COMMUNICATION ROLES IN PROJECT TEAMS

by
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The design process is a rich environment to study communication. Increasingly the design process is employing people from varying professional backgrounds and disciplines in order to achieve innovative solutions to today's problems. To work together effectively, these professionals must interact and engage in the process of knowledge exploration. Failure to do so can result in conflict and jeopardize the project.

This study is based on the previous research of Sonnenwald & Lievrouw (1997) and used a taxonomy of communication roles developed by Sonnenwald (1996). The study looked at the communication roles that emerged in two project teams from two different non-profit organizations. The results indicate that team members do fill certain communication roles as the project develops. In cases where certain roles did not emerge or were not strong, the process of knowledge exploration was hampered and conflict emerged.

Headings:

I. Introduction

In response to today's changing business environment, design project teams increasingly need to include experts from a variety of disciplines in order to create innovative and successful products. For example, a project team may need to include specialists from marketing, telecommunications, hardware engineering, and software engineering. Communication among these specialists can be difficult but is crucial to the project's success. Understanding communication roles that reduce conflict and increase the level of cooperation within project teams will be critical for the continued development of innovative problem solutions.

This study analyzes the communication between team members in order to help determine the types of communication that support the design or collaboration process and outcomes. The uses a model of communication roles and study methodology developed recently Sonnenwald (1996, 1997). The purpose of this study will be to test Sonnenwald's model in different organizational environments and perhaps even add to the model by testing its applicability in different organizational settings.

Sonnenwald developed a taxonomy of communication roles that emerged among project team members. These roles reduced conflict among participants and led to innovative design solutions. Additional case studies are needed to further extend the model, verifying if the same roles emerge in different institutional settings. Sonnenwald built her model based on qualitative studies of architectural, engineering and software design projects where the design situation involved a product such as a building, environmental sensor, telecommunications system, and an expert system. The projects took place in "for profit" corporations. People working in non-profit agencies or government agencies might approach project teams differently.

This study investigated teams in two non-profit agencies. The study looked at

the communication among the team members that emerged during their particular project and team members' perceptions of project outcomes. The findings indicate that strong communication roles do lead to better outcomes. When strong roles did not emerge, team cohesiveness was low, contested collaboration emerged and the project was not viewed as successful. Furthermore, the results show the importance of boundary spanning and knowledge exploration. When team members never left there own perspective, they never fully understood the project or the other participants. As a result, there was noticeable tension between some team members and the project suffered.

2. Related Research

The literature on communication and project teams comes from a wide variety of sources. It spans information science, communication, and the management literature. Thus there is a growing body of literature (e.g. Ancona, 1990, Ancona, & Caldwell, 1992. Sonnenwald & Lievrow, 1997) that clearly links good communication among team members with successful projects. These results provide the impetus for this project.

Several key research issues or topics emerge when examining this research in depth. It has been shown in the past that good communication improves project team performance but these articles seek to explain more than that. Research has illustrated that in many cases the type of information exchanged varies according to an individuals' role within an organization or within the project team itself. Studies seek to understand how task complexity relates to information need. Communication becomes very important in design tasks especially as the tasks grow more complex. Communication patterns emerged during the design process such as information transfer among individuals and the form of communication that is chosen. Also of importance in the literature is team building and trust. Researchers recognize the importance of having

team members with varying backgrounds, whether those backgrounds represent different disciplines, different functions within the organization, or even a user group that will eventually have to use a new system once completed and once assembled having the team work together as a unit. The common thread among these studies is the recognition that good communication among team members is necessary to the development of a successful project.

Katriina Bystrom (in press) studied information needs and seeking behavior and its relation to task complexity. She found that task complexity influences the source of information. She divided task complexity into five categories based on their difficulty. Her categories include: automatic information processing tasks, normal information processing tasks, normal decision tasks, known-genuine decision tasks, and unknown-genuine tasks. Automatic information tasks have "clear and comprehensive rules and directions for task performance" (in press, p. 5). At the opposite end of the spectrum are unknown-genuine tasks that are unpredictable with no "established practice to follow or the performer is unaware of their existence" (p. 5). Bystrom found that when task complexity increases or moves along the continuum from automatic to unknown-genuine, people tend to seek out other people for their information sources rather than document sources. According to Bystrom's results, people were consulted for automatic information processing tasks only 30% of the time but for known genuine tasks they were consulted 88% of the time. Because of the complex and often unpredictable nature of design tasks, most tasks would fall under the unknown-genuine.

Simarily, Herbert Achleitner and Robert Grover (1988) found that oral communication was the predominant format for information transfer. All the managers in their study identified people as the sources of information for their work. They found that "people were major sources of data, procedural information, interpretative

information, source (who to see) information, current information, and some external information" (p. 95).

Achleitner and Grover also found that information transfer among managers and workers was influenced by an individual's role, access to both internal and external information, and corporate culture. They found that both formal and informal information transfer patterns existed. Formal patterns meant that a person's position in the organization influenced the information needs and kinds of information produced. Informal patterns of information transfer existed and influences from whom information was gathered. One interesting finding in their study was that "information workers requested information from *trusted* human sources a) at the same or lower levels in the organization's hierarchy, and b) from sources in other organizational units within the enterprise" (p. 98).

The issue of trust and building team cohesion is another element of importance within the literature. Pinto and Pinto's (1990) research in project management found that managers should encourage team building and suggest that project managers make the common mistake of not allowing enough time to allow the team to develop into a cohesive unit. Their interviews with project managers revealed that "project teams engage in a task oriented approach too quickly, before team members have a chance to develop a sufficiently high comfort level that encourages trust and cooperation. It is reasonable to expect that if trust is not developed early in the project, project teams will be less willing to engage in informal communication" (p.209). Informal communication is important because it encourages trust and cooperation. It is a way for team members to feel comfortable around each other.

Pinto and Pinto's research on project team communication also focused on cross functional cooperation. Cross functional cooperation is defined as the cooperation

among individuals whose functional backgrounds are different from each other. The development of new solutions and programs almost require people of a variety of backgrounds to work together. They suggest that communication is "the vehicle through which personnel from multiple functional areas share information that is so critical to the successful implementation of projects" (p. 210).

Groups with high levels of cooperation experienced greater project success than groups with low cooperation levels. Groups with high cooperation spent more time engaged in specific tasks and less time resolving personality conflicts. They suggest that this last finding may be the result of higher trust levels among cooperative teams.

Pinto and Pinto suggest a role for management is to encourage cooperation and foster an environment that promotes accessibility. James Ward (1995) suggests that the organization needs to do more. He noticed that there may be organizational forces that work against a project's success. Management should insure that everyone understands the project's purpose and scope. "If management does not ensure that that the scope of the project is understood by everyone involved, then people in decision- making positions will not understand project requirements. Decisions will be based on partial understanding of the project" (p. 74). Ward also noted the importance of acceptance criteria for project requirements. "If you can't express how you are going to meet a requirement, chances are you won't be able to meet it. For every requirement, there should be a definition of acceptance criteria-- evidence that the requirement has been met. If this cannot be clearly stated at project inception, the project is in jeopardy" (p.74).

Mumford and MacDonald (1989) in their case study of the creation of an expert system discuss the benefits of a participative approach to design. The idea of participatory design involves giving some or all of the control in a design situation to the

actual users of the system. The design process is intended to be a collaborative effort between the users and the technical experts. The process of participation involves information seeking, learning, developing effective working relationships, goal achievement, and solution implementation. The authors identify roles that are essential for a project to be successful. For example, a facilitator helps guide the group through the task whereas a steering committee establishes the framework in which the design task is to be carried out.

Sonnenwald (1996) incorporates and builds on many of the themes identified above and provides a model of communication in design that is the foundation for the current study. Sonnenwald's model suggests that multidisciplinary design teams are necessary to develop innovative solutions to problems. No one person can be expected to possess all the necessary information that complex problems require. These varied backgrounds aid in developing the necessary solutions. This idea is similar to Pinto and Pinto's cross functional cooperation (1990), and Mumford and MacDonald's (1988) participatory design since users and technical experts work together.

The key to successful integration of these various disciplines is knowledge exploration. Sonnenwald discusses three categories of knowledge exploration: artifact context, design context, and technical and scientific knowledge (Sonnenwald, 1996). Artifact exploration is learning how the solution will benefit the organization. It is necessary because it enables design team members to familiarize themselves with how the created artifact will support the organization's work and how it will effect the environment and culture of the organization. The design context is the environment in which the project team will work. It includes the backgrounds and personalities of the team members. Finally, technical and scientific knowledge exploration allows design participants the opportunity to explore information from a variety of disciplines in order to

find the solution to a problem.

However, these diverse backgrounds can lead to tension between members, because each member has his/her own vision and understanding of what the solution should be and how to go about designing the solution. Also each member bring with them a preexisting perspective and it is this uniqueness that makes their participation meaningful (Sonnenwald, 1995). Each has their own view and perspective on the solution should work. For example, an information systems specialist knows how to design a system that will accomplish the project goals but a user of the system can contribute additional knowledge about the system's function. Sonnenwald argues that each participants must "collaborate and explore one another's life-world and specialized knowledge so that they can come to a working understanding of how the artifact will co-exist with and, ideally support patterns of work activities, social groups, and personal beliefs" (Sonnenwald, 1995, p. 872). Referring back to the information system example, systems specialist are influenced by new technologies which impacts how a design problem might be solved. They must share this information with users and design a system that is not only influenced by new technology but by users' needs and constraints.

This uniqueness of perspectives and specialized knowledge that can lead to better solutions to problems can also be problematic. These different perspectives can be a barrier. Each discipline has its own specialized vocabulary and professional culture and it can be difficult for outsiders to understand. This can cause misunderstanding and conflict; Sonnenwald has called this contested collaboration. The idea of contested collaboration is that collaboration produces opposing forces. Participants must gain an understanding of each others' perspectives, specialized knowledge, and language while at the same time the need to solve the tasks may force the participants to delve deeper

into their own perspective. This may cause participants to contest or challenge each other's contributions to the project (Sonnenwald, 1995).

Sonnenwald's main focus is on communication roles that support design and encourage knowledge exploration. The roles relate to information exchange across boundaries. Team members bring information that is relevant to the project from inside and outside of the project and share it among team members. She divides her roles into five different categories based on the type of boundary each role spans. The five boundary spanning areas proposed by Sonnenwald are: organizational, task, discipline, personal, and multiple boundaries (Sonnenwald, 1996). There are several roles assigned within each category.

There are five organizational boundary spanning roles. The first is the *sponsor* role, which refers to the person who works to insure the project's acceptance and funding by the larger organization and helps to keep the design project's goals in line with the goals of the larger organization (Sonnenwald, 1996). People must be aware of a project in order to support it and they must understand how the project is going to fit into the organization's existing work patterns. A sponsor also helps make sure that the project solution is in step with the organization's needs, goals, and objectives. The sponsor is not necessarily a team member but is, nonetheless, someone who needs to be consulted. The sponsor can be key to providing access to necessary people and information.

The next organizational boundary spanning role is the *interorganizational star*. This person interacts with the larger organizational units and relevant external organizations in an effort to come to an understanding about "how the design project (and possible future design projects) can meet the larger and external organizations' goals and strategies" (Sonnenwald, 1996, p. 289). This person may have the title of

project leader. His/her objective is to discuss the project's goals, plans, budget and the larger organizations' goals and plans and therefore help insure compliance between the two sets of goals. The interorganizational star also shares relevant information with the other team members.

The *intraorganizational star* works to satisfy the information needs of the design team members by filtering and transmitting "information about the project's goals and subgoals, plans, tasks, and detailed budget information among formal organizational levels within the design project" (Sonnenwald, 1996, p. 290). This person may have the title of group leader. These roles and the sponsor role work together to insure the project's continuing support, to keep the project's goals aligned with those of the larger organization's and to keep the members of the design team properly informed.

The final two roles within organizational boundary spanning are the *intergroup star* and *intragroup star*. The intergroup star discusses design plans with other intergroup stars from different groups within the project whereas the intragroup star helps to foster interaction among team members (Sonnenwald, 1996, 290-291). Intragroup stars help foster a team environment, a sense of cooperation, and other personal support within the design team. The Intergroup star, on the other hand, help foster cooperation among different groups in the design team and other design teams. Discovering how other teams have faced difficult problems can be instructive and may save time and money.

Task boundary spanning roles form the next group. Sonnenwald suggests that conflict can occur between team members when inter-related tasks have different priority levels or conflicting constraints. When this situation arises an *intertask star* coordinates the tasks and negotiations between the related tasks and individuals involved (Sonnenwald, 1996, p291). An intertask star encourages team members to

come up with more than one solution while keeping detailed notes on each solution and attempts to keep design constraints open for as long as possible. Other methods are more formalized and include assigning tasks, creating progress reports, and presenting completed tasks (Sonnenwald, 1996).

Task boundary roles also include *intratask interaction*. This is a role that may not be clearly associated with any one individual but is a method for sharing information with other team members. These interactions are discussion of the problems encountered discussions of the alternatives along with the pros and cons of each alternative and any other information that needs sharing.

Discipline boundary spanning roles have two components as well. The first is an *interdisciplinary star* whose responsibility is to interact with the design team "using knowledge from their disciplines to create new knowledge" (Sonnenwald, 1996, p. 292). In other words, these people actively share their own knowledge and integrate other peoples' knowledge from different backgrounds in order to come up with the best solution. *Intradisciplinary stars* take the new knowledge and developments from their discipline and share it with others in the same discipline (Sonnenwald, 1996, p. 292). This can take the form of scanning journals or newsgroups and then sharing important news.

Personal boundary spanning roles have two components: the *interpersonal star* and the *mentor*. The role of the interpersonal star is to facilitate interpersonal discussions among team members. The hope is that this kind of informal communication among team members will make it easier to discuss design issues. This role may be filled by many design participants since this is viewed as a very common activity. This activity creates a sense of trust, cooperation, and comfort among team members. This is supported by Pinto & Pinto's (1990) idea of team building.

The mentor role is someone who provides information to individuals that might benefit their careers. This includes job opportunities, services and benefits of the organization, and others interested in similar problems. Another purpose of the mentor is to promote individual achievements (Sonnenwald, 1996, p293). Sonnenwald points out that this role may be gaining significance because design teams can be transitory and participants need to consider other job opportunities. Their membership in any one project team may be of limited duration.

The final category of boundary spanning, multiple boundary spanning, has two roles: *environmental scanner* and the *agent*. The environmental scanner goes outside the design situation boundaries and brings back pertinent information regarding competing products, new components that might be useful, and new design methods or tools, etc (Sonnenwald, 1996).

The agent is responsible for a variety of tasks. These include resolving conflicts that may arise between team members, facilitating communication between team members, and ensuring that the participates have the necessary information to complete their tasks. The agent may have another formal role within the team but does not necessarily have to have a specific task assignment (Sonnenwald, 1996 p. 294).

Project team members may assume one or more of these roles and also these roles may change over time. The roles are not necessarily explicitly assigned but can be. Knowledge of these roles may allow project team members to plan strategies that allow for communication roles to emerge. Some of Sonnenwald's data reveal that some roles may require skills that are picked up only after several years of professional experience.

Methodology

This study is designed to replicate Sonnenwald's & Lievrouw's study (1997) to

determine if similar roles would emerge in two project teams in non-profit organizations. The methodology used in the current study is based on the methodology developed by Sonnenwald & Lievrouw (1997). However, adjustments to the methodology were made to one of the data collection techniques because the project teams in this study had completed the project whereas Sonnenwald and Lievrouw had the opportunity to collect data from teams while the project was in progress.

Two non-profit organizations agreed to participate in this study. One organization was a large medical library located in the northeast United States. The goal of their project was to develop a closed network database for a panel of specialized medical and public health professionals. The network database held bibliographic references, discussion boards, chat rooms, and a calendar as well as group email. It would allow the panel members to comment on papers and discuss important topics relevant to their field. It was designed both to facilitate their communication and to meet their information needs. Another goal of the project was also to move the library beyond its traditional service, and into the design and development of information resources. The project team was composed of 7 people including medical information specialists, information systems specialists, a medical doctor, and public health professionals. All had at least a masters degree and one is had a MD. Six of the seven team members participated in this study.

The second organization was a large medical professional association whose headquarters are also located in the northeast United States. Their project was the preparation for a series of cyclical meetings that occur every six months. The tasks included the preparation of agenda items, follow ups from previous meetings, written preparation of meeting minutes, and preparation of action items (those items that will be acted upon by the organization over the next six months) for the specialized committee

meetings. This study looked at the preparation for one of those meetings. The participants also came from a variety of professional and educational backgrounds, ranging from French culture to Art History. Job titles of the team members included associate executive vice president, executive assistant and Internet coordinator, two directors, and a manager. The team was composed of six people though one did not participate in this study.

In both cases, permission to conduct the research was obtained from a personal contact within each organization. Once permission was obtained, a list of the potential participants was received. From that list, each person was contacted via email. Interview times were arranged and the survey forms and written consent forms were mailed out along with a return envelope.

Three data collection techniques were used in this study. All participates were interviewed via the telephone. In person interviews were the preferred interview method but geographic location of the organizations and scheduling made that impossible. The alternative was telephone interviews.

The aim of the interview was to learn about the project from each team members' perspective. Interview questions cover the project's purpose, history, and tasks involved. Each member was asked to describe their specific tasks and also describe the tasks of other team members. They were encouraged to describe the aspects of the team that worked well and those aspects that did not work well. For example, issues raised by team members included the perception that weekly meetings worked well for information sharing but email was an unreliable form of communication and did not allow adequate information sharing. In another case, participants described critical incidents that occurred that caused the project to really come together. A set of probe questions to be used during the interview is included in Appendix A.

A content analysis of each interview was performed, which allowed a picture of the team's interactions to develop. The interviews provided data on the communication roles that developed among the team members, cohesion, and an interpretative lense for survey answers. For example, a comparison of the interview responses provided the opportunity to see how well the project team members understood the project's purpose as well as each other's role within the team. If two people described the project's purpose differently or if person A describes their task differently than person B describes person A's task, then this provides evidence of flawed information exchange or a lack of group cohesion. Similarly, if the participants describe the project's purpose and each other's tasks in similar terms then that provides evidence of good information exchange and cohesiveness.

The second data collection technique used was a performance survey. A copy of the performance survey is included in Appendix B. The survey provided team members with an opportunity to evaluate their team's performance and the effectiveness of each team member, utilizing a five point Likert scale. In particular, the participants were asked to: evaluate their interactions with each team member, identify the overall effectiveness of each team member, and identify the two team members who contributed the most. Finally the team members were asked to compare the performance of this team with other teams in which they were involved.

This data was analyzed in several ways. First, a content analysis was performed to triangulate the interview data and check its completeness. For example, a person may identify another team member as highly ineffective on the survey but may not have mentioned anything during the interview. In other words, it may complete the picture begun by the interview by filling in gaps and vice versa.

Second, Means and standard deviations were calculated for each survey item

and then will be compared. Third, correlation measures for the individual interaction ratings and for their effectiveness ratings were also calculated. Sonnenwald's & Lievrouw's previous research (1997) suggested that communication among the team members was strongly related to individual performance ratings. In their data analysis, Sonnenwald & Lievrouw employed asymmetrical analysis to establish degrees of similarity between individuals' rating of each other.

The final data collection method was a demographic survey. This is included as Appendix C. The survey asked questions relating to the participants' educational and professional backgrounds, years of work experience, length of time in their present organization, and hours worked on the project. Participants were asked to identify their roles on the project as well. These were coded to identify communication roles. The information was used primarily to provide background information about the participants.

Results

The results show that communication roles exist and emerge in project teams. Each team studied fulfilled the roles with varying degrees of overall effectiveness. One team developed an effective communication network and the other team attempted this but without success. When this happened, contested collaboration emerged and project performance did not meet expectations. This would indicate that it is one step to develop roles but another step to implement and carry out the roles effectively.

The results also illustrate several communication issues. For example, project management must know what they want and be able to express their goals to the team. Team members must ask questions to insure full understanding of the project's goals. The team members should engage in the process of boundary spanning and knowledge exploration to better acclimate themselves to each other. Management and the other project team members should conduct a needs assessment to make sure what is being

proposed is really what the users want.

Communication Roles

The data gathered suggests that communication roles exist and a team member
may assume several roles during a project. Of the thirteen roles identified by
Sonnenwald, twelve were identified. Table 1 provides a summary of the roles that
emerged.

Communication roles		
Role	**Team Member**	**Organizational Level**
Sponsor	**Team 1** #6, **Team 2** #12	Division head, VP
Interorganizational Star	**Team1** #2, **Team 2** #7, #8, #9, #10, #11	Division head, VP
Intergroup Star	**Team 1** #1, #4, **Team 2** #7	Professional staff, VP
Intraorganizatinal Star	**Team 1** #1, #4, **Team 2** #7	Professional staff, VP
Intragroup Star	**Team 1** #2, **Team 2** #7	Division head, VP
Intertask Star	**Team 1** #2, #5, **Team 2** #8, #9, #10, #11	Division head, Professional Staff
Interdisciplinary Star	**Team 1** #1, **Team 2** #7	Professional staff, VP
Intradisciplinary Star	**Team 1** #5, **Team 2** #8, #9, #10, #11	Department Head, professional staff
Interpersonal Star	**Team 1** #6, some evidence #1 **Team 2** #7, #8, #9, #10, #11, #12,	Division Head, VP, Professional staff
Environmental Scanner	**Team 1** Some evidence #3, #5	Professional staff
Agent	**Team 1** #2, **Team 2** #7	Division head, VP
Mentor	**Team 1** #1, **Team 2** evidence to support an unknown mentor	Professional staff

Organizational Boundary Spanning Roles

Participants in both teams identified *sponsors*. In team 1, several participants identified person 6 with the sponsor role. This person was described as the visionary behind the project and as the person who initially approached the organization with the project and laid out all the project goals. Person 6 made all final decisions on the project. The second team identified person 12 as the sponsor. Person 12 was the central figure that everyone reported to and was described as the person who "knows everything" and sees the big picture.

In team 1, person 2 had three organizational boundary spanning roles associated with them: *interorganizational star*, *intertask star*, and *intragroup star*. Of these 3 the interorganizational star were the most noticeable but all 3 roles were closely associated. This person had to arbitrate conflict among all the participants and set priorities among the team members. Person 2 was very interested in the project's outcome because, he/she saw the organization's future in this type of project. Person 2 moved between the sponsor's department and the other participating departments to monitor things. He/she forcibly set a high priority when it became apparent that the priority level of the project did not match among the various departments. One participant did feel that there were "competing agendas" between the departments. On occasion, participants said parts could not be done, he/she encouraged him to "play with it" or "have fun with it".

Several people on team 2 were associated with the role of *interorganizational star*. The team members had to go outside of their organization to other organizations to gather relevant information needed to complete their tasks. For example, team 2 members had to contact medical professionals who were acting as chairpersons on the specialized committee meetings for which the staff member was responsible for

preparing. These outside specialists provided the necessary organizational information and feedback that the team members to complete their tasks.

Three people were associated with the *intergroup star* and *intraorganizational star*, two of whom were associated with the same project team. Two of the three had the title of project manager. As an intergroup star in team 1, Person 4 acted as a go between for his/her department and the other departments involved. This person told people what needed to be done, checked on progress and reported problems. Person 4 described his/her management style as follows:

> acting as a go between—finding out what was needed, finding out what [the sponsor] wanted, and checking on feasibility. It was my job to be a pain in the ass.

Person 1 acted in the same manner initially but had little success. At the beginning of the project, person 1 acted as an interorganizational star, serving as the liaison between the sponsoring department and the other departments. At this person's request, person 4 took over those responsibilities because he/she came from the sponsoring department and would get better results. "[Other participants] identified [person 4] as coming from office with power, closer to [the sponsor] who started it, his/her idea and he/she had final say on everything."

In team 2, person 7, by default, had to assume the intergroup star, intraorganizational star, and the agent role. This person was at the center and had final approval on all parts of their project. He/she was also the central figure and the only project member who had contact with all participants. Participants met with this person on a regular basis to discuss what was happening and what needed to be done.

Discipline Boundary Spanning Roles

The discipline roles were important features of both project teams. In team 1 there was a clear need for an *interdisciplinary star* and the fact that this role was not

fulfilled properly was a key contributed to the conflicts associated with team 1. Person 1 is associated as filling the role of an interdisciplinary star for team 1. This person's chief task was to interpret what the sponsor wanted to accomplish to the other participants so they could produce it. He/she had to bring information to everyone involved and bring information back to the sponsor's department. It required person 1 to speak several professional languages to insure proper understanding. The participants indicated that what was needed was a person who could communicate effectively between the various disciplines involved and while this was done, it was not done effectively. The reasons for this will be discussed in the next section. Person 7 also filled this role on team 2 since he/she oversaw the entire project, he/she had to understand all aspects of others' responsibility. This person had the authority to approve all committee work. Nothing could be finalized without this person's approval. Person 7 left the tasks up to individual participants but was kept informed on everyone's progress and made suggestions and comments during the process.

A number of individuals filled the *intradisciplinary star* roles. Person 5 was responsible for developing the technical solutions on team 1 and their information came from within their own discipline. He/she applied the latest technical applications to apply to the project. The other participants were all associated with team 2. They worked fairly autonomously and with others outside the organization to complete their tasks. These external participants were not within the same discipline in a proper sense but their background and the team members professional job title/description were similar. Team members communicated with this people to gather relevant information and used it to complete their tasks.

Personal Boundary Spanning Roles

Several people all filled the role of *interpersonal star*. In team 1, person 6 filled

this role. Person 6 was described as being very considerate and careful to thank all the people involved. She also took people out to lunch and dinner at various times. There is some evidence that person 1 also functioned as an interpersonal star. One participant said that:

> [he/she] clued us into things that [we] didn't know about. [He/she]
> would send us things and this was done socially.

In team 2, the environment contributed to most of the people acting as interpersonal stars. Most of the communications seemed to be done on an informal level. One person said that:,

> because we are in such close proximity that it is easier
> to just stick your head [in the other person's office] door.

Another said that they:

> frequently talked to other team members for 5 to 10
> minutes to see how things were going.

Another participant described everyone as being really friendly and there are no doors.

<u>Multiple Boundary Spanning Roles</u>

Person 2 gave a very clear example of an *agent* role. For example, at one point in time, there was a conflict between two participates in two different departments. The agent had both participants come in and sit down and encouraged them to talk. One of the participants was finally able to articulate their need and the other was able to understand exactly what needed to be done. Person 2 commented that this incident convinced him/her that the project could be done. Person 2 was facilitating interaction among the participants.

Also, there is some evidence that person 1 acted as a *mentor* to person 4. Person 4 joined team 1 while the project was already underway and person 1 brought person 4 up to speed with the project. In team 2, person 8 revealed that he/she had a mentor when he/she said that a colleague helped get her started. This person was new

to the organization and needed to be introduced to the process. However, the person who did the mentoring never revealed himself or herself.

There is some evidence to support person 3 in team 1 as being an *environmental scanner.* This person described his/her tasks as "brainstorming" and thinking about "the potential uses of information." They were seeking out new ideas from the external environment that could be incorporated into the project or as future additions to the project.

In summary, the data collected does show that communication roles emerge within project teams. These roles were not necessarily assigned but they emerge as a necessity to complete tasks. The agent role developed fully in team 1 as conflict emerged and the interdisciplinary star emerged as a result of the project. In team 2 the tasks dictated the need for both interorganizational stars and intradisciplinary stars. The relevant information they needed lay outside the organization with other professionals. In team 2 the organizational environment made it possible for interpersonal stars to develop and flourish.

Relationships between Roles and Team Performance

Sonnenwald has hypothesized that there are relationships between these roles and project outcomes. Identifying the relationships can lead to the development of specific communication strategies that support positive project outcomes and reduce the amount of conflict in project teams. An analysis of the survey data indicate support for this hypothesis and provide insight into project team dynamics.

On the performance survey, participants were asked to rate their feelings about the project team, to compare this team with other teams they have worked on, and finally to describe their feelings about the project's outcome. As mentioned above, all responses were on a five point Likert scale. A table indicating the mean response for

each project team is given in Appendix D. Because of confidentiality, individual

responses are not used. A comparison of the mean responses provides several key

points with respect to communication, team cohesion, and project outcome.

The first part of the survey asked for a rating of their feelings about the team

itself. The answers yielded data about participant satisfaction, team cohesion, and

expectations placed on the team by the larger organization and by the individual team

members. Team 1 indicated either negative results or indifferent results. Question 1

asked about recognition for accomplishments and the majority of the respondents (60%)

answered three indicating neither positive nor negative feelings but on question 2 which

dealt with satisfaction being apart of the team, team 1 participants were negative. The

mean answer was a 2.6 with 40% answering either 1 or 2 and another 40% answering

3. Question 3 asked about team cohesion and the results indicate that team 1

participants felt there was little cohesion (mean=4.2), all participants answered either 4

or 5. The interviews shed some light as to why this may be.

Three team 1 participants said at the outset that this was not a team or a

collaborative effort. It was a part of their jobs. One person said that none of the

participants had a choice therefore it was not collaboration. This might explain some of

the feelings but there was another key thread in the interviews that may explain some

additional factors. Sonnenwald (1996, 1997) also discusses that boundary spanning

and knowledge exploration play an important role in building team cooperation.

Boundary spanning and knowledge exploration helps reduce instances of contested

collaboration. The interview data suggest that boundary spanning was lacking and as a

result contested collaboration occurred. One participant reported that:

> at meetings team members spoke in their own specialized
> language and they didn't try to understand each other.

This same participant said he could visibly tell that team members weren't listening to

each other. The participant also commented that:

> it was important that people [team members] leave their own perspectives to complete the project and that never happened. This limited the kind of questions people asked and as a result the right questions were not asked. There was no effort to accommodate each other.

Another participant said that everyone looked at the project from his or her own perspective. A third member said that they could feel a tension with certain people and that this experience was new. This person had worked on multidisciplinary projects before and reported having had no trouble collaborating. The person felt that what this project needed was someone who could communicate and ask the right questions.

One possible explanation for the lack of boundary spanning was that the interdisciplinary star role was not a strong role in this project. A person was identified as filling the role but it was not a strength. The mean effectiveness rating for this person was a 3.25 not a negative rating but not a high rating. If this role had been more effective then some of the communication gaps that emerged may have been avoided since this person incorporates knowledge from various disciplines and bring it to the project.

A weak agent role also contributed to the emergence of contested collaboration. One of the responsibilities of the agent role is to negotiate conflict among members. The agent's mean effectiveness score was also 3.25. The agent, as described above, did take some proactive measures to reduce conflict but, as one respondent indicated, it was not effective because [he/she] did not involve himself/herself directly. Direct involvement may have improved performance.

This lack of direct involvement most likely contributed to the very low responses in questions 8-10. These questions all deal directly with the team's involvement and interaction with management. Question 8 asked whether the ideas and concerns of

team are understood by higher levels in the company to which the mean response was a 2.4 (60% answering 1 or 2). Question 9 asked whether the team receives appropriate recognition from management and the response was a 2.2 mean (60% answering 1 or 2). Question 10 asked whether the team is considered a top performing team and the responses indicated no (mean=1.8, 80% answering 1 or 2). One respondent indicated that there was not an effective interorganizational star role even though a project manager had been named.

The presence of an environmental scanner and strong intratask interactions contributed to technical solutions being described as innovative in question 12. The mean response was a 4.4 with all respondents answering with a 4 or 5. In one department there existed strong working relations which carried over into the project. This enabled the department to work together and get tasks done quickly.

Two last notes with respect to team 1 and project outcomes. The project was deemed useful to the organization (mean=4.0, 80% answering 4 or 5) but proved average in meeting organizational goals (mean=3.0, 40% answering 4 or 5). The startling number was user satisfaction which was negative (mean=2.6, 40% answering 1 or 2, another 40% answering 3). Referring back to the interviews, it appears that a proper needs assessment was not undertaken with the users before the project was begun. One participant observed that the sponsor based the project on strong assumptions made about users information seeking behavior and how they do work. They never explored how and where the users would do work and in the end the system designed was not useful to the users and was discontinued. Again, an interdisciplinary star role would have been useful in this area as well.

Team 2 was different from team 1 in terms of its organization. In team 2 only person #7 had contact with everyone. This person had the title project manager and

assumed several communication roles: interorganizational star, intraorganizational star, agent, interdisciplinary star, and intergroup star. This person had a high level of interaction rating (mean=4.50) and a high effectiveness rating (mean=4.0). Also, each participant was called on to fulfill a variety of roles and to communicate with people outside the organization and so they could complete the project. All the interviews indicate that this was a team that worked well together.

However, question 3 responses indicate that cohesion was not as tight as might be expected (mean=3.2). The question asked whether there was little cohesiveness or group spirit within the team and the majority answered either 4 or 5 (60%). It appears that in spite of an open work atmosphere there were still problems. Responses to question 8 further reveal this. The question asked whether higher levels in the company understood the ideas and concerns of the group. The mean response was 2.8 with 60% answering in the 1,2, or 3 range. This might be linked to the lack of an effective sponsor role. The person associated with the sponsor role received an effectiveness rating of 3.00.

There seemed to be a feeling that the team did not complete its tasks on time as evidenced by question 14 responses. The mean was 3.0 with 60% answering 2 or 3. This may have been the result of what participants called a chronic problem of understaffing. User satisfaction seemed to be low as well (mean=3.0, 40% answering 2). Reasons for this are less clear, as it seems that each staff member encouraged feedback from the necessary outside people and incorporated their suggestions into the project. One staff member reported that their outside contact seemed disinterested in the process and that hampered that portion of the project. This person was also new to the process which also may have impacted the outcomes. For the most part, everyone reported that the process worked well.

Discussion

If this model proves to be accurate then there are broad implications for research into communication roles project teams. Many studies have emerged dealing with the importance of communication in project teams but few have the potential to be developed into strategies that will improve project team performance.

One important implication is that this model can be used in developing communication strategies for project teams. If participants adapt the roles such as agent, interorganizational star or any of the roles identified in the model then this can lead to better information exchange among team members. Each team member is expected to bring information to the group from an area associated with a specific role. Someone adapting an intraorganizational star role will know that they are expected to share with the group important project information.

These strategies can also be used to facilitate interaction and reduce conflict among the team members. This creates an atmosphere that is more receptive to collaboration and innovation. For instance, the model encourages knowledge exploration. If team members are actively encouraged to engage in the three types of knowledge exploration before the project begins, they gain a better perspective on not only the project but the viewpoints of the other team members as well. The less time groups spend resolving personal conflicts, the more time and energy they have to focus on the task assigned them.

Conclusion

This study provides support for Sonnenwald's model. Participants did adapt certain roles that were partially based on their job position but also came out as a natural part of completing the tasks. The results of this study indicate that a strong agent and interdisciplinary star roles are essential to reducing contested collaboration.

An environmental scanner role aids in bring innovative technical solutions to the project team. Brainstorming and technical knowledge are important steps in discovering new solutions and ideas.

I would like to thank all the participants for their time and willingness to share their experiences with me. I would also like to thank Dr. Diane H. Sonnenwald for her generous use of her methodology, her help and enthusiasm for this project and her comments along the way.

References

Achleitner, Herbert, K., & Grover, Robert (1988). Managing in an information-rich environment: Applying information transfer theory to information systems management. *Special Libraries,* Spring 1988, 92-100.

Ancona, D.G. (1990). Outward bound strategies for team survival in an organization. *Academy of Management Journal, 33,* 334-365.

Ancona, D.G., & Caldwell, D.F. (1992). Bridging the boundary: External activity and performance in organizational teams. *Administrative Science Quarterly, 37,* 634-665.

Bystrom, Katriina, (in press). Municipal administrators at work – information needs and seeking (IN&S) in relation to task complexity: A case study amongst Municipal Officials. Department of Information Studies, University of Tempere, Finland.

Mumford, E., & MacDonald, W.B. (1989). *XSEL's Progress: The Continuing Journey of an Expert System.* New York: John Wiley.

Pinto, M.B. & Pinto, J.K. (1990). Project team communication and cross-functional cooperation in new program development. *The Journal of Product Innovation Management. 7*(3), 200-212.

Sonnenwald, D.H. (1995). Contested collaboration: A descriptive model of intergroup communication in information system design. *Information Processes and Management, 31(*60), 859-877.

Sonnenwald, D.H. (1996). Communication roles that support collaboration during the design process. *Design Studies*, *17*(3), 277-301

Sonnenwald, D.H., & Lievrouw, Leah A. (in press) Collaboration during the design process: a case study of communication, information behavior, and project performance. To appear in *Information Seeking in Context,* Reijo Savolainen, Ed. Graham Taylor Publishing.

Ward, J.A. (1995). Project pitfalls. *Information Systems Management.* Winter 1995, 74-76.

Appendix A

Interview Probes

1. Please describe the goals of the project that you worked on?

2. Could you please give me a brief history of the project?

3. How does this project relate to other projects within the organization or how does the project relate to other parts of the organization?

4. How many people worked on the project? How were the participants organized? Is there an informal structure in addition to the formal structure? Was anyone identified as a project manager on this project? How was the project managed?

5. What was your role in the project? What were your tasks? What were the tasks of the different team members?

6. Did any project member do other things in addition to their formal tasks? For example organize social events, mentor other team members, circulate information about related projects or new technology that might be of interest to team members.

7. How long did the project take?

8. What do you feel worked especially well in this project? For example was their an incident that occurred that was very helpful or was a particular interaction helpful.

9. What did not work well in this project?

10. What was the project's timeline?

11. Is this a typical project for either your department or the organization?

12. Did you evaluate any of the team member's performance? If so, how?

13. How was the overall project evaluated?

14. Were there any unusual factors with respect to this project or organization which you felt influenced project team behavior and/or performance?

15. Is there anything else you feel I should know about?

Appendix B. Performance Survey

NAME:_____

Performance Survey

Please answer all the following questions and return this form to Jeffery Alpi, 200 Barnes Street apt 1i, Carrboro, NC 27510. A self addressed stamped envelope is enclosed. Your answers will be kept confidential. Thank you for your participation.

1. Please evaluate your interaction with each team member of (*company name*) project team, excluding yourself, by circling a number between 5 and 1 on the scales below. Please add any person who you interact frequently with about the project

name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor
name	excellent	5 4 3 2 1	poor

2. From your perspective, which two members of the project team have contributed the most to the project (including yourself)? What have been their major contributions.

_____

_____

_____

_____

_____

3. Please evaluate the overall effectiveness of each member of the project team, including yourself, by circling a number between 1 and 5 on the scales below. Please add any person who you interact frequently with about the project.

name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective
name	highly effective	5 4 3 2 1	not effective

4. Please circle the number on the scales below that best describe your feelings about the project team.

I receive appropriate recognition for may accomplishments from team members.	agree strongly	5 4 3 2 1	disagree strongly
Group members are satisfied being part of the team.	agree strongly	5 4 3 2 1	disagree strongly
There is little cohesiveness or group spirit within the team.	agree strongly	5 4 3 2 1	disagree strongly
The team is effective at meeting individual group member needs.	agree strongly	5 4 3 2 1	disagree strongly
Our team's overall performance meets my boss' expectations.	agree strongly	5 4 3 2 1	disagree strongly
Team goals are congruent with organizational goals.	agree strongly	5 4 3 2 1	disagree strongly
It is often hard to figure out just what management expects in terms of our team's performance.	agree strongly	5 4 3 2 1	disagree strongly
The ideas and concerns of our team are understood by higher levels in the company.	agree strongly	5 4 3 2 1	disagree strongly
Our team receives appropriate recognition for our	agree strongly	5 4 3 2 1	disagree strongly

accomplishments from upper management.

Our team is considered a top performing team through out the organization.	agree strongly	5 4 3 2 1	disagree strongly
It is easy for team members to gain the cooperation of others in the organization who can assist the team.	agree strongly	5 4 3 2 1	disagree strongly

5. Please compare this project team to other teams you have been a member of, either in this organization or in other organizations where you have worked, and circle the numbers on the scales below that best describes your opinion about this team.

Technical solutions created by the team are innovative.	agree strongly	5 4 3 2 1	disagree strongly
The team's design and development process is efficient.	agree strongly	5 4 3 2 1	disagree strongly
The team achieves its goals on time and within budget	agree strongly	5 4 3 2 1	disagree strongly
This is a top performing team	agree strongly	5 4 3 2 1	disagree strongly

6. Please circle the number on the scales below that best describe your feelings about the project's outcome.

| This project will be useful to the organization | agree strongly | 5 4 3 2 1 | disagree strongly |

| The project outcome meets our organizational goals | agree strongly | 5 4 3 2 1 | disagree strongly |

| The users are satisfied with the system developed | agree strongly | 5 4 3 2 1 | disagree strongly |

7. Please write any additional comments you have about this team on the back of this form.

Appendix C

Demographic Survey

What is your name?

What is your age?

About how many years of professional experience do you have?

What is your highest level of education?
      A. high school
      B. associate degree
      C. bachelors degree
      D. masters degree
      E. Ph.D. degree
      other:_____

In what discipline was your highest degree?

How long had you worked at your present organization at the time of the project?
      A. less than 3 months
      B. 3-6 months
      C. 7-12 months
      D. 13-18 months
      E. 19-24 months
      F. over 2 years

What was your job title at the time of the project?

How long did you work on the project?
      A. less than a week
      B. 2-4 weeks
      C. 4-8 weeks
      D. 2-3 months
      E. 4-6 months
      F. 7 months- 1 year
      G. more than a year

Approximately how many hours per week did you spend on the project?

Please describe your specific responsibilities on the project.

Appendix D
Means and Standard Deviations for Performance Survey Responses

Team 1

Category	Mean	Standard Deviation	Number
1. I receive appropriate recognition for may accomplishments from team members.	3.00	.7071	5
2. Group members are satisfied being part of the team.	2.6	1.1402	5
3. There is little cohesiveness or group spirit within the team.	4.2	.4472	5
4. The team is effective at meeting individual group member needs.	2.4	.5477	5
5. Our team's overall performance meets my boss' expectations.	3.4	.5477	5
6. Team goals are congruent with organizational goals.	3.4	1.5166	5
7. It is often hard to figure out just what management expects in terms of our team's performance.	3.5	1.2910	4
8. The ideas and concerns of our team are understood by higher levels in the company.	2.4	1.402	5
9. Our team receives appropriate recognition for our accomplishments from upper management.	2.2	1.3038	5
10. Our team is considered a top performing team through out the organization.	1.8	.8367	5

11. It is easy for team members to gain the cooperation of others in the organization who can assist the team.	3.00	.8165	4
12. Technical solutions created by the team are innovative.	4.4	.5477	5
13. The team's design and development process is efficient.	2.6	1.3416	5
14. The team achieves its goals on time and within budget	3.4	1.1402	5
15. This is a top performing team	3.0	1.00	5
16. This project will be useful to the organization	4.0	.7071	5
17. The project outcome meets our organizational goals	3.0	1.4142	5
18. The users are satisfied with the system developed	2.6	1.1402	5

Team 2

Category	Mean	Standard Deviation	Number
I receive appropriate recognition for may accomplishments from team members.	4.00	1.2247	5
Group members are satisfied being part of the team.	4.00	.7071	5
There is little cohesiveness or group spirit within the team.	3.2	1.6432	5
The team is effective at meeting individual group member needs.	2.8	1.4832	5
Our team's overall performance meets my boss' expectations.	3.6	1.1402	5
Team goals are congruent with organizational goals.	3.8	1.0954	5
It is often hard to figure out just what management expects in terms of our team's performance.	2.4	1.5166	5
The ideas and concerns of our team are understood by higher levels in the company.	2.8	1.3038	5
Our team receives appropriate recognition for our accomplishments from upper management.	3.4	1.5166	5
Our team is considered a top performing team through out the organization.	3.75	1.2583	5
It is easy for team members to gain the cooperation of others in the organization who can assist the team.	3.4	1.3416	5

Technical solutions created by the team are innovative.	3.75	.9574	4
The team's design and development process is efficient.	3.6	.5477	5
The team achieves its goals on time and within budget	3.0	1.00	5
This is a top performing team	3.6	.5477	5
This project will be useful to the organization	4.2	.4472	5
The project outcome meets our organizational goals	4.2	.4472	5
The users are satisfied with the system developed	3.00	1.00	5

Mean Comparison