The members with in-group relationships are usually trusted and empowered by the leader. They "tend to land desirable assignments, enjoy considerable autonomy, participate in decision making, and receive the lion's share of resource" (Sweeney & McFarlin, 2002, p. 183). There are three dimensions of relationships between leader and followers: fairness or organizational justice (Scandura, 1999), trust (Dirks, 2000), and ethics (Bass & Steidlmeier, 1999).

Shared leadership is different than traditional leadership. The definition of shared leadership is "a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to achievement of group or organizational goals or both" (Pearce & Conger, 2003, p. 1).

Although there are various types and definitions of leadership, leadership typically is a process of social influence for a particular purpose (Barge, 1996).Team transformational leadership is one type of team leadership (Avolio, Jung, Murry, Sivasubramaniam, & Garger, 2003). They state that team leadership can be described as occurring when "all members of the team collectively influence each other toward accomplishing its goals" based upon Team-member exchange (TMX) (Avolio, et al., 2003, p. 145; Sivasubramaniam, et al., 2002) but characterizing a team rather than a dyad. The term "team leadership," is also called "shared leadership, peer leadership, or collective leadership" (Avolio, et al., 2003; Sivasubramaniam, et al., 2002). Team leadership is different from traditional leadership in that leader behavior is shared by all members if the team interactively (two-way influence) interacting (Pearce & Conger, 2003). Traditional leadership focuses on distribution of individual to subordinates and top-to-down hierarchical influence (one-way influence). However, Sivasubramaniam, et al. (2002) indicated that "Team-level leadership is similar to individual-level leadership in that the functional relationships hypothesized at the individual level are expected to be 'isomorphic' with the next level" (p. 68). In summary, leadership within a team presupposes that all team members are able to contribute to each other in terms of leading. Team transformational leadership based on Bass's (Bass & Avolio, 1995) model includes idealized influence (II), idealized behaviors (IB), inspirational motivation (IM), intellectual stimulation (IS), and individualized consideration (IC) (Avolio, et al., 2003).

Team empowerment has four dimensions: choice, meaningfulness, competence, and process (Kirkman & Rosen, 1997). Furthermore, Gorn and Kanungo (1980) revealed that the more meaningful an employee's job was, the more satisfied the employee was with his or her job. Naturally, employees will find more meaning in their jobs when the scope of their activities is large (Griffin, 1991), which is often the case with empowered work teams (Wellins et al., 1991). Thomas and Velthouse (1990) defined psychological empowerment as intrinsic motivation manifested in four cognitions reflecting an individual's orientation to his or her work role: meaning, competence, self-determination, and impact.

Team trust is a collective attribute which involves multiple trustees within team members (Jarvenpaa, Knoll, & Leidner, 1998). It is also called collective trust. The definition of team trust is "the belief that an individual or group (a) makes good-faith efforts to behave in accordance with any commitments both explicit and implicit, (b) is honest in whatever negotiations preceded such commitment, and (c) does not take excessive advantage of another even when the opportunity is available" (Cummings & Bromley, 1996, p. 303). There are three stages of trust building:

deterrence-based trust, knowledge-based trust, and identification-based trust. Of course, a high level of trust between managers and employees might lead to better communication and job satisfaction for both groups.

Tymon and his associates (Thomas & Tymon, 1994; Tymon, 1988) and Spreitzer and her colleagues (1997) discovered a link between empowerment and job satisfaction at the individual level of analysis. Besides, people working in teams had higher levels of job satisfaction than workforce working in traditional settings within the same company (Cordery, Mueller, & Smith, 1991; Wall, Kemp, Jackson, & Clegg, 1986). Job satisfaction consists of intrinsic and extrinsic satisfaction (Weiss, England, & Lofquist, 1967). The facets of challenge, achievement, and ability utilization are part of the intrinsic satisfaction which concerns with direct job experience. Additionally, extrinsic satisfaction is comprised of supervision, company policies and practices, and compensation which are related to different people attitudes toward work environmental factors (Santana & Robey, 1994).

Business enterprisers are facing the tremendous pressure of globalization and competition, a more flexible and adaptive organization has shifted to a team-based structure. Recently, research concentrates not only on organizational level, but also commitment at the team level. Team commitment is "the relative strength of an individual's identification with, and involvement in, a particular team" (Bishop & Scott, 2000, p. 439). According to some authors, effective teamwork can be based on a commitment to the team, workplace, division, and/or corporation (Sano, 2002, p. 941). The team commitment has become one of the important levels of commitment. Team commitment is used "to describe very different constructs, experiences, degrees of involvement and motivation" (Hopfl, 2001, p. 90).

Moreover, based upon a field study from 114 technical people within a consulting firm, conducted by Vegt and his associates (2000), the cross-sectional study found that both individual-level task interdependence and job complexity were positively related to individual job satisfaction, team satisfaction, job commitment, and team commitment. Moreover, Scott, and Townsend (1994) found that team commitment was correlated to team performance. In addition, the aggressiveness toward other people and the value employees place on autonomy were negatively correlated to team commitment.

HYPOTHESES, ANALYSIS AND MEASUREMENT

Figure 1 depicts the proposed relationships among team transformational leadership, team trust, job satisfaction, and team commitment in development teams as an input-process-output (IPO) model. It integrates into one research model team transformational leadership, empowerment, trust, job satisfaction, and commitment that were never previously examined together in modeling the interactions among team members as a whole. The hypotheses below articulate the expected interrelationships among the variables:

Hypothesis H1a: Team transformational leadership is related to team empowerment in software development teams.
Hypothesis H1b: Team transformational leadership is related to team trust in software development teams.
Hypothesis H2a: Team empowerment is related to job satisfaction in software development teams.
Hypothesis H2b: Team trust is related to job satisfaction in software development teams.
Hypothesis H3: The job satisfaction is related to team commitment in software development teams.

The level of analysis is the individual level. Characteristically, respondents can be arranged in hierarchical order. For example, the organization, the group, and the individuals are moving from the macro level to the micro level. The higher levels (such as the group level) include the lower levels, for example individual respondents (Yammarino & Jung, 1998).

For all scales a 5-point Likert scale ranging from 5 = "strongly agree", 3 = "moderately", to 1 = "strongly disagree" provides the response format except the TMLQ with a 5-point Likert scale ranging from 5 = "frequently or always", 3 = "sometimes", to 1 = "not at all."

Team transformational leadership. Team transformational leadership (TTL) is assessed with the Team Multifactor Leadership Questionnaire (TMLQ) (Sivasubramaniam, et al., 2002).

Team empowerment. This research measures team empowerment with two scales: an 8-item potency scale (Guzzo, Yost, Campbell, & Shea, 1993) and 18-item empowerment inventory (EI) (Thomas & Tymon, 1993, 1994). Three of the four EI dimensions: meaningfulness, choice (autonomy), and progress (impact) (Guzzo, et al., 1993) are used.

Team trust. Since "trust emerges in the team as members learn from their success and failures to rely on one another"(Mayo, Meindl, & Paster, 2003, p. 211), team trust is defined as each team member's perception of other members' abilities, integrity, and benevolence (Jarvenpaa, et al., 1998).

Job satisfaction. Team level job satisfaction is measured with a 4-item assessment developed by Thomas and Tymon (1994).

Team commitment. A variety of assessments of team-level team commitment exist in the previous literature, such as Shapiro and Kirkman's (1999) 3-item questionnaire, Alutto and Hrebiniak's (1975) 4-item questionnaire, March and Simon's (1958) 5-item assessment, Rossy and Archibald (1992), and Bishop and Scott's (2000) 8-item assessment. However, Bishop and Scott (2000) modified portions of the Organization Commitment Questionnaires (OCQ) short form (Mowday, Steers, & Porter, 1979) to assess team level commitment. It is defined as "the relative strength of an individual's identification with, and involvement in, a particular team" (Bishop & Scott, 2000, p. 439).

Criteria for acceptance / significance. The path analysis is used to test the hypotheses because of its capability to evaluate causal relationships (Loehlin, 1987; Pedhazur, 1982). The level of significance for testing the hypothesis is $p = .05$. If the null hypothesis (Ho) is not rejected, this indicates that the hypothesis is accepted within 5% level of significance. Although there is 5% possibility that the null hypothesis is wrong, the researcher has 95% of confidence that the null hypothesis is accurate.

STUDY FINDINGS

Figure 2 presents the confirmatory factor analysis of team transformational leadership items. Each of the five facets of team transformational leadership exceeded the criterion of .5. The Cronbach's alphas for the team transformational leadership dimensions all exceeded the conventional minimum requirement of .70, $\alpha = .85$ for IA, $\alpha = .79$ for IB, $\alpha = .83$ for IS, $\alpha = .82$ for IM, and $\alpha = .84$ for IC.

Figure 3 presents the confirmatory factor analysis results for team empowerment. The factor loadings for team empowerment were .55 for meaningfulness, .58 for potency, .81 for progress (as impact), and .61 for choice (as autonomy). Reliability estimates for the facets of team empowerment *(α)* was .96 for meaningfulness, $\alpha = .92$ for potency, $\alpha = .92$ for progress (as impact), and $\alpha = .87$ for choice (as autonomy).

The latent variable, team trust, used a 5-item scale. The levels of factor loadings for each item appear in Figure 4. All items have factor loadings of .79 or greater. The Cronbach's alpha of team trust was .88.

Team job satisfaction was measured by using a 4-item job satisfaction scale. The factor loadings are all .91 or higher, as depicted in Figure 5. A reliability estimate for job satisfaction (*α)* was .94.

This research measures team commitment with an 8-item team commitment scale. Figure 6 lists all factor loadings for the team commitment items, all exceeding .70. The reliability analysis (α) of team commitment was .92.

Summary of Findings

Concerning the SEM analysis, AMOS 6.0 software was used to examine the research hypotheses and research model for fit in the sample data. The results (Figure 7) using path analysis indicate that team transformational leadership is strongly positively related to team empowerment (r= .86, p= .00) and team trust (r= .82, p= .00) in software development teams. In addition, team empowerment (r= .27, p=. 55) and team trust (r= .29, p= .55) are not related to job satisfaction in software development teams. There is a slight positive relationship between job satisfaction and job commitment (r= .18, p= .04).

The above summary demonstrates that the findings of this study contribute to the body of empirical literature regarding the individual attributes of, and attitudes leadership and team qualities in software development teams in the United States. The results in indicate that team transformational leadership is strongly, positively related to team empowerment and team trust in the software development teams. Both job satisfaction and the team commitment also have a positive direct relationship. These finding have a great deal of applicability in the workplace.

This study could be applied to other fields such as software project managers, hardware or software system administration, or IT departments. The sample size is too small to represent the software publishing industry. A larger sample size is required for SEM technique to calculate the proposed relationships (Kline, 1998). The suggestion is to conduct other survey media for enlarging and encouraging the size of respondents. Potential respondents could be concerned the internet security threat or against company policy in answering the online survey. Using traditional self-administered questionnaires with return address instead of on-line survey could be better than the online survey. This study could be conducted in a single large software publisher with documents on the history of the company for case study. This study could also be deployed in other countries or regions for comparing and contrasting. The population could sample university students majoring in computer science, information system, or other related. Finally, such a study could examine mediator variables such as team empowerment, team trust, and job satisfaction.

REFERENCES

1.   Avolio, B. J., Jung, D. I., Murry, W., Sivasubramaniam, N., & Garger, J. (2003). Assessing Shared Leadership: Development of a Team Multifactor Leadership Questionnaire. In C.L. Pearce & Jay A. Conger (Eds.), *Shared Leadership: Reframing the Hows and Whys of Leadership*. (pp. 143-172). Thousand Oaks, CA: Sage Publications.
2.   Barge, J. K. (1996). Leaderships Skills and the Dialectice of Leadership in Group Decision Making. In R. Y. Hirokawa & M. S. Poole. (Eds.), *Communication and group decision making* (pp. 55-80). (2nd ed.).Thousand Oaks, CA: SAGE Publications.
3.   Bass, B. M., & Steidlmeier, P. (1999). Ethics, Character, and Authentic Transactional Leadership Behavior. *Leadership Quarterly*, 10(2), 181-217.
4.   Bishop, J. W., & Scott, K. D. (2000). An Examination of Organizational and Team Commitment in a Self-Directed Team Environment. *Journal of Applied Psychology*, 85(3), 439-450.
5.   Bradford, D. L., & Cohen, A. R. (1998). Power up: transforming organizations through shared leadership. New York: John Wiley.
6.   Brown, J., & Dobbie, G. (1999). Supporting and Evaluating Team Dynamics in Group Projects. The Proceedings of the Thirtieth Sigcse Technical Symposium on Computer Science Education March 24 - 28, New Orleans, LA, 281-285
7.   Cohen, S. G., & Bailey, D. E. (1997). What Makes Teams Work: Group Effectiveness Research from the Shop Floor to the Executive Suite. *Journal of Management*, 23(3), 239-290.
8.   Cordery, J. L., Mueller, W. S., & Smith, L. M. (1991). Attitudinal and Behavioral Effects of Autonomous Group Working: a Longitudinal Field Study. *Academy of Management Journal,* 34, 464-476.
9.   Cummings, L. L., & Bromiley, P. (1996). The Organizational Trust inventory: Development and Validation. In Kramer, R. M., & Tyler, T. R. (Eds.), (1996). *Trust in Organizations: Frontiers of Theory and Research* (pp. 302-330). Thousand Oaks, CA: Sage Publications.
10.   Dirks, K. T. (2000). Trust in Leadership and Team Performance: Evidence from NCAA Basketball. *Journal of Applied Psychology*, 85(6), 1004-1012.
11.   DuBrin, A. (2002). *Fundamentals of Organizational Behavior*. (2nd ed.). Australia Cincinnati, OH: South-Western Thomson Learning.
12.   George, C. S. (1972). *The History of Management Thought* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.
13.   Gorn, G. J., & Kanungo, R. N. (1980). Job Involvement and Motivation: Are Intrinsically Motivated Managers More Job Involved? *Organizational Behavior and Human Performance*, 26, 265-277.
14.   Graham, P. (2002). Human Relations. In M. Warner. (Ed.), *International Encyclopedia of Business and Management* (pp. 2610-2616). (2nd ed.). (Vols. 1-8). London: Thomson Learning.
15.   Griffin, R. W. (1991). Effects of Work Redesign on Employee Perceptions, Attitudes, and Behaviors: a Long-Term Investigation. *Academy of Management Journal*, 34, 425-435.
16.   Guinan, P. J., Cooprider, J.G., & Faraj, S. (1998). Enabling Software Development Team Performance During Requirements. Definition: a Behavioral versus Technical Approach. *Information System Research* 9(2), 101–125.

17.   Guzzo, R. A., & Dickson, M. W. (1996). Teams in Organizations: Recent Research on Performance and Effectiveness. *Annual Review of Psychology*, 47, 307-338.
18.   Hopfl, H. (2001). *Motivation*. In E. Wilson. (Ed.), (2001). Organizational Behavior Reassessed (pp. 86-103). London: Sage Publishtions.
19.   Howard, A. (2001). Software Engineering Project Management. *Communication of ACM*, 44(5), 23–24.
20.   Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998). Is Anybody Out There? Antecedents of Trust in Global Virtual Team. *Journal of Management Information Systems*, 14(4), 29-64.
21.   Kline, R. B. (1998). *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press.
22.   Kirkman, B. L., & Rosen, B. (1997). A Model of Work Team Empowerment. In R. W. Woodman, & W. A. Pasmore. (Eds.), *Research in Organizational Change and Development* (pp. 131-167). Greenwich, CT: JAI Press.
23.   Loehlin, J. C. (1987). *Latent Variable Models. Hillsdale*, NJ: Lawrence Erlbaum Associates.
24.   Maurer, G. J., Shulman, M. J., Ruwe. L. M., & Becherer, C. R. (1995). *Encyclopedia of Business*. Detroit, MI: Gale Research.
25.   Mayo, M., Meindl, J. R., & Paster, J. C. (2003). Shared Leadership in Work Teams: a Social Network Approach. In C. L. Pearce, & J. A. Conger (Eds*.), Shared Leadership: Reframing the Hows and Whys of Leadership* (pp. 193-214). Thousand Oaks, CA: Sage Publications.
26.   Nelson, D. L. (2000). *Organizational Behavior: Foundations, Realities, and Challenges*. (3rd ed.). Cincinnati, OH: South-Western College Publisher.
27.   Newstrom, J. W., & Davis, K. (2002). *Organizational Behavior Human Behavior at Work*. (11th ed.). New York: McGraw-Hill Higher Education.
28.   Pearce, C. L., & Conger, J. A. (2003). All Those Years Ago. In C. L. Pearce & J. A. Conger (Eds.), *Shared Leadership: Reframing the Hows and Whys of Leadership*. (pp. 1-18). Thousand Oaks, CA: Sage Publications.
29.   Pedhazur, E. J. (1982). *Multiple Regression in Behavior Research*. (2nd ed.). New York: Holtz, Rinehart, & Winston.
30.   Rasch, R.H., & Henry L. Tosi. (1992). Factors Affecting Software Developers' Performance: An Integrated Approach. *MIS Quarterly*, 16(3), 395–413.
31.   Robbins, S. P. (2003). *Organizational Behavior*. (10th ed.). NJ: Upper Saddle River.
32.   Roth, W. F. (1993). *The Evolution of Management Theory: Past, Present, Future*. Orefield, PA: Roth & Associates.
33.   Royce, W. (1998). *Software Project Management: A Unified Framework*. Reading, MA: Addison Wesley Longman, Inc.
34.   Sano, Y. (2002). Commitment. In M. Warner. (Eds.), (2002). *International Encyclopedia of Business and Management*. (2nd ed.). (Vols. 1-8). London: Thomson Learning.
35.   Santana, M., & Robey, D. (1994). Controlling Systems Development Effects on Job Satisfaction of Systems Professionals. Proceedings of the 1994 Computer Personnel Research Conference on Reinventing Is: Managing Information Technology in Changing Organizations: Managing Information Technology in Changing Organizations, 184-191.
36.   Sawyer, S., & Guinan, P. J. (1998). Software development: Processes and performance. *IBM Systems Journal*, 37, 4, 552-568.
37.   Scott, K. D., & Townsend, A. (1994). Teams: Why Some Succeed and Others Fail. *HRMagazine*, 39(8), 62-68.
38.   Sivasubramaniam, N., Murry, W. D., Avolio, B. J., & Jung, D. I. (2002). A Longitudinal Model of the Effects of Team Leadership and Group Potency on Group Performance. *Group & Organization Management,* 27(1), 66-96.
39.   Spreitzer, G. M., Kizilos, M. A., & Nason, S. W. (1997). A Dimensional Analysis of the Relationship Between Psychological Empowerment and Effectiveness, Satisfaction, and Strain. *Journal of Management*, 23, 679-704.
40.   Sweeney, P. D., & McFarlin, D. B. (2002). *Organizational Behavior: Solutions for Management*. Boston: McGraw-Hill Irwin.
41.   Thomas, K. W., & Tymon, W. G. Jr. (1993). *Empowerment Inventory*. NY: XICOM.
42.   Thomas, K. W., & Tymon, W. G. Jr. (1994). Does Empowerment Always Work: Understanding the Role of Intrinsic Motivation and Personal Interpretation. *Journal of Management Systems,* 6, 1-13.

43.   Thomas, K. W., & Velthouse, B. A. (1990). Cognitive Elements of Empowerment: An "Interpretive" Model of Intrinsic Task Motivation. *Academy of Management Review*, 15, 666-681.
44.   Tsoi, L. H. (1999). A Framework for Management Software Project Development. Proceedings of the 1999 ACM Symposium on Applied Computing, San Antonio, TX USA, February 28 - March 2, 1999, 593-597.
45.   Tymon, W. G. Jr. (1988). An empirical investigation of a cognitive model of empowerment. Unpublished doctoral dissertation, Temple University, Philadelphia.
46.   Vegt, G., Emans, B., & Vliert, E. (2000). Team Members' Affective Responses to Patterns of Intragroup Interdependence and Job Complexity. *Journal of Management*, 26(4), 633-655.
47.   Wall, T. D., Kemp, N. J., Jackson, P. R., & Clegg, C. W. (1986). Outcomes of Autonomous Workgroups: A Long Term Field Experiment. *Academy of Management Journal*, 29, 280-304.
48.   Weiss, D. J., England, G. W., & Lofquist, L. H. (1967). Manual for the Minnesota Satisfaction Questionnaire (*Minnesota Studies in Vocational Rehabilitation*, No. 22). MS: University of Minnesota Press.
49.   Wellins, R. S., Byham, W., & Wilson, J. (1991). *Empowered Teams: Creating Self-Directed Work Groups that Improve Quality, Productivity, and Participation*. San Francisco: Jossey-Bass.
50.   Yammarino, F. J., & Jung, D. I. (1998). Asian Americans and leadership: A Levels of Analysis Perspective. *The Journal of Applied Behavioral Science*, 34(1), 47-68
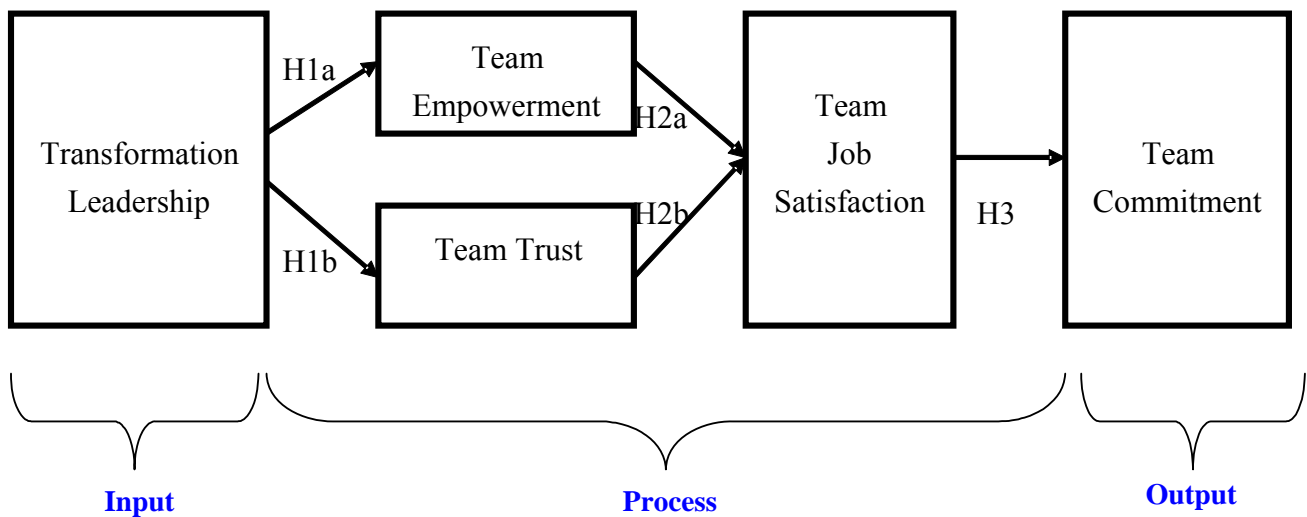
Figure 1. Research model in software development team.

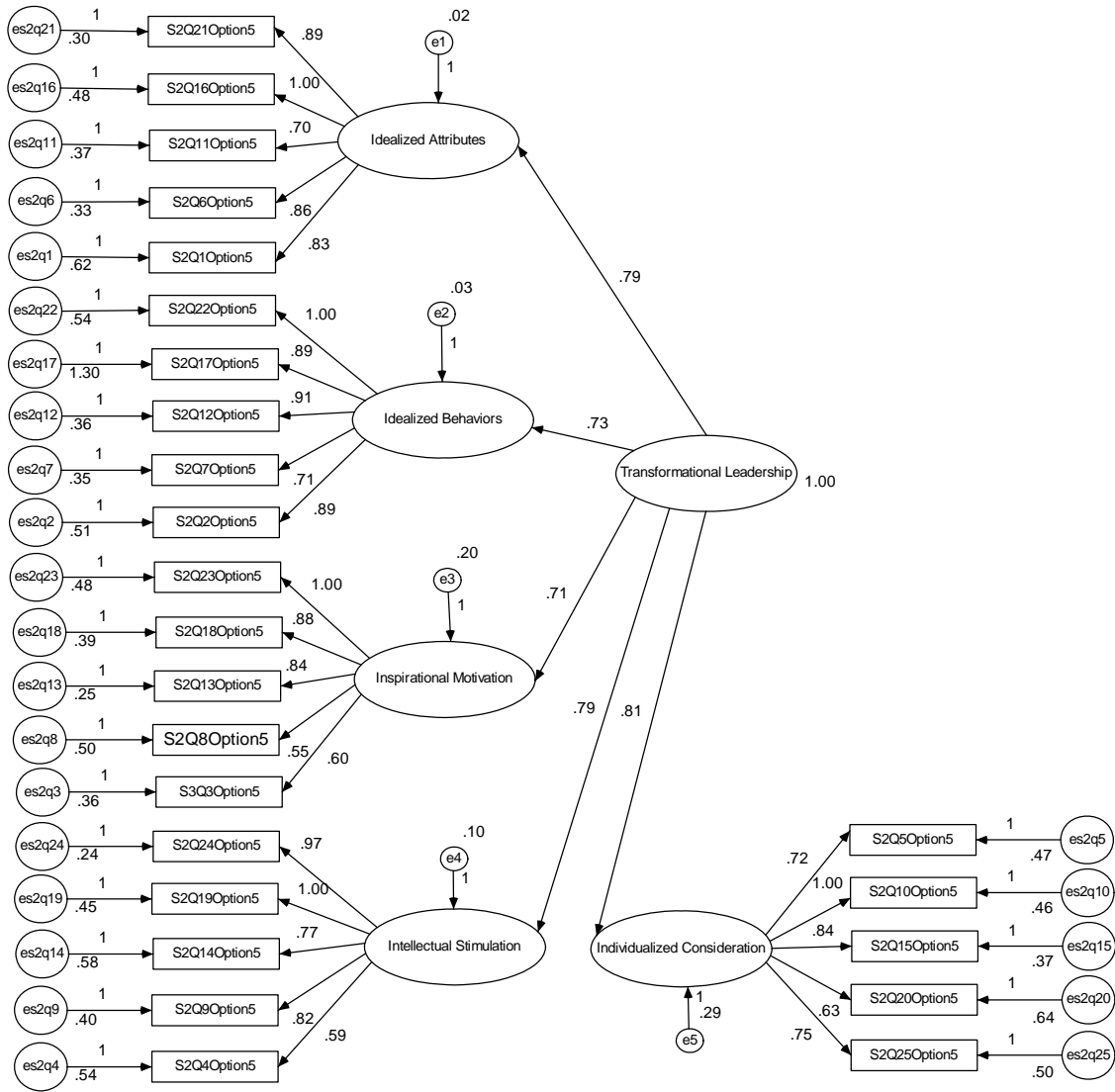A Confirmatory Factory Analysis for Team Transformational Leadership Model

Figure 2. The confirmatory factor analysis of team transformational leadership.

A Confirmatory Factory Analysis for Team Empowerment Model

Figure 3. A confirmatory factory analysis for team empowerment.

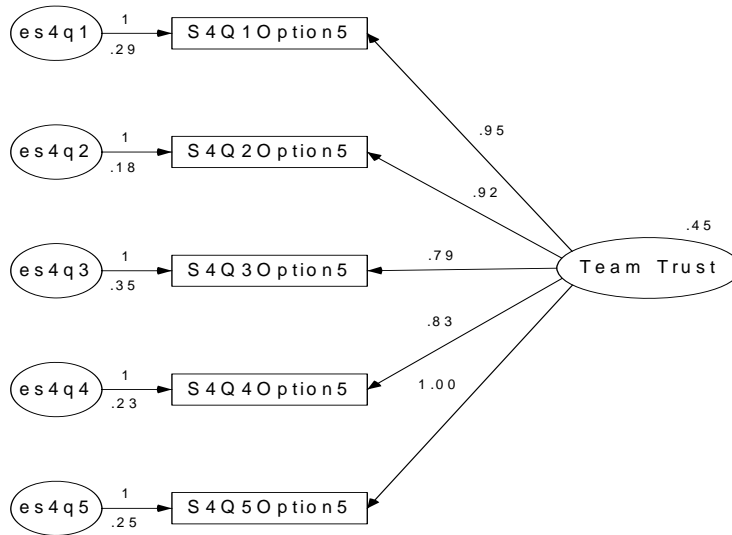A Confirmatory Factory Analysis for Team Trust Model

Figure 4. A confirmatory factory analysis for team trust.

A Confirmatory Factory Analysis for Job Satisfaction Model

Figure 5. A confirmatory factory analysis for team job satisfaction.

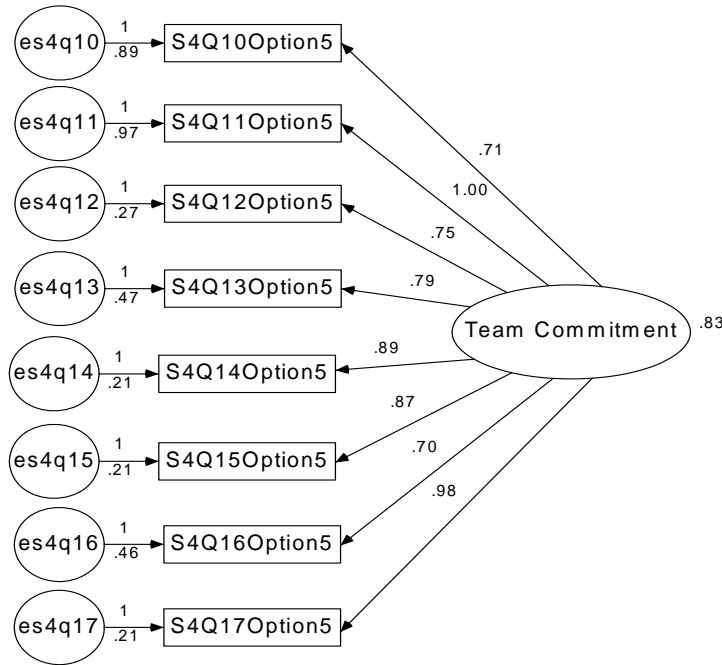A Confirmatory Factory Analysis for Team Commitment Model

Figure 6. A confirmatory factory analysis for team commitment.

A path diagram of Research Model

Chi-square = 684.365 (df = 294)
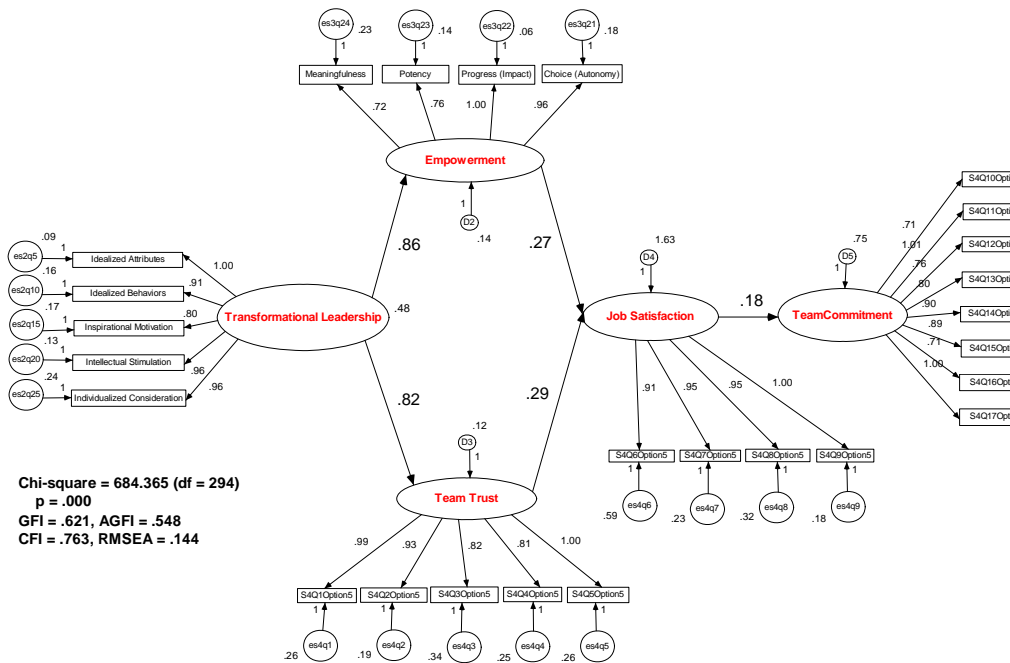p = .000
GFI = .621, AGFI = .548
CFI = .763, RMSEA = .144

Figure 7. The path diagram results for research model.