Adapting Communication Structures For Globally-Networked Manufacturing Organizations

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ABSTRACT

The manufacturing environment of the late twentieth century provides new challenges for the modern corporation. The world has become increasingly smaller as technology and other factors evolve to create one marketplace. This business reality also creates global dispersement of capability and capacity. Because of these global realities, management and communication structures must be adapted to facilitate the best use of a company's capabilities. Structures must be identified that will ensure this geographic dispersion does not hinder product development and production.

This thesis explores past research that relates to effective communication in a variety of contexts. It identifies the methods, structures and mechanisms that enable effective communication. This background is used to analyze the current environment at a globally-networked manufacturing organization and identify specific responses to increase the effectiveness of communication.

One of the key insights provided by the organizational analysis is that the focus on communication structures is secondary to the more important aspects of the global organization - purpose, common understanding, common language and emphasis on knowledge transfer. Designing communication structures for global organizations is premature without the understanding of what the global organization is to accomplish and how each site is expected to contribute.

Communication is a process that must be managed. With the wide range of possibilities available, a company limits itself when it does not use both formal and informal structures for communicating. These structures must be reinforced with management systems, such as rewards, information, and measurements.

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Chapter 1: Introduction

The manufacturing environment of the late twentieth century provides new challenges for the modern corporation. The world has become increasingly smaller as technology and other factors evolve to create one marketplace. This business reality also creates global dispersement of capability and capacity. Because of these global realities, management and communication structures must be adapted to facilitate the best use of a company's capabilities. Structures must be identified that will ensure this geographic dispersion does not hinder product development and production. This thesis will address the changing communication needs of a globally-networked manufacturing environment.

The goal of this thesis is to explore a wide range of existing research as it relates to effective communication in a variety of contexts and establish the methods, structures and mechanisms that enable effective communication. This background will then be used to analyze the current environment at a globally-networked manufacturing organization and identify specific responses to increase the effectiveness of their communication.

1.1 Chapter Overviews

Chapter Two: Current Thinking

This chapter provides the background that establishes the importance of communication, communication structures and communication mechanisms. This background is explored as it relates to communication research, how effective teams communicate, what can be learned from the perspective of global companies, how knowledge transfer and learning organization concepts facilitate communication, and the effect of corporate culture on communication.

Chapter Three: Current Possibilities

This chapter takes the characteristics defined in the previous chapter and explores the methods, structures and mechanisms that can be employed within a given company environment.

Chapter Four: The Polaroid Perspective

An internship conducted at the Polaroid Consumer Hardware Division provided the basis to explore the characteristics established in Chapter Two and the structures identified in Chapter Three. This chapter contains the organizational background and current context. A baseline condition was established, needs were identified, and work was started on implementation of change. This chapter concludes with specific recommendations for future actions.

Chapter Five: Summary and Conclusions

This chapter summarizes the thesis and presents conclusions for the broad applications of the mechanisms and structures addressed.

Chapter 2: Current Thinking

No one disputes that the corporate environment of the late 1990s has changed. As the world becomes smaller for companies, they are faced with questions of where to design, where to manufacture, how to distribute and which labor markets are appropriate. As they find answers to these questions, follow-on questions appear. When the corporate environment is spread over the face of the globe, how does a company ensure the communication that occurs between the different sites is effective?

This thesis addresses the spectrum of options open to manufacturing companies as they design their communication mechanisms for dealing with globally dispersed operations. A variety of sources including business and academic research, the internship, anecdotal evidence from the internship company and other work experiences have all contributed to this study. This chapter presents the research background that provides the framework for exploring options available to manufacturing organizations.

The range of research encompasses not just communication structures but includes analysis of teams and effective team environments, global companies, knowledge transfer and learning organization concepts and an understanding of culture and mechanisms for changing culture.

2.1 Communication

It would be an oversimplification to assume that companies, organizations and individuals understand communication because they use it every day. Much has been written about the value of communication and the importance of its effectiveness. But even this focus

doesn't ensure that communication is well understood by those attempting to adapt its use to a new environment.

How communication occurs can be simplified to the following three scenarios:[1]

- One-on-one conversations to share ideas and understanding,
- One-to-many broadcasts--the classic presentation,
- Many-to-one researches to gather overviews, opinions, and data.

These are overlaid with the options for where in an organization these scenarios are played out. Effective communication involves more than the flow of information that moves up and down the hierarchy in traditional organizations. It also requires horizontal communication across departments and inter-organizational boundaries at the peer level, directed to achieve innovation through the concurrent involvement of functional specialists.[2]

The recognition of the purposes and methods of communication offers a first step for building a structure that encourages effective communication. Current research also suggests that there are communication mechanisms that provide the pathways for the purposes of communicating and navigating the organization. These can be either established, formal procedures or informal, subtle methods that occur casually.

Mechanisms that fall within the "formal" include:[3]

- departmentalization - the formal structure that groups activities within organizational units following the principle of division of labor as a mechanism for organizational influence.

- centralization or decentralization - the determination of whether decision-making authority lays in the higher or lower levels of the chain of command.
- normalization and standardization - the extent to which polices, rules, job descriptions, etc., are written down in manuals and other documents, and procedures are established through standard routines.
- planning - the systems and processes (i.e., strategic planning, budgeting, establishment of schedules) that intend to guide and channel the activities and actions of independent units.
- output control - the evaluation of files, records, and reports submitted by the organizational units to corporate management.
- behavioral control - the evaluation based on direct, personal surveillance.

The informal group of mechanisms consists of three kinds:[4]

- relationships that cut across the formal structure - including direct contact among managers of different departments that share a problem, temporary or permanent task forces, teams, committees, integrating roles, integrative departments, etc.
- a network of informal and personal contacts - where informal communication supplements the formal network through corporate meetings and conferences, management trips, personal visits, transfer of managers, etc.
- socialization - the development of an organizational culture through individuals by communicating to them the way of doing things, the decision-making style, and the objectives and values of the company.

One problem involves equating frequent informal contact with transfer of value-adding information. Unless well-planned and reasonably structured, such contact can just be time-consuming and distracting. Reliance on oral communication may promote sloppiness in record keeping, which can lead to extremely costly errors.[5] There is a danger of a general erosion in disciplined communication when, confident of easy access to others because of close proximity, people are tempted to pass along incomplete or inadequate information with the attitude that it can be fixed later.

2.2 Team Building

The importance of information for team success is not to be underestimated. The most effective team environment with the most efficient, technically capable team will accomplish nothing without information and coordination between the team and the outside world. The exploration of what effective teams use for communication structures is a second research path.

The ability of team members to locate and apply relevant information will be critical to the team's success, especially where rapid technological or business changes are taking place.[2] In most firms, designers of teams must rely on some sort of team-building process to create interpersonal trust, shared vision, effective group decision-making, and so on.[6]

The pioneering work of Allen at MIT has evolved a research stream with the underlying premise that communication among project team members and with outsiders stimulates the performance of development teams.[7] Thus, the better members are connected with each other and with key outsiders, the more successful the development process will be.

The results of these early Allen studies highlight the importance of external communication to success. Specifically, these studies observed the presence of *gatekeepers,* high-performing individuals who also communicated more often overall and with people outside their specialty. These gatekeepers brought information into the organization and dispersed it to fellow team members. [7]

Ancona and Caldwell further developed a typology of external communication or "boundary-spanning" behaviors found in effective teams.

- Ambassador activities consisted of political activities such as lobbying for support and resources, buffering the team from outside pressure and engaging in managing impressions of the team.
- Task coordination involved coordination of technical or design issues.
- Scouting consisted of general scanning of other activities within the organization for useful information.
- Guard activities were those intended to avoid the external release of proprietary information.

They subsequently identified group-level strategies employed by product development teams in their sample. One of this study's interesting findings was that the frequency of external communications was not a significant predictor of team performance. Rather, communication strategy was germane. The most successful product development teams engaged in a comprehensive external communication strategy, combining ambassador and task-coordination behaviors that helped these teams to secure resources, gain task-related information, and so enhance success. In contrast, less successful product development teams used strategies involving fewer types of external communication activities and less overall external communication. Thus, more effective teams engaged in both political and task-oriented external communications, suggesting that product development teams must

attend not only to the frequency of external communication, but also to the nature of that interaction.

One clear pattern was that all successful teams had high levels of ambassadorial activity. The cases also suggest that task-coordinator activity plays a pivotal role in team success. In all cases reviewed, successful teams were deeply engaged in communication with outsiders. Probing teams actively engage outsiders; the highest performers as rated by top management one year after team formation were the probing teams, who combined upward persuasion with lateral feedback seeking coordination and testing of solutions.[8]

Overall, two themes emerge in the literature. One, an information-processing view, emphasizes that frequent and appropriately structured task communication (both internal and external) leads to more comprehensive and varied information flow to team members and, thus, to higher performing development processes. The second, a resource dependent view, emphasizes that frequent ambassadorial communication (typically external) leads to higher performing development processes by increasing resources (e.g., budget, personnel, equipment) available to the team.[9]

Process performance is highest when there is moderate levels of team tenure - team members have been together long enough to be comfortable and not so long to build complacency. They are most likely to engage in both extensive internal and external communication and, therefore, to receive maximum benefit.[9]

Researchers, consultants and corporate executives alike have long agreed that collocation is one of the critical factors in the successful management of new product development. Tom Allen's 1977 study of communication patterns in R&D labs inaugurated a now almost universal view that physical proximity is beneficial to the outcome of development

projects.[7] However, recent experiences in successful product development by globally distributed teams suggest that the value of collocation may be greatly exaggerated, possibly leading practitioners to overlook other underlying factors that are more critical to project success.[5]

Collocation is increasingly becoming less feasible. Its purported benefits often do not materialize and other less costly communication mechanisms and managerial processes can provide adequate coordination and integration when the development partners are geographically dispersed. Project managers should seriously consider alternative means of communication and integration before going through the expense and trouble of collocating project team members. Second, if any subset of project team members is already collocated, project managers should not take for granted that appropriate levels of communication and coordination will indeed take place.[5]

Even when all entities involved in the development process belong to the same company, the growing complexity and sophistication of many products would rule out the physical proximity of the many engineering and design subgroups whose input must be effectively integrated into a complete system. Unless organizational, attitudinal, and strategic differences between separate functional areas or organizational units are recognized and dealt with, collocation by itself offers minor value.[5]

Dealing with the underlying causes of cross-functional disharmony - lack of trust, absence of shared goals, lack of empathy, and ignorance about the concerns of other functional areas - requires more than just putting everyone under the same roof. At its best, collocation is but one factor in an array of approaches that can help achieve effective integration and communication.

2.3 Global Companies

A third research area looks at companies with globally dispersed operations to identify unique characteristics that enhance communication. Today's global competitive strategies are complex and expensive and they are often administered best by a transnational team whose talents have been carefully blended.[10] But keeping a company strategically agile while still coordinating its activities across divisions, even continents, means eliminating parochialism, improving communication, and weaving the decision-making process into the company's social fabric.[11]

Bartlett and Ghoshal describe the implementation approach of the modern global company as "centralizing some resources at home, some abroad, and yet distributing other activities among its many national operations."[12] This results in a complex configuration of assets and capabilities. A complex configuration is accompanied by a similarly complex pattern of coordinating the associated flow of parts, components, finished goods, funds, skills, intelligence, ideas, and knowledge.

Due to the complexity of the company configuration and coordination requirements, a firm must initially understand its distinctive competence(s) and then build its global strategy around the location-specific and firm-specific advantages developed through the functional activities associated with that distinctive competence.[13]

For Porter a global strategy means strategically configuring value-adding activities around the globe. Globally operating companies increasingly locate activities where they can be performed best from a worldwide perspective. This implies that all value-adding activities do not necessarily have to be performed at every location.[14]

Bartlett and Ghoshal derive that perhaps the most difficult task for global organizations is to coordinate the voluminous flow of strategic information and proprietary knowledge required to operate a transnational organization.[15] Porter emphasized the competitive advantages that arise out of a systematic accumulation of knowledge: "The ability to accumulate and transfer . . . knowledge among units is a potent advantage of the global competitor over domestic or country-centered competitors".[16] To evaluate decisions from a global perspective therefore requires a systematic effort to collect and/or integrate relevant information from different locations.

Overall the transition to a global network involves moving from an organization based on local autonomy to one based on specialized and allocated roles, which requires the building of linkages, the breaking down of embedded power structures and the introduction of new mechanisms for coordinating and managing dispersed activities.[17]

Effective global teams directly confront the multicultural issues that inevitably arise in the group and search for ways to resolve them. Another use for global teams is to contribute to organizational learning. Teams whose main contribution is learning are expected to bring together knowledge from various parts of the company, transfer technology, and spread innovations throughout the firm.[18]

The worldwide diffusion of technologies, knowledge and information contrasts with the traditional economics argument, which said that there are substantial differences between costs of communication incurred in transferring knowledge within a nation and those incurred in transferring knowledge across borders.[19]

2.4 Learning organizations

A fourth research area identifies characteristics associated with organizational learning and how that learning is shared within a company. The implicit logic of a large part of the literature on organizational learning relies on the contention that organizational learning exceeds the sum of individual processes and thus provides additional benefit to the organization, e.g., in terms of innovations, synergies or efficiency.[20] But the learning culture must be built on the assumption that communication and information are central to organizational well-being. This culture must therefore create a multichannel communication system that allows everyone to connect with everyone else. It must also contain a core shared assumption that the appropriate way for humans to behave is to be proactive problem solvers and learners.[21]

Duplicative innovation may be pursued with teams in different locations addressing complex problems utilizing different methodologies. The result is innovation that is not only adaptive to local environments, but also provides for the organization multiple sources of learning that may result in integrative development based on capturing "the best" from each site. This enhances the organization's strategic flexibility and reduces its dependence on single facilities. However, essential to the process is leveraging organizational learning throughout the entire international network, so that the resulting innovation may be maximally exploited. This is why global coordination of innovation would conceivably accompany this configuration as it allows local learning to benefit the total organization. Organizations must be careful that this process doesn't result in expensive and potentially wasteful coordination as extensive integration is necessary to link innovation globally.[13]

2.5 Culture

A final research topic explores the role of corporate culture and its influence on communication. Cultures basically spring from three sources:[22]

- the beliefs, values, and assumptions of founders of organizations;
- the learning experiences of group members as their organization evolves, and
- new beliefs, values, and assumptions brought in by new members and leaders.

One of the most powerful mechanisms that founders, leaders, managers, or even colleagues have available for communicating what they believe in or care about is what they systematically pay attention to. This can mean anything from what they notice and comment on to what they measure, control, reward, and in other ways systematically deal with.[23] Table 1 defines primary and secondary mechanisms that signal leaders' emotional commitment to certain actions.

Organizations must create processes that first of all acknowledge the problem of cross-functional communication and then facilitate a level of mutual understanding across subcultural boundaries.[24] However, the analysis of organizational culture has opened the perspective for cross-border influences of culture, resulting in the realization that culture can actually make certain structures and processes in different countries more similar.[19] Within a global company, corporate culture can serve as a unifying influence and as a counter to national cultural influences.

Primary Embedding Mechanisms	Secondary Articulation and Reinforcing Mechanisms
What leaders pay attention to, measure, control on a regular basis	Organizational design and structure
How leaders react to critical incidents and organizational crisis	Organizational systems and procedures
Observed criteria by which leaders allocate scarce resources	Organizational rites and rituals
Deliberate role modeling, teaching, and coaching	Design of physical space, facades, and buildings
Observed criteria by which leaders allocate rewards and status	Stories, legends, and myths about people and events
Observed criteria by which leaders recruit, select, promote, retire, and excommunicate organizational members	Formal statements of organizational philosophy, values and creed

Table 1. Culture-Embedding Mechanisms[25]

The development of a healthy group process must take into account five major factors reflecting national and corporate cultures: (1) degree of similarity among the cultural norms of the individuals of the team, (2) extent to which such norms are manifested in the group, (3) level of fluency in the common language used by the team, (4) communication styles and expectations of what constitutes effective group behavior, and (5) management style of the team leader.[26]

2.6 Summary

The prior research identified in this chapter demonstrates the wide variety of research available to help manufacturing companies think about their communication structures in a globally dispersed environment. Such companies would be remiss if they ignored the information on communication structures, effective teams, global organizations, learning organizations or the effects of corporate culture on communication.

The research on communication structures defines the basic functions of communication and highlights the availability of both formal and informal mechanisms. Analysis of effective team performances offers the insight that team communication is built on trust and shared visions. It further points out that effective teams contain external communication to other areas of the organization. This external communication is multi-purpose - ambassadorial, coordinating, scouting and guarding. Communication strategy is more important than frequency. Collocation has been effective but is increasingly not possible for companies with widely dispersed operations.

Global organizations ensure communication by considering the competencies of each location and building a strategy that takes advantage of them. The coordination of information and knowledge is difficult but necessary. Recognition and resolution of multicultural differences are other characteristics of effective global organizations. These organizations also acknowledge and accept their responsibility to add to the organizational learning by transferring knowledge from the various parts of the company.

Implicit in the research on learning organizations is the contention that organization learning exceeds the sum of individuals learning and provides additional benefits in terms of innovations, synergies and efficiency. The final research area, company culture, emphasizes the importance the culture plays in whether communication is valued or not. It also considers the impact of differences between national cultures and corporate cultures on global organizations.

Chapter 3: Current Implementation Possibilities

As the corporate environment changes, moving from centralized to dispersed operations, an assessment of the current communication status, team environment, organizational learning mechanisms and culture is required. The challenge for the globally dispersed company is to establish methods and structures that will fit the specific company environment and ensure that the information flow is effective within the corporate culture. The research areas explored in Chapter Two provide a starting point. Additional prior research also suggests that the structures and systems discussed in this chapter offer some alternatives for companies. The choices made can then be adapted and tailored for a particular company's situation.

3.1 Communication Structures

Prior research emphasizes the need to conceive complex organizations as networks of formal and informal relationships and interactions. Formal management processes and systems and the informal social system are two underused interfunctional coordination approaches. Formal management processes and systems include everything a company can formally do outside of the organization structure. Formal interactions can be pursued, for instance, by planning meetings and coordination groups which provide numerous opportunities to exchange views, perceptions on strategic issues and information. Informal interactions differ from formal interactions; the latter are explicitly intended by management while the former evolve as different areas of the organization are exposed to one another. Formal interactions can thus be conceived as the prescribed communication structure whereas informal interactions represent emergent communication processes.[20]

The strategy development process is the foundation upon which to build an appropriate organizational structure and management processes.[27] The organization's structure and design can be used to reinforce leader assumptions but is rarely an accurate initial basis for embedding these assumptions because structure can usually be interpreted by the employees in a number of different ways.[28] An organization structure based on sequential transfer of responsibility, which organizes people into functional or product hierarchies, fragments the sense of responsibility for overall goals. This fragmented responsibility is divisive and eventually grinds the organization to a halt.[2]

If the organization structure is the beginning point, then companies must understand the differences in organization design between multiple sites and address them. The company certainly has the prerogative to design organization structures to fit the local environment but must make these decisions fully aware of the strain this places on communication between sites when there are differences. If functional and product organizations have different titles, then there are probably different responsibilities and the search for similarities between sites becomes more complex. Agreement on organizational design, titles and responsibilities is a first step to facilitating communication among dispersed organizations.

The beginning of functional coordination lies in the creation of a unified, holistic strategy ("marching orders" and priorities). It is unified because all departments have contributed to its development; it is holistic because it describes each role. Each department understands its role in the strategy and how that role relates to its sibling functions and other sites.[29]

This agreement carries further into job design, identification of standard job processes and roles and responsibilities. If there has been a conscious decision to discuss how certain

responsibilities will be performed between sites, then the communication of what has been accomplished, what is in work, what needs to be done starts from this common understanding. This eliminates the question, during the information flow, about exactly what is meant by certain activities. This also encourages the exchange of new information about the agreed responsibilities and improved ways to execute the responsibilities - the establishment of current best practice and the creation of a framework for future improvements.

Task forces and committees are other management processes related to the organization structure. A task force tends to be temporary while a committee can be permanent. Both encourage people from different parts of the organization to come together and jointly solve problems or take advantage of an opportunity.

The goal-setting process and the systems for measuring performance and allocating rewards are closely related. The explicit differences in the goal-setting process, measurement system, and rewards system are much easier to identify than other subtle, more cultural aspects of an organization. At the same time, the goal-setting process, measurement system, and rewards system tend to make the culture and tone of the organization more tangible by emphasizing either cross-functional goals and rewards, or single department goals and rewards. To the extent that the goals and rewards are interfunctional, they tend to foster coordination across departments.[30]

Another formal management process that contributes to interfunctional coordination is career paths. In many companies an individual moves from function to function, gaining a good deal of background and perspective along the way. In addition, someone who has worked in functions will have "political connections" there. People in these career paths can help turn a formal system into an effective informal social network.[31]

Making use of the informal social system can also be helpful. It is an old and effective method of encouraging an organization to work together. Geography is important to the informal social system. By and large, people tend to work most closely with those who are near them. If one thinks carefully and creatively, one can identify a wide range of opportunities for such informal team-building. If the Sales Vice President and Manufacturing Vice President go on a series of plant tours and customer visits together, they will tend to work better together over time. In addition, the symbolism is powerful. Their subordinates will understand that it is acceptable and admirable to work cross-functionally.[32]

Frequent interactions within these informal networks also engender commitment to communicate information or an issue since the addressee is known personally. By communicating across organizational and national boundaries, these persons are important linking mechanisms for the integrated global organization.[20] Within global companies, benchmarking and the transfer of best practices are also important processes which exchange information within the firm and between sites.[19]

Recognizing that both formal and informal structures are necessary, companies with global operations must make a conscious effort to identify and use these structures to enhance communication. Informally, encouraging employees who share job titles and responsibilities to also share information between company sites results in building the "informal" network. Establishing "buddies" between sites extends the reach of the formal organizational agreements about job designs, responsibilities and processes. Offering formal opportunities for information exchange between sites such as quarterly meetings also extends the informal networks. Establishing processes for information exchange, such as formal reports of current activities, identifies not only what is going on but who is

involved. This offers another method of information exchange and further encourages the informal interaction between individuals with mutual interests.

Designating individuals as focal points at all company sites in areas where a company wants to provide special focus, such as product areas or company initiatives, encourages further communication on significant issues. An easily identifiable presence establishes the importance of the activity and eases the search for information. These focal points become product or initiative champions. Carrying the concept further, they become the *gatekeepers* at company sites for certain kinds of information flow.

From a global perspective, processes in each location contribute a part to the total regardless of whether the elements are completely concentrated at these locations or dispersed. A consequence of the dispersion of activities is that there is not automatically a comprehensive knowledge of the internal and external situation of the global organization. The problem is not to generate data, but to determine what information is relevant.[20]

3.2 Management Systems

As communication structures are determined and established, supporting management systems must be put in place. One key to effective structures is the measurement of the usefulness of the structure. Another key is having an identified way to change the structure when the measurement indicates the need for improvement.

The information system is one of the most important tools we have to cope with the increasing complexity of customer relationships, functional coordination and the vast growth in transaction volume. It is also a powerful communications tool and a potent aid in managing important interfunctional activities. Communication methods like shared

databases using computer networks, electronic mail, voice mail, and teleconferencing all reduce the barriers of distance, time, and organizational and geographic boundaries.[33] But the prescribed efforts of securing a far-reaching informational support as part of information systems have to be complemented by structures and means that support the ad-hoc and informal transfer of strategic information.[20]

Promotions and hiring should be based not just on functional competence but on an ability to coordinate and cooperate across jurisdictional boundaries and to engender such behavior from subordinates. In essence, the promotion process becomes part of the formal reward system. If a company makes a conscious effort to develop people with interfunctional perspectives, it will have promotable managers with broad views and interfunctional experience. At a minimum, the people an organization hires must be competent in their own functions. If they are not, the organization will suffer interjurisdictional coordination problems because people coordinate best when those they coordinate with are able and respected.[34]

It is important for managers to construct a reward system that recognizes the tangible results of networking.[2] If activity reports are the established method for providing status information and not everyone provides their status, then an adjustment must be made to non-participants' rewards and also to the structure of the report. Is the format difficult; is the timing such that it conflicts with other assignments; are there adjustments that can be made that make it easier to comply with the requirement? If the gatekeeper role is important to encourage communication, then all job descriptions should include this activity as part of the identified responsibilities and each employee's performance evaluation should include this in the assessment.

If companies want individuals between sites to communicate, then they must measure the effectiveness of the communication and make adjustments to the structures.

3.3 Technology

The communication structures and systems can be enhanced with the use of technology. It is hard to conceive of a company in the 1990s not using voice mail, electronic mail and video-conferencing. The availability and judicious use of these technologies ensure that communication between different company sites can occur without having to synchronize time zones and individuals' availability. Members must agree, however, on how the use of these technologies should be coordinated and prioritized.

Some companies capitalize on differences across time zones to accelerate the product development process. With developers in many global locations, the results of each day's work can be transmitted electronically to the group in the next time zone. The result is a work day that uses all 24 hours. One challenge for companies who employ this technique is the identification of unique and transferable responsibilities. Identification and prioritization of communications mechanisms used for coordination is essential to success.

The expansion and use of computer systems beyond electronic mail also provides further communication enhancements. Shared data files, electronic designs, troubleshooting databases all offer opportunities to share information between sites and organizations. Glaxo-Wellcome's medical R&D teams share a database for clinical-trial information. Kodak's Photo CD Launch Team shared access to databases that contained information about customers, distributors and other parties.[35]

Decision support systems, *groupware*, such as group scheduling, group authoring, real-time conferencing, and project management will be relied on more heavily in the future as this technology becomes more sophisticated and team members are more comfortable with these decision aids. The use of the Internet allows global information availability for those both in and outside of companies. Many companies have provided access to the Internet for universally available information and established company Intranets that mirror the structure of the Internet but have limited access to company information. The important aspect of using technology to enhance communication is the analysis of information needs and then the decision about which technologies appropriately satisfy those needs.

Chapter 4: The Polaroid Perspective

This chapter provides an overview of the internship conducted at the Polaroid Corporation's Consumer Hardware Division in Norwood, Massachusetts. This chapter will present the background and current situation as it existed in Norwood from mid 1996 until the end of the year. The communication characteristics and structures presented in the two previous chapters will be used to analyze the interactions between Norwood and their companion site located in the Vale of Leven, Scotland (the Vale). This chapter will conclude with some general results of the internship and recommendations for follow-up actions.

4.1 Background

Instant camera assembly in Norwood dates to the mid 1970s when Polaroid introduced the SX-70 model. Prior to this, camera production had been contracted to external producers and Polaroid concentrated on the production of the instant film formats that were used by these cameras. Even today, the attitude that cameras are "film burners" can be traced to these early days.

As markets developed outside the United States, camera assembly was expanded to the Vale of Leven, Scotland and in the early 1990s to China, Russia and finally India. These expansions also sought to take advantage of low cost labor markets or relief from import duties with local manufacturing. Figure 1 summarizes production volumes at each site as Polaroid expanded its camera manufacturing network.

Camera design has traditionally been completed only in Massachusetts. As a new product development was starting, personnel were cycled from the camera assembly production site in Norwood to Cambridge where the hardware designers resided. These production

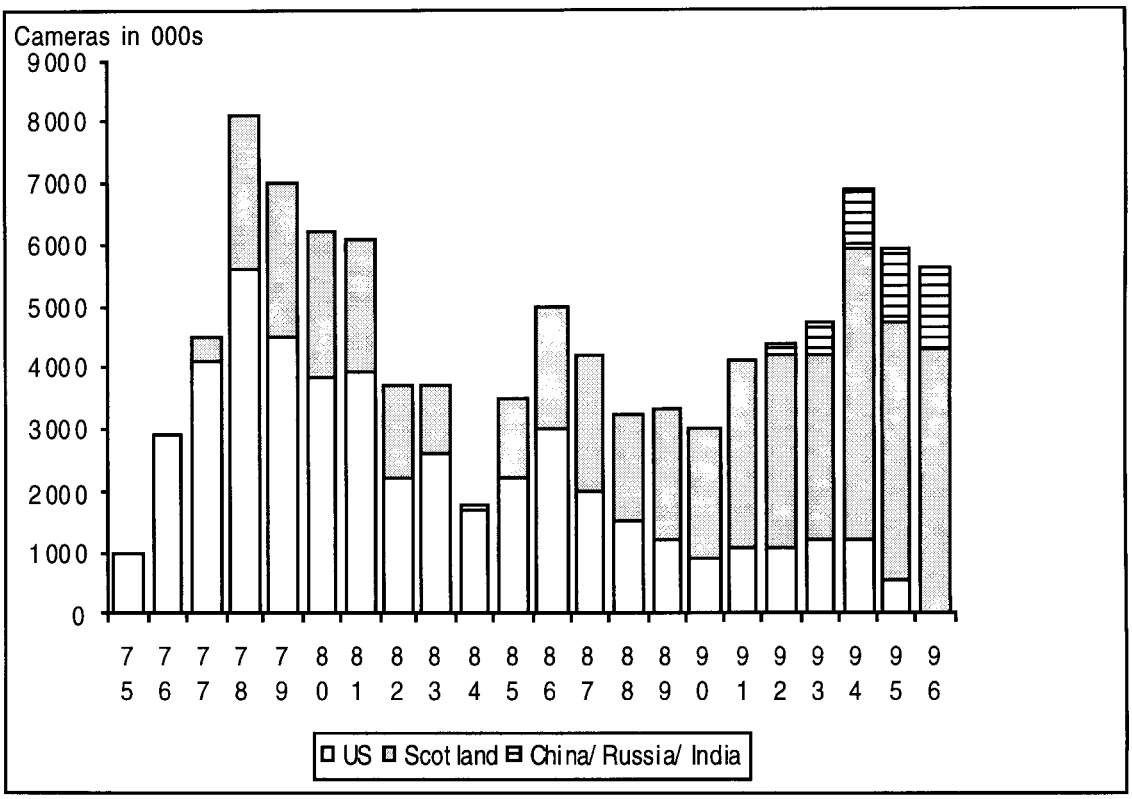

Figure 1. Polaroid Production Volume by Location

personnel would *disappear* from production for the development cycle, arrive back in Norwood as the new product was ready for manufacturing pilots and then transition with the product into production. The *old* product would then transition from Norwood to the Vale of Leven as the stable product; the production personnel from Norwood who had been involved with the stable product would move to the next new development program. This cycle was typically every two to three years. The success of this process is difficult to measure because of the monopolistic position in instant photography that Polaroid held during this time. Personnel from Norwood were dedicated to the *new* product and there

was no measurement of the pilot-to-production transition or the timeliness of problem resolution.

From the early 1990s through mid 1996, Polaroid used a development model where product development teams consisting of designers and manufacturing representatives concurrently defined the camera features, the design and the manufacturing processes. As the design stabilized, a series of pilots were completed - first engineering pilots where camera viability and capability were proven and then manufacturing pilots that proved the manufacturability of the product. These pilots involved numerous changes to the design as problems were identified. After these pilots were completed, the camera was tested, approved for sale and manufacturing started. The model involved two phases; *development*, activities through the Approval for Sale, and *inception*, activities associated with manufacturing until the target production rate had been achieved. After completion of the inception phase, a camera was considered in production.

This development model implied a series of unique and identifiable decision points as the design moved from a concept to reality. The actual situation is that this process is a continuum. Very rarely can you find the results of any of the decision points.

With the advent of this model for product development, designers were collocated with production personnel in Norwood and the Joshua camera designed in the early 1990s was considered (within Polaroid) a benchmark for concurrent development and integrated product teams. Unfortunately, despite the new process model, the product did not have the anticipated market success.

The Vale's initial inception experience involved the enhancement of an existing camera product designed in Norwood and then transferred to the Vale. A few units were produced

in Norwood but the *inception* phase was split between Norwood and the Vale. This experience at the Vale was not considered very successful - a postmortem lessons-learned memo offered suggestions for changes to avoid some of these first mistakes. The memo was circulated at Norwood but systematic changes weren't implemented as a result.

The pattern of camera design being completed only by Polaroid designers was also changing. Because of schedule problems with the Joshua enhancement development cycle, Polaroid contracted outside design firms for small restyle programs for the first time. They initially used a local Massachusetts firm and then chose a design firm located in London because of proximity to the Vale site. Norwood was very busy with Joshua development, production and enhancements in this time period and, for the first time, the Vale was responsible for the entire *inception* phase of a product. There is little formal documentation of the results of this experience but the lack of major problems is attributed to the low production rate and the minor changes made to the product.

4.2 Current situation

The Joshua camera introduction did not go well. The product was very late to the market and the marketing forecast wasn't very accurate. Consequently, the product never lived up to expectations and manufacturing production processes had been designed for a production volume that never materialized.

In early 1996, all camera production in Norwood was suspended and Joshua was canceled. These were drastic steps taken by a new CEO and management staff in an attempt to gain control of their camera assembly costs and camera development process. The current expectation of management is that the product development cycles for all Polaroid products will be greatly accelerated - products will get to market faster, ideas will be many, fewer

will become concepts, some prototypes will follow and actual products that don't meet expectations will be abandoned quickly. This is a major paradigm shift for Polaroid where the culture had been one of expecting each product to be technically excellent in all aspects before market introduction and once a product got to the market, it would be very successful.

The changing camera development process is also an adaptation of the product development model that included *development* and *inception*. At this point, it is unclear how the series of pilots and evolution to production will be completed. The small restyle program in progress through 1996 is a combination of in-house and outside designers, Manufacturing support from the Vale with some personnel in Norwood used as local support, pilots planned for completion in the Vale, and initial production start-up scheduled at the Vale.

Another factor affecting the relationship between Norwood and the Vale is the level of support available in Norwood. Employee severance programs throughout 1996 left few employees with actual camera assembly or product development experience. The severance programs were very successful - people left and left quickly with almost no transition. Knowledge transfer was not a priority. Years of camera development and production experience were lost because of the swiftness of their departures.

As of mid 1996, there were a number of new products in the idea stage. These new products were using a new core development team structure called the Triumvirate. This core team is composed of Development, Marketing and Manufacturing representatives. Each of the core team members leads a team made up of more representatives from their functional organizations. Figure 2 shows this new team structure.

4.3 Assessment of the Current Norwood/Vale Relationship

This section will discuss the initial work done during the internship. This assessment established the relationship between the Manufacturing organizations at the two sites. It served as the background used to define the baseline of the current relationship on which discussions about future actions were based.

With all the changes in their environment described in the last section, the Manufacturing organization located in Norwood realized that future product inceptions would not follow the traditional model. This realization actually formed during 1995 when Householder's

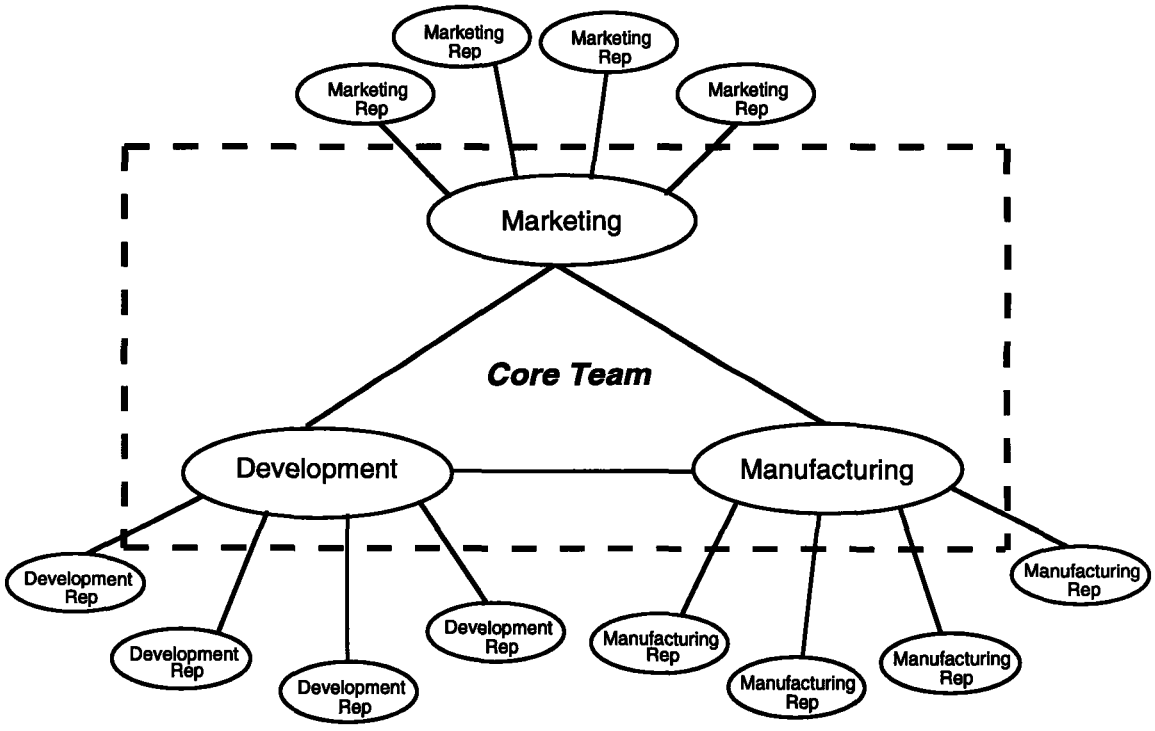

Figure 2. Polaroid New Product Development Triumvirate

Leaders for Manufacturing internship focused on a changing inception model and how to adapt to changes in the manufacturing network.[36] Unfortunately, only a year later, the

environment had changed again. With the Norwood manufacturing future in question, the development model in transition and experienced personnel at a minimum, Norwood's Manufacturing organization wanted to focus on their interactions with the Vale and how to best facilitate communication between these sites.

The reality was that no longer would the Vale be just the recipient of stable products. They might be the lead site for all activities of restyle-type programs; they might be the Manufacturing representative of the Triumvirate; they might be the site for pilots. Obviously, these would be new roles for the Vale and new responsibilities for Norwood personnel with respect to these Vale roles. There was no plan to collocate Vale personnel at Norwood with the Development and Manufacturing organizations. This placed new constraints on the communication structures between these sites.

4.3.1 Restyle Meetings

Early in the internship, there were a series of meetings scheduled in Norwood to discuss the current restyle program and bring the post-severance participants up-to-date on this program's progress. This offered a wonderful opportunity to meet the principals from both Norwood and the Vale, observe them in action, discover what was involved in the restyle program and see what was important to each of the players. Participants included representatives from Norwood Development, the outside design contractor, Norwood Manufacturing, the Norwood Plant Manager, the Vale Plant Manager and the Vale Program Managers. Also included were a number of participants who had been brought in by each of these organizations. The announced reason for the extra participants was to bring their expertise to this restyle program because of their past program experience, but it soon became obvious that they were there to support different organizational positions that would surface over the course of the meetings.

The restyle meetings were interesting because they provided a starting point for understanding the organizational and site interactions. This restyle team was not a team that had clearly defined the roles of each of the participants or sites. There were clear controversies about who had responsibility for design - the in-house designers or the outside contractor; who represented Manufacturing - the Norwood Manufacturing personnel or the Vale participants; where the pilots would be performed; who was responsible for choosing suppliers and where these suppliers should be located. These uncertainties weren't surprising given the recent organizational changes and the suddenness of the severance program departures. What was more surprising was that these controversies weren't resolved during the course of the meetings. This would be a recurring theme for observing interactions between Norwood and Vale personnel. The hard questions would be asked, discussions would present the differing viewpoints and then move on without clear resolution.

4.3.2 Norwood and Vale of Leven Interviews

At this same time, interviews with the Norwood Plant Manager's staff provided a starting point for understanding the diverse responsibilities of the Norwood site. Norwood had some molding manufacturing for optical lenses used by Polaroid products (Optics Production), responsibility for selling these same molding capabilities to outside customers (OEM), manufacturing development program support (Manufacturing), on-going product support (Continuing Engineering), materials management support for the Norwood site (Materials), and site support functions (Plant Engineering, Human Resources, Information Systems). Later, interviews at the Vale would identify that their Manufacturing, Continuing Engineering and Materials were counterpart organizations, at least in name. The relationship with their Norwood peers was not well defined and the responsibilities between the two sites shared some overlap but not clear alignment. With the exception of

Materials, there had been no attempt to define the common processes, skills or responsibilities of the organizations at each of these sites.

These initial observations and interviews served as a starting point for gathering data from Norwood and the Vale to establish the current status of communication between the sites. Areas of interest were past interactions between the sites during product development, how product transitions from Norwood to the Vale had been handled and what was being done with the current new product development activities and the small restyle program in progress.

During the course of the early days of the internship, interviews were conducted with personnel located in Norwood who had past product development experience, who had production transition experience, or who were currently assigned to new product development core teams. Each of these interviewees was asked to identify their counterpart at the Vale if they knew who they were, identify the organization they had most likely worked with in the past and who, if anybody, their current contacts were.

The initial data from Norwood was used to establish a Norwood baseline definition of the relationship with the Vale. It also established the preliminary contact list at the Vale. The data from the Norwood interviews were then reviewed with the interviewees' management to establish and verify the general themes that were recurring throughout the interviews.

As a follow-up to the Norwood interviews, interviews were conducted in the Vale with personnel who had been identified by Norwood interviewees, personnel who were identified by Vale management with similar experiences as those interviewed at Norwood and the Vale Plant Manager's staff. These interviews served to define the current relationship between Norwood and the Vale from the Vale's perspective, a Vale baseline.

4.4 Communication Baseline

"They took our jobs." . . . Norwood interviewee

"We can't raise our hand and say we have a problem." . . . Vale interviewee

As would be expected, there were areas of agreement between the two sites and there were areas of disagreement or misunderstanding. There were also some recurring conditions that were apparent from the interviews. This section discusses these. The following section will then describe how the understanding gained from this analysis was used to establish what the communication needs are between the two sites.

The overwhelming sentiments are best summarized by the quotes above. Norwood felt that the camera assembly shutdown was because the Vale had taken the production away - they wanted the chance through the new development activities to prove that they were still a value-added organization and that they possessed unique skills and experience. The Vale expressed the feeling that they were viewed as uncreative and not capable of successfully completing an inception program, and they wanted the opportunity to prove that this wasn't the case.

4.4.1 Agreements

Interviewees at both sites agreed that given the current organization structure, process discipline should be established that included how tasks common to the two sites would be completed and how best practice could be shared to allow continuous improvement as one site discovered a better way.

Establishing common measurements was another area of agreement. Interviewees identified that the past missions of Norwood and the Vale had been very different. Norwood was expected to "shake the product out and get it stabilized" so that the product could be transitioned to the Vale and the Vale could "get to rate and assemble cameras in a volume production environment". If the interactions between Norwood and the Vale had now shifted to the product development cycle, then the common measurements should focus on how well that interaction occurred.

4.4.2 Differences

Norwood and the Vale held very different ideas about the roles and responsibilities of the two Manufacturing organizations, what the organizational vision should be and how the organization should be staffed between the two sites. There was also a fundamental difference in the way the two sites defined manufacturability. For Norwood, manufacturability meant assuring that the product design could be made. For the Vale, manufacturability meant not only could the product be made, but that it could be made at the rates planned for volume production. These were differences that could be resolved. What was important was that even though both sites recognized they held joint responsibilities and that the nature of their interactions had changed, neither had initiated a discussion about what the ramifications of having differences were.

4.4.3 Other Results

The identified lack of communication was not unexpected given the other conditions that were apparent from the interviews. Polaroid has a corporate culture that relies on personal relationships to get the job done. If the personnel involved in the past left during the severance program, then the personal relationships didn't exist to start the communication.

The new staff were all trying to understand the new product development process and had not yet taken the time to figure out who their counterpart was at the other site.

Polaroid has relied on the informal organization for almost all communication and has an aversion to any kind of bureaucracy. This is manifested in very few formal processes and procedures for completing work. Processes and procedures that are formalized are implemented in a very informal manner and are usually viewed as guidelines rather than imperatives. The informal organization didn't have any established method for dealing with the differences between Norwood and the Vale and therefore they weren't addressed.

The informal nature of the organization and the lack of processes and procedures also manifested itself in a lack of documentation. Very little documentation describing past experiences during product development programs exists. The lack of documentation was further exacerbated by the severance program when much of the documentation that did exist was purged as the offices were vacated.

All of these conditions created an environment where it was very hard to establish what had been done in the past, what had been learned from those past experiences, who the new participants were and what would be the roles of Norwood and the Vale.

4.5 Identification of Communication Needs

Using the baseline definition of the relationship defined during the interviews and the research and structures discussed in Chapters Two and Three, areas that required work between Norwood and the Vale were identified. This initial work would serve as the foundation to address the communication possibilities. Before communication structures and paths could be established, there were some basic understandings required.

A common agreement between Norwood and the Vale was important on the organizational view. This would be the cornerstone for the work to follow. This organizational view would establish:

- what roles and responsibilities were included,
- specific tasks to be performed,
- common processes to be used,
- how processes would be changed,
- the core competencies the organization currently possesses,
- the competencies needed for the future,
- skills required by personnel in the organization,
- how work would be divided between the two sites,
- how personnel assignments would be made,
- how work would transition between the two sites.

It was proposed that completing and implementing one organization would allow Manufacturing, whether it was Norwood or the Vale, to appear as one organization with respect to the other core team members. This would eliminate the *playing one side against the other* (Norwood versus the Vale) observed in the early restyle meetings.

It had been agreed that the two sites viewed each other in very different lights. The expectations and measurements had been distinctly different but nothing had been done to establish common expectations. To further the understanding between sites, effort needed to be expended on team building. Once organizational agreements were reached as a result of the initial activity, the agreements needed to permeate the rest of the organization. Time spent establishing a common understanding and language would be the start of the

implementation of a new organizational view. This team building was also important because of the culture's reliance on relationships and the informal organization.

The work of establishing a common understanding should also address the range of product development activities that can be expected in the future. History had shown that products came in a wide variety - developed from scratch (something brand new that hadn't been done before), major redesigns (addition of new features and styling incorporated together) or restyles (product is given a new look but the technology remains constant). Establishing operational procedures for each of these possibilities before they were pending would save time and effort later.

Specific communication structures that addressed the organization, development situations, and cultural requirements would come next. When this work was completed, then common measurements that focused on the right expectations could be established. Finally the discipline to constantly test the agreements and adjust should follow. This focus on common activities, processes, and experiences allows the gradual buildup of a knowledge base where organizational learning from both sites is systematically collected and shared.

There was also a need to understand the Vale production environment and its impact on the product development process. The value of including Manufacturing as a member of the Triumvirate is the production and manufacturability expertise they can share with the team. If the Manufacturing representatives do not have an understanding of the current production environment at the Vale, this value is diminished. Because the Vale is a dynamic assembly plant, they are constantly focusing on better ways to do things. This creates a very *"volatile"* production floor; recognition that what was known about the current production capability yesterday may not be true today is key to being an informed Triumvirate member.

4.5.1 Summary

The areas that required work between Norwood and the Vale are summarized below:

- establish a common view of the organization - processes, competencies, skills
- implement the common organizational view
- establish common measurements
- build team atmosphere- common organizational understanding, language, trust using culture's reliance on relationships and the informal organization
- define operational procedures to handle the range of product development activities
- establish communication structures for the common organization, common measurements, and team building already identified
- establish discipline for adjusting the above when measurements indicate that adjustment is necessary
- transfer knowledge between the two sites
- understand the current production environment in the Vale
- implement mechanisms to keep the production understanding up-to-date

4.6 Activities Completed

With the identification of these specific areas, work could start between the two sites. A major breakthrough was the common understanding that these needs would not be addressed by just establishing communication structures. Because the interviews had shown very different perceptions about the organization, initial work between Norwood and the Vale centered on resolving these differences.

Video-conference meetings were used when everyone was working at their home site. When travel to Norwood permitted, face-to-face meetings were held. These times were used to discuss the stages of product development, how these basic stages would change depending on the extent of the product development (new, redesign or restyle), what the role of Manufacturing was at each stage regardless of which site was included as the Manufacturing representative and what skills would be required to support the Manufacturing roles at each of these stages.

Because the internship was over before all the areas where work was needed between Norwood and the Vale could be addressed, details of the research and specific actions that might be taken were reviewed with, and documented for, key representatives from both sites, including the Norwood and the Vale Plant Managers, their management staff and a Polaroid facilitator who was identified to complete these activities after the end of the internship.

4.7 Recommendations

Recommendations for specific actions that can be completed to address the needs are outlined below:

- **Use the informal organization.**

  Because of the reliance on the informal organization and personal relationships at Polaroid, the initial steps taken should focus on ways to use these elements of the culture. Identifying the personnel at Norwood and the Vale who have similar responsibilities, pairing them up, creating a buddy system, expecting that they will communicate about their experiences and measuring whether they do would use both the informal organization and personal relationships that are so important.

- **Schedule specific opportunities for interactions.**

  Scheduled interactions are also important. The use of voice mail, e-mail and video-conferencing when face-to face meetings are not possible are alternatives. Until there are indicators that there are common understandings, quarterly meetings at one or the other of the sites provide an opportunity to build the personal relationships, understand the local environment and discuss common processes and experiences.

  Something as simple as a periodic written activity report that details activities of common interest can be used between scheduled meetings. The use of shared files and on-line documentation allow these reports to be created electronically and save the time in the mail between the two sites.

- **Establish common processes at the two sites.**

  Continuing the work on common processes at the two sites is important. Establishing focal points at each site for important activities where information can accumulate is another opportunity to further common processes. This gatekeeper role could be established around corporate initiatives and/or product development programs. This becomes an extension of the buddy systems already proposed.

- **Apply discipline to interactions.**

  The transfer of information is key to organizational learning and building commonality. Discipline needs to be applied to meetings and telephone conversations. The use of detailed agendas and meticulous

recording and availability of minutes are small first steps to create organizational knowledge and transfer that knowledge beyond just the original participants. There must also be a recognition that the power of communication and information is in the sharing and that hiding data is only harmful to both sites.

The use of short term assignments where personnel from each site are expected to participate in an activity at the other site is another way to build an appreciation about the other environment and establish the personal relationships that are so important at Polaroid.

- **Align the measurements.**

  Measurements are key to the successful implementation of any changes. Focus on the behaviors that enhance the transfer of information and communication. Reward those behaviors. Use assessments by peers and others outside the organization as one measurement.

- **Use technology as an enabler.**

  Finally, Polaroid has a wide variety of technology available that would facilitate and enhance these recommendations. After specific actions and structures have been decided on, identification of some enabling technologies would be appropriate. The standardization of the use of voice mail and e-mail is appropriate and already exists. Identify current shared databases, their uses and expand the availability to all areas of the organization. Provide information about little known technologies such as computer systems that use both electronic and video outputs. All of the above are easily implementable without additional capital investment.

4.8 Cautions about current environment

Completion of the activities identified that require work between the two sites, implementation of specific structures and measurement of how well the structures are working are not trivial tasks and there are some cautions that should be recognized.

The role of leadership is paramount. As discussed earlier, the most powerful signal that a leader sends is what catches the leaders' attention consistently, particularly what arouses them emotionally.[37] If Polaroid leadership focuses on communication, disciplined communication structures and the sharing of information, then whether the organization considers it important will not be a question. The organizational leaders must establish that the relationship between Norwood and the Vale is a partnership, not a competition, and the success of each is tied to the other site. Participation in formal meetings that already exist, such as the Quarterly Business Meetings and Communication Meetings, at each site provide a very visible reminder to subordinates that this partnership is important to the site leadership.

Polaroid is an environment that relies on personal relationships and not reverence for the organizational structure. As shown by the earlier quotes, there is great organizational antagonism between the two sites. This antagonism is not manifest in individual relationships but does flavor the interactions. Geographical distance, even within the same country, but particularly across national borders, adds to functional integration problems. National cultural differences amplify functional cultural differences; suspicion festers and miscommunication becomes more routine. The logistics of communication also grow more difficult with geographical distance as travel becomes harder and time zone differences disrupt easy communication.[38] These organizational feelings are definitely a factor to be considered as changes are made.

These two sites have long histories which are deeply rooted in the Polaroid corporate culture. It would be a mistake to underestimate the impact of this legacy on the current environment. The perception that Norwood is the freewheeling US problem solvers and the Vale has no design knowledge but can build high volume efficiently permeate the interactions between the sites.

Finally, there is an inherent fear of change and how change will affect each individuals' livelihood. The one constant in the lives of Norwood and the Vale in the recent past has been change and they are both afraid. They're afraid they don't have the right skills to do the new jobs they're being asked to do. They're afraid that what they are being asked to do won't be successful and there will be more severance programs. And they're afraid that they don't even understand what it is they are being asked to do. Recognizing that this fear exists goes a long way to alleviating the fear.

Chapter 5: Summary and Conclusions

5.1 Summary

This thesis has presented the research in a number of areas that define and identify effective communication characteristics and structures. The research covers the basic purposes of communication, identifies the need for both formal and informal mechanisms, establishes that effective teams use a variety of communication mechanisms and that team members have different communication responsibilities for the team to communicate effectively. Allen's work defining the role of a gatekeeper highlights the importance of external communication by teams and organizations. Recent experiences establish that while collocation is important, it may not be the overriding factor it was once believed to be. There is a recognition that companies that operate in a global arena must be especially mindful of the information that must be communicated and the structures that are established to make sure that communication occurs. The basic assumption is that communication and information flow are essential elements for organizational learning and knowledge transfer to occur. Finally, corporate culture plays a major role in establishing the importance of communication and validating which communication structures will be effective.

Effective communication structures start from a common strategy and understanding. Formal and informal processes are then used to reinforce and facilitate this shared vision. Organization design provides a formal mechanism for defining the communication expected. Common language and processes are another communication mechanism. These structures are then supported by management systems such as rewards and measurements, job assignments and the use of technology as an enabler.

Polaroid provides one example of the importance of defining the appropriate information to be shared and establishing an environment that has the right communication structures to ensure sharing occurs. The relationship between Norwood and the Vale is important. But not just because of their joint responsibilities, but also because it is a microcosm of Polaroid. Communication breakdowns are not isolated to Norwood and the Vale. By understanding the current relationship, the communication needs and specific actions that are available, Polaroid creates an opportunity to expand its organizational learning to encompass other sites where camera assembly is accomplished. Polaroid is not just a camera assembly company so these interactions are important in its other divisions, with its customers, with its suppliers and any other place where information and communication is critical to ensure the success of the company.

5.2 Conclusions

One of the key insights provided by the Polaroid internship experience is that the focus on communication structures is secondary to the more important aspects of the global organization - purpose, common understanding, common language and knowledge transfer. Designing communication structures for global organizations is premature without the understanding of what the global organization is designed to accomplish and how each site is expected to contribute.

Just as companies have realized that they must understand their operating strategy, competencies and visions, these same companies must address how operating globally fits. The differences in the past operating missions of Norwood and the Vale had been fairly clear. Norwood would participate from camera development through the early production days. Once a product was stable, the Vale would produce at volume through the rest of the product life. With the changes discussed in Chapter Four, these roles have blurred. Just as new management is addressing the company strategy, competencies and vision,

Norwood and the Vale must address how their new relationship fits in the company context. Without this basic agreement and understanding, designing communication structures is futile since there would be no idea what the communication structures should accomplish, what information needs to be communicated and how the data should be interpreted.

The prior research discussed in Chapter Two suggest that companies use both formal and informal structures for communication. Polaroid has relied on the informal structures for much of its corporate life. With the expansion of its operating environment globally and the changing nature of its business, the time is right for inclusion of more formal structures. The new product development model requires speed and information availability across a wider portion of the organization. With more products in the pipeline, faster development cycles and the Triumvirate structure, larger portions of the organization are involved in the process. The current informal organization is not up to the task of providing the information needed across this wide spectrum. Process discipline and documentation of all aspects of development are required. Consistency of purpose and methodology are necessary. This discipline is required of all communication.

Collocation has been an important factor in recent product developments for Polaroid. While the Joshua product was not a market success, its product development process is viewed as successful. The cancellation of all camera assembly in Norwood will have a direct impact on future product developments. As demonstrated in the restyle meetings observed early in the internship, the trust and functional competence confidence between the two sites have not been established. The success of the Triumvirate depends heavily on trust and functional competence. If Polaroid does not find a way to bridge this void, new product developments will suffer.

Norwood Manufacturing involvement in the Triumvirate is not as effective without the insight gained from participating in the day-to-day production environment. The longer there is no production in Norwood, the less effective the Manufacturing representatives become. There are options available to Polaroid for establishing this credibility again, such as pilot production in Norwood or required short term assignments to other manufacturing sites such as the Vale, China, Russia or India. But Polaroid must acknowledge this deficiency, design a process that incorporates knowledge transfer from production sites to Triumvirate representatives, measure the effectiveness of the information transfer, and then adapt as necessary.

The challenges facing Polaroid in the late 1990s are not unique. Companies have expanded their operations globally to take advantage of conditions in new locations. When the corporate environment changes, the purpose of this global network must be readdressed to decide how each of the sites now fits. The purpose of each site and the interactions between sites need to be clearly defined. When the sites are expected to be a continuum of one another, like Norwood and the Vale, the information flow is particularly critical. They are dependent on one another for their very survival.

Communication is a process that must be managed. With the wide range of possibilities available, a company limits itself when it does not use both formal and informal structures for communicating. These structures must be reinforced with management systems - rewards, information, measurements. Companies cannot afford to duplicate all activities at every site. Identification of effective communication characteristics is required for the global network to be successful.

The biggest problem with communication is the illusion that it has occurred.

Alan Mulally, LFM Keynote Address, September, 1993

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