Managing Technology-Intensive Project Teams in the Global Enterprise

Hans J. Thamhain, PMP, PhD
Bentley University
hthamhain@bentley.edu

Abstract

The challenges of managing culturally diverse and globally dispersed project teams are examined in a field study of technology-intensive product developments. The findings provide insight into the business processes, organizational conditions and managerial leadership style most conducive to high project performance in these culturally diverse team environments requiring the integration of many disciplines. The paper suggests a framework for assessing leadership effectiveness and makes recommendations for building high-performance multinational project teams critically important for today’s globally operating enterprises.

Keywords: Global project management, team leadership, technology, multinational, networked, virtual enterprise, product development.

1. Introduction

There is no argument that team leadership is critically important to project performance and essential for competing effectively in today's global arena [19, 24, 36, 46]. However, building and managing a workgroup as a fully integrated, unified team is a daunting task with strong impact on business performance. This has been recognized by researchers and practitioners for a long time, and documented in formal studies that can be traced back to the classic 1939 Hawthorne studies [40], and their discovery of performance benefits associated with workgroup identity and cohesion [17]. In today’s more complex and technologically sophisticated environment, the group has reemerged in importance as the project team [20, 38, 64], supported by extensive research, especially focused on the organizational dynamics and behavioral aspects associated with team leadership effectiveness [6, 24, 28, 30, 36, 39, 55].

However, in spite of the well established body of knowledge on conventional teamwork and team leadership, the expanding role of distributed teams in our globally connected business world has created a new set of challenges and the need for more specific research into the dynamics of project teams in a geographically and culturally distributed setting [1, 28, 32, 33, 45]. Most challenged seem to be managers in complex and technology-intensive project situations, such as R&D, high-tech product and system development. These projects often span numerous organizational lines that connect a broad spectrum of personnel, support groups, contractors, partners and customers, creating a business environment characterized by high speed, high change and high uncertainty [12, 46, 67]. In fact, few of these companies can accomplish all of their research and product development needs in-house [44]. Whether Yahoo! creates a new search engine, Sony develops a new laptop computer, or the World Health Organization rolls out a new information system, from medical research to computer systems development, companies try to leverage their budgets and accelerate their schedules by forming alliances, consortia and partnerships with other firms, universities and government agencies. These collaborations range from simple cooperative agreements to ‘open innovation’, a concept of scouting for new product and service ideas, anywhere in the world. Other companies which operate globally as an enterprise, such as IBM, Boeing or Microsoft, often have their developments dispersed across international borders as part of their global business strategy. In our connected world, companies can access the best talent and most favorable cost and timing conditions anywhere, regardless of their geographic location. However, organizing and

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<th>Table 1. Major issues, challenges and their derivatives of multinational project management</th>
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<td>PRIMARY ISSUES:</td>
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<td>☐ Cultural diversity, differences in norms &amp; values</td>
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<td>☐ Distance, time zones, travel</td>
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<td>☐ Language differences</td>
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<td>☐ Working across different standards, regulations, political systems</td>
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<td>☐ Communications across the project and its team</td>
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<td>☐ Project work integration, team unification</td>
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<td>☐ Risk identification &amp; management, detecting problems early</td>
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<td>☐ Accounting differences</td>
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<td>DERIVATIVE ISSUES:</td>
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<tr>
<td>✓ Support &amp; supply systems’ differences</td>
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<td>✓ Unifying policies, procedures, directions</td>
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<td>✓ Trust &amp; respect beyond the local level</td>
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<td>✓ Meaningful stakeholder involvement</td>
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<td>✓ Unifying collective thinking</td>
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<td>✓ Change &amp; scope management</td>
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managing such globally dispersed teams towards desired results is an art and a science, and a great challenge [57, 58] as summarized in Table 1.

While the managerial issues of cross-functional integration and project leadership are known for a long time [27, 28, 30, 31, 32, 45, 56], little has been published on organizational environments and team leadership most conducive for complex, culturally-diverse, multi-national projects teams, which is the focus of this paper.

2. Characteristics and Challenges of Multi-National Projects

As companies leverage their operations across national borders to take advantage of multinational sourcing, joint ventures and alliances, their business practices become more sensitive to cross-cultural issues and challenges. These concerns are being reflected in the large number of training and executive education programs that have emerged in recent years to deal with these issues. Indeed, managing multi-national projects and programs is highly complex and difficult. From the strategic side, guidelines and unified direction toward project objectives, technology transfer and project integration must be “synthesized” centrally and translated across borders into the cultures of the local operations [34]. Then, linkages among individual work components need to be developed and effectively "managed" across geographic areas and organizational cultures as graphically shown in Figure 1 [32]. Therefore, multinational project teams need to be integrated not only across the miles, but also be unified among different business processes, management styles, operational support systems, and organizational cultures [4, 14, 15, 35]. As a result, organizations that manage projects across international borders often find it frustratingly difficult to achieve their objectives, even with carefully prepared and mutually agreed-on plans.

2.1.1. Systems Perspective. Consistent with the well-known systems approach to organizations and management, formally adapted to project management by Cleland and King (1968), many scholars have used systems concepts for describing project management environments and breaking down their complexity into sub-systems. Typically, focus has been on the operational aspects, such as planning, organizing and controlling, hence executing projects in a well defined operational environment with limited interactions with the overall enterprise and its external environment. However, many of today’s projects involve the management of larger systems that are multidisciplinary in nature, require extensive collaboration of organizations around the world, have strong political and economical implications, and require long periods of definition, development, and sustained operations and upgrading. Examples of such systems range from aircraft design to space exploration programs, national communication networks and disaster relief efforts. These complex projects and programs cannot be managed in isolation, but must be aligned with many internal and external support systems, partners, customers and other stakeholders. To break down the complexity and to facilitate systematic study of these intricate business environments, I have used specific organizational subsystems in my previous research [54, 55, 56, 58]. The model, graphically shown in Figure 2, is being adapted to the current study as discussed below.

Five overlapping organizational subsystems seem to influence the effectiveness of multinational teams especially strongly. These subsystems interact with each other as part of the multinational enterprise environment, as shown in Figure 2.

SUBSYSTEM #1: Project Work and its Complexities. The complexity of the project, its interfaces and technologies create further challenges to multinational team management. Large and technologically complex efforts require a broad talent pool which often benefits from joint-ventures and multinational partnerships, hence leading to more complex and dynamic team structures that require intricate managerial interactions. Typical examples are complex R&D undertakings, new product developments, multi-national mergers, resort management and foreign assistance programs. When describing these project, managers point to specific complexity indicators which link to team management
challenges, such as the high degree of technical difficulties, evolving solutions [5, 14], high levels of innovation and creativity, complex decision processes, high levels of uncertainty, intricate technology transfer networks [31, 58], complex support systems, intricate multi-company support [14], and highly complex forms of work integration [33,48].

SUBSYSTEM #2: People, Their Culture, Values and Skills. The people networked across the multi-national enterprise provide the backbone of the project organization. These multi-national teams behave differently than regional workgroups. For one thing, project integration and performance of these multinational teams relies to a considerable extent on member-generated performance norms and evaluations, rather than on hierarchical guidelines, policies and procedures [26, 41]. As a result, power for decision making and responsibility for achieving specific outcomes are more distributed among team members. This is the characteristics of self-directed teams, a workgroup model that is especially useful and effective for orchestrating and controlling complex projects. As these contemporary work teams replace traditional, hierarchical project teams, effective managerial role performance requires a more sophisticated management style which relies strongly on group interaction, resource and power sharing, individual accountability, commitment, conflict handling, cross-functional linkages and cooperation, technology transfer models, top management involvement, self-directed teams, and design/build approaches [13]. As a result of these shifts, traditional project management tools, designed largely for conventional project management, with clearly defined horizontal and vertical lines of communication and control, and centralized “command system,” are no longer effective in these contemporary situations, and are being replaced with more team-based management processes.

SUBSYSTEM #3: Work Process and Business Process. The way the project work is structured, flows through the organization and connects with its support systems has considerable influence on the team and its management style. A commercial airplane development results in very different organizational interactions than a pharmaceutical project with multinational R&D partners. A matrix environment results in different work processes than a projectized organization, just to give a few examples.

SUBSYSTEM #4: Management Tools and Techniques. The technology used for supporting the project work, facilitating interdisciplinary communications and integrating the subsystems affects the team dynamics and management style. Appropriate and skillful application of this technology can significantly increase managerial effectiveness.

SUBSYSTEM #5: Multinational Enterprise Environment. All four enterprise subsystems operate within a socially, politically, and economically complex business environment. Therefore it is not surprising that projects extending internationally exhibit an intricate and diverse characteristics regarding organizational culture, structure and management philosophy. Managers have to deal with differences in languages, time zones, organizational and personal cultures, policies, regulations, business practices and political climate [2, 10, 32, 39]. These complexities call for specialized work processes, new concepts of technology transfer and more sophisticated management skills and project leadership.

3. Objective, Scope and Method

The Objective of this Paper is to improve the understanding of (i) the dynamics and interaction of culturally diverse project teams and (ii) the influences of managerial leadership on performance. Special focus is on technology-based, geographically dispersed project environments. The research reported here includes the latest phase of my ongoing field study into technology-based, multinational project organizations. The paper expands on the earlier, more quantitative parts of this study which is summarized in the appendix and discussed in the literature [3, 38, 63, 55, 56]. The results reported here provide more qualitative inside into the workings of multinational teams with emphasis on lessons learned and implications to leadership style and organizational performance. The methodology for the combined study is discussed below.

3.1 Method

This three-phase field study includes 27 technology-based project organizations. Each organization is part of a large, “Fortune-500” type enterpriseootnote{65% of the companies in the sample fall in to the Fortune-500 classification, 23% are Fortune-1000 companies, while the remainder are smaller firms. None of the companies in the sample can be classified as “small or medium size.”}, operating in multinational environments. For each of these organizations, the research was conducted in three stages. In the first stage, on-site observations and interviews with project leaders and project team personnel, helped to (1) understand the specific nature and challenges of the project work undertaken, (2) prepare for the proper introduction of the questionnaire, and (3) design the follow-up interviews. During the second stage, data were collected as part of a management consulting or training assignment, using questionnaires, observations, and expert panels. The third stage relied mostly on in-depth retrospective interviewing, providing perspective and additional information for clarifying and leveraging the data captured in stage one and two. This paper focuses on the results of the third stage, which was completed in 2009. The results are integrated with the previous findings of stage 1 and 2 providing the
basis for the recommendations and conclusions of this paper. A summary of the stage 2 results, with its more quantitative focus, is shown in the Appendix of this paper. In addition to the interviews, the stage-3 data collection includes other sources of relevant material, such as project progress reports, company reports, design review memos, committee action reports, financial statements and information from the public media.

The purpose of this combined three-stage data collection method was to leverage the information-gathering process for identifying the drivers and barriers to project team performance, and for gaining insight into its management process. This combined method is particularly useful for new and exploratory investigations, such as the study reported here [18, 21]. While there are case studies and books on global project management, there is currently little scientific empirical research on globally-distributed team management, and there are no theoretical models that describe or explain the formation, development or integration of these teams.

The format and process of the specific questionnaires and in-depth semi-structured interviews used in this study, was developed and tested in previous field studies of project management, similar in context to the current investigation [32,57, 58, 59, 60, 61, 64].

Data. The unit of analysis used in this study is the project. The combined field study, conducted between 2004 and 2008, yielded data from 42 project teams with a total sample population of 495 project professionals such as engineers, scientists, and technicians, plus their managers, including 16 functional resource managers, 42 project team leaders, 18 product managers, 8 directors of R&D, 7 directors of marketing, and 11 general management executives at the vice presidential level. Together, the data covered over 122 projects in 27 companies, spanning a total of 18 countries. The projects involved mostly high-technology product/service-oriented developments and their roll-out, such as information system, financial services, automotive, computer and pharmaceutical products. Project budgets averaged $1,200,000.00 and project lifecycles averaged 18 months. All project teams saw themselves working in a high-technology, multi-national, culturally diverse environment. The data were obtained from three sources, questionnaires, participant observation and in-depth retrospective interviewing, as discussed in the previous section. Specifically in stage 3, 138 interviews were held with team leaders, line managers, product managers, marketing directors and general management executives. These discussions provided interesting, useful insight into the issues and challenges of cross-functional integration necessary for successful technology transfer. The implications for multinational project management have been integrated with the Result Section of this paper.

3.2 Data Analysis

Standard statistical methods were used to evaluate and summarize the survey data of stage-2 (cf. appendix for summary of Stage-2 results). Because many of the organizational and behavioral variables investigated do not follow normal distribution, non-parametric statistical methods, such as Kendall’s Tau rank-order correlation and Kruskal-Wallis analysis of variance by ranks are deemed more robust and appropriate\(^2\) and were chosen to evaluate the survey data of stage 2. Stage 3 utilizes mostly content analysis for evaluating the interviews and observations. In combination with the findings from stage 2 [56,57], the stage-3 analysis allows us to go beyond the quantitative results of the statistical data analysis, and to integrate some of the more interesting lessons learned from the broader context of the field research. The interviews, observations and follow-up discussions obtained during stage-3 were especially useful in gleaning additional deeper insight into the processes and challenges of working with culturally diverse project teams, and to identify implications for project leadership effectiveness.

4. Results

Faced with the rising level of projects relying on multinational team efforts, organizations must find ways of organizing and executing these projects successfully in spite of the many challenges that exist in addition to conventional, more centralized project management. The empirical results suggest that of the five subsystems or influence spheres studied (people, work content, work process, tools and techniques, and enterprise environment), the people side, together with its culture, values and skill sets seem to have the strongest influence on team effectiveness and overall project success. It also has a strong correlation to desired characteristics of other subsystems, such as work content and work process. For example, project teams that indicated a high degree of professionally stimulating work, work challenge, recognition, trust and respect, were also seen by their managers as being able to deal effectively with technology transfers, client interfaces, changes, risks and cross-functional communications, all components that are part of the work process. Specifically, this association was tested via Kruskal-Wallis analysis of variance by rank in addition to the Kendall-Tau correlation analysis reported in the appendix of this paper. One of the significance of this finding is that it provides a model for “performance projection.” Project teams that see themselves in a professionally stimulating environment also seem to be part of a more effective work process and use work-related tools and techniques effectively across

\(^2\) Many of the variables investigated as part of this study contain ordinal measurements that do not follow a normal distribution. Therefore, parametric statistical methods are not seen appropriate. Instead, distribution-free, non-parametric methods have been chosen which offer more flexibility but less ability to extract information from the sample data.
The empirical results presented in this paper show that specific conditions in the multi-national project environment appear most favorable to team work across borders. These conditions serve as bridging mechanisms, helpful to enhancing project performance, especially in complex, technology-based organizations as observed in this study. One of the consistent and most striking findings from the earlier quantitative analysis of Stage-II, already point at the need for increasing involvement of all project stakeholders throughout the organization and its external partners. Managers point out, that for today's technology-based projects, success is no longer the result of a few geniuses, experts and skilled leaders. Rather, project success depends on effective multidisciplinary efforts, involving teams of people and support organizations interacting in a highly complex, intricate, and sometimes even chaotic way. Especially for multi-national efforts, the process requires experiential learning, trial and error, risk taking, as well as the cross-functional coordination and integration of technical knowledge, information, and components. Most managers see their multi-national projects as part of a fuzzy process that cannot always be described linearly or planned perfectly, nor can results be predicted with certainty. Yet, in spite of all these challenges, many project teams that we observed work highly effective across international borders, producing great results within agreed-on budget and schedule constraints. This suggests that multi-national projects can be managed, given the right team environment and leadership. This observation is further supported by the statistical analysis of the field data of stage-II of this study which are summarized in the appendix. Specifically, the findings of the retrospective interviews and on-site observations from the action research of Stage Three are integrated with the statistical results of Stage One. This enables us to go beyond the conclusions already gleaned from the statistical data summarized in the appendix of this paper, and advance specific suggestions for leading and working effectively with culturally diverse project teams.

### 4.1 Guidelines for Effective Team Management

The specific suggestions that emerged from this study for effectively managing multi-cultural teams have been organized into 10 guidelines, sequenced in a somewhat chronological order, typical for managing a project from its start-up into execution. While these guidelines emphasize the importance of conditioning the project environment for cooperation, connectivity and unification during the early stages of its lifecycle, management must pay continuous attention to the factors that drive or impede these conditions throughout the life of the project. Therefore, the suggestions advanced below provide an overall framework for managerial actions and leadership that should be valid throughout the project lifecycle.

1. **Define the Team Structure, Work Process and Communication Channels.** Management must provide an infrastructure conducive to effective cross-functional teamwork and technology transfer. This includes properly defined interfaces, task responsibilities, reporting relations, communication channels, and work transfer protocols. Most of the tools for systematically describing the work process and team structure come from the conventional project management system: Project charter, defining the mission and overall responsibilities of the project organization, including performance measures and key interfaces; project organization chart, defining the major reporting and authority relationships; responsibility matrix or task roster; project interface chart, such as the N-Squared Chart, and job descriptions and well-defined phase-gate criteria. All of these tools can help project managers develop cross-functional linkages, facilitate interdisciplinary cooperation, establish alliances, and improve communications. They have been used by project managers for a long time. However, to be effective, and in spite of virtual team settings, they need to be fine-tuned and calibrated to the specific project situation and carefully integrated with the overall business process and its multi-cultural environment.

2. **Build a High-Performance Image.** Project teams that have a clear sense of purpose and confidence in their mission, perform better. This is true for any environment. A high-performance image stimulates the team’s interest, pride of participation, and sense of ownership. Common goals and shared can-do images serve as a bridging mechanism, helping to unify the team across the miles and cultures. It also builds professional confidence and encourages team members to reach out to think outside-the-box and to resolve issues “locally” with a minimum of administrative support. Project leaders and senior managers can build a favorable project image by making the project visible and stressing its importance via media exposure, management involvement, and budgetary actions as well as by emphasizing its critical success factors and the professional opportunities and rewards its success realization offers. These factors promote project ownership among team members and encourage each individual’s desire to succeed. To build such a high-performance image, team members must have a clear sense of the significance of their contributions. All stakeholders should clearly understand the organization’s goals and its mission objectives. By establishing a favorable project image, project managers unify their team, build commitment toward accomplishing the project’s objectives, and establish high project priority.

3. **Stimulate Enthusiasm, Excitement, and Professional Interests.** Factors that satisfy personal and professional
needs of individuals have the strongest effect on team unification and overall project performance. The most significant performance drivers are derived from the work itself—personal interest, pride and satisfaction with the work, professional work challenge, accomplishments and recognition. Whenever possible, managers should try to accommodate the professional interests and desires of their personnel. Interesting and challenging work is a perception that can be enhanced by the visibility of the work, management attention and support, priority image, and the alignment of personnel values with organizational objectives. Interesting work leads also to increased involvement, better communication, lower conflict, higher commitment, stronger work effort, and higher levels of creativity. Well-established practices, such as front-end involvement of team members during the project planning or proposal phase, one-on-one discussions, are effective tools for matching team member interests and project needs.

4. **Adapt Project Management Tools, Techniques and Leadership to Local Culture.** With the globalization of many of today's project activities, success depends not only on the effective use of managerial tools and leadership style in one particular organizational environment, but equally important, on the effective use of these techniques across different geographic regions which often incorporate great differences in their organizational cultures. For many companies, defining and implementing an effective process for managing multinational programs amounts to managing organizational change with all of its dynamics, complexities, risks, and challenges. Therefore, it is important to adopt management tools, techniques and leadership style to local cultures and organizational values without losing consistency, purpose, and managerial integrity. This is a great challenge that is not being easily solved with a “virtual team” template or procedural document, but requires the skillful guidance and nurturing of local management in coordination with overall project leadership.

5. **Unify Management Process.** Successful management of culturally diverse project teams requires a unified managerial process for effective technology transfer and integration. To some managers this seems to contradict the need for agility, change-orientation and organizational learning, which is precisely the challenge. Regardless of the need and attractiveness of flexible, flat and transparent organizations, complex projects have a high probability of failure (Standish 2002, 2007, Thamhain 2005, 2007) unless their work processes are integrated throughout the enterprise and aligned with the overall management process. This does not mean rigid “top-down management” or “centralized operation,” but rather a skillfully designed management process with enough flexibility and adaptability to local leadership while functioning consistently within established organizational norms and cultures. The real challenge for companies engaged in multinational projects lies not so much in identifying these barriers but in getting the organization to recognize their significant impact on business performance and to invest resources for optimizing the multinational business process. Focus groups, organizational studies and developments, internal and external consultants, process action teams, professional training and teambuilding sessions, all are powerful tools for unifying and optimizing the work flow and for managing the process. However, this also requires significant cross-organizational effort, management involvement and resource commitment.

6. **Ensure Senior Management Support.** The team’s perception of senior management support is critically important to project performance. An effective working relationship among resource managers, project leaders, and senior management across the whole project organization, favorably affects the credibility, visibility, and priority of the team, and helps to unify the team across its cultures and geographic boundaries, and should be actively promoted.

7. **Promote Self-Direction and Commitment.** With the shift toward more self-directed teams, more flexible and less hierarchical organizations, management control is based to a large extent on commitment, motivation and local team leadership. This is also a great opportunity for designing multinational project management systems which accommodate both the local organizational environment and its multinational superstructure necessary for overall project integration and control. However, building such multi-tier processes requires more than simply empowering people at the local level. Senior management needs to work with their organizations to build strong linkages between the local teams, their support systems, and the sponsor organization and its leadership. These partnerships are more readily achieved when managers across all organizations sense a strong degree of cross-organizational dependency. This requires an understanding of the technical and managerial challenges involved in the ongoing project. It also requires personal commitment from these managers to build the multifunctional and cross-cultural people alliances necessary for implementing the multinational project plan.

8. **Share Managerial Power and Influence.** Given the political nature of organizations, and the diversity of organizational culture and possible regional differences in managerial style, examined in this study, it appears that power is often shared between managers of the
local organization and the project integrator or headquarters organization. In some areas there may be even a power vacuum, that is, jurisdiction, authority or responsibility over certain issues and decisions may not be clear. This provides an opportunity for managers to enlarge their sphere of power and influence. While such shifts in organizational power and influence are natural and predictable, they do not necessarily enhance cooperation and commitment. Usually, such shifts in power and influence are predictable by-products of new multi-organizational project start-ups. They can also be warning signs that the managerial process is changing and requires fine-tuning. Either way, these changes should be monitored, examined and dealt with to avoid the risk of organizational tension, mistrust, conflict and power struggle.

9. Recognize Differences in Management Style and Philosophy. Based on the field observations and interviews, we can glean from the field study some insight into the diverse managerial thoughts and possibly diverse leadership styles of culturally different regions, which explains in part the difficulties that managers experience in trying to establish a common project management process, and an unified framework for direction and leadership in a multinational environment. The implication of these findings is for managerial skill development and organizational support, both seen by managers as crucial for effective managerial role performance, and for resource decisions on training and organizational development issues.

10. Foster a Culture of Continuous Support and Improvement. Culturally diverse teams are intrinsically complex, highly dynamic and continuously changing. By updating and fine-tuning established project management processes to changing conditions, team members feel empowered and unified by the relevant organizational environment. Management can establish “listening posts,” such as discussion groups, action teams, and suggestion systems, that enable them to capture the voice of the customer as well as the lessons learned from past projects. This is the basis for continuous organizational improvements. Tools such as the project maturity model and the Six Sigma project management process can provide a useful framework for analyzing, developing and unifying project teams and their management processes.

5. Conclusions

The empirical results presented in this paper show that effective management of globally dispersed project teams involves a complex set of variables which relate to the organizational environment, business process, managerial tools, and most importantly, to the people in the organization and to the work itself. In fact, we find consistently and measurably that the people issues often have the strongest impact on project performance. They also affect the other major performance variables, such as work process and managerial tools, because people are an intricate part of these subsystems, and issues affecting people eventually impact the broader enterprise. In particular, the field study shows that certain conditions related to the people side, such as personal interest, pride and satisfaction with the work, professional work challenge, accomplishments and recognition, and capability of the supporting staff/co-workers appear most favorable toward unifying culturally diverse project teams and their work processes. These conditions serve as bridging mechanisms, helpful in enhancing project performance in multi-cultural organizations. Managing projects across international borders is difficult and challenging. While information technology, such as conference calls, e-mail, groupware, and web-based project monitoring, provide a powerful tool set for supporting multinational projects, management cannot expect to create a unified project team, working seamless across borders and cultures, by simply issuing work orders, project summary plans or management guidelines. Emphasis must be on common values and goals, rather than on differences, to focus and unify the team. By recognizing the greater autonomy of all international partners as well as their cultural differences, management can build a true partnership among all the contributing organizations with strong linkages for communication, decision making and technology transfer. Also, higher level of transparency in terms of rewards and payoffs based on a cross-cultural understanding. Such a partnership is most likely to evolve if all team members throughout the project organization share the same objectives and commitments to desired results. Moreover, to be sustainable, these multinational alliances must not only be built at the beginning of the project life cycle, but continuously be refueled and maintained over the lifetime of the project.

6. References


APPENDIX

Table A1 summarizes the analytical data collected during Stage One of this field study. The correlation between variables of the team environment and team performance provides a snapshot of the critical importance of both human factors and traditional project management techniques to team performance. The 20 variables of the team environment are listed in order of importance to overall team performance. The presence and strength of these organizational variables was measured on a five-point scale as a perception of project team members, while team performance was measured as a judgement perception of senior management. Initially, the dataset was analyzed separately for each “local” team in its own cultural environment using Kendall-Tau correlation analysis as summarized in Table A-1. Then, the cross-team association was tested via Kruskal-Wallis analysis of variance by rank which shows at a confidence level of 98% that an agreement exists among local teams on their rankings. That is, we can conclude that local teams and their managers come from the same population and therefore could be aggregated into one larger sample. This finding is interesting because it shows similarity among the various local teams in spite of their differences in culture. While specific interpretation and perception of environmental characteristics such as “needs” and “professionally stimulating” are differing among teams, the rank-order correlation to project performance metrics is similar. The significance of this finding for team leaders is the need for creating a work environment that is professionally conducive and stimulating to the project work in progress. This cannot be accomplished by procedures or formalities but requires palpable actions, earned credibility, trust and respect of the project manager.

Characteristics of High-Performance Team Environments

It is interesting to note that the same conditions, which are conducive to overall team performance, also lead to (i) innovation and creative problem solving, (ii) change orientation and high response rate of the team, (iii) self-directed teams with minimum supervision, (iv) effective customer & client interface, (v) effective conflict resolution among team members, (vi) ability to deal with risk and uncertainty, (vii) stronger personal effort and commitment to established objectives, (viii) more effective communications within the team and its interfaces, and (viii) favorable schedule & budget performance. Hence the correlation statistics validates analytically the basic proposition of this study that the organizational environment influences the team characteristics which influences team performance.

The team characteristics and project performance was measured as a perception of senior management (as discussed in the method section of this paper). The most significant associations point at the importance of professional esteem needs and managerial leadership as particularly favorable influences on project team performance. Specifically: (1) professionally stimulating and challenging work environments $\tau=0.45$, (2) opportunity for accomplishments and recognition $\tau=0.38$, (3) clearly defined organizational objectives relevant to the project $\tau=0.36$, (4) job skills and expertise of the team members appropriate for the project work $\tau=0.36$, (5) overall directions and team leadership $\tau=0.35$, (6) trust, respect and credibility among team members and their leaders $\tau=0.30$, (7) business process, as reflected by cross-functional cooperation and support $\tau=0.27$, (8) clear project plans $\tau=0.25$ and (9)
clearly defined authority relations, and sufficient autonomy and freedom of actions in line with the managerial expectations and accountabilities \( \tau = .23 \). While many of these factors, such as clear objectives, skill sets and effective business processes deal with conventional project management practices, they also relate to the human side, conditioning the work environment for success. Hence in a complex project environment that relies on commitment, buy-in and personal drive for success, these influences appear to deal effectively with the integration of goals and needs between the team member and the organization. In this context, the more subtle factors seem to become catalysts for cross-functional communication, information sharing, and ultimate integration of the project team with focus on desired results. All associations are significant at \( p = .1 \) or better, with the most significant correlations \( (p = .01 \) or stronger) shown in bold. To a lesser degree, opportunities for career development and advancement \( \tau = .12 \), as well as job security \( \tau = .12 \), seem to have a positive influence.

Furthermore, the analysis provides a model for “performance projection.” Project teams that are perceived by their management as effective in any one of these seven categories, such as innovation, change orientation, etc, are also seen as effective in many of the other seven categories, including efficiently utilizing time and resources, and leading to high overall project performance. While this finding is not surprising, it is interesting to see it statistically validated. Specifically, we have tested the high degree of cross-correlation among the set of three performance variables via Kruskal-Wallis analysis of variance by rank.\(^3\) The test shows that managers agree on the ranking of team performance factors in Table 3 at a confidence level of 98%. That is, managers who rate their team’s performance high in any one of the performance variables are likely to give high ratings also to the other variables.

It is interesting to note that many characteristics of the work environment, that were perceived by managers as important and influential to effective team performance, did not correlate significantly as measured by a p-level threshold of .10. Others resulted even in negative correlations. As summarized in Table 3, the factors of lesser influence to project team performance are: (#10) career development \( \tau = .12 \), (#11) job security \( \tau = .12 \), (#12) salary increases and bonuses \( \tau = .15 \), (#13) time-offs \( \tau = .15 \), (#14) project visibility and popularity \( \tau = .12 \), (#15) maturity of the project team, measured in terms of time worked together as a team \( \tau = .10 \). In addition, several conditions of the work environment actually correlated negatively to performance although they were seen by the majority of project managers as important positive drivers. As summarized in Table 3, they include: (#16) project duration \( \tau = -.08 \), (#17) project requirements, stability and minimum changes \( \tau = -.10 \), (#18) stable organizational structures and business processes.

### Table A1.

<table>
<thead>
<tr>
<th>Team Environment*</th>
<th>Team Characteristics and Performance*</th>
<th>Overall Team Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interesting Work</td>
<td>.42 .30 .43 .27 .27 .39 .43 .35 .37</td>
<td>.45 .42</td>
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<tr>
<td>2. Recognition/Accompl</td>
<td>.45 .31 .39 .28 .38 .27 .35 .23 .38</td>
<td>.38 .35</td>
</tr>
<tr>
<td>3. Clear Org’s Objectives</td>
<td>.33 .29 .45 .30 .38 .21 .28 .22 .31</td>
<td>.36 .31</td>
</tr>
<tr>
<td>4. Job Skills &amp; Expertise</td>
<td>.31 .15 .37 .28 .33 .32 .15 .11 .21</td>
<td>.36 .37</td>
</tr>
<tr>
<td>5. Direction &amp; Leadership</td>
<td>.37 .33 .27 .33 .27 .27 .22 .13 .33</td>
<td>.35 .30</td>
</tr>
<tr>
<td>6. Trust/Respect/Credib</td>
<td>.35 .44 .36 .27 .43 .08 .40 .38 .27</td>
<td>.30 .28</td>
</tr>
<tr>
<td>7. Cross-Func’t Sup’t</td>
<td>.29 .32 .29 .23 .38 .37 .28 .47 .25 .27 .29</td>
<td></td>
</tr>
<tr>
<td>8. Clear Proj Plan, Suppt</td>
<td>.36 .20 .35 .40 .36 .36 .36 .29 .29 .40 .25 .36</td>
<td></td>
</tr>
<tr>
<td>9. Autonomy, Freedom</td>
<td>.38 .34 .42 .28 .15 .34 .36 .23 .23 .23</td>
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<tr>
<td>10. Career Development</td>
<td>.22 .37 .15 .17 .09 .10 .07 .06 .24 .12 .07</td>
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</tr>
<tr>
<td>12. Salary/Raise/Bonuses</td>
<td>.09 .18 .06 .07 .07 .07 .09 .12 .30 .15 .09</td>
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<td>13. Compensatory Time</td>
<td>.10 .13 .09 .02 .00 .00 .04 .09 .05 .12 .15 .03</td>
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<td>15. Team Maturity</td>
<td>.32 .30 .30 .13 .12 .11 .11 .12 .12 .10 .18</td>
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<tr>
<td>16. Project Duration</td>
<td>-.05 .07 .04 .26 .11 .16 .06 .27 .03 .08 .02</td>
<td></td>
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<tr>
<td>17. Project Stability</td>
<td>.12 -.10 .32 -.14 .22 .20 .05 .33 .05 .10 .09</td>
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<tr>
<td>18. Organizational Stability</td>
<td>.29 .18 .17 .22 .19 .14 .09 .27 .15 .12 .16</td>
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<tr>
<td>19. Technol’ Complexity</td>
<td>.11 .22 .32 .09 -.11 -.13 .12 .09 .11 .15 .12</td>
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<tr>
<td>20. Proj Size/Complexity</td>
<td>-.12 .02 -.15 .16 .06 .07 .10 .07 .03 .18 .08</td>
<td></td>
</tr>
</tbody>
</table>

*All variables were measured with descriptive statements on a 5-point Likert scale: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, (5) strongly agree.

Statistical Significance: p< .01 (\( \tau \geq .20 \)), p< .05 (\( \tau \geq .31 \)), p< .01 (\( \tau \geq .36 \)); correlation significance of p< .01 or stronger marked bold. Negative correlations are marked in italics.

\* Symbols: \# team member, \# senior management.

\(^{1}\) The Kruskal-Wallis One-Way Analysis of Variance by Rank is a test for deciding whether k independent samples are from different populations. In this field study, the test verified that managers perceive in essence the same parameters in judging high team performance.