Philosophy of Social Network Analysis in Efficient Project Management

PROJECT REPORT

submitted for the course

Social and Information Network (CSE3021)

by

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Abstract:

The aim of the study is to evaluate the impact of social networks on project management performance. In particular, the study examines the four most significant social network structures, as found in the literature, and uncovers their specific network contents. A qualitative analysis was conducted by interviewing a sample of project managers in the college, be it classmates or acquaintances. The study first ascertained their general perspectives of the four network structures. Thereafter, it determined their perspectives of how these network structures contributed to their most and least successful projects. The results highlighted the project managers' perceived impact of each of the network structures on project management performance.

1. Introduction:

This research study focuses on project management performance in the consulting engineering industry. It aims to demonstrate the impact of social networks on project management performance. The study proposes to assess the project manager's management of external social network structures. It focuses on the resultant contributions of these social networks to project management performance as perceived by the project manager. This study is guided by the following primary research question:
Question: How do Social Networks Contribute to Project Management Performance?

The study will uncover the literature's four most significant social network structures based on their impact on project success, both benefits and drawbacks (network contents). It will then ascertain the project manager's perspective of each social network structure, together with his or her specific network contents for a case study of successful projects. Finally, the study will present social network content models comparing the literature and the project manager's perceived network contents. This study adds to the existing knowledge by focusing on gaps as identified in the literature. Chung and Hossain (2009) and Newhart (2008) highlight the requirement for examination of network structure relationship to knowledge-intensive project workgroups. Furthermore, a call for papers by Hossain (2009) reveals the neglect of social network research on complex project coordination. This study sample will be the consulting engineering industry. This study comprises a boundary-less network, which ensures the inclusion of all potential external project networks. For example, reference to Choi (2002) reveals the dearth of literature on a group's external networks in contrast to its internal dynamics and performance. However, much of the research on group networks is based on defined group boundaries. Nevertheless, Mead (2001) makes clear that network boundaries are ever expanding and so should not be defined.

Results suggest that first, out-degree centrality is perceived to have a significant contribution to project management performance. Second, betweenness centrality is perceived to have a reasonable contribution to project management performance but is dependent on project size and project manager capability. Third, team member structural holes are perceived to have a reasonable contribution to project management performance but are dependent on team member competency and project size. Fourth, boundary spanning, only if via the project manager, is perceived to contribute significantly to project management performance. Results show that the specific network contents do contribute positively but can also negatively impact project management performance. Therefore, the project manager should consider the project dependencies of project size, team competency, and project manager capability. Moreover, a social networks content model presented may facilitate the project management approach decision. Thus, the project manager can manage social networks to improve project management performance.

2. Literature Review

This section discusses the two major parts of the research question from a theoretical perspective; namely, project management performance and social networks. The first part reviews project management performance. The second part introduces social networks in relation to projects. The subsequent four parts examine specific social network structures. The last part offers a conceptual model of social networks in relation to project management performance.

2.1. Survey of the Existing Works

2.1.1. Project Management Performance:

Baccarini (1999) claims that project management success along with product success are the two components of project success. First, project management success relates to the project process. Its three criteria are: (1) to meet time, cost, and quality objectives; (2) the project management process quality; and (3) the satisfaction of the project owner and team. Second, product success relates to the project's final product. A project may be a project management failure, but still be perceived a project success, if the product success is achieved. Baccarini concludes that good project management is unlikely to prevent product failure but can contribute towards product success. Baccarini indicates there is a positive relationship between project management success and product success. This construes that the project manager must continuously monitor the project management performance. Pinto and Kharbanda (1996) propose twelve factors that contribute to the failure of project management. They suggest that the best way to achieve project management failure is to manage it without consideration of the project's external environment, including stakeholders. They state that it is foolhardy to ignore the power of the stakeholder. They recognise that the project manager's role is “almost always highly visible,” whereas for the majority of failed projects the project manager was essentially invisible.

A Guide to the Project Management Body of Knowledge (PMBOK Guide) (Project Management Institute [PMI], 2004) stresses the importance of stakeholder management for the project management team. Additionally, Kingston (2007) highlights the importance of the project team's interaction with stakeholders, including their internal and external networks. He stresses that this is an often-overlooked subject. He highlights the importance in dealing with other team members and external stakeholders for successful project execution.

2.1.2. Social Networks:

A social network is categorised as the relational links between two or more actors (Storberg-Walker & Gubbins, 2007). Lin, Ensel, and Vaughn (1981) define social network contents as the resources obtained from the social network, which are of use to an actor and the social network structure as the network of actors. Lin et al. suggest that greater network contents are attained from higher network structure positions. Furthermore, Wolff and Moser (2009) found that networking is the behaviour performed to gain (network contents) benefits by building, maintaining, and using informal relationships.

The basis of the conceptual model is illustrated in Figure 1: As a consequence of social networks, these network structures present network contents. It is these network contents that impact project management performance.

Figure 1: Social networks interrelationship diagram.

2.2. Future Work identified in the Survey

Future researchers may be able to make use of the network contents comparative model. The contrasting network content impacts require further verification in future research. The study's population is project managers from one college in India alone. It may be difficult to generalise these results to the entire project management population; therefore, a broader range of organisations may prove worthwhile. The recommended project management centrality adapted may be explored in relation to project size and project manager capability. The strategic transition between the alternative strategies may be examined (primary point of contact, deputy, technical leaders, project management team, and project manager on the periphery). The dependency variables of project size and team competency may be explored for team member structural holes. The recommended strategy for boundary spanning may be explored in relation to team competency and clear roles and responsibilities.

3. Overview of the Proposed System

3.1. Introduction

3.1.1. Degree Centrality:

In-degree centrality is the frequency an actor is brought into an interaction (e.g., by requests for information and advice). (Bertolotti & Tagliaventi, 2007) Conversely, Bertolotti and Tagliaventi (2007) define out-degree as the number of times an actor initiates an interaction (e.g., communication of information and advice). Freeman (1977) showed that degree centrality does influence performance (Chung & Hossain, 2009). In particular, research by Hossain and Wu (2009) found that out-centrality (out-degree plus out-closeness) is a greater requirement for coordination than in-centrality (in-degree plus in-closeness).

Parkin (1996) argues that the project manager would be the most central actor in the network of communication flows and decision-making. Accordingly, he or she would increase his or her power through the use of his or her communicative and negotiation skills. Consequently, he or she would attain control and monitoring of the actor-network. Nevertheless, inappropriate

(out-degree) communications may give rise to interference. Sparrowe et al. (2001) report that hindrance networks (interference) are negatively related to individual and group performance.

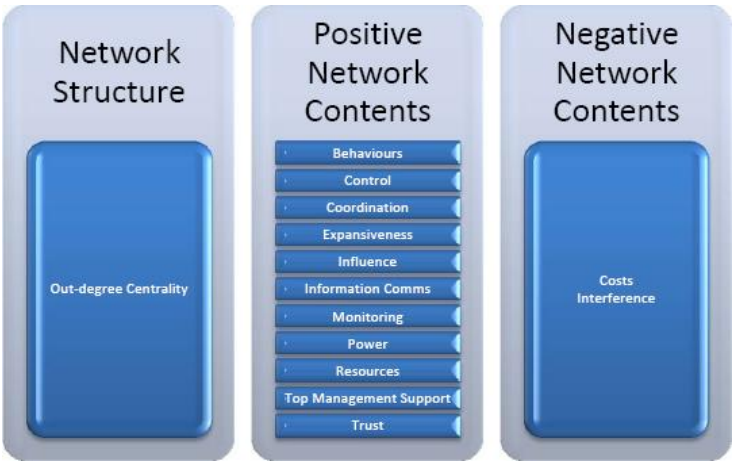

Figure 2: Out-degree centrality detailed conceptual model.

3.1.2. Betweenness Centrality:

Freeman (1977) defines betweenness centrality as the extent to which an actor lies in the shortest communication path to all others in the network. The network contents for inclusion in the betweenness centrality detailed conceptual model are now assessed. Freeman (1977) notes that betweenness provides the potential to control and influence, for example, by withholding or biasing information (Freeman 1977; Hossain & Wu 2009). Moreover, this actor would most likely emerge as group leader and would participate more in task solutions.

Adverse risks, however, may become prevalent. Cross, Parker, Prusak, and Borgatti (2001) suggest that individuals may become bottlenecks by hoarding information and knowledge and may not participate in knowledge sharing (negative development). Consequently, project teams may become over-reliant on centralised individuals with specialist expertise; thus, these individuals may become overloaded or unavailable to the project.

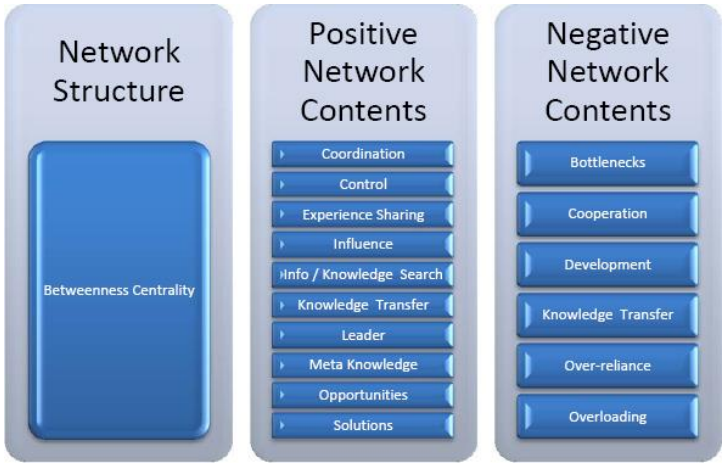

Figure 3: Betweenness centrality detailed conceptual model.

3.1.3. Structural Holes:

This section examines the impact of structural holes on projects. Burt's (1995) structural holes theory proposes that an actor's network structure position provides brokering advantages between independent groups of social networks. A study by Cummings and Cross (2003) found a number of network structures in which structural holes are realisable.

Cummings and Cross (2003) found that group performance was negatively related to the structural holes of the leader. Actors with many structural holes gain power and influence in their social networks through the obtaining, control, and brokering of information (Burt, 1995). In addition, Burt (2000) observes that creativity (innovation) and learning (development) are the major benefits of actors who bridge structural holes. Apart from this, Reagans and McEvily (2003) claim that ties to different knowledge pools increase one's ability to transfer complex knowledge.

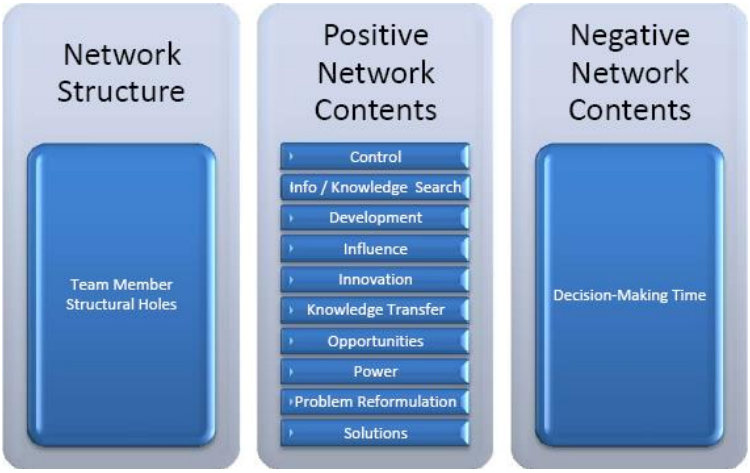

Figure 4: Team member's holes detailed conceptual model.

3.1.4. Boundary Management:

Weinkauf and Hoegl (2002) define boundary management as the leadership activity that establishes strategies for the team's interaction with its external environment. Cross et al. (2000) show that buffering is the concealment of knowledge from oneself or a group. Due to ever changing dynamics, buffering will not be considered as having a significant impact on project management performance. The literature review for tie strength reveals that the positive and negative network contents have been cancelled out by one another.

Choi (2002) identifies three external networking activities: ambassador, coordination, and scout activities. First, ambassador activities attempt to gain support and resources from top management. Second, coordination activities focus on task processes of cross-functional work-flows. Third, scout activities are the information search and transfer process from the external environment. Staber (2004) suggests that new skills (development) and opportunities should be undertaken by employees through the management of their boundary-spanning activities. Staber (2004) claims that boundary spanning will create a learning and innovative environment by developing an inter-departmental knowledge base (knowledge utilisation). Hansen (1999) asserts that continuous communication across team and organizational boundaries contributes to project effectiveness due to the timely (timely access) integration of knowledge.

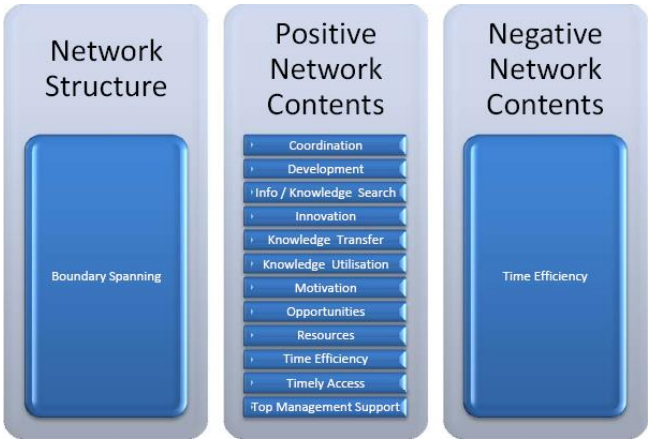

Figure 5: Boundary spanning detailed conceptual model.

3.2. Architecture of the Proposed System

We intended to collect all our sample data via face-to-face interview method with all the 30 project managers. We collected the data from their experiences in a statistical manner in a tabular form and further analyse which factors have positive and which factors have negative effects on the performance of any project. We further compared our results with the results of the literature survey and put forth a comparative model.

Figure 6: Architecture of the proposed model

4. Proposed system analysis and design

4.1. Research Design:

The time and cost for adequate quantitative research are outside the scope and resources of this study. Social network management infers that the network boundaries should be ever expanding and so should not be defined.

Qualitative research is employed for this study, because the literature proposes many benefits. Admittedly, the literature does not offer an optimal research methodology. Despite this, Burke (2008), explains that qualitative research may enable the author's "how" question to be investigated in more depth.

4.2.Interview Sample:

This study's population is project managers in the college environment. The population is refined so as to attain a context-specific study. An extended population of dissimilar, extreme, or deviant subjects would be a major limitation because it would be less reliable. The research is based on a sample of thirty project managers. More specifically, the interview data of this sample were continuously analysed in order to ascertain the required sample size.

4.3. Interview Schedule:

In-depth, semi-structured interviews were performed, on average, in one-hour durations. Easterby-Smith, Thorpe, and Jackson (2008) found that they allow the researcher to "probe deeply to uncover new clues, open up new dimensions of a problem, and to secure vivid, accurate inclusive accounts that are based on personal experience."

The project managers were requested to choose two projects on which to act as case studies for the interview. These projects were what the project managers personally considered as both their own most successful and least successful projects (hereafter classified as the two project categories). The projects were based on their own perceived success criteria. The four main topics for the interview were the four sub-structures (sub-questions).

4.4. Data Gathering Technique:

A matrix formed the heart of the data gathering process, as suggested by Easterby-Smith et al. (2008). Separate matrices are compiled for each network structure; thereafter, this is performed for each of the interviewees. An element of quantification is introduced from this matrix by calculating percentages as a means of comparison.

5. Implementation

Content analysis is employed for interrogating the qualitative data. This is supported by reference to the literature review's detailed conceptual model. This model includes constructs and ideas, which are decided on in advance. The natural language content analysis allows for the interrogation of data for themes, which have already been found (Easterby-Smith et al., 2008). This matrix formed the heart of the data gathering process, as suggested by Easterby-Smith et al. (2008). Separate matrices are compiled for each network structure; thereafter, this is performed for each of the interviewees. An element of quantification is introduced from this matrix by calculating percentages as a means of comparison.

The following table presents the statistical results of our study:

		Combined Project Categories- Positive Contents						Combined Project Categories- Negative Contents					
	Network Structure	Outdegree	Between	Holes	Boundary	Result data	Literature data	Outdegree	Between	Holes	Boundary	Result data	Literature data
	Network Content					Total						Total	
Commitment	Commitment/Cooperation	25%	15%	5%	5%	50%	1	0%	-10%	-10%	0%	-20%	0
	Disillusionment	0%	0%	0%	0%	0%	1	0%	-5%	0%	0%	-5%	0
	Effort Obtainment	0%	0%	5%	0%	5%	1	0%	0%	0%	0%	0%	0
	Empowerment	0%	0%	20%	15%	35%	1	0%	-5%	0%	0%	-5%	0
	Involvement	0%	0%	10%	10%	20%	1	0%	0%	0%	0%	0%	0
	Motivation	0%	10%	10%	10%	30%	1	0%	-10%	0%	0%	-10%	0
	Pride	0%	0	5%	5%	10%	1	-5%	0%	0%	0%	-5%	0
	Project Climate Sensing	0%	0%	0%	0%	5%	1	0%	0%	0%	0%	0%	0
	Undermine Members	0%	0%	0%	0%	0%	1	-10%	-5%	0%	0%	-15%	0
	Willingness to Engage	0%	5%	15%	15%	40%	1	-10%	-5%	-5%	0%	-20%	0
Comms	Comms structure absense	0%	5%	0%	0%	5%	1	0%	-10%	-5%	-5%	-20%	0
	Information Comms	50%	35%	15%	15%	115%	2	0%	-25%	-15%	0%	-40%	0
	Misunderstanding	0%	0%	0%	5%	5%	-	-15%	-5%	-30%	-25%	-75%	-
	Progress Reporting	40%	10%	0%	0%	50%	-	0%	0%	-10%	-10%	-20%	-
Control	Control	20%	50%	5%	15%	90%	3	-10%	-15%	-10%	-20%	-55%	0
	Coordination	45%	40%	0%	15%	100%	2	0%	-5%	-30%	-10%	-45%	0
	Monitoring	15%	35%	0%	20%	70%	1	0%	-10%	0%	0%	-10%	0
Decisions	Decision Documenting	5%	5%	0%	5%	15%	-	0%	-10%	-15%	-20%	-45%	-
	Decision Facilitation	15%	20%	20%	20%	75%	-	0%	0%	-10%	-5%	-15%	-
	Decision Stating	0%	0%	0%	0%	0%	-	0%	0%	-5%	-5%	-10%	-
	Prioritisation	5%	15%	0%	0%	20%	-	-5%	-10%	-5%	0%	-20%	-
	Strategic Decisions	10%	5%	0%	0%	15%	-	-10%	0%	-10%	-5%	-25%	-

Cost	Cost	10%	15%	0%	5%	30%	0	-10%	0%	-10%	-10%	-30%	-1
	Org Financial Gains	10%	5%	5%	5%	25%	0	0%	0%	0%	0%	0%	-1
Interference	Distraction	0%	0%	0%	0%	0%	0	-10%	-5%	0%	0%	-15%	-1
	Groupthink	0%	0%	5%	0%	5%	0	0%	0%	0%	0%	0%	-1
	Interference	0%	0%	0%	0%	0%	0	-20%	-5%	-15%	-5%	-45%	-1
	Law of Reciprocity	0%	0%	5%	10%	15%	0	0%	0%	0%	0%	0%	-1
Knowledge	Group Advice Networks	5%	0%	0%	15%	20%	0	0%	0%	0%	0%	0%	-1
	Info/Knowledge Search	0%	0%	15%	25%	40%	3	0%	0%	0%	0%	0%	0
	Information Competition	0%	5%	0%	0%	5%	3	0%	0%	0%	0%	0%	0
	Knowledge Transfer	20%	5%	45%	40%	110%	3	0%	-15%	-5%	-5%	-25%	0
	Knowledge Utilization	0%	0%	5%	5%	10%	1	0%	-5%	0%	-5%	-10%	0
	Opportunities	5%	0%	10%	10%	25%	3	0%	0%	0%	0%	0%	0
	Timely Access	5%	0%	5%	20%	30%	1	0%	0%	0%	0%	0%	0
Leader	Directing	15%	15%	0%	0%	30%	1	0%	-5%	0%	0%	-5%	0
	Facilitation	15%	15%	5%	0%	35%	1	0%	-5%	0%	-5%	-10%	0
	Leadership	15%	0%	0%	0%	15%	1	0%	0%	0%	0%	0%	0
	Proactive	10%	10%	0%	0%	20%	1	0%	0%	0%	0%	0%	0
	Reactive	0%	0%	5%	0%	5%	1	0%	-15%	0%	0%	-15%	0
Trust	Trust	20%	5%	15%	10%	50%	1	-10%	-5%	-10%	0%	-25%	0
Listening	Development	0%	0%	10%	30%	40%	2	0%	0%	0%	-5%	-5%	-1
	Expansiveness	5%	0%	0%	5%	10%	1	0%	0%	0%	0%	0%	0
	Experience sharing	5%	5%	15%	5%	30%	1	0%	0%	0%	0%	0%	0
	Feedback	10%	5%	0%	10%	25%	1	0%	0%	0%	0%	0%	0
	Lessons learnt	0%	5%	5%	5%	15%	1	-5%	0%	0%	-5%	-10%	0
Objectives	Alignment of objectives	35%	30%	0%	0%	65%	-	-5%	-5%	-10%	-5%	-25%	-
Overloading	Bottlenecks	0%	0%	5%	5%	10%	0	0%	-35%	0%	-5%	-40%	-1
	Overloading	0%	0%	5%	5%	10%	0	0%	-30%	0%	-5%	-35%	-1
	Over-reliance	0%	0%	0%	5%	5%	0	0%	-25%	0%	-5%	-30%	-1
Power	Influence	10%	0%	0%	0%	10%	3	-10%	0%	-5%	-5%	-20%	0
	Power	0%	0%	0%	0%	0%	3	0%	-5%	0%	-10%	-15%	0
	Self Interest	0%	0%	0%	0%	0%	3	-10%	0%	0%	0%	-10%	0
Quality	Quality Control & Assurance	15%	30%	5%	20%	70%	-	-5%	0%	-15%	-5%	-25%	-
	Approachability	15%	5%	0%	5%	25%	-	0%	0%	0%	0%	0%	-
	Cohesive Project	5%	5%	5%	5%	20%	-	0%	0%	0%	0%	0%	-
Relationship	Relationship Damage	5%	0%	0%	0%	5%	-	-5%	-5%	-5%	-5%	-20%	-
	Resolve Conflict	10%	10%	0%	0%	20%	-	0%	0%	0%	0%	0%	-
	Working Relationships	15%	10%	10%	10%	45%	1	-5%	0%	0%	0%	-5%	0
	Meta Knowledge	0%	5%	10%	10%	25%	2	0%	0%	0%	-10%	-10%	0
	Resources	10%	10%	10%	15%	45%	2	0%	0%	-5%	0%	-5%	0
	Specialists	0%	5%	0%	20%	25%	2	0%	0%	0%	0%	0%	0
Risks	Contractual Issues	0%	0%	0%	0%	0%	-	0%	-5%	-10%	-10%	-25%	-
	Sensitive Info	0%	0%	0%	5%	5%	-	0%	0%	0%	-10%	-10%	-
	Early Problem Identification	15%	25%	5%	10%	55%	-	0%	0%	0%	0%	0%	-
Solutions	Innovation	15%	0%	0%	20%	35%	2	0%	-5%	0%	0%	-5%	0
	Perspective	5%	10%	5%	10%	30%	1	0%	0%	0%	0%	0%	0
	Problem Reformulation	5%	5%	0%	10%	20%	2	0%	0%	0%	0%	0%	0
	Problem Deterioration	0%	0%	0%	0%	0%	2	0%	-5%	0%	0%	-5%	0
	Solutions	40%	20%	45%	45%	150%	3	0%	-10%	0%	0%	-10%	0
	Validation	15%	5%	5%	45%	70%	1	-5%	0%	0%	0%	-5%	0
Status	Reputation	0%	0%	0%	0%	0%	1	0%	0%	-5%	0%	-5%	0
Support	Negotiation	5%	0%	0%	0%	5%	1	0%	-5%	0%	0%	-5%	0
	Social Support	5%	0%	0%	0%	5%	1	0%	-5%	0%	0%	-8%	0
	Support Provision	0%	0%	0%	0%	0%	1	0%	0%	-5%	-5%	-10%	0
	Top Management Support	10%	0%	0%	0%	10%	2	0%	0%	0%	0%	0%	0
Time	Decision Making Time	20%	10%	35%	20%	85%	0	0%	-5%	-10%	0%	-15%	-1
	Effort	0%	0%	5%	0%	5%	0	-5%	0%	0%	0%	-5%	-1
	Time Efficiency	30%	15%	45%	20%	105%	1	-5%	-25%	-5%	-15%	-50%	-1

Table 1: Statistical study data

6. Results and Discussion

6.1. Social Networks Comparative Model:

This model compares the results models with the detailed conceptual models generated from the literature.

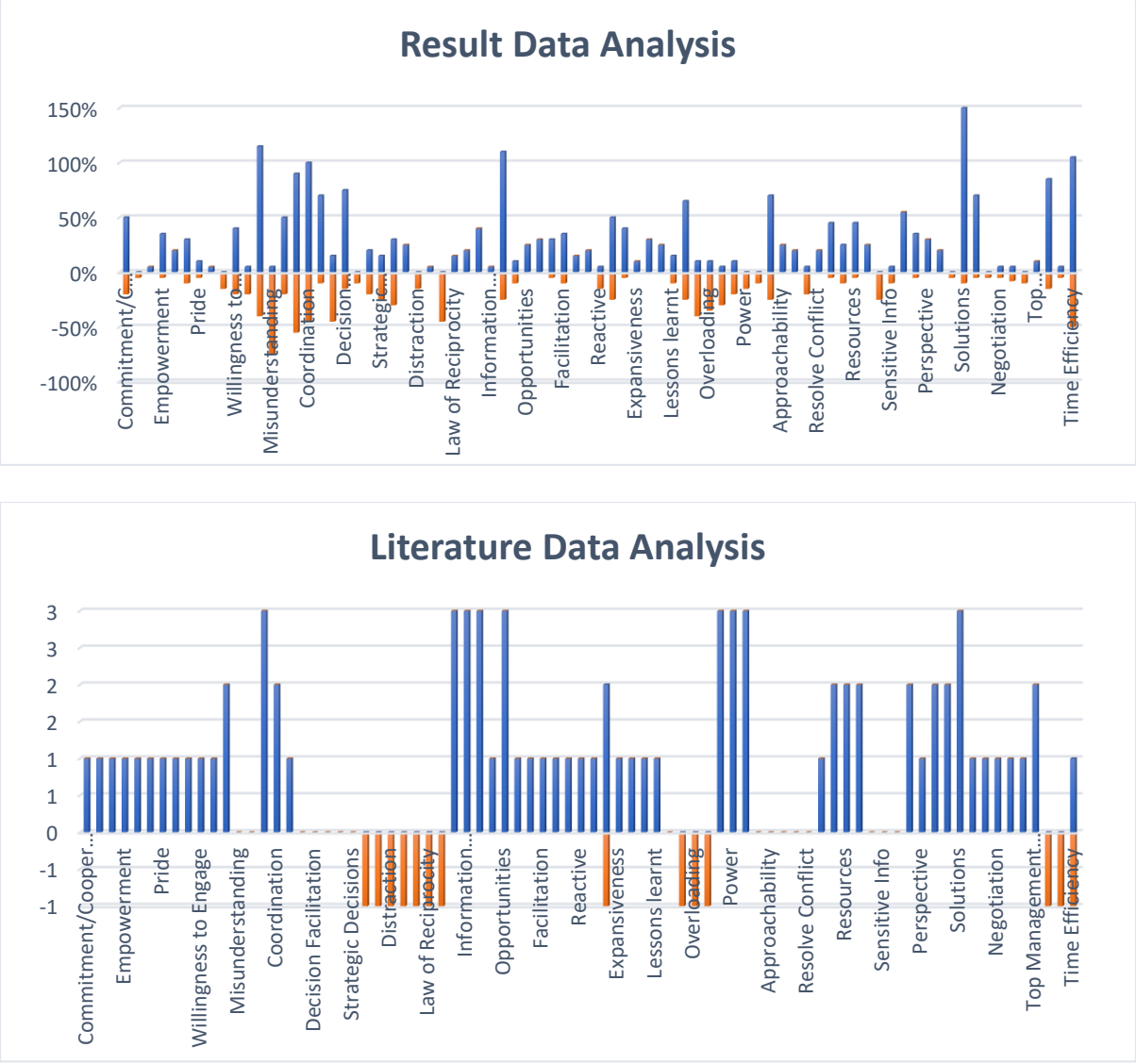

Figure 7: Social Networks comparative model

The literature review considers seven positive network contents, which are the most significant as depicted in the model. Of those, the project managers assuredly concur with three; namely, *solutions, knowledge transfer*, and *control.* The project managers moderately concur with *information/knowledge search* and *opportunities.* In contrast, the project managers perceive the remaining two network contents of *power* and *influence* as negatively impacting project management performance.

Studies revealed an additional eight considerable positive network contents. Of those, the project managers assuredly concur with two network contents, being *information communication* and *coordination.* Apart from this, they moderately concur with *resources, development and innovation* and, to a lesser extent, with *meta-knowledge and problem reformulation.* Finally, *top management support* gets only a modest reference.

Many significant positive network contents were exposed from the interviews, which were not uncovered in the literature. These were *decision-making time, quality, objectives alignment*, and *progress reporting.* Admittedly, the project managers perceived each of these network contents as potentially becoming negative in some cases.

The literature review posits that there are ten negative network contents. Of those, the project managers assuredly concur with six network contents, being *interference, over-reliance, overloading, bottlenecks, cost,* and *time efficiency.* Many more negative network contents were exposed from the interviews, in addition to those ten literature findings. *Misunderstanding* is the greatest virtually unconditional negative network content discovered.

Many primarily positive network contents also exhibits negative aspects. Interestingly, four of the greatest project managers' perceived positive network contents also exhibit four of the greatest negative network contents. These four network contents are *control, time efficiency, coordination,* and *information communications.* This may be partly explained via the four sub-structures under study. First, two sub-structures are direct actions of the project manager; namely, *out-degree* and *betweenness centrality*. These two sub-structures facilitate *control, coordination,* and *information communication.* However, they also create *time inefficiency*. Second, the other two sub-structures are only being managed by the project manager; namely, *team member structural holes* and *boundary spanning.* These sub-structures engender *time efficiency;* however, they cause reductions in *control, coordination,* and *information communication.* These trade-offs are discussed in more detail in the following sub-structure sections.

6.2.Out-degree Centrality:

As the results suggest, *out-degree centrality* was perceived by project managers to have a strong connection to project success. The result agrees with previous studies.

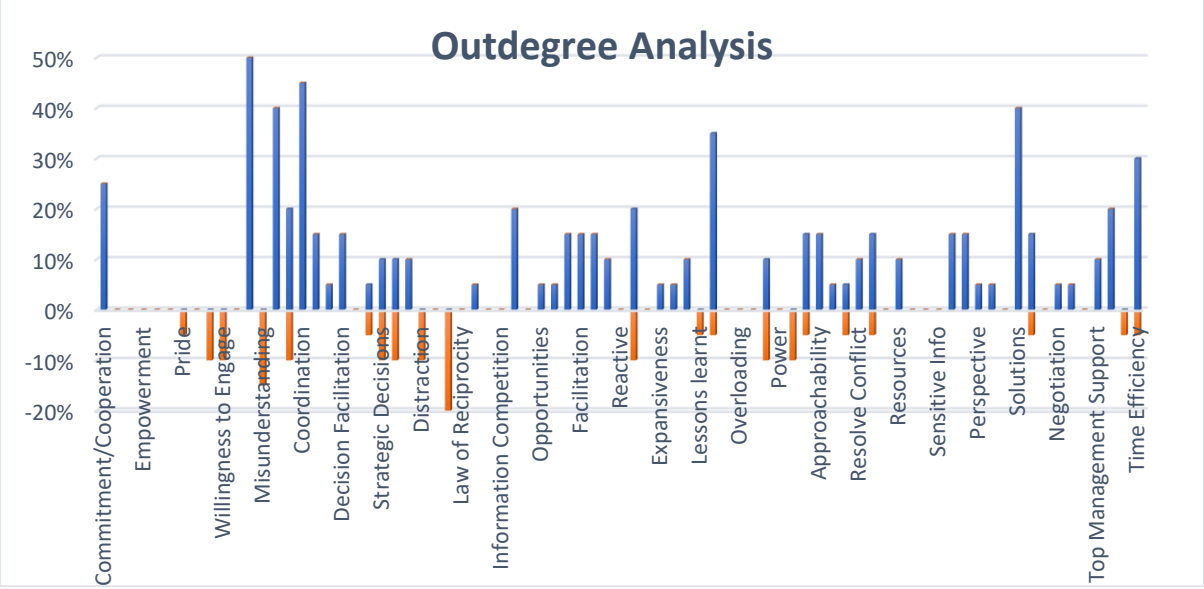

Figure 8: Outdegree centrality comparative model

The project manager's highest perceived network contents of *information communication*, and *coordination* were consistent with previous studies. Particularly, Turner and Müller (2004, 2005) reported that continuous *communication, trust,* and *information sharing* with the client, are essential for project performance.

The results model shows *trust* and *control* as having both positive and negative impacts in contrast to previous studies, because *trust* and *control* may be lost through over-frequent inconsistent directions.

Accordingly, *interference* and *cost* were the only negative literature impacts agreed on by the project managers.

6.3. Betweenness Centrality:

Results show that the project manager position seems extremely dependent on *project size* and *project manager competency.* Thus, there is no perceived optimal strategy of project manager position for all projects. Both dependencies, though not specifically for social networks, have been determined by Patanakul, Milosevic, and Anderson (2007) to assist in assigning of projects to project managers.

The results of the interviews revealed that betweenness centrality has a positive impact on all the most successful projects as well as a degree of the least successful projects as perceived by project managers.

Many more project managers perceive the opposing project management periphery strategy (non-betweenness) as having a negative impact for the least successful projects. This result is in accordance with a study by Freeman (1977).

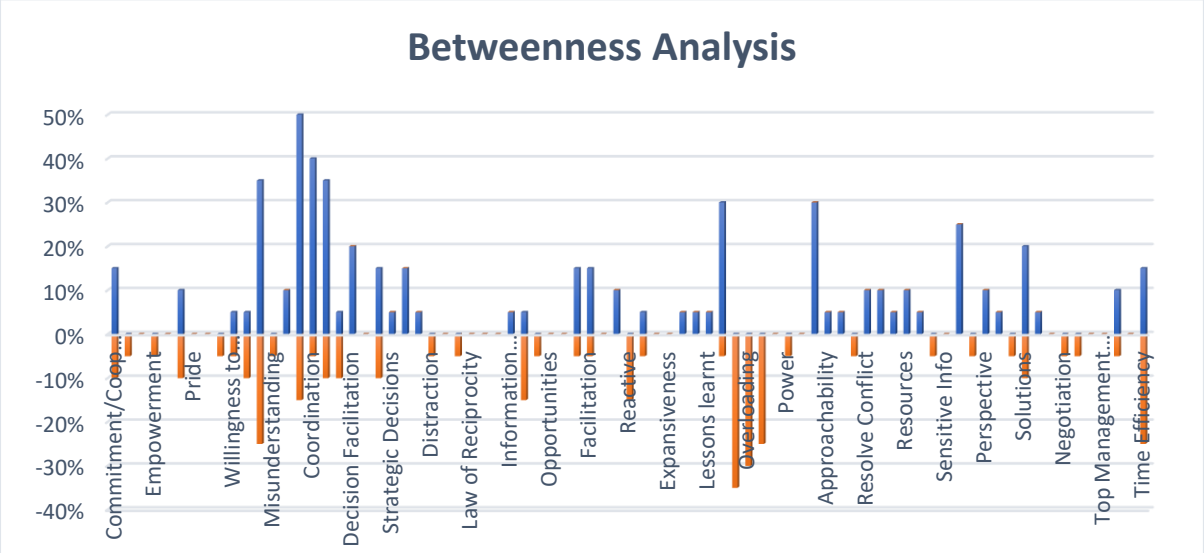

Figure 9: Betweenness centrality comparative model

The project managers perceived *control* and *coordination* as the greatest positive impacts of betweenness centrality on project management performance, which is in concurrence with Freeman (1977) and Hossain and Wu (2009).

A number of network contents had both positive and negative impacts. First, the project managers agreed with Freeman (1978) that betweenness may facilitate *control* and *information communication* but illustrate that *"Communication was not managed and so the project was let go out of control."* Second, the project managers do not present Reagans and McEvily's (2003) theory that *knowledge transfer* ability is increased with broadening perspectives but do concur with Guetzkow and Simon (1955) that centralisation is inefficient for *knowledge transfer* in complex tasks. Third, the project managers partly agreed with Molm's (1994, p.165) *reduced cooperation* philosophy but do also perceive betweenness as enhancing cooperation.

6.4. Team Member Holes:

Structural holes are perceived to have a reasonably positive impact on project success from a project manager's general perspective. Notably, though, there were considerable amounts of project manager-perceived negative impacts. Control of these negative impacts may be possible with the management of the significant project manager perceived dependencies of *team competency* and *project size.*

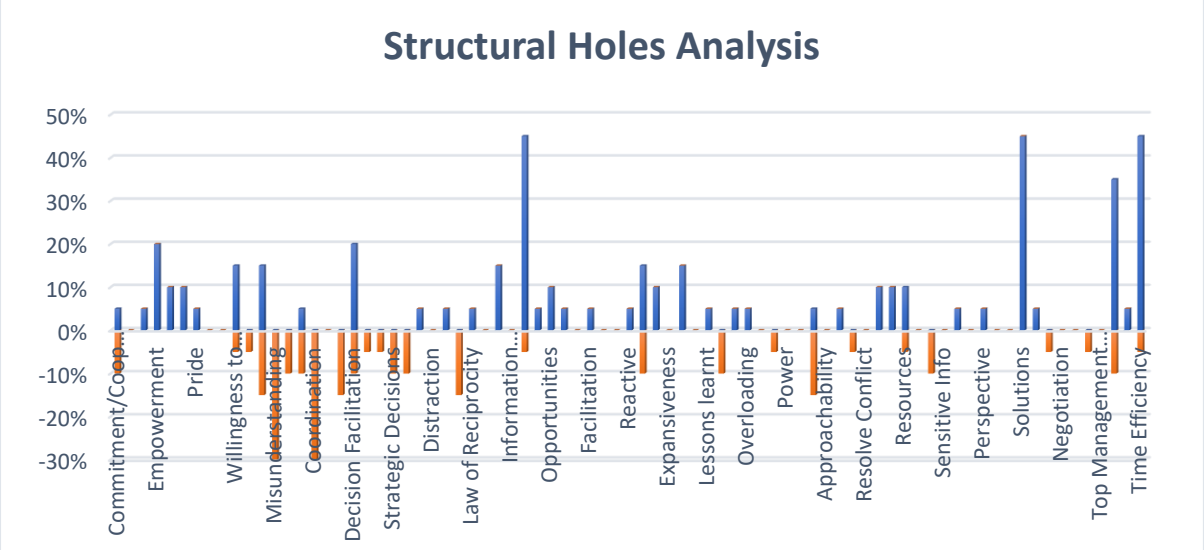

Figure 10: Team member holes comparative model

The project managers also highlighted five positive network contents in addition to previous studies. Surprisingly, improved *decision-making time* is perceived by project managers as positive. This is due to technical specialist's decision-making in contrast to Brookes et al.'s (2006) processing time for non-validated information. Similarly, the benefit of *information* (Burt, 1992) is agreed on but its inadequate *communication* can be a downfall:

The project managers warn of five additional negative network contents to the literature, such as lack of coordination and misunderstandings.

6.5. Boundary Spanning:

Just over half of the project managers perceive *team member boundary spanning* as having a positive impact on project success. Conversely, though, project managers generally viewed external interfacing as having a substantial, negative *network content* impact and seen as negatively oriented for the least successful projects. Constructively, though, the project managers perceive elimination of all potential negative impacts possible by interfacing externally via the project manager.

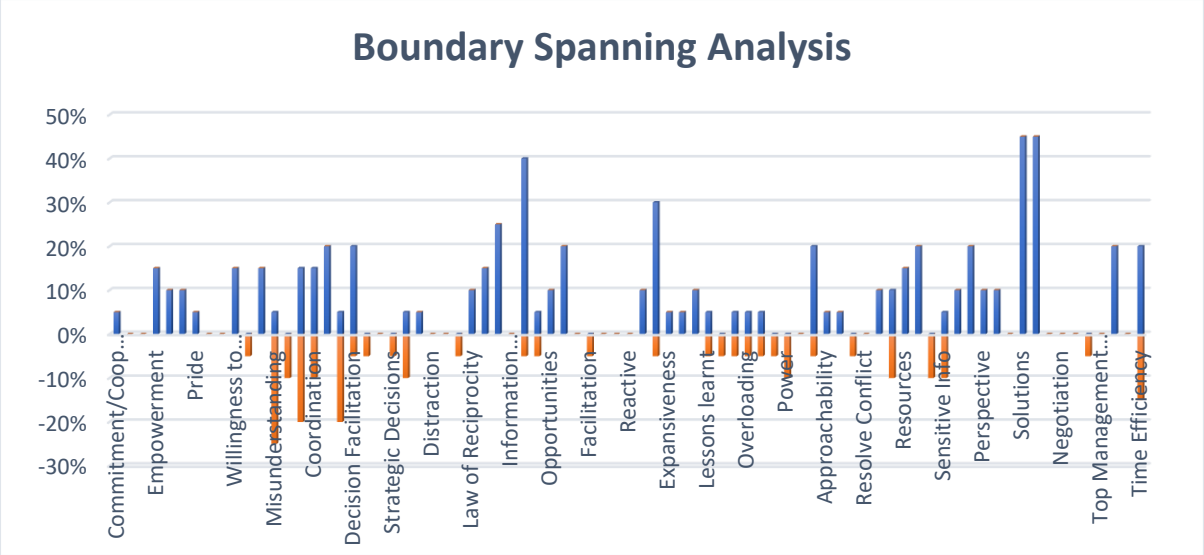

Figure 11: Boundary spanning comparative model

This emphasises that the project manager's strategy should be based on the team competency dependency. Nevertheless, the project manager's seven additional positive network contents, plus those found in the literature, do enhance the benefits of boundary spanning and again may contribute to Marrone's (2010) requirement for detailed research on boundary spanning impacts beyond that of team performance.

Finally, time efficiency is improved through the use of boundary spanning, such as synchronisation of efforts (Mohrman et al., 1995) but intriguingly, the inappropriate use of these interfaces represents a negative impact on project success, such as redundant information.

7. Conclusion and Future Work

The four sub-question topics (sub-structures) showed that social networks have a perceived positive relationship to project management performance. First, the project managers perceived *out-degree centrality* to have a strong connection to project management performance. Second, the project managers perceived project management *betweenness centrality* to have a positive impact on project management performance, although it is considerably dependent on project size and project manager capability. Third, the project managers perceived *team member holes* to have a reasonably positive impact on project management performance. However, there are considerable perceived negative impacts, which prompt significant dependencies of team competency and project size. Fourth, the project managers perceived *boundary spanning* as being significantly dependent on team competency. Nevertheless, the project managers perceived *boundary spanning* via the project manager as eliminating all potential negative impacts, thereby contributing positively to project management performance. The sub-structures comparative models illustrate that a balancing of their positive and negative network contents may be necessary. This study depicts that by considering the project dependencies of project size, team competency, and project manager capability, social networks can be managed to improve project management performance.

The question raised by the study was how social networks contribute to project management performance. The literature revealed the four most influential social network sub-structures on

which the field study focused. Results showed that the four sub-structures have a perceived positive impact on project management performance; however, these impacts have significant dependencies on project size, project manager competency, and team competency. Furthermore, the study depicts comparative models of social network contents. Accordingly, the project manager can consult these models to ascertain the specific contribution of social networks in general and its network sub-structures, in particular, to project management performance. The subsequent implications for both research and practice further develop on these findings and their significance. Indeed, the limitations and future research directions highlight the expansiveness of the social networks concept. The study emphasises that the project manager has increasing considerations in his or her effort to enhance project management performance.

Future researchers may be able to make use of the network contents comparative model. The contrasting network content impacts require further verification in future research. The study's population is project managers from one college in India alone. It may be difficult to generalise these results to the entire project management population; therefore, a broader range of organisations may prove worthwhile. The recommended project management centrality adapted may be explored in relation to project size and project manager capability. The strategic transition between the alternative strategies may be examined (primary point of contact, deputy, technical leaders, project management team, and project manager on the periphery). The dependency variables of project size and team competency may be explored for team member structural holes. The recommended strategy for boundary spanning may be explored in relation to team competency and clear roles and responsibilities.

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