Social Networking Aspects of Project Management Teams for Effective Value Propositions

Blanas G.
TEI of Larissa, Greece

S. Kylindri, L. Henriksen, S. Tanev
University of Southern Denmark

Abstract

Social network analysis adds to our research capabilities to analyse not just individuals but also groups of people who are connected with some kind of relationship in order to achieve a purpose.
In the current paper we use both traditional attributes of group entities and network constructs in order to examine what makes small project management teams to cooperate in order to develop effective value propositions.
Our research has investigated a number of group attributes and relationships within members and how their corresponding network measures are correlated with the effectiveness of 17 final year student teams working towards their final year group project.
Network measures like cohesion and centrality that are meaningful for small groups have been calculated on all relationships between group members. In addition to traditional attributes like size and sex ratio, the research team has developed a new attribute called group diversity as a measure of the inverse in similarity of team members' roles used in the Belbin (1993) psychometric test.

Keywords: social networks, project management groups, value propositions

Introduction

Project management teams consist of individual members who are interdependent in relation to the tasks they carry out as a group, while they are embedded in one or several larger social systems (Brass, Galaskiewicz, Greve & Tsai, 2004)
Value propositions (VPs) reflect the development or the improvement of products or services produced or offered by firms or of the systems used in order to achieve these improvements Osterwalder & Pigneur (2010). New product development (NPD) is considered to be one of the value propositions that are important to economic development.
Based on the definition in Wikipedia *"A value proposition is a promise of value to be delivered and a belief from the customer of value that will be experienced. It can apply to an entire organization, or parts thereof, or customer accounts, or products or services"* [1].
In order to investigate how small project management groups or teams interact effectively in order to carry on their tasks and specifically in relation to the development of new value propositions we analyzed the correlations of suitable group attributes and social network constructs of these groups in relation to group effectiveness.

[1] http://en.wikipedia.org/wiki/Value_proposition

New Product Development as a Value Proposition Process

New product development (NPD) is viewed to be vital to economic and business development and survival. Innovation and New Product Development (NPD) have been mostly related with large firms (Vossen, 1998). The reason is explained in Caputo et al., (2002) ie, “high costs, fear, moderate knowledge base, limited time and modest financial resources affect owner-managers' opportunities for developing new products”.
Rothwell (1991) claimed that there are opportunities for New Product Development (NPD) in small and medium enterprises (SMEs) due to their characteristics such as skilled workforce, flexibility and flexible management. The innovation activity in small firms can overcome industry lines and to open up new industry areas (Acs & Audretsch, 1990).
According to Hsing et al (2007), in order to be able to compete in a highly antagonistic industry, a firm involved in New Product Development (NPD) processes must be interconnected with other appropriate firms.
Continuous technology changes and globalization of markets require flexibility and innovation in both technological and organizational capabilities (Tapscott, 2009).
New product and service development or improvement are two alternative categories of value propositions in the context of this research. Value propositions also include new or improved processes that may facilitate the quality and decrease the cost of product or service developments and improvements.

Project Management Teams

A work team comprises individuals who consider themselves and others as a social entity (Guzzo & Shea, 1992). The word “team” has, to a large extent, been replaced with the concept “group” in organizational research (Guzzo & Dickinson, 1996). Alternatively the word “group”, is used as in group cohesion, group dynamics and group effectiveness (Cohen & Bailey, 1997). It is acknowledged that groups may vary in their degree of ‘‘groupness’’, and some are thus more interdependent and integrated than others. Some authors have used the term ‘‘team’’ instead of groups in order to stress the development of a high degree of groupness (Katzenbach & Smith, 1993).
Project management teams are teams that are formed temporarily and specifically to work towards the completion of a project. A project can one or more value propositions in the context of the current paper.

Team effectiveness and team performance

Team performance relates to its capability to meet quality and objectives (Schrader & Goepfert, 1996). There isn’t any simple way to measure team effectiveness (Henttonen, 2010). Cohen and Bailey (1997) review a number of effectiveness dimensions like (1) performance effectiveness, (2) member attitudes, and (3) behavioral outcomes. They list performance measures like efficiency, productivity, response times, quality and innovation, creativity, knowledge management, attitudinal measures like satisfaction and commitment, and behavioral measures like absenteeism and turnover.
In Henttonen (2010), team effectiveness measures are efficiency, productivity, response times, quality and innovation, creativity,

knowledge management, and attitudinal measures are satisfaction and commitment.
Team performance can be defined as “the extent to which a team is able to meet established quality, cost, and time objectives” (Schrader and Goepfert, 1996).
Technology managers are concerned about social networks developing either within their companies or within their customer base. They are especially concerned with human connections developing in their teams that work on new product developments (Green & Aiman-Smith, 2004).
Information exchange and its common interpretation between research group members is vital for their cooperation in Research and Development (R&D) actions (Dougherty, 1992).
For teams to achieve their objectives in time and according to quality specifications, team members must communicate proper information in time (Katz and Allen, 1988; Hauptman and Hirji, 1996).
Teams must coordinate their members’ individual activities so that they serve the common objectives (Adler, 1995).
Managers is necessary to make possible that all team members can contribute their knowledge and capabilities fully (Seers, 1989).
Project team members should communicate effectively with each other and mutually support their task allocations (Tjosvold, 1984; Cooke and Szumal, 1994).
It is imperative that project teams should develop and continually support effective and efficient work norms (Hackman, 1987).
Team members must share frequently quality information in order be able to face problems and ensure project risk avoidance (Keller, 1994).

Social Networks

The question of whether the social-network tradition is based on any real theory or theoretical approach has aroused a great deal of debate among researchers in this field. Others rather see it as an “orientation towards the social world” and “a collection of methods” (Scott, 2000:27), or “as a theory of social structures” (Degenne & Force, 1999:12).
Social network theory is a set of interconnected theories that have been developing for more than four decades(Kilduff & Tsai, 2007).
A social network in the context of this paper is “a set of nodes and the set of ties representing some relationship, or a lack of relationship between the nodes” (Brass, Galaskiewicz, Greve & Tsai, 2004:795)
Wasserman & Faust (1994) refer to a social network as a set of actors (“nodes”) and the relations (“ties” or “edges”) between these actors. Katz, Lazer, Arrow & Contractor (2004) added that the nodes can be not only individuals but also groups, organizations, or even societies.

Social Network analysis of group constructs to outcomes

Coleman (1988)has arrived to the conclusion that social networks with several strong connections are related to winning teams.
According to Shah & Jehn (1993, teams where all members are connected with friendship relationships experience high levels in communication and collaboration.
There is an indication that higher level of interaction increases cross-fertilisation that may result to more and better ideas (West, 1990).

Team cohesion is important in achieving increased effectiveness (Mullen and Copper, 1994).
Scott (1997) found that cross-functional teams with members that value common goals highly, display higher cohesion and achieve improved effectiveness in terms of budget, time, and product quality.
Cross-functional teams in contrast to hierarchical or matrix structures display higher performance in cases of high innovative product developments (Olson, Walker & Ruekert, 1995).
Setting clear and precise performance project objectives is not easy in the case of innovative value propositions because of the complexity and uncertainty involved in the relevant processes. High levels of team collaboration may not correlate with team performance, because task characteristics such as task novelty, complexity, and uncertainty may influence this relationship (Gladstein, 1984).
The involvement of small groups such as teams has dramatically expanded in response to competitive challenges like increased competition, shortening life-cycles, increased customer requirements, developing technology and globalization. They are often suggested as the most effective means for the need to innovate and develop new value propositions (Manz & Sims, 1993).
Yang and Tang (2004) tested the impact of group centrality in a number of relations like friendship, advice seeking and facing of adversarial information exchange on performance and they found that group centrality in friendship and advice relations was positively related to performance while group centrality in adversarial relations was negatively related to performance, where performance was the equivalent of the project effectiveness measure in the context of this paper.
(Kratzer, Leenders & Van Engelen, 2005) tested the effect of non-work relationships (friendly and friendship relations) on performance in innovation teams. They found that the cohesion of friendly communication is positively related up to a point and after that point is negatively related to the performance whereas the cohesion of friendship relation is positively related to performance. They used as control variables team size, tenure and phase of innovation process.
Large team sizes make it more difficult for team members to interact with all other team members given the dramatic increase of (possible) individual links between team members as team size grows (Steiner, 1966).
Wong (2008) found that internal network density as a measure of the relationships that build internal advice networks and group knowledge was positively related to knowledge development. He also found that external network density as a measure of the relationships that build group knowledge was also positively related to knowledge development.
Kratzer, Leenders & Van Engelen (2010) found that network range, ie the extent of interaction with other networks is positively correlated to team creativity, while network range has negative correlation with team size, ie larger teams develop fewer contacts to other teams than do smaller teams that need to make extra efforts to access knowledge and other resources. They also found that larger teams show lower creativity. The same negative correlation was found between the efficiency of team networks and the creativity of teams.
Tsai (2001) found that absorbing capacity and network position are key determinants of knowledge transfer.
Shah, Dirks & Chervany (2006) found that the internal friendship group density appeared to have a positive correlation to constructive controversy.

Methodology

A total number of 17 project management teams from final year students in the Department of Business Administration of the TEI of Larissa working on their final year project participated in this empirical experimental research. The focus of this research was given in their projects which require the design and development of prototype business models for the development of effective value propositions, ie product or service development and improvement processes. All the projects are based on the development of added value propositions that involve research and creativity processes. These processes were described by teams as prototype business models on templates as developed by … The teams could invite and include external partners to help them with their work and/or cooperate with external development teams. The communication process for teamwork development processes during class was forced to be done under an electronic platform used for teaching and collaboration purposes.

This experimental approach has the advantage that the researcher can come back at any time in order to apply new or refined models in order to explain the saved processes while several variables related to effectiveness and social networking processes can be easily measured. Additional data were gathered through individual data collection utilizing a structured questionnaire that addressed several attributes and relations of teams.

Several attributes and network constructs have been measured and correlated to project effectiveness for each group.

Importantly, networks differ in size, defined as number of contacts, and range, defined as diversity of contacts (Burt, 1982). Large networks are potentially, but not necessarily, diverse (Granovetter, 1973).

The size of a project team is an important structural variable or attribute with potential influences on the quality of a team's collaborative task process and project success (Gladstein, 1984; Hackman, 1987).

Another group attribute that has been used in our analysis is the ration between males and females participating in the group.

In the current analysis we have proposed a group diversity attribute that is the inverse of the group similarity attribute. Each team member assessed his/her two most pervasive group roles using the Belbin (1993) standard psychometric instrument. Group similarity is the sum of similarities between pairs of members. For each pair of members we calculated the number of common pervasive roles (max 2) that gives us a measure of similarity in group role playing between these group members.

We followed the standard procedure for measuring networks proposed by Katz, Lazer, Arrow & Contractor (2004). Each team member listed every other member of the team. Respondents were asked to fill their relations with other group members as follows:

Friendship and business collaboration relations required straight answer (1 or 2 respectively)

Acquaintance or team tenure was determined by the number of years that team members knew each other (Kratzer, Leenders & Van Engelen, 2005).

Cooperation in previous projects for each member of the group was measured as the number of years that team members had been members of the same team.

Communication to and from each member to others was measured in several ways related to the means of the communication platform used and the percentage of communication originated from between each member to each member in the team.

For each measured relationship we calculated the cohesion and the degree of centrality and power within each team. The cohesion construct measures the density of a network, ie the total number of ties or relations divided by the total number of possible ties. The Freeman (1979) centrality and power construct refers to how close they are in their relationships and whether they have the same power in these relationships. Mathematically, for a given binary network of relations with vertices v1....vn and maximum degree centrality cmax, the network degree centralization measure is S(cmax - c(vi)) divided by the maximum value possible, where c(vi) is the degree centrality of vertex vi. The number of vertices adjacent to given vertex in an asymmetric graph is the degree of that vertex.

Results

Table 1 presents the results of the correlation analysis using the SPSS statistical package between project effectiveness that is the equivalent measure of value propositions made by groups as marked by their tutors, and the group attributes under consideration, ie sex percentage (number of men divided by the number of women as a percentage), the group size (number of members in the group) and group diversity as defined in the relevant paragraph for the description of variables.

Table 1: Attributes of Groups

		PROJ-EFFECT
SEX-PERC	Pearson Correlation	-,340
	Sig. (2-tailed)	,182
	N	17
GRP-SIZE	Pearson Correlation	,373
	Sig. (2-tailed)	,141
	N	17
DIVERSITY	Pearson Correlation	,438
	Sig. (2-tailed)	,078
	N	17

The relationship between sex percentage (as measured by SEX-PERC) and project effectiveness (as measured by PROJ-EFFECT) was investigated using the Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was a medium negative correlation between the two variables, r=-,340, n=17, p<.005, with comparatively higher levels of male to female ratio (sex_perc) associated with lower levels of project effectiveness (proj-effect).
The relationship between group size (as measured by GRP-SIZE) and project effectiveness (as measured by PROJ-EFFECT) was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of

normality, linearity and homoscedasticity. There was a medium positive correlation between the two variables, r=-,373, n=17, p<.005, with comparatively higher levels of number of members in a group (GRP-SIZE) associated with higher levels of project effectiveness (PROJ-EFFECT).

Table 2: Group Relations - Cohesion

		PROJ-EFFECT
FR	Pearson Correlation	-,371
	Sig. (2-tailed)	,142
	N	17
BCOL	Pearson Correlation	,286
	Sig. (2-tailed)	,266
	N	17
ACQ	Pearson Correlation	,353
	Sig. (2-tailed)	,164
	N	17
COOP	Pearson Correlation	,217
	Sig. (2-tailed)	,403
	N	17
COMFROM	Pearson Correlation	,244
	Sig. (2-tailed)	,346
	N	17
COMTO	Pearson Correlation	,176
	Sig. (2-tailed)	,500
	N	17
RESP	Pearson Correlation	-,106
	Sig. (2-tailed)	,686
	N	17

The relationship between group diversity (as measured by DIVERSITY) and project effectiveness (as measured by PROJ-EFFECT) was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was a strong positive correlation between the two variables, r=-,438, n=17, p<.005, with higher levels of group diversity (DIVERSITY) associated with higher levels of project effectiveness (proj-effect).

Table 2 shows the resulting correlation between the project effectiveness with network measures of group relations like Friendship (FR) & Business Collaboration (BCOL), Acquaintance (ACQ), Cooperation (COOP) in other projects, Communication to (COMTO) and Communication from (COMFROM), and Response to this communication (RESP). The correlation results found weak statistical significance (far from the 985% significance level).

Table 3 shows the resulting correlation between the project effectiveness and Friendship-IO & Business Collaboration-IO, Acquaintance-IO, Cooperation-IO in other projects, Communication from-IO (the extent to which actors send direct ties), Communication to-IO (the extent to which actors receive direct ties) and response-IO.

IO in these measures stands for the average of the in-degree and out-degree centrality scores for each team, where the in-degree centrality of a vertex u is the number of ties received by u vertex and the out-degree centrality is the number of ties initiated by u. The

correlation results found weak statistical significance (far from the 985% significance level).

Table 3: Group Relations – Centrality & Power

		PROJ-EFFECT
FR-IO	Pearson Correlation	-,340
	Sig. (2-tailed)	,182
	N	17
BCOL-IO	Pearson Correlation	,279
	Sig. (2-tailed)	,279
	N	17
ACQ-IO	Pearson Correlation	-,179
	Sig. (2-tailed)	,493
	N	17
COOP-IO	Pearson Correlation	,179
	Sig. (2-tailed)	,491
	N	17
COMFROM-IO	Pearson Correlation	-,135
	Sig. (2-tailed)	,606
	N	17
COMTO-IO	Pearson Correlation	-,427
	Sig. (2-tailed)	,087
	N	17
RESP-IO	Pearson Correlation	-,421
	Sig. (2-tailed)	,092
	N	17

Conclusions and Proposal for further research

As discussed in the paragraph on past research, similar studies on several group constructs related to group relations have found indications of positive correlations, and in some cases negative ones. Most of past studies concentrate on a small number of possible relationships within groups.

Our study has investigated the correlation of network measures for a number of possible relationships between members within project teams with project effectiveness. In all cases, the correlation analyses found weak statistical significance (far from the 95% significance level).

Some limitations in our study may stem from to the similarity of team sizes and the restricted scope of projects (final year projects within the time period of one semester. On the other hand, the measures were tested under more exact laboratory experimental conditions.

Future studies may include network constructs that relate to their external network environment, a variation in group attributes like size, project scope and types, and correlate these to more specific measures of effectiveness like time delays, knowledge development, constructive controversy, etc., and extend the research to professional project management groups in the industry.

References

Acs, Z., & Audretsch, D. (1990). Innovation and Small Firms, Cambridge: MIT Press.

Adler, P.S. (1995) Interdepartmental interdependence and coordination: the case of the design/manufacturing interface. Organization Science 6 (2), 147–167.

Belbin, R. (1993). A reply to the Belbin Team-Role Self-Perception Inventory by Furnham, Steele and Pendleton. Journal of Occupational and Organizational Psychology, 66(3), 259-260

Brass D., Galaskiewicz J., Greve H. & Tsai, W. (2004) Taking stock of networks and organizations: A multilevel perspective, Academy of Management Journal 47 (6), 795–817 pp.

Burt, R. S. (1982) Towards a structural theory of action. New York: Academic Press.

Caputo, A. C., Cucchiella, F., Fratocchi, L., Pelagagge, P. M., & Scacchia, F. (2002). A methodological framework for innovation transfer to SMEs, Industrial Management and Data Systems, 102(5), 271–283 pp.

Cohen S. & Bailey D. (1997) What makes teams work: Group effectiveness research from the shop floor to the executive suite, Journal of Management 23 (2), 239–290 pp.

Coleman, J. S. (1988). *Social capital and the creation of human capital*. American Journal of Sociology, 94, 95–120.

Degenne A. & Force M. (1999), Introducing Social Networks. Sage Publications, London

Dougherty, D. (1992) A practice-centered model of organizational renewal through product innovation. Strategic Management Journal 13 (Summer), 77–92.

Freeman, L. C. (1979) Centrality in social networks: I. Conceptual clarification. Social Networks, 1: 215-239.

Gladstein, D.L. (1984) Groups in context: a model of task group effectiveness. Administrative Science Quarterly 29, 499–517.

Granovetter, M. (1973) The strength of weak ties. American Journal of Sociology, 78: 1360–1380.

Green, S. & Aiman-Smith L. (2004), Research on the human connection in technological innovation: an introductory essay, Journal of Engineering and Technology Management 21, 1–9 pp.

Guzzo, R. & Shea, G. (1992) Group performance and intergroup relations in organizations. In: Dunnette, M.D., Hough, L.M. (Eds.), Handbook of Industrial and Organizational Psychology, vol. 3. Consult. Psychol. Press, Palo Alto, CA, 269 pp.

Guzzo, R.A., Dickinson, M.W. (1996) Teams in organisations: Recent research on performance and effectiveness. Annual Review on Psychology 47, 307–338.

Hackman, J.R. (1987) The design of work teams. In: Lorsch, J.W. (Ed.), Handbook of Organizational Behavior. Prentice-Hall, Englewood Cliffs, NJ, pp. 315–342.

Henttonen K. (2010) Exploring social networks on the team level—A review of the empirical literature, J. Eng. Technol. Manage. 27, 74–109 pp.

Hsing H. Ch., He-Yau K., Xiaoqiang X., Amy H.I. L.,*, Yunhuan T. (2007) *Developing new products with knowledge management methods and process development management in a network.* Elsevier, Computers in Industry 59 (2008) 242–253

Katz, R., Allen, T.J. (1988) Investigating the not invented here (NIH) syndrome: a look at the performance, tenure, and communication patterns of 50 R&D project groups. In: Tushman, M.L., Moore, W.L.

(Eds.), Readings in the Management of Innovations. Ballinger, Cambridge, MA, pp. 293–309.
Katz N., Lazer D., Arrow H., Contractor N., (2004), "Network Theory and Small Groups" SMALL GROUP RESEARCH, Vol. 35 No. 3, 307-332, Sage Publications
Katzenbach, J. & Smith, D. (1993), The discipline of teams, Harvard Business Review 71, 111–120 pp.
Kilduff, M. & Tsai, W. (2007) Social Networks and Organizations. Sage Publications: Athenaeum Press Limited, Gateshead
Kratzer, J., Leenders, R., Van Engelen, J. (2005) Informal contacts and performance in innovation teams. International Journal of Manpower 26 (6), 513–528.
Kratzer, J., Leenders, R., Van Engelen, J. (2010) The social network among engineering design teams and their creativity: A case study among teams in two product development programs, International Journal of Project Management 28, 428–436.
Manz, C. & Sims, H. (1993) Business without Bosses: How Self-managing Teams are Building High-performing Companies, Wiley, New York.
Mullen, B., Copper, C. (1994) The relation between group cohesiveness and performance: an integration. Psychological Bulletin 115 (2), 210–227.
Olson, E.M., Walker, O.C., Ruekert, R.W. (1995) Organizing for effective new product development: The moderating role of product innovativeness. Journal of Marketing 59, 48–62.
Osterwalder A. & Pigneur Y. (2010) Business Model Generation, Hoboken, New Jersey: John Wiley & Sons, Inc.
Rothwell, R. (1991). External networking and innovation in small and medium size manufacturing firms in Europe. Technovation, 11(2), 93−112 pp.
Schrader, S., Goepfert, J. (1996) Structuring manufacturer-supplier interaction in new product development teams: an empirical analysis. In: Gemünden, H.G., Ritter, T., Walter, A. (Eds.), Proceedings of the 12th International Conference on Industrial Marketing and Purchasing, vol. 1. Universität Karlsruhe, Karlsruhe, pp. 557–598.
Scott, S.G. (1997) Social identification effects in product and process development teams. Journal of Engineering and Technology Management 14 (2), 97–127.
Scott, J. (2000) Social Network Analysis: A Handbook, Sage: London.
Seers, A. (1989) Team-member exchange quality: a new construct for role-making research. Organizational Behavior and Human Decision Process 43, 118–135.
Shah, P., & Jehn, K. (1993). *Do friends perform better than acquaintances? The interaction of friendship, conflict and task*. Group Decision and Negotiation, 2, 149–165.
Shah, P.P., Dirks, K.T., Chervany, N. (2006) The multiple pathways of high performing groups: the interaction of social networks and group processes. Journal of Organizational Behavior 27, 299–317.
Steiner, I.D. (1966) Models for inferring relationships between group size and potential group productivity. Behavioral Science 11, 273–283.
Tapscott, D. (2009) Reinventing innovation for competitive advantage. Available at: www.watchit.com/PGDSCR.cfm?c_acronym=WRIC.
Tjosvold, D. (1984) Cooperation theory and organizations. Human Relations 37 (9), 743–767.
Tsai, W. (2001) Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance *The Academy of Management Journal*, Vol. 44, No. 5, pp. 996-1004.

Vossen, R. (1998). Relative strengths and weakness of small firms in innovation. International Small Business Journal, 16(3), 88–94 pp.
Wasserman, S., Faust, K. (1994) Social Network Analysis: Methods and Applications. Cambridge University Press, Cambridge.
West, M. (1990) The social psychology of innovation groups. In: M.A. West, J.L. Farr (eds.), Innovation and Creativity at Work, Wiley: Chichester, 309 pp
Wong, S.-S. (2008) Task knowledge overlap and knowledge variety: the role of advice network structures and impact on group effectiveness. Journal of Organizational Behavior 29 (5), 591–614.
Yang, H.-L., Tang, J.-H. (2004) Team structure and team performance in IS development: a social network perspective. Information & Management 41, 335–349.