PROJECT MANAGEMENT AND USE OF INFORMATION TECHNOLOGY FOR PROJECT COMMUNICATION MANAGEMENT IN TURKISH ELECTRONIC SECTOR

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Approval of the Graduate School of Social Sciences

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ABSTRACT

PROJECT MANAGEMENT AND USAGE OF INFORMATION TECHNOLOGY FOR PROJECT COMMUNICATION MANAGEMENT IN TURKISH ELECTRONIC SECTOR

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In this study, Project Management, especially Project Communication Management applications and use of information technology are scrutinized. The general situation of Turkish electronic sector is investigated. The project management applications and closeness to new technologies of companies that operates in Turkish electronic sector are analyzed. A research model is developed with a designed questionnaire, and the levels of project communication management applications and use of interactive communication technologies, and its effects on performance of organizations are evaluated for Turkish electronic sector by analyzing the collected data.

Keywords: Project Management, Communication, Information Systems, Turkish Electronic Sector

ÖZ

TÜRKİYE ELEKTRONİK SEKTÖRÜNDE PROJE YÖNETİMİ VE PROJE İLETİŞİM YÖNETİMİ İÇİN BİLGİ SİSTEMLERİ KULLANIMI

Tuncer, Şeniz
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Bu çalışmada, Proje Yönetimi, özellikle Proje İletişim Yönetimi uygulamaları ve bilgi sistemleri teknolojileri kullanımı incelenmiştir. Türkiye Elektronik Sektörünün genel durumu değerlendirilmiştir. Türkiye elektronik sektöründe faaliyet gösteren firmaların Proje yönetimi uygulamaları ve bilgi sistemleri teknolojilerine yakınlığı araştırılmıştır. Hazırlanan bir anket ile birlikte bir araştırma modeli geliştirilmiş ve toplanan veriler analiz edilerek, Türkiye elektronik sektörünün proje iletişim yönetimi uygulamaları ve enteraktif iletişim teknolojileri kullanım seviyesi ve bunların firmaların performansı üzerindeki etkileri değerlendirilmiştir.

Anahtar Kelimeler: Proje Yönetimi, İletişim, Bilgi Sistemleri, Türkiye Elektronik Sektörü

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INTRODUCTION

Before defining what the project management is, it is important to understand the project.

> A project is a sequence of unique, complex, and connected activities having one goal or purpose and that must be completed by a specific time, within budget, and according to specification (Wysocki et.al, 2000, p. 65).

Each project is temporary because it has a definite beginning and a definite end. Every project is unique because it is carried out only once.

Davis (1951) defines the project as "any undertaking that has definite, final objectives representing specified values to be used in the satisfaction of some need or desire."

Newman, et.al, (1987) define a project as a combination of organizational resources pulled together to create something that did not previously exist and that will provide a performance capability in the design and execution of organizational strategies. Projects have a distinct life cycle, starting with an idea and progressing through design, engineering, and manufacturing or construction, through use by project owner (Cleland and Ireland, 2002).

Rosenau, (1998) defines project as one of a kind undertakings that originate when something has to be done.

Projects must have a single goal, a specified completion date, resource limits. Scope, quality, cost, time, and resources are the constraints on every project. These

constraints are independent. Scope defines the boundaries of the project and describes what must be and not be done. Quality can be considered as the meeting of project and product requirements depending on standards and specifications by providing customer satisfaction. Cost and time are the major considerations throughout the project life cycle. Resources are assets, such as people, materials, physical facilities, or inventory.

According to Cleland and Ireland (2002), the basic considerations in any project focus on the cost, schedule, and technical parameters, and how well the project results fit into the operational or strategic purposes of the enterprise. The results of project management usually take the form of a new or improved organizational product, service, and process.

> Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes such as: initiating, planning, executing, controlling and closing. (Project Management Institute, 2000, p. 6).

The project manager and project team perform the requirements and work of the projects. The work of a project means fulfillment of demands for scope, time, cost, risk and quality; dealing with needs and expectations of stakeholders; and identified requirements.

Project management is a method and set of techniques based on the accepted principles of management used for planning, estimating, and controlling work activities to reach a desired end result on time and within budget according to requirements of the project.

Cleland and Ireland (2002) defines the project management as a series of activities embodied in a process of getting thing done on a project by working with project team members and other stakeholders to attain project schedule, cost, and technical performance objectives.

Projects are generally divided into several project phases to manage project successfully, to improve management control and to link the project to the ongoing operations of the performing organization, since projects involve a degree of uncertainty. The area of uncertainty in a project is reduced with each succeeding phase until the actual point of completion is reached. In the light of this a process can be defined as a system of operations in the design, development, and production of something. In other words, a process is a series of actions, changes, or operations that bring about an end result, in the case of a project attainment of its cost, schedule, and technical performance objectives. A process is an ongoing movement or progression. Project management teams and stakeholders progress from initiation activities to planning, executing, controlling, and closing activities. A project life cycle is the sum of project phases. A project life cycle contains a series of major steps in the process of conceptualizing, designing, developing, and putting in operation the project's technical performance deliverables.

Principal responsibilities of project management are creating specific cost, schedule, and technical performance objectives; concerning with product, service, and process design and development; supporting organizational strategies, and also communicating and dealing with project stakeholders. Project management is used in several forms within many organizations. Regardless of industry or product being produced, project management has applications in order to improve productivity.

The principal reason to use project management is to provide an organizational focus and philosophy on how to deal with the inevitable changes facing organizations, and to implement the strategic goals through the best use of resources to meet organizational purposes. The certain aim of project management is to achieve project goals efficiently and effectively, and to prescribe methods for managing project activities such as defining, planning, scheduling, and controlling of the tasks based on project requirements in timely manner and within budget. Project management aims to accomplish three-dimensional objectives of projects that are achievement of the performance specification, the time schedule, and the cost budget.

Effective project management requires performing many more activities or work packages under each of the functions of processes. Successful project management requires accomplishing the performance specifications on the time limit and within the budgeted cost.

Project Management has knowledge and skill areas to describe project management knowledge and practice in point of their processes. A sample of the areas of knowledge can be given as 'primary knowledge and skill areas', such as scope management, technical performance management, schedule management, cost management, configuration management, planning, resource management, and 'supporting knowledge and skill areas', such as risk management, communication management, contract administration, negotiation, leadership, decision making, marketing, customer relationship, personnel conflicts.

Project Management Institute organizes these processes in the PMBoK Guide 2000 into nine knowledge areas as follows: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management (Project Management Institute, 2000, p. 7,8).

Project management provides a sharp focus on planning, implementation, and control over work of an organization. Project management techniques and applications give many organizations some advantages, such as control of financial, physical, and human resources, better customer relations and internal coordination, shorter development times, lower costs, higher quality and increased reliability, higher profit margins, improved productivity, higher worker morale. If project communication is not properly managed, performance deviations can occur and affect adversely on the project. To avoid customer dissatisfaction, regularly communication of the project team and stakeholders is important.

Communication is the process by which information is exchanged between senders and receivers through a common system of symbols, signs or behavior, via one or

more channels. Most problems in organizations arise from poor communication. Project communication management requires ensuring timely and appropriate generation, collection, dissemination, storage, and ultimate disposition processes of project information (Project Management Institute, 2000). A policy on how to communicate has a major importance for project communication management. The goal of project communications is to provide information to the project stakeholders depending on communication policy.

> The professional literature is mainly based on a normative concept of how communication management should be carried out and the tasks it involves. The question that needs to be addressed here is whether the emphasis that the literature places on internal and external communication as "steerable" phenomena implies that communication management is a separate policy area that takes the form of a specialized function at management level. (Ruler, 2000).

There is a direct relationship between project success or failure and effectiveness of the communication pattern carried out on the project. Communication is the principle force used by a project manager to ensure that project stakeholders work together. Some difficulties cause the problems in communication. Many meanings of words can be given as an example of a barrier to effective communication. As the number of people involved in a project increases, the complexity of communication also increases. Geographic location and cultural background also increase the complexity of project communications.

The advancement of technology has provided benefits to improving the ability to communicate in the business world and to manage projects. Such means as telecommunications, network, electronic databases, teleconferencing, groupware, and Internet provide to enhance communication capabilities.

Accurate and timely information is essential for the management of a project. An accurate and complete project management information system must exist to provide the basis for how the project is doing. Project management information system is vital for the communications of a project. As a store of knowledge, the plans,

practices, procedures, standards, and methodologies are readily available to consult prior to making a decision or taking an action.

The objective of information systems is to provide the basis to plan, monitor, do integrated project evaluation, and show the interrelationships among cost, schedule, and technical performance for the entire project and for the strategic direction of the organization. Besides, information should provide a prospective view in order to identify project problems before they occur, so they can be avoided or their results can be minimized.

Technological innovations support the development of a sophisticated information system that incorporates early warning measures to highlight variances from standard practices. The design of the project management information systems should meet the needs of projects. Computer-based information systems have become valuable for project management to manage project effectively. In the 1970s and into the 1990s, computing capability through the substantial infrastructure was used. Today, desktop computer has led to a flood of project management software packages. Computers, telecommunications technology, and Internet are revolutionizing the availability and use of information as a key element in the project management of organizations. Hardware and software for a project management information system permit easily access to the project's store of knowledge.

> Recently, Jeffres and Atkin (1996) argued that the Internet represents a merger of opportunities for interpersonal (or point-to-point) communication, group communication, organizational communication and mass communication. They conceptualized communication needs to include both message sending and receiving (Atkin and Jeffres, 1998).

Empirical research on communications in project management showed that projects often lack good communications beyond the boundaries of the project team.

> All problems are related to the management of project information and communication policy over the distributed project organization. Communication determines the flow of information between project partners. It is vital to effective communication that the right people receive the right information at the right time (Hameri and Puittinen, 2003).

There are tools and techniques providing effective transfer of information among people, and improve communication such as e-mail, project management software, groupware, fax machines, telephones, teleconferencing (audio-video conferencing) and web-conferencing systems, document management systems, word processors, reporting guidelines and templates, meeting ground rules and procedures, decision-making processes, problem-solving approaches, conflict resolution and negotiation techniques, obtaining feedback, establishing multiple communications channels, using face to face communications, using a simple language.

> Several research studies are now focusing on integration of the construction and communication processes through standardization of data, taking advantage of evolving computer technologies. The capability of these technologies, such as the Internet and World Wide Web (WWW), has made a significant impact in other industries, especially in manufacturing where performance and productivity has been improved significantly (Howard, et.al., 1989).

Projects can benefit from interactive technologies and conferencing tools that enable distance-bound project teams to participate in real-time meetings electronically.

Some recent studies on project management note that the way of managing projects successfully passes through good communication in organization and poorly communicated processes heavily affect on project failure. All projects in different industries need to communicate project information properly. Thus, there is a direct relation between the communication process and project performance. On the other hand, information technology has aided to communication process and has improved organization's ability to communicate more effectively, since the last decade of 20^{th} century. Organizations have started to benefit the developed interactive communication technologies. Therefore, I want to investigate especially the project communication management and use of information technology under the project management discipline.

This study investigates the prevalence of Project Management applications and how much benefit is gained from the Information Technology at Project Communication Management applications. In this context, the aim of this study is to investigate the

closeness of the companies to new technologies, operating in Turkish electronic sector, which are the member of TESİD (Turkish Electronics Industrialists Association), SASAD (Defense Industrialists Association), and some other firms operating in Turkish electronic sector. The research model is developed with a designed questionnaire based on a critical review of literature.

In this study, the proposition is that firms in Turkey, which apply project management principles to manage a project in their organizations, have communications policy in order to communicate effectively and increase efficiency of projects. The other proposition is that organizations' and projects' performance increases, and creates new business opportunities, thanks to follow the new technologies, and to benefit from information technologies and interactive communication technologies. This leads to the hypothesis that is to apply a good communication management, in other words to determine how to communicate and use of tools and techniques provide organizations to perform project activities successfully because of effective flow of information even if from a long distance. Moreover, use of information technology contribute to improve customer satisfaction, respond more quickly to changing market conditions, provide better control of processes and better internal coordination, since these tolls and techniques help to complete processes as in conformity with quality requirements, in timely manner, and within budget.

This thesis is organized as follows:
In the next chapter project management and project communication management is explicitly defined; aspects and approaches in the literature to the related issues are provided. Chapter 3 describes the methodology and the aim of the case study with a research model. The designed questionnaire is explained in detail. Chapter 4 provides the data analysis and experimental results of the case study. Finally, in Chapter 5 concluding remarks on the study are presented.

CHAPTER 2

THEORY OF PROJECT MANAGEMENT AND LITERATURE REVIEW

In this chapter, it is investigated project management concept and principles in a theoretical framework based on the project management evaluation literature and recent studies on organizations' project management approaches. The aim of this chapter is to review the project management and project communication management concepts and its characteristics, and to understand the goals, contents, main actions and applications. Within this context, communication, communication management skills, communication processes and communication technologies will be described.

2.1 Introduction

A theory of project management should be prescriptive. It should reveal how action contributes to the goals set to it. On the most general level, there are three main actions. First one is to design of the systems employed in designing and making. Second one is to control of those systems in order to realize the intended production. Last one is the improvement of those systems. It can be assumed that there are three basic goals of project management and all production. Getting intended products produced in general is the first one. Second one is internal goals, such as cost minimization and level of utilization. Thirdly, external goals related to the needs of the customer, like quality, dependability and flexibility.

Project Management Institute (PMI) prepared the Guide to the Project Management Body of Knowledge (PMBoK Guide) that is a key document in the project management profession and is approved by American National Standard Institute. Project management is relatively new profession and practice in literature while there is substantial commonality in practice, there is little commonality in the terms used.

2.2 What is Project Management?

A project is a temporary endeavor undertaken to create a unique product or service (Project Management Institute, 2000, p. 4).

Every project has a definite beginning and a definite end therefore it is temporary. The product or service is different from all other products or services therefore it is unique. A project is undertaken to accomplish a unique purpose. Every project should have a well-defined objective.

Projects are in general implemented in order to achieve an organization's strategic plan. Therefore projects are critical to the realization of the performing organization's business strategy. Operations and projects differ in principle. Operations are ongoing and repetitive activities while projects are temporary and unique. Projects may involve several people to perform activities and different duration from a few weeks to a few years. Projects may involve a single unit of one organization or may cross-organizational links.

A project should have a primary sponsor or customer. The main sponsor for the project is often interested in the effective use of resources to complete the project in an efficient and timely manner. The project sponsor usually provides the direction and fund for the project.

A project requires resources that include people, hardware, software, or other assets of organization. People from other companies – product vendors and consulting companies – may be assumed as resources for meeting new project objectives.

Resources must be used effectively in order to meet project and other corporate goals.

> Project Management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes such as: initiating, planning, executing, controlling and closing (Project Management Institute, 2000, p. 6).

The project team manages and performs the requirements and work of the projects. The work of a project involves competing demands for scope, time, cost, risk and quality; differing needs and expectations of stakeholders; and identified requirements.

Project management primarily focused on providing schedule and resource data until the 1980s. Beginning in the late 1990s, business environments have become more complex. Developments of technology have forced to change the comprehension of project management. Today, new technologies have become the most significant factor in many businesses. Computer hardware and software, networks, the use of interdisciplinary and global work teams have changed the work environment. Companies are recognized to be in need of more sophisticated and better project management.

Project management techniques and applications give many organizations some advantages, such as control of financial, physical, and human resources, better customer relations and internal coordination, shorter development times, lower costs, higher quality and increased reliability, higher profit margins, improved productivity, higher worker morale.

In these days, many companies need to adopt information technology and a far more rigorous approach to project management to make up for lost time while improving the success rate of projects. As computer became smaller and more affordable, and software became more easy to use and cheaper, project management software became to be employed prevalently. In these days, many different industries use

project management software on all types and sizes of projects because software programs are facilitative, inexpensive, and available for anyone to update. There are different project management software tools providing specific functionality to manage projects.

In the last part of the 20th century, every industry began to investigate and apply different aspects of project management to their projects. The effectiveness of project management tools and techniques, which are being applied and used today, have influence on the companies by doing business, using resources, and responding to market requirements with speed and accuracy.

2.3 The Project Management Context

Projects involve a degree of uncertainty and may operate as part of a system. Therefore, projects are generally divided into several project phases to improve management control and to link the project to the ongoing operations of the performing organizations. Project phases generally involve concept, development, implementation, and close-out.

> Turner (implicitly) firstly claims that project management is about managing work; this is the conceptualization. Secondly, he claims that work can be managed by decomposing the total work effort into smaller chunks of work, which are called activities and tasks in the PMBOK Guide. Thirdly, he claims that this conceptualization and the principle of decomposition serve three essential purposes of project management. (1) an adequate or sufficient amount of work is done; (2) unnecessary work is not done; (3) the work that is done delivers the stated business purpose (Koskela and Howell, 2002).

Project phases determined by completion of work or product that is called deliverable. Key deliverables and project performance show the situation of project phase on date. This review determines if the project is completed this phase successfully and if it should move on to its next phase. This method provides cost of detecting and correcting errors effectively.

In the concept phase, managers usually develop a plan for the project, which describes the needs of the project and basic underlying concepts. Project work is

usually defined in a work breakdown structure (WBS) that defines the total scope of the project. In the development phase, a more detailed project plan, a more accurate cost estimate, and a more through WBS are created. In implementation phase, the project team delivers the required work, creates more definite cost estimate, and provides performance reports. In the close-out phase, all of the work is completed. A sort of customer acceptance of the entire project is provided. The project team experiences on the project should be documented in a lessons-learned report.

A project life cycle is a collection of project phases. The beginning and the end of a project define the project life cycle. Its definition also determines including transitional actions of the project. Project life-cycles generally define technical work and personal in each phase. Project life-cycle descriptions may be very general or very detailed.

Project stakeholders are people and organizations, which are actively involved in the project or affected by project activities. They may also influence on the project and its results. The project management team must identify the stakeholders, determine their requirements, and then manage these requirements to complete the project successfully. Key stakeholders on every project include project manager, customer, performing organization, project team members, and sponsor.

Organizations develop a culture that reflects their shared values, norms, beliefs and expectations in their policies and procedures; in their view of authority relationships, etc. operations of project-based organizations consist primarily of projects. Nonproject-based organizations often lack management systems to support project needs. Organizational structures can be characterized from functional to projectized, with a variety of matrix structures in between.

There is a hierarchy in the classic functional organization where each employee has one superior. Staff members are grouped by specialty, such as production, marketing, engineering, and accounting at the top level. Functional organizations also have projects, but the perceived scope of the project is limited to the boundaries of the function. Team members are often collocated in a projectized organization. Most of

the resources are involved in a project work. Project managers have a great deal of authority and works independently. Projectized organizations often have organizational units called departments. These groups either report directly to the project manager or provide support services to the various projects. Organizations may involve these structures as mixed at various levels. Matrix organizations are a mix of functional and projectized characteristics.

2.4 Project Management Processes

A process is series of actions directed toward a particular result. Project management process groups progress from initiation activities to planning, executing, controlling and closing activities. Project management integrates actions and activities, all areas usually interacts each other.

Project management processes can be organized into five groups:

- *Initiating process* authorizes the project or phase, involve actions to begin or end project phases.
- *Planning process* defines objectives, and selects the best of the alternatives of action to attain the objectives. Planning processes involve devising and maintaining a workable scheme to accomplish the project's needs. Planning is an ongoing effort during the life of the project.
- *Executing process* coordinates resources to carry out the plan. This process produces the products or deliverables of the project or phase.
- *Controlling process* involves monitoring and measuring progress regularly to identify variances from plan in order to ensure that project objectives are met and take corrective action if necessary.
- *Closing process* formalizes acceptance of the project or phase at the end. Closing processes include contract closeout and administrative closure.

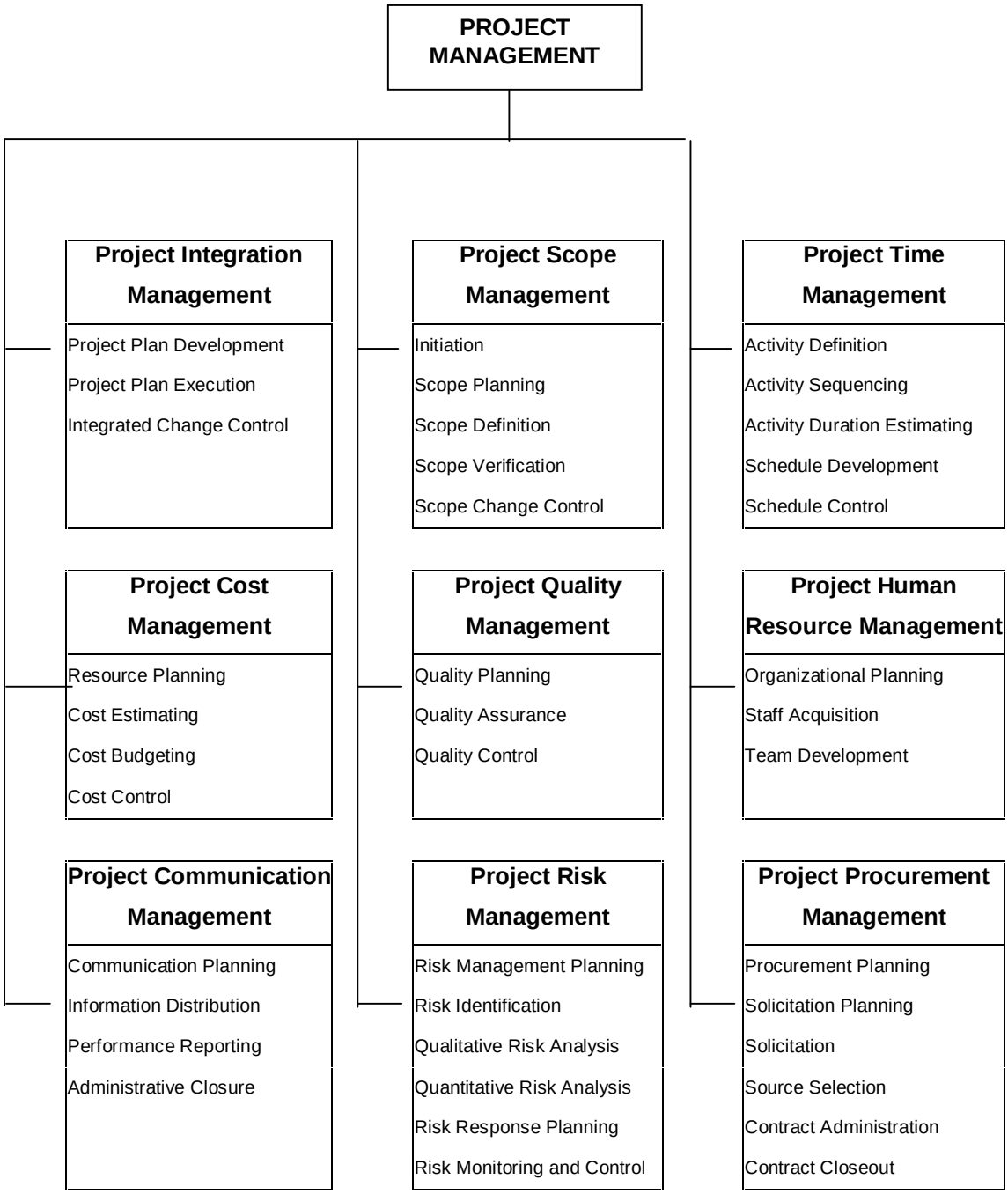
Inputs and outputs links the individual processes within each process group. Inputs mean documents or documentable items that will be acted upon. Tools and techniques mean mechanisms applied to the inputs to create the outputs. Outputs mean documents or documentable results of the process.

Some planning processes have clear dependencies. Dependencies require processes to be performed in essentially the same order on the most projects. This kind of processes is called ‘core processes’. For example, activities must be defined before they can be scheduled or cost. This includes scope planning, scope definition, activity definition, activity sequencing, activity duration estimating, schedule development, risk management planning, resource planning, cost estimating, cost budgeting, project plan development.

Interactions among other planning processes are more dependent on the nature of the project. These are ‘facilitating processes’. For example, there may be little or no identifiable risk until after most of the planning has been done. Then the team recognizes that the cost and schedule targets are too much and thus involve considerable risk. They include quality planning, organizational planning, staff acquisition, communication planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, procurement planning, solicitation planning.

2.5 The Project Management Knowledge Areas

The Project Management Knowledge Areas describes project management knowledge and practice in point of their processes. PMBoK Guide organizes these processes into nine knowledge areas as follows: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, and Project Procurement Management.



Source: Project Management Institute (PMI), 2000, p.8

Figure 2.1 Overview of Project Management Knowledge Areas and Project Management Processes

As outlined by Figure 2.1, project management knowledge areas are separated into two main groups. Leading to specific project objectives are called core knowledge areas, which are project scope management, project time management, project cost management, project quality management. Project scope management defines and manages all the work required to successfully complete the project. Project time management involves estimating how long it will take to complete the work, developing an acceptable project schedule, and ensuring timely completion of the project. Project cost management consists of preparing and managing the budget for the project. Project quality management ensures that the project will satisfy the stated or implied needs for which it was undertaken.

Facilitating knowledge areas are the means through which the project objectives are achieved. This group of knowledge areas are project human resource management, project communication management, project risk management, and project procurement management. Project human resource management is dealt with making effective use of the stakeholders involved with the project. Project communication management includes generating, collecting, disseminating, and storing project information. Project risk management identifies, analyzes, and responds to risks related to the project. Project procurement management concerns with acquiring or procuring goods and services that are needed for a project from outside the performing organization.

Project integration management builds a bridge of functions that affects and is affected by all of the other knowledge areas. Project managers should have skills in all nine of these knowledge areas. Project management tools and techniques assist project managers and their teams in carrying out requirements and activities of project. Project management software can facilitate management processes in all the knowledge areas.

In spite of the advantages that project management offers, it does not guarantee to success on all projects. What works on a project may not work on another, since every project is unique.

2.6 Project Communication Management

Technological developments and its adaptation in several forms to organizations have improved project management applications. Even though technology enables more effective applications to manage projects, project performance depends on having good communication processes. Effective transfer of project information between project team and stakeholders directly affects project success. According to some studies, inefficient means of communication is one of the main factors for project of the failure. This emphasizes the importance of projects' communication processes. Furthermore, information technologies have provided to improve communication by using as part of organizations' project communication tools and techniques. Organizations have benefited from information technologies and audio-videoconferencing tools during the past 20 years. This has enabled real-time meetings electronically from a long distance, document management systems, electronic messaging, and so on. These communication technologies affect the performance of project and project team in a cost-efficient way and immediately transfer of information.

2.6.1 Communication

One of the most inclusive of definitions of communication is: "Communication is any behavior that results in an exchange of meaning." (Kezsbom and Edward, 2001, p.379) Kinesics (body language), proxemics (distance or spatial language), linguistics, theater, graphic arts are sciences of communication. The right information to the right person at the right time should be transmitted cost effectively in order to acquire effective communication in a project.

> The linear communication model (Berlo and Agarwala, 1960; Rogers, 1976) defines communication as a process in which a source transmits information to a receiver through one or more channels (Moenaert, et.al., 2000).

Effective communication implies that a receiver's understanding of the meaning is equivalent to the sender's intent. The way of exchange information is important to receive message correctly in the communication process.

Communications must be established early in the project to prevent the arising problems on project communication. The project manager must develop and maintain good relationships with project team. Moreover, it should always be kept in mind that message send might not be received in the same form. Receiver may interpret the meaning of messages or words differently.

Effective communication requires human relationships based on trust between teamwork. Technology does not substitute for the actions and relationships. There is a direct correlation between the project manager's ability to manage the communications process and project performance. One critical role of a project manager is that of communicator. Obtaining, updating, and disseminating of accurate information effectively by project managers affect team coordination, integration, and performance.

The functional applications of project manager in communication process are providing project direction via decision making, authorizing work, directing activities, negotiating, reporting; attending meetings; overall project management; marketing and selling; public relations; records management by minutes, memos/letters/newsletters, reports, specifications, contract documents. It is essential for a successful project that the project manager must serve as a contact point to senior management, team specialists, functional managers, customers, and people outside the project that are concerned with project results. Project managers must ensure project teams are communicating effectively and appropriately.

Communication skills can be developed as well as technical skills. Employees might benefit from communication training. Training sessions help participants to develop specific skills. A minimal investment in communication training can gain many things to individuals, then their project and their organizations. These skills learned in training courses are permanent for employees. Organizations aim to improve communication skills and achieve more proper planning, support, and leadership from management by training.

> Two-thirds of the construction problems were caused by inadequate coordination and inefficient means of communication of project information and data (Cornick, 1990). It is clear that integration of the design and construction processes alone cannot improve productivity and performance without an improved communication and efficient means of exchanging information **(**Dawood et al., 2002).

There may be hard obstacles to overcome in project communication process. Project managers create an environment within the project structure that affects the success of communication and interpersonal relationships. Clearly defined channels, well established reporting mechanisms, and good working relationships enhance organizational and project communication. Some circumstances can create problems on communications process such as confused lines of authority and reporting relationships, lack of proper planning, restructuring and/or reorganizing the organization on a frequent basis, centralized control with little project authority, cumbersome bureaucracies, need for interpersonal communication skills among employees, physical distance, and cultural and language barriers.

2.6.2 Project Communication Management Processes

> Project communication management includes the processes required to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. It provides the critical links among people, ideas, and information that are necessary for success. Everyone involved in the project must be prepared to send and receive communications, and must understand how the communications in which they are involved as individuals affect the project as a whole (Project Management Institute, 2000, p. 117).

> Examples are the Standish Group's comparison of project management with a three-legged stool with one leg being good communications (Standish Group. CHAOS '98), or research at Pennsylvania State University, USA, which identified poorly communicated objectives as a major factor of project failure (Müller, 2003).

Project communication management has the following major processes:

- *Communication planning* determines the information and communications needs of the stakeholders that include who needs the information, when they will need it, and how it will be given to them.

- *Information distribution* process concerns with making needed information available to project stakeholders in a timely manner.
- *Performance reporting* includes collecting and disseminating performance information by status reporting, progress measurement, and forecasting.
- *Administrative closure* involves generating, gathering, and disseminating information to formalize a phase or project completion.

The general management skill of communicating is undoubtedly related to project communication management. Communicating is a broader subject and involves a substantial knowledge that is not unique to the project context, for example sender-receiver models, choice of media, writing style, presentation techniques, meeting management techniques, and so on.

2.6.2.1 Communications Planning

Communications planning includes determining the information and communications needs of stakeholders. Even though all the projects need to communicate project information, it differentiates the informational needs and the methods of distribution.

Inputs to communications planning are as follows:

- *Communications requirements* are combining the type and format of information required with an analysis of the value of that information. It is important to examine whether communicating information contributes to success or where a lack of communication can lead to failure. Project communications requirements include:
    - Project organization and stakeholder responsibility relationships
    - Disciplines, departments, and specialties involved in the project
    - Logistics of how many individuals will be involved with the project and at which locations
    - External information needs

- *Communications technology*: The technologies or methods used to transfer information back and forth among project stakeholders can vary significantly. Communication technology factors affecting the project are the immediacy of the need for information, the availability of technology, the expected project staffing, and the length of the project
- *Constraints* are factors limiting the project management team's options.
- *Assumptions* are factors that are considered to be true, real or certain. Assumptions usually involve a degree of risk.

The technique for communications planning is stakeholder analysis. The information needs of stakeholders must be analyzed to develop a methodology for meeting these needs and to avoid wasting resources (time, money etc.) on unnecessary information or inappropriate technology. It is important to know what kinds of information will be distributed to which stakeholders.

Communication management plan is the output from communications planning. Communication management plan is a document of which type will vary with the needs of the project. Communication management plan includes a collection and filling structure, a distribution structure, methods, production schedules, and a description of the information.

When project management and team members assume using existing communications channels to relay project information is sufficient, problems may occur, since each of these groups and other stakeholders has different communication needs. Creating and reviewing a communications management plan with project stakeholders early in a project prevents or at least reduces later communication problems. If organizations work on many projects, developing some consistency in handling project communications makes the organization work simpler. WBSs also provide the information regarding the content of project communications.

2.6.2.2 Information Distribution

Information distribution includes making needed information available to project stakeholders in a timely manner. The communications management plan is implemented, and unexpected requests for information is responded in this process.

Getting project information to the right people at the right time and in a useful format is as important as developing the information. Project managers and their teams must decide the best way to distribute the information. The use of technology, formal and informal communications, and the complexity of communications are important considerations for information distribution.

Inputs to information distribution are work results, communication management plan, and project plan.

Tools and techniques for information distribution are as follows:

- *Communication skills* are used to exchange information. The sender should make the information clear, unambiguous, and complete, so that the receiver can receive it correctly, and for conforming properly understood. The receiver should be sure that information is received in its entirety and understood correctly. Communicating has many dimensions, such as written or oral, listening and speaking; internal or external; formal and informal; vertical (up & down the organization) and horizontal.
- *Information retrieval systems* are manual filling systems, electronic databases, project management software and systems that allow access to technical documentation such as engineering drawings, design specifications, test plans etc.
- *Information distribution methods* are various, such as project meetings, hard-copy document distribution, shared access to networked electronic databases, fax, electronic mail, voice mail, videoconferencing, and project intranet.

Outputs from information distribution are project records, project reports, and project presentations.

Technology can facilitate the process. For example, by using an internal project management information system, it can be organized project documents, meeting minutes, customer requests, requests to change status, and make them available in an electronic format. This information can be stored in local software or make it available on an intranet, an extranet, or the Internet. Storing templates and samples of project documents electronically can make accessing standard forms and also the information distribution process easier.

Effective distribution of information depends on having good communication skills of project managers and project team members. Communicating includes many different dimensions and project personnel need to use all of these dimensions in their daily routines. Different types of communication can be effective for different people. For example, a project sponsor may prefer to be informed through informal discussions held once a week over coffee. Informal conversations may allow the project sponsor to provide insights and critical information to the success of the project. Short face-to-face meetings are effective and important as well as electronic communications. Oral communication also helps build stronger relationships among people who work on that project.

Project managers should evaluate the needs of the organization, the project, and the individuals by determining which communication medium is suitable for use, and when.

2.6.2.3 Performance Reporting

> Performance reporting involves collecting and disseminating performance information to provide stakeholders with information about how resources are being used to achieve project objectives. This process includes status reporting, progress reporting, forecasting. Performance reporting should provide information on scope, schedule, cost and quality. Many projects also require information on risk and procurement (Project Management Institute, 2000, p. 122).

Performance reporting informed stakeholders about how resources are being used to achieve project objectives. Inputs to performance reporting are project plan, work results, and other project records.

Tools and techniques for performance reporting are performance reviews, variance analysis, trend analysis, earned value analysis, and information distribution tools and techniques. Performance reviews are meetings held to assess project status and/or progress. Status reports describe and address where the project stands at a specific point in time and in terms of meeting scope, time and cost goals. Progress reports describe what the project team has accomplished during a certain period of time. Project forecasting may be used to predict future project status and progress based on past information and trends. Earned value management can also be used by estimating the budget at completion, based on how the project is progressing. Variance analysis involves comparing actual project results to planned or expected results. Trend analysis involves examining project results over time to determine if performance is improving or deteriorating.

Outputs from performance reporting are performance reports and change requests. Performance reports include organizing the information gathered and presenting the results of any analysis. Reports should provide the kinds of information and the level of detail required by various stakeholders, as documented in the communications management plan.

> Another important technique for reporting is the status review meeting. Status review meetings are a good way to highlight information provided in important project documents, empower people to be accountable for their work, and have face-to-face discussions about important project issues. Many program and project managers hold monthly status review meetings to exchange important project information and motivate people to make progress on their parts of the project (Schwalbe, 2002, p. 279).

2.6.2.4 Administrative Closure

The project or phase (concept, development, implementation, or close-out) requires closure, after achieving its objectives and being terminated. Administrative closure consists of documenting project results for acceptance of the product of the project by the sponsor, or the customer. It includes collecting project records; providing conformance of final specifications; analyzing project success and effectiveness, documenting lessons learned; and archiving such information for future use. Employee skills in the staff pool database should be updated to reflect skills and proficiency increases.

Inputs to administrative closure are performance measurement documentation, product documentation, and other project records. Performance reporting tools and techniques, project reports, and project presentations are tools and techniques for administrative closure. Outputs from administrative closure are project archives, project closure, and lessons learned. Project archives are a complete set of organized project records that provide an accurate history of the project. Project-specific or program-wide historical databases should be updated. When project are done under contract, or when they involve significant procurement, particular attention must be paid to archiving of financial records.

Project closure, in other words formal acceptance means that the project's sponsor or customer signs related documents to show they have accepted the products of the project. In a common situation, the buyer must legally accept the products produced as part of the contract so the seller can receive payment. In a non-contract situation, all parties must agree on completion of the work so that people and other resources can be reassigned.

The project team members should prepare a lessons-learned report after completing a project. Lessons learned are written statements reflecting experiences of project team members on that project. Many projects are done under contract, and contracts often specify what each of these outputs should consist of. If projects are not done under contract, it is still very important to prepare these items. Some items discussed in

lessons learned reports include the causes of variances on the project, the reasoning behind corrective actions chosen, the use of different project management tools and techniques, and personal words based on team members' experience.

2.6.3 Communication Technologies

Determining how to communicate is not sufficient for generating a clear message. There is a set of tools, techniques and principles that provides effective transfer of information among people, and improve communication. Tools involve e-mail, project management software, groupware, fax machines, telephones, teleconferencing systems, document management systems, and word processors. Techniques involve reporting guidelines and templates, meeting ground rules and procedures, decision-making processes, problem-solving approaches, conflict resolution and negotiation techniques, obtaining feedback, establishing multiple communications channels, using face to face communications, determining how sensitivity of the receiver, being aware of symbolic meaning such as expressions on people's faces, communicating at proper time, reinforcing words with actions, using a simple language, using redundancy if possible. Techniques alter depending on project and project requirements. Principles include providing an environment for open dialogue and an agreed upon work ethic between project people.

Most organizations use several forms of information technology as part of their project communications tools and techniques. All industries are developing communications infrastructures to help in managing projects.

> At the beginning of this new millennium, the field of technical communication is experiencing a radical reconfiguration. The language and delivery methods of technical communication are shifting, while at the same time new alliances are emerging. To work effectively, professionals in technical communication now find it necessary to immerse themselves in fields and collaborations often considered external to technical communication, human-computer interaction, instructional technology, business information systems, product design, ergonomics, and management (Zachry et al., 2001).

Developed communication technologies have provided working together from a long distance. Videoconferencing, e-mail, the Internet, corporate intranets and groupware

applications all make possible to work together wherever people are. PCs and World Wide Web influenced how project teams are able to communicate and share project information across multiple sites in the globe. “The performance assessment of the system shows a saving of more than 90% in man-hours, with estimated huge saving in cost.” (Dawood et al., 2002). The electronic messaging technology with software systems has also made the storage and retrieval of project information more efficient. Even though technology creates business opportunities and enables to communicate within long distance, technology alone cannot create a sense of commitment or an assurance for effective communication without human relations and interactions.

Projects can benefit from interactive technologies and conferencing tools that enable distance-bound project teams to participate in real-time meetings electronically. “Internet technology adoption in the context of the broader domain of innovation and communication needs fulfilled by technology use.” (Atkin and Jeffres, 1998)

Various electronic technologies, computer-based connections are used for communication process, such as pagers or beepers, e-mail, telephone, facsimiles, voice-mail, audio-conferencing, video-conferencing, Internet, Intranet, groupware systems, Web conferencing. These communication tools affect performance of a team such as in a way of speed, immediacy, and documentability. Project managers and the team must consider when choosing which tools to use at what time. Having a variety of information technologies for communication does not guarantee productivity. Tools must be used to build the team and encourage continued interaction. Teams must search for the most appropriate media for their communication needs, with consideration of the limits of cost and availability. Multiple media should interact and provide the development of relationships. Tools should be chosen fitting for its intended purpose.

Project relevant information should be obtained, analyzed, and reviewed in a timely manner as well as good planning to manage project efficiently. This can provide early warning of problems to progress of plans and management actions. Project managers use software to help in the difficult task of tracking and controlling projects. Using software programs is insufficient alone while not being project

leadership, communicating team members, identifying task-related problems, taking corrective actions. Today, organizations have access to computer-aided project management systems.

The return on the investment for this technology is quite high, when teams are trained on how to use the applications. However, technology still does not replace the need to get together periodically, preferably as a whole team. Physical connections between team players are necessities for building credibility and trust, which may affect the team's decision-making processes positively or negatively. Face-to-face meetings may also include more reinforcing the importance of the relationships.

Communication is among the more important factors for success in project management. Technology can aid to the communications process, but improving an organization's ability to communicate is more important. It often requires a cultural change in an organization that takes a lot of time, hard work, and patience. Project managers must guide all stakeholders (management, team members, and customers) for the importance of good project communications and ensure that the project has a communications plan in respect of project's communication policy to help make good communication happen.

2.7 Conclusion

Project communication management provides to execute and link a series of distinct, interactive, and at times project activities. If communication is not properly managed, problems occur and this adversely affects the project performance. It leads to draw a conclusion that other project processes, such as the design and engineering processes alone cannot improve productivity and performance without an enhanced communication and efficient means of information transfer. In order to enhance organizational and project communication, communication policy must be determined. In addition, there should be clearly defined communication channels, well-established and easily accessible documentation systems, and good working relationships in the organization. It is also required for a successful project that the project manager must serve as a communicator to people who related to project.

Since the last 20 years, organizations have used information technology that have provided organizations to be flexible and respond more quickly to changing market conditions, and the ability to improve communication processes and performance. Information technology and teleconferencing systems help project teams to collaborate more effectively at a distance. Computer-mediated communication is used for communication processes to increase performance of a team such as in a way of speed, immediacy, and documentability. Project team members can improve their productivity, when they are trained on how to use the applications. As a result, communication is among the more important factors for success in project management and these developed communication technologies provide to increase the project performance and project success.

In the next chapter, the methodology of research, which investigates the prevalence of project management applications and how much benefit is gained from the information technology at project communication management applications in Turkey's electronic sector, with a designed questionnaire and the aim of this developed research model will be explained. In the following chapters, the results of this research will be clarified, and concluding remarks of this study will be presented.

CHAPTER 3

EMPIRICS ON PROJECT COMMUNICATION MANAGEMENT

Through the last decades of the 20th century, people in every industry began to investigate and apply different aspects of project management to their projects. In these days, which project management tools are being applied and used influences the way companies do business, use resources, and respond to market requirements with speed and accuracy. In the light of these developments, in this study a questionnaire is designed in order to evaluate the project management practices in electronic sector in Turkey. In this study, it is aimed to assess the prevalence of Project Management applications and the benefits of the Information Technology at Project Communication Management applications. The sampled companies are the member of TESİD (Turkish Electronics Industrialists Association) and SASAD (Defense Industrialists Association), and some other firms operating in electronic sector.

3.1 Aims of Case Study

The objective of this study is to measure the prevalence of Project Management applications and how much benefit is gained from the Information Technology at Project Communication Management applications; to investigate the closeness of the companies to new technologies, companies operating in Turkey's electronic sector that are the member of TESİD and SASAD and some other electronic firms are scrutinized. In other words, the objective is, in general, to determine the usage of communication tools and information technologies that become obligation more than

necessity in this information age for the firms in electronic sector in Turkey; to draw a common picture of firms about strategies, policies and approaches on communication and project management by using information technologies and communication tools, and to evaluate the conformity of them to Project Management principles.

Besides, it is intended to determine the levels of Project Management applications of firms in electronic sector by analyzing the data such as whether project communication management fundamental techniques and tools are used in proportion to the general profile of firms, whether innovations of information technologies are followed, whether adaptation of these technologies provide competition superiority, whether the performance measurement of communication activities is done, and training level of employees. Furthermore, it is intended to identify the advantages and disadvantages brought by the applications project communication management principles and techniques.

3.2 Studies on Communication Management and Information Technologies: A Retrospect

The importance of information technology (IT) in several industries has grown exponentially in last years.

> Computer-aided design packages, scheduling and contract management software, document management systems, and Internet applications have demonstrated their ability to improve operations, increasing both service quality and productivity. The increasing number of applications of IT, and their direct and indirect impacts to the core business, have made management of the IT investment process an increasingly critical problem for the senior management of large-scale projects (Pena-Mora et al., 1999).

Some recent studies concern with the understanding the linkage between information systems and performance of individuals and organizations in all industries in terms of efficiency, productivity, communication capability, time and cost reduction. Information technology developments have a significant impact on large-scale architectural, engineering, construction projects. Therefore, the issue of whether

these organizations are receiving adequate returns from their information technology (IT) investments remains another important concern.

The Research Center for Business Practices[1] (2002) survey can be given as an example of these studies. It is the research arm of the consulting and training organization, Project Management Solutions, Inc. surveyed between more than 100 senior-level project management practitioners with knowledge of their organizations' project management practices and their organizations' business results. This survey was called as The Value of Project Management. More than 94% of the respondents stated that implementing project management added value to their organizations. Organizations in all industries reported significant improvements in financial measures, customer measures, project/process measures, and learning and growth measures.

When implementing project management, organizations expectations are improvements on the order of 50% in project/process execution, 54% in financial performance, 36% in customer satisfaction, and 30% in employee satisfaction that resulted from by the companies surveyed. So it was concluded that those organizations not implementing project management would be at a competitive disadvantage to those who do.

It was appeared that organizational initiatives included implementing a project office, a project management methodology, project management software, integrating project management into key company processes, training staff in project management tools and techniques, and deploying a development program for project staff.

According to data of this study, the years engaged in project management is 3.12 in average, the dollars spent on project management is $676,000 per year, and the number of employees engaged in project management is 235. The survey sample was

[1]This part is summarized from the study carried out by Center for Business Practices, 2002.
Janice Thomas et al., "Getting Senior Executives 'On Side'," In James S. Pennypacker, ed., *Justifying the Value of Project Management*, Center for Business Practices, 2002. (Project Management Solutions, Inc., 2003)

segmented according to company size, including small businesses with annual revenue, and also according to several industries (information; professional, scientific, and technical services; and manufacturing) (Center for Business Practices, 2002).

Another study was performed by Hayne and Pollard in 1995-1996. They surveyed to identify the critical issues in Information Systems (IS) during the 5 years by conducting 157 Canadian IS personnel in organizations. This study employed a questionnaire throughout Canada using a modified Delphi technique and follow-up interviews. They aimed to investigate information systems issues that are currently faced by business management in Canada. They listed issues in IS management and their supporting rational. The survey focused on building a responsive IT infrastructure, improving IS project management practices, and planning and managing communication networks. They compared some issues to rankings previously reported in Canada and to data collected internationally in a comparable time period. Delphi method was employed in order to move respondents to a level of consensus about the critical issues they were facing in IS management.

Hayne and Pollard (2000) stated that the trend in Canada has been towards technological issues. From a global perspective, Canada currently appears to lead in management issues and lag in technological issues. IT is an increasingly important resource that must be managed well. Respondents agreed that project management is more critical than the software itself. Well-trained, highly specialized, multi-disciplinary teams must be used to deliver systems on time and within budget. Based on the interviews, they claimed that firms start to recognize that competitive advantage can only be realized by custom software and strategic software creation must be well managed.

A research by Moenaert et al. (2000) suggested five requirements that determine the effectiveness and efficiency of communication in international product development teams according to the analysis of the case study data. The case study has been completed over a two year time period (1998-2000), and the research team has investigated selected innovation projects in four European multinational

corporations. The requirements were network transparency, knowledge codification, knowledge credibility, communication cost, secrecy. They said that organizations might create firm level capabilities (parallel structures, cross-functional and inter-unit climate, communication infrastructure, goal congruence) and team level capabilities (core team, team leadership, formalization, procedural justice) in order to perform these communication requirements. They focused on the organization process of international innovation, and particularly on the communication flows during such projects.

According to their (Moenaert et al., 2000) study, the technological communication media have a great impact on both the effectiveness and efficiency of cross-functional communication flows. Video conferencing and uniform direct access documentation systems increase efficiency of communication at low variable cost. A systematic information classification and retrieval systems provide significant cost savings by limiting unnecessary cross-functional communication flows. The low variable cost of new communication media enhances the organization of meetings and the sharing of information. Thus, such communication media provide additional opportunities for team members to exchange information. On the other hand, they suggested that personal relationships and trust between employees are a prerequisite for electronic communication to be efficient. In the absence of regular face-to-face contacts, which help to maintain a relationship, the usefulness of electronic communication media will be limited (De Meyer, (1991), Kuemmerle, (1997)). Furthermore, electronic communication may be suitable for making appointments or schedules, but it cannot really provide moral support or emotional issues. Besides, the use of electronic communication may lead to incidental information leaks. Therefore, they proposed that the deployment of a communication infrastructure enables the innovating firm to lower communication costs and improve network transparency, but may decrease information secrecy in international product innovation teams.

Van Ruler (2000) studied on the daily practice of persons working in Dutch public relations that is “communication management.” He analyzed two research projects in 1995 and focused on the tasks and position of the communication management

departments in (Dutch) companies, including the background of their heads. The first study is a quantitative, empirical description of the profession. A random sample of 2,047 addresses was chosen from a representative database of the Vierhand Agency consisting of 12,863 Dutch commercial and nonprofit organizations each employing more than 50 staff. The second study is a qualitative study of labor differentiation. 522 respondents participated in the study and were allocated into the three responsibility groups: officers, senior officers, and policy managers. He investigated whether the emphasis on communication management is a separate policy area that takes the form of a specialized function at management level. This was an exploratory and an evaluative study of communication management in the Netherlands.

Van Ruler (2000) observed that the daily practice of the communication management departments consists, reportedly, for most part of copy production and representation, though chief executive officers and authors on communication management acknowledge communication as a strategic variable within an organization. He further pointed out that even executives with management positions function merely as "technicians." Interviews in this study showed that most of the officers acquired their professional background in other areas and come from other departments; they had no relevant training in communications, nor did they have significant knowledge of relevant theories. The position of the communication management department within the organization reflects its operational activities and (lack of) professional background. Several studies (for example by Kleijn, 1995) have shown that senior managers regard communication as an important factor in the success of their organization and as a strategic variable. The professional literature is mainly based on a normative concept of how communication management should be carried out and the tasks it involves (van Ruler, 2000).

The major challenge of managing knowledge is less its creation and more its capture and integration (Grant, 1996; Davenport, 1997). Indeed, knowledge is of limited organizational value if it is not shared. The ability to integrate and apply specialized knowledge of organizational members is fundamental to a firm's ability to create and sustain competitive advantage (Grant, 1996). On the other hand, as Brown and

Duguid (1991) note, knowledge will not necessarily circulate freely firm-wide just because the technology to support such circulation is available.

During the last decade or so, significant productivity improvements experienced by a wide range of industries have been associated with IT implementation. IT has provided these industries with great advantages in speed of operation, consistency of data generation, accessibility and exchange of information.

Dawood et al. (2002) described a collaborative research study being undertaken between University of Teesside and an international contracting organization based in the UK. They developed a methodology and a system that will ease and improve communication and exchange of data and information between the construction project team depending on an IT-based tool for site document management. They claimed that it provides an automated integrated environment for communication, retrieval, storage and distribution of project documents between the construction project team. They proposed information management system that is based on evolving IT facilities such as Internet, World Wide Web (WWW), and database technology with three interactive stages: requirement analysis, design, and implementation (Dawood et al., 2002).

The study by Mohamed and Stewart (2003) detailed an empirical investigation of users' perceptions of a web-based communication tool adopted on a large construction project. A questionnaire-based research approach on a construction project with 42 participants was adopted for this purpose. This research aimed to solicit user perceptions of web-based communication to highlight its role in enabling improved project information management and business relationships, compared to the prevailing business-as-usual level. The objective of developed questionnaire survey was to gauge the interests of key stakeholders (e.g. managers, engineers, architects, employees, etc.) across IT-related performance perspectives. Each perspective consisted of a diverse set of identifying questions (items) that focused on individual aspects where IT-induced improvement might arise (Mohamed and Stewart, 2003).

Hameri and Puittinen (2003) concerned with problems related to distributed engineering projects (DEP) and how World Wide Web (WWW)- based technologies can improve projects' efficiency and success rate. The focus of this study was on how WWW can improve project organizations to manage their knowledge, be it in the form of documents, formal communication or the tacit aspect of human interaction on engineering projects with complex deliverables and artifacts, in other words how to improve their performance with World Wide Web (WWW) based information and knowledge management applications. They stated that WWW-technologies provide project management to improve performance through better management of project information and through better understanding of the involved business processes.

Hameri and Puittinen (2003) stated that World Wide Web provides the integration medium and the technologies to link various partners, their operations and information sharing and manipulation needs in distributed engineering projects. They designed a case study for a European multi-national and a high-tech company over the one year time period. The analyses were based on the quantitative data form each project, which had been generated on the servers as the projects advanced. In addition, they collected data by several personal interviews with project team members and representatives of the line organization formed and by site visits through participant observation.

They dealt with organizational processes taking place in the distributed project business in order to search improved efficiency and leaner organizations resulting from networked operations. It was applied to two industrial cases harnessing advanced networking technologies in their distributed operations. The cases guided to describe a global delivery process of complex investment goods and a smaller scale knowledge-intensive company with rapid product release cycles. Basing on these cases they reached the results that deploying advanced WWW-technologies to distributed engineering processes their punctuality, cost control and workflow can be improved. Results also indicated that the new tools enable the initiation of learning processes based on the quantitative information that accumulates in the network

servers during the execution of the project. This information can be used to refine the organization and focus the processes on the suitable value-adding activities.

All problems are related to the management of project information and communication policy over the distributed project organization. Several research results on engineering projects (Morris and Hough, 1987; Lewis, 1993; Hameri, 1997) indicate that by excluding the political difficulties the fundamental problems of not achieving the project goals originate from: ignorance of what other project teams are doing and progressing in their tasks, lack of discipline in design change control and lack of policy on fulfillment responsibilities and communication of team, diverse views on the objectives and goals of the project, rigid project planning and scheduling routines, lack of a method to communicate and implement changes in the schedule, poor reactivity to sudden changes in the project environment, and unforeseen technological difficulties.

According to research studies on IT projects, high numbers of project failures, where projects are either abandoned before completion, did not meet their objectives, or were not accepted by the systems users. Communication across organizational boundaries, such as IT vendors with their customers, increases the complexity of communications because of the buyer and seller firms' difference in perspective towards project. IT seller firms and project managers focus on the delivery of product in accordance with the contracts they have with their customers. Research by Müller (2002) showed that these differences of perspective lead to significant differences between project manager and sponsor in their choice of communication frequency, contents and media for their communication during IT project implementation. Another empirical research by Partington (1997) on communications in project management showed that projects often lack good communications beyond the boundaries of the project team. Communication with the members of the project team formed for implementation of the project is emphasized rather than communication with customers and other organizations external to this team. This view was supported by organizational communications research by Huber and Daft (1987), which showed that communication patterns between organizations

are based on an organization's ''sensable'' representation of their external environment, i.e. a perception of the environment, and not the environment itself.

Communication frequency refers to the number of formal communications events taking place between project manager methodologies. Research literature and general project management literature suggest reporting frequencies at either fixed intervals like daily, bi-weekly and monthly, or variable intervals like at milestone, phase, or project end achievements. Communications content refers to the way to convey a message, in other words information exchanged between project manager and sponsor at any formal communications event and by use of any media. Organizational structures are assumed to determine communication processes to a greater extent than communication processes are thought to shape organizational characteristics (Krone et al., 1987).

Müller (2003) examined the impact of relational norms, organization structure and project risk on project manager's choices in communications media, frequency and contents in Information Technology (IT) business to business markets. He designed a research model in 2001, to identify the impact of the three independent variables that were organization structure, relational norms and project risk on the dependent variables communication frequency, contents and media. This mode measured the impact of the independent variables on the project manager's choice in communication frequency, contents and media for formal communication with the sponsor. A questionnaire was designed and Delphi techniques were used in five rounds of e-mail based questioning to validate the research mode and the associated constructs, cluster and categorize the questionnaire items, and ensure clarity, understandability and correct order of questions. Responses totaled to 107, and came from 26 different countries (Müller, 2003).

The objective of the Alavi and Leidner's (1999) study was to ascertain the meaning managers ascribe to the concept of knowledge management. Three perspectives emerged: an information-based perspective, a technology-based perspective, and a culture-based perspective. They invited a non-random sample of 109 participants in an executive development program conducted at a Northeast university in July of

1997 to participate in this study. The participants in the program represented were from twelve countries whose significant IT investments. These participants were attending a two-week residential executive development program on the management of information technology. The participants were chief information officers (CIOs), information systems (IS) managers, and general and functional area executives. The participants were asked to respond to the study questionnaire. The usable response rate was 45.8 percent. The questionnaire included the respondents' concepts and perceptions of Knowledge Management Systems (KMS), their perceptions of the current levels of KMS activities in their firms, their expectations of potential benefits, and their concerns regarding these systems. This study provided a description of emerging issues and practices of Knowledge Management Systems.

To work together on complex projects, people should agree on a set of shared goals, coordinate the actions of contributors independently into a unified whole. These activities are the basic components of intellectual teamwork that can be defined as people working together over substantial periods of time to create information-intensive products. Intellectual teamwork demands extensive information sharing and coordination, but communication needs vary over time and over tasks. According to these variations, Kraut and Galegher (1990) suggested that different communication modalities might be useful at successive stages in the life of a long-term project. Limitation is inconsistent with current communication needs in business and science. On the one hand, they are becoming more geographically and temporally distributed, and, on the other hand, more interconnected. Kraut and Galegher (1990) stated that these considerations have prompted people to turn to electronic mail and computer conferencing to counter the costs and restrictions associated with face-to-face communication and the demand for synchronous availability associated with telephones.

Some researches on the uses of electronic mail tend to support task groups or teamwork communications model. For example, Finholt et al. (1990) study of ad hoc task groups indicated that electronic mail is typically used for coordinating work (Sumner, 1988).

In order to assess the utility of computer-mediated communication for various types and phases of intellectual teamwork, Kraut and Galegher (1990) constructed an experiment in which the participants, 117 first-year MBA students, carried out a complex collaborative writing project. In this experiment, defining the contents of the required document and the strategy for constructing it were treated as the planning phase, original writing as the execution stage, and revision and assembly of the final document as the integration phase. The experiment evaluated the effects of task divisibility and communication modality on work processes, on group performance, on individual experiences in the group and on the extent to which group members feel that the group is a viable, cohesive social entity. The goal of this examination was to determine if the limited interactivity and bandwidth of computer-mediated communication influences groups' ability to perform sustained intellectual team work, and whether these effects depend on the groups' tasks and phases (Kraut and Galegher, 1990).

Besides to all these studies, IS/IT investment appraisal is important, because organizations are devoting high levels of resources on IS/IT investments.

> Expenditure in the UK and the US on IS/IT investments is such that it now represents a substantial element of capital expenditure. Today, organizations face the global economic and competitive climate along with increasing IS/IT spending levels. Therefore organizations concerns with IS effectiveness measurement, cost justification and cost containment. (Ballantine and Stray, 1998).

In this section, samples of some recent studies were described. It is clearly seen that the linkage between information systems and performance of individuals and organizations in all industries in terms of efficiency, productivity, communication capability, time and cost reduction are investigated. It is generally focused on the effects of computer-aided systems, and Internet applications to improve operations, financial measures, customer relations, project/process performance, and to provide competitive advantage. Some studies especially focused on the organization process of the communication flows and international innovation. Some results are showed that implementing project management added value to their organizations in terms of increasing both service quality and productivity. Some results lead us to draw a

conclusion that information systems implementation improved project performance in a wide range of industries and the communication technologies have a great impact on both the effectiveness and efficiency of cross-functional communication flows. The low variable cost of new communication technologies investments enhances the sharing of information of organizations.

In the next sections, research model, designed questionnaire that is prepared based on a critical review of the project management value evaluation literature and these recent studies on organizations' and projects' communication management approaches related to information systems technologies, samples, and methodology of the case study will be explained in detail.

3.3 Indicators and Scope of Case Study

This questionnaire[2] contains 32 questions. In order to prepare the most appropriate questionnaire for the objectives of this study, questions are formed by examining the related literature. The cover page of questionnaire, which was sent by e-mail, includes an explanation of the aim of the questionnaire. The cover page is prepared in order to increase the participation by giving firms the impression of trustworthiness. It is clarified that the results could be shared as long as the confidentiality of the firms is protected, since the trustworthiness of the questionnaire is very important.

The questionnaire was designed with 32 questions that was categorized into three definable robust perspectives, which are organization structure of companies, the utility of information technologies in those companies, and lastly use of project management tools and techniques especially for project communication management.

In the first step, it is examined how the firms work, whether they work on production or services, what they produce, and on which area they work such as hardware, software, telecommunication, computer components, etc. It is important to clear

[2]Questionnaire is placed in the Appendix.

which activities those companies perform such as production, research and development, design, engineering, software, and marketing to support prior answers. The profile of employees depending on organization structure is another determinant for this questionnaire. In the second step, it is explored which communication tools and information systems technologies used in the companies to perform the work, and their effects to success rate of projects or to business such as competitive advantage, efficiency or rapid response of market changes. In the third step, it is ascertained whether the companies, which work in electronic sector in Turkey, apply project management practices, the application levels of project management, which tools and techniques are used, and its positive or negative effects to project performance. As a special case under the project management, project communication management practices are scrutinized.

The research model developed in this questionnaire is based on a critical review of the project management value evaluation literature and recent studies on organizations' and projects' communication management approaches.

3.4 Sample-Sectors and Case Study Methodology

The questionnaire, which is the basic data resource of this study, was sent out a selection of 144 firms, the members of TESİD and SASAD, in electronic sector in Turkey by e-mail. 10 firms that work at METU Teknokent (Middle East Technical University, Techno polis) were visited to fill the questionnaire forms by hand together with contact person during this visit.

The questionnaire was sent out in the last week of May and first week of June 2003. Among the total 144 members of TESİD and SASAD are 5 firms, which are the members of both TESİD and SASAD. Therefore, total number of members is 139. The usability of information systems technologies and principles of project communication management was taken into consideration for this selection. A total of 26 questionnaire forms that were sent to members of TESİD and SASAD were returned, 8 from TESİD member firms and 18 from SASAD member firms, since the companies were closed down or companies' mail address were not reachable. 14

firms responded in the first round. Except 14 firms, one company declared not to participate this study. Since response rate was not sufficient, the questionnaire was secondly sent out the rest of firms in the third week of September 2003. 14 firms responded in the second round. Since it has still not enough to analyze, on November 17th and 18th, all firms that has not responded the questionnaire were called, then sent the questionnaire by e-mail again, and 10 firms that are not the member of TESİD or SASAD were visited to fill the questionnaire forms with an interview. In the third round, 24 firms responded with the visited firms. 52 of the rest of 123 formed the scope of this study by answering the questions. This representative sample size is large with respect to firm sizes in the sample.

In this study, project management applications and use of communication technologies in Turkey are investigated. Therefore, firstly electronic sector is chosen since this sector should follow and adopt new technological developments. Secondly, since the projects of companies, which work on in this sector, are complex and required long period of time, it is assumed that these firms need to apply project management and need to use information technologies. Because of these two reasons, TESİD and SASAD member firms are sampled. Furthermore, it is applied to interview with some firms operating in electronic sector for this study, in order to increase the response rate.

It is witnessed an extremely rapid change progression in the world in this information age. Everything takes shape again in this progression and is transformed into information society. Simultaneously, information technologies also change rapidly and are renewed continuously.

Electronic sector takes place in center of global economy because of its market capacity, and electronic sector has the most strategic importance in point of economy. Electronic sector is an area that developed industrial countries reign. In order to compete against developed countries, both it should be invested in R&D, and it should be produced in high quality, and also it should be market in appropriate for contemporary marketing techniques. In this context, it is important the increment of Turkey's market share. Participating important fairs of Turkey electronic

companies in the last years is another important factor that provide to expand of market share. It can be interpreted that Turkey electronic producers follow the product development strategy in focus of market and in this parallel they implement contemporary marketing activities.

Today, electronic sector affects and develops all other industries. Besides, it provides the most employment area in the 21st century. According to Undersecreteriat of Foreign Trade data, export of electronic product increased from $502.247 million in 1995, to $1515.710 million in 2001, and $2156.243 million in 2002. Turkey consumer electronic sector is in the best situation among the other subsectors in point of competition level. Turkish Customer Electronic firms expanded their exports as mentioned in this section, since it has taken place in technological changes and new formation. This sector reached an important share of market especially in European TV market, and companies continued growing up with a rise in foreign market share. Telecommunication equipments follow it. Component subsector cannot meet the internal demands in point of production quantity and quality. Therefore, components are generally exported. Computer subsector has a quite limited chance of international competition, since computer equipments are highly imported. However, there is a dynamic market in Turkey on especially consumer electronics and telecommunication subsectors. These subsectors entered into the world market. Turkey is considered has a potential for software in international competition area. Furthermore, support of Turkish Defense Industry to modernization is a good opportunity. Turkish electronics industry grows up rapidly with increasing employment, productivity, capital stock, production and exports.

On the other hand, Turkish electronics sector has some problems, such as information sharing, design, R&D, raising and orienting human resources, standardization, adequacy of legal infrastructure and institutionalizing. Some obstacles of international competition of Turkish electronics industry, such as lack of a committee on legal infrastructure; inapplicability of clear and supportive encouragements; inadequacy of institutionalization; mergers; strategic partnership with firms in the world, weaken the competition power. But applying stable policies

can be solved these problems. According to Undersecreteriat of Foreign Trade statements, some arrangements started to put in order.

In the light of above discussion, it can be concluded that today electronic industry has a special importance in point of technological developments, innovation, research and development activities, and competition power.

3.5 Conclusion

According to collected data, it is expected to reveal the prevalence of project management applications, especially project communication management approaches of the companies in electronic sector in Turkey. The strategies and policies of companies on communication and project management by using information technologies and communication tools will be evaluated in this study.

In the next chapter, the results of the designed questionnaire that responded by electronic companies in Turkey will be analyzed. It is expected that to apply a good communication management, and use of tools and techniques provide organizations to perform project activities successfully. Furthermore, use of IT enables customer satisfaction, to respond more quickly to changing market conditions, to provide better control of processes and better internal coordination.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION OF RESULTS

In this section, the results of the questionnaire applied to selected electronic companies in Turkey are analyzed. It is evaluated whether these companies follow the new technologies and apply the project management principles, and how much they utilize the information technologies and project communication management applications.

4.1 Introduction

The literature review revealed that a significant amount of work has been done in various areas of project management and communication process. The project management applications and their processes vary from one project to another. In order to achieve the goal defined for the study, three key aspects need to be analyzed. These issues are introducing organizational structure of firms, understanding how much organizations benefit from information technologies, and in this context, evaluating usage of project management applications and communication techniques. Therefore, the questionnaire was designed based on addressing these three issues.

Building on the above description, questions in the first part of questionnaire were prepared in relation with the organizational structure of companies. It is aimed to draw a general picture about firms of which working areas and activities, kinds of projects, number and type of personnel such as managers, engineers, technicians, operators and workers.

Second part of this questionnaire addresses the following research questions in general; are the information technologies (telecommunication-computer technologies, hardware or software) used; which communication tools and techniques are used; how does the use of information technology affect the organizations performance; is there any standard or systematic communication policy in their own company; what are the communication capabilities and new technologies that are adopted; does the use of information technologies provide competitive advantage; does employees benefit from training; what are the impacts of information technologies?

In the third part, questionnaire items were designed to reflect the particular aspects where project management applications and information technology implementation can improve the performance of project and communication processes. Questions of the last part include which project processes and project management techniques are applied in their organization, whether the project management software programs used, which processes of project communication management are applied such as planning, information distribution, performance reporting, and administrative closure, and whether project management applications affect the efficiency and performance of projects success.

4.2 Descriptive Status

This case study research was designed to develop a comprehensive practical framework on project management of Turkish electronic sector. Examining real situations in detail, the exploratory purpose of the research questions is enabling to develop practical guidelines. The questionnaire measures the impact of the variables on the project management applications and utilization of information technology in communication. Responses totaled to 52, response rate is 42.3%, all of which could be used for analysis. Except these 52 firms, one firm expressed that they would not participate this research. After the data collection process, data items were edited and transformed into data list. In the first step, frequency distribution of data was computed for every question. All questions except 2,6,8,9,13,14, 18,19,21 are multiple-choice. Therefore, sum of percentages is not to 100% for some questions,

since respondents are allowed to choose more than one answer. Proportional results of every option were revealed. In this section, descriptive statistics are reported.

4.2.1 Organizational Structure of the Firms

Before the questions, the task of respondent, and his or her telephone number and mail address were asked in order to contact if it is needed. Tasks of the respondents are several, such as quality assurance manager, general manager, general manager assistant, project development director, system integration managers, R&D and system development manager, R&D engineer, design engineer, software engineer, project manager, production manager or engineer, plant manager, information processing responsible, marketing manager, program manager, human resources manager, etc.

For the first part, questions from 1 to 6 are interested in the organizational structure of companies. In the first question, the operations of companies were asked, such as project type, mass production, or service. The structures of and systems in the organizations affect the operations and projects with regard to management systems, style, and organizational culture. In this context, project type organizations based on operations and activities of projects. This kind of companies tend to apply project management systems. Non-project type companies usually do not tend to have project management systems to design and support project needs effectively. Therefore, the question 1 is important for the organizations' systems.. In the light of this result that can be seen in the Figure 4.1, it can be concluded that a considerable number of electronic firms in Turkey operate project type, and mass production for various products follows it. Firms take into consideration operating focused on customer more than operating focus on process.

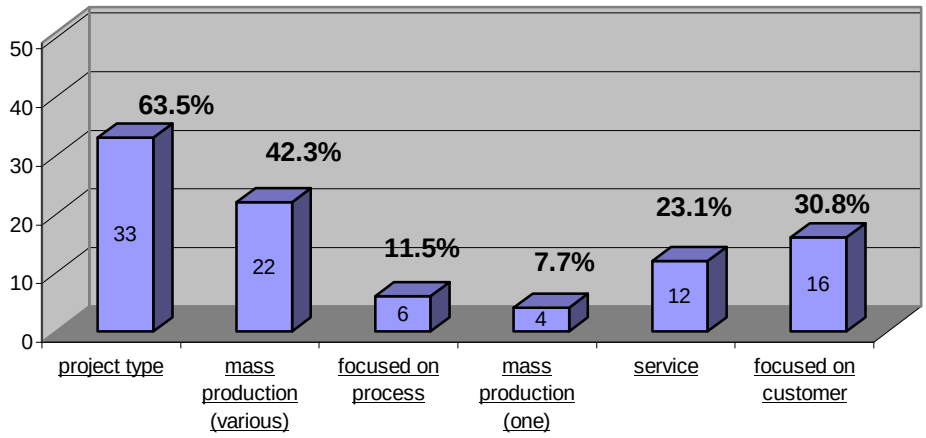


Figure 4.1 Operations of Companies

In the second question, the total number of personnel, in the following question the distribution of worker as manager, engineer, technician, operator, and unskilled personnel were asked. Results show that total personnel number is less than or equal to 10 for 5 companies, between 11 and 50 for 8 companies, between 51 and 200 for 19 companies, between 201 and 500 for 9 companies, and more than 501 for 11 companies. Average number of personnel per firm is 386.74. This number is an evidence that the most of the firms in our sample are mid-size firms. It is observed from the results by comparing question 1, 2 and 5 that firms, which work on only software projects, work with low number of personnel. It is also observed that firms, which operate project type or mass production with the several activities such as production, design, engineering, R&D, marketing right along with software, work with more personnel in respect of organization's capacity.

The aim of asking personnel distribution in the 3rd question is to have an opinion about technical and non-technical personnel number who works for companies in Turkish electronic sector. People determine the success and failure of organizations and projects. Besides, the skills and qualities of people involved in project affect project activities and project performance. In fact, work teams have long been considered an effective device to enhance organizational effectiveness. This value is

observed in broad sense and established relations with the firms' operations and activities, as follows.

According to results, firms, which work on only software projects, work with low number of personnel that on a large scale are engineers. Working technicians are much less than engineers, and operators and unskilled personnel number is either one or none. Number of personnel increases for organizations operating project type or mass production with the various activities. It is observed for 15.4% of companies, of which total personnel number is between 11 and 50, that technician and operator number is too low, while engineer number is high, and technician and operator number is high, while engineer number is too low. Unskilled personnel number is low in these organizations. It can be concluded that if engineer is much more then technicians, then organizations do not need to work technicians, and engineers do technicians' job. The same result is observed for 36.5% of companies, of which total personnel number is between 51 and 200. For these organizations, operator and unskilled personnel number increase as parallel of total personnel number. It is observed for 17.3% of companies, of which total personnel number is between 201 and 500, that technician number is more than engineers. These companies operate in great degree on production, more than engineering activities. Similarly, operator and unskilled personnel number increase for these organizations, too. It is observed for 21.1% of companies, of which total personnel number is more than 500, that engineers much more than technicians, and also unskilled personnel number is high. Number of manager is low for every company, but manager number increases a few for the total personnel number being high organizations. In general, the share of technicians in organizations is less than 35%, and of engineers is more than 50%. There is not established relation with the personnel number and organization structure.

Table 4.1 Personnel Distribution of Sampled Firms in Turkish Electronic Sector

Number of personnel	Manager	Engineer	Technician	Operator	Unskilled personnel
1-10	Low	High	quite Low	one or none	one or none
11-51	Low	High	quite Low	quite Low	Low
		quite Low	High	High	
51-200	Low	High	quite Low	Higher	Higher
		quite Low	High		
201-500	Higher	Low	High	Higher	Higher
More than 500	Higher	High	Low	Higher	Higher

The next question was about the projects of companies such as software, hardware, telecommunication, computer, or other. This question is multiple-choice. It is observed that "other" option, was pointed out either additionally right along with other options (software, telecommunication, system design, hardware, computer equipments) by perceiving in the mean of sector or only another choice as other sectoral products, such as other electronic products. It can be seen from the Figure 4.2 below that projects including software, hardware and system design have major importance for companies in Turkish electronic sector. Projects related to telecommunication and defense industry have an important place that can not be undervalued.

Today innovative implementations of electronic and telecommunication technologies in point of technical and institutional applications is widespread in every area. The share of telecommunication subsector, in total imports, increased depending on investments and improvements in telecommunication sector. Turkish Customer Electronic firms expanded their exports, especially during the last five years, by taking place in technological changes and new formation. This sector reached an important share of market by organizing distribution channels successfully. Turkish electronics industry grows up rapidly with increasing employment, productivity, capital stock, production and exports. Turkey telecommunication industry developed rapidly, and it has a structure of following and implementing technology. Thus, these results of this survey support that firms follow new technologies and keep up with

these technological developments to their own organizations in Turkish electronic sector.

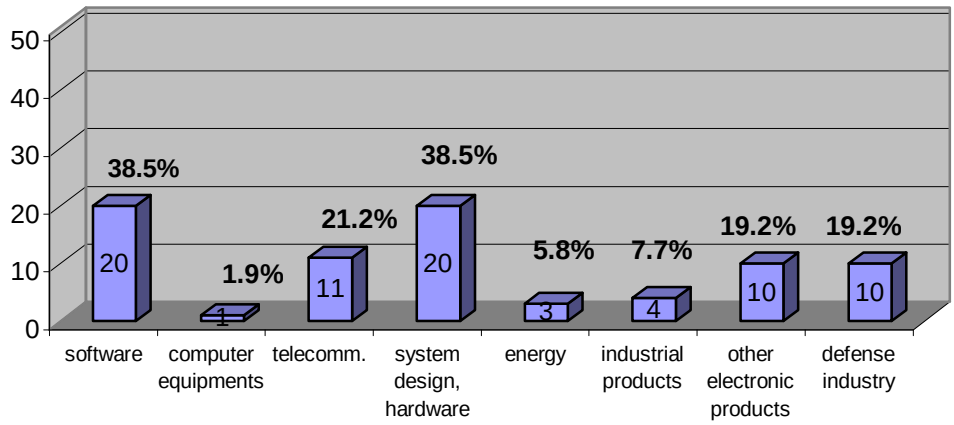


Figure 4.2 Projects of Companies

It was aimed to form an opinion about capabilities and capacities of organizations, and operating activities that are arranged as production, engineering, software, design capability, research and development, and marketing of companies in the fifth question. Results can be seen in Figure 4.3. It can be observed that electronic firms in Turkey have a major priority and pay attention to R&D activities. Following R&D, on a large scale of firms carry out engineering and design activities in their organizations. Production, marketing and software activities also have importance sequentially. There is an inconsistency between this result and the problems of Turkish electronic sector in Chapter 3, section 3.5. In this case it may be stated based on these results that Turkish electronic sector progress on R&D and design. On the other hand, based on these results it is difficult to classify the firms according to their areas of activity since percentages of operating activities are close to each other. It is seem that firms in Turkish electronic sector pay attention to perform all operating activities, which are mentioned in this question.

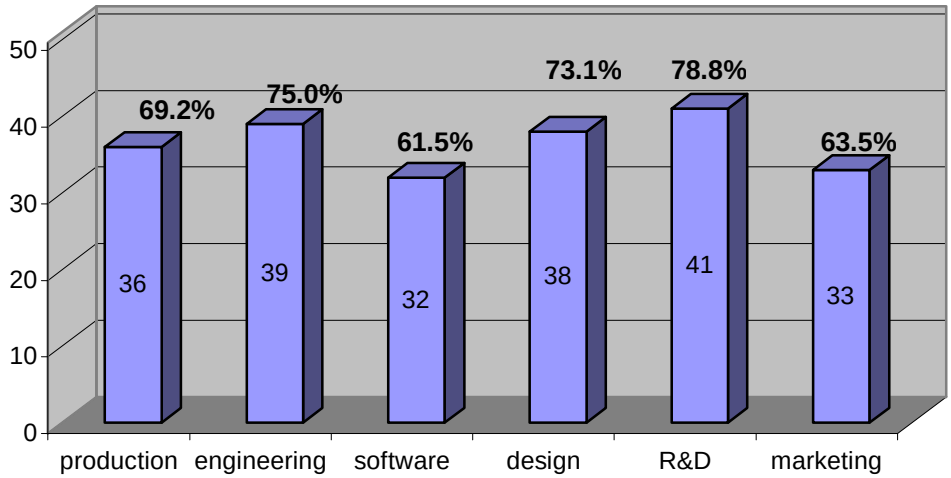


Figure 4.3 Operating Activities of Companies

The last question of the first part was related to organization structure of firms. Organizational structures are characterized as functional, projectized, matrix, and mixed. Functional organization includes hierarchy, every worker has one superior, and staff members are grouped such as engineering to support the business. Project manager's authority is little or not, with a title as project coordinator or project leader and they work part-time on projects for the functional organizations. In projectized organizations, project manager's authority is high, almost total, and they work on projects full-time with a title of project or program manager. Team members of project are collocated, and resources are involved in project work. Matrix organizations are a mix of these two characteristics. Project manager's authority and role on project vary depending on organizations. Mixed organization structure involves all three structures at various levels. Results are shown in Figure 4.4. One firm did not answer this question. The results of question 1 showed that firms in Turkish electronic sector mostly operates project type as share of 63.5%. For projectized organizations, project manager's authority is high, and for matrix and mixed organizations, project manager's authority and role on project vary depending on organizations. The role and authority of project manager can be designated for these three kinds of organizational structure and for needs of project. On the other hand, the rate of functional organizations is 33.3%. This result shows that organizational structure of some organizations is functional, even though these firms operate as project type. Functional organizational structure is not proper for

operating project type, since functional organizations include hierarchy, project manager's authority is little or not, and they work part-time on projects. This includes incoherence for these organizations and may influence project success adversely.

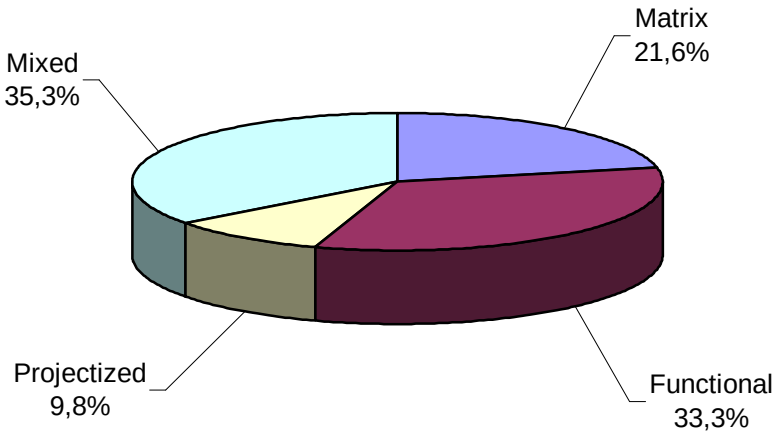


Figure 4.4 Organizational Structure of Firms

4.2.2 Use of Information Technologies

For the second part, questions from 7 to 20 are related to the understanding of how much organizations benefit from information technologies. Firstly, used communication tools in their own company were asked. The technologies, methods and tools used to transfer information among people can vary as to systems and needs of organizations. The need for adequate communication channels and tools is extremely important in creating an atmosphere for successful system implementation. Today, most of the companies use several forms of information technology as part of their communication infrastructure to enhance the communication in their organizations. It can be seen from the Figure 4.5 below that internet and networks systems are used for communication prevalently in Turkish electronic sector. Use of internal firm publications, fax and intranet follow them. Video-conferencing technology is seen as not widespread.

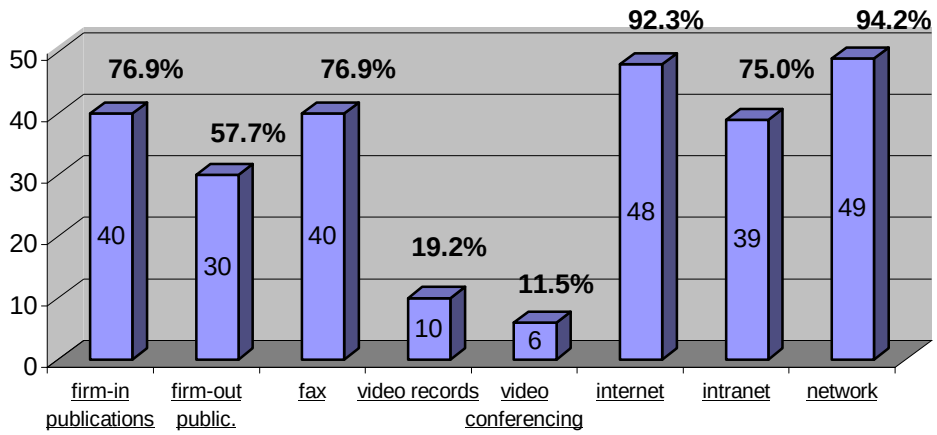


Figure 4.5 Communications Tools

All firms clarify to use information systems technologies in their organizations with the 8th question. Use of information technology is important for many countries with the need to be flexible in today's global business environment**.** At the beginning of this new millennium, the field of information technology causes a radical reconfiguration of products, services, and organizational processes. According to result of the 9th question, respondents are in agreement that use of information systems technologies affect re-planning of main business processes such as production, design, research and development, marketing, etc., as share of 94.2%. On the contrary, 5.8% of firms are not in agreement with this effect of information systems. In this context, it can be concluded that use of information technologies has become an indispensable element more than necessity for companies in Turkey, even for all business world. In addition, use of information technologies result in the redesign of the main processes.

It was asked in the tenth question which strategical businesses are planed to use of information technologies, such as new enterprises, budgeting, communication management, investment, and training. Strategic planning establishes the mission, objectives, goals and strategies for where the organization wants to go in the future. IT has become a strategically important factor to respond to competitive opportunities for organizations. Results can be seen in Figure 4.6. These results

show us firms pay attention to new enterprises and investments in a great degree. However, communication management and training remain in the background for companies in Turkish electronic sector.

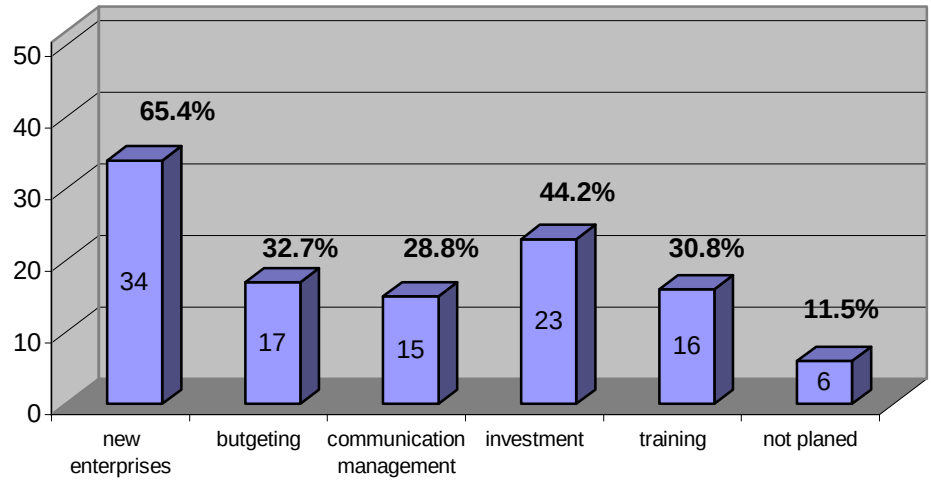


Figure 4.6 Strategic Business Plans

The next question was whether there is any systematic communication policy in their organization in order to define who, when, how people access which information easily. 9 firms clarified not to have any communication policy. 8 firms pointed out that communication policy is determined through the requirements of project contract, but there is no systematic communication policy as seen in Figure 4.7 below.

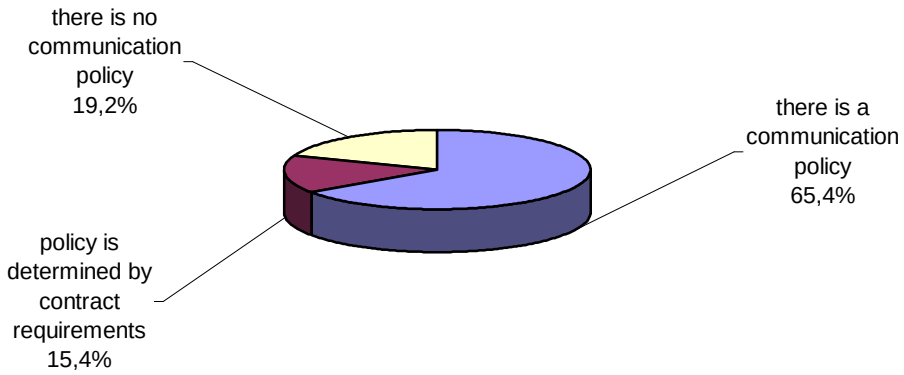


Figure 4.7 Communication Policies of Firms

65.4% of firms stated to have a systematic communication policy and it is determined in respect to internal/external communication of firm, market-based communication, financial communication and investor relationships, relations of social environment, international communication, and/or communication researches. None of firms was pointed out the employee market relationships as determinant, as seen in Figure 4.8 below. Firms, which consider communication important, in Turkish electronic sector have priority to communication in their own organizations and international communication, after then marked-based communication. However, financial communication and investor relations and communications research lag behind them to determine communication policy. According to these results financial communication seems having little importance as a determinant for communication policy, moreover labor relationships do not be assumed as a determinant. It can be concluded that firms take into consideration completing activities and processes in respect of requirements and business necessities, but not take up communication systematically and comprehensively all processes.

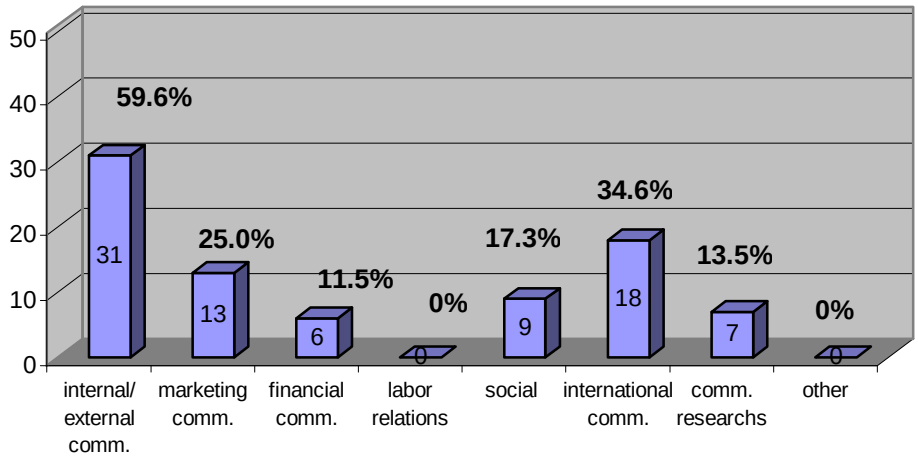


Figure 4.8 Priorities of Determining Communication Policy

In the following question, firms are stated that they benefit from the consulting services as share of 26.9% in order to determine the communication policy and support applications such as analyze, design, software, distribution, as shown in Figure 4.9. All projects and operations need to communicate information, since the informational needs and the methods of distribution vary organization to organization. Identifying the informational needs and determining a suitable means of meeting these needs, namely a communication policy is an important factor for success. This result shows us that university-industry cooperation is not established in the context of communication management policy. Furthermore, benefiting from consulting is far from serving needs of determining communication policy. Thus, firms do not perceive the importance of communication policy and the requirements of systematic communication.

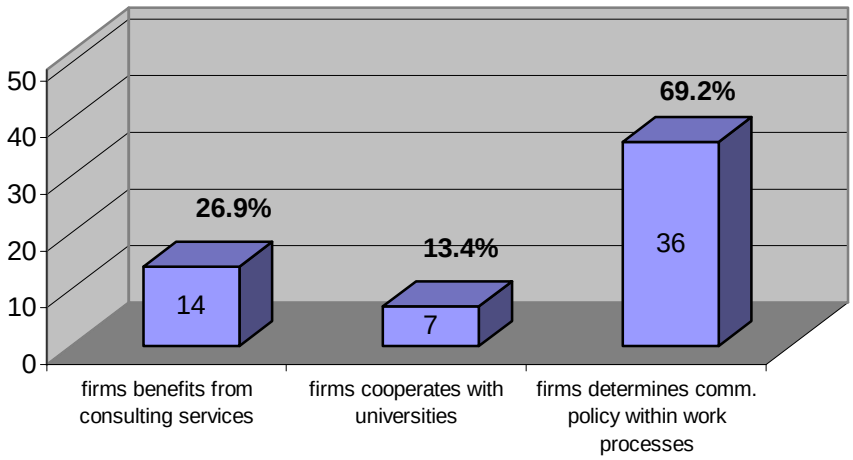


Figure 4.9 Support Applications for Communication Policy

It is seem that firms generally follow the recent innovations and developments for the information systems technologies and adapt to their organizations if necessary. Adoption of new technologies contributes to the success of operations, with respect to the quality of the product, the productivity of the development, and the lead time to market. The result of 13th question, 46 firms as share of 88.5% follow the recent innovations and developments, but 6 firms as share of 11.5% do not. This result supports the claim of the 4th question.

It was asked with the 14th question whether firms make performance measurement for project and communication management through performance reports and use of information technologies. Performance measurement keeps people in organization informed about how executed activities are met the goals and objectives that are determined before. Performance measurement provides information on project and communication activities. If this information reported, then inadequacies or problems are revealed that enables understanding of how current and future performance can be improved. According to results, 31 firms are stated yes as share of 59.6%, rest of 21 as share of 40.4% pointed out no. This result can be concluded that firms in Turkish electronic sector take note of evaluations and performance measurement of project and communication management applications, and have an importance, but it should become prevalent. On the other hand, this result is less than expected for an

effective communication management, since performance measurement of project and communication activities is one of the most important factor of effective project and communication management.

The 15th question was how firms make performance measurement of communication activities. In the light of this result, as seen in Figure 4.10, it can be claimed that performance measurement of communication activities has importance mostly with respect to project requirements and contract. But, in broad sense communication activities are executed only to serve needs of organizations.

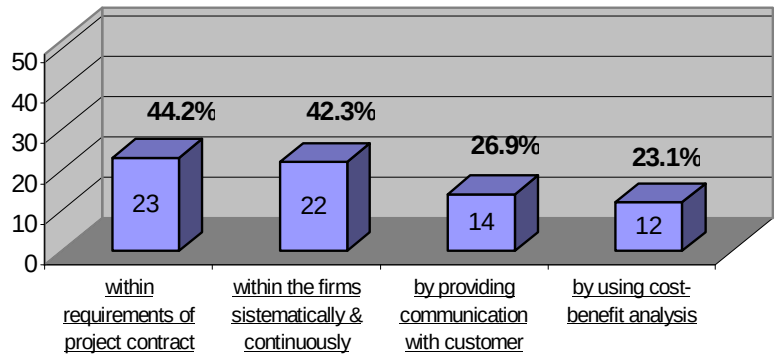


Figure 4.10 Performance Measurement Methods of Communication Activities

It was asked on which areas use of information technologies provide competition power, in the 16th question. Proportional results are shown in Figure 4.11. According to the recent studies, use of IT for competitive advantage is the most critical issue in today's global business world and managers should pay more attention to software development and technology application. IT generates direct and indirect benefits for all organizations, as it changes the basis of competition as well as changes the ways of doing business in owner-contractor relationship. It can be observed from the results of this study that use of information technologies provides competitive power and advantages almost for every issue, especially for rapid response capability to recent developments. Increasing of communication through easily access to inner and outer information systems communication network also provide competitive

advantages to firms on a large scale. At the same time this shows us use of IT increase communication in the organizations. Problem solving and intervention on time, and innovation and entrepreneurship can not be underestimated from the standpoint of the providing advantages of IT. On the other hand, it is surprising that the rates of increasing creativity and re-design of main processes are less than expected. Whereas, one of the main functions of IT to increase creativity for both capability and productivity, and use of IT brings along with re-design of main processes. Moreover, there is a contradiction with the result of question 9, firms were in agreement in agreement as share of 94.2% that use of information systems technologies affects re-planning of main business processes. Besides, innovation and entrepreneurship requires creativity. Maybe, competitive advantages of using IT is mostly perceived from the point of view of increasing communication and rapid response capability, problem solving.

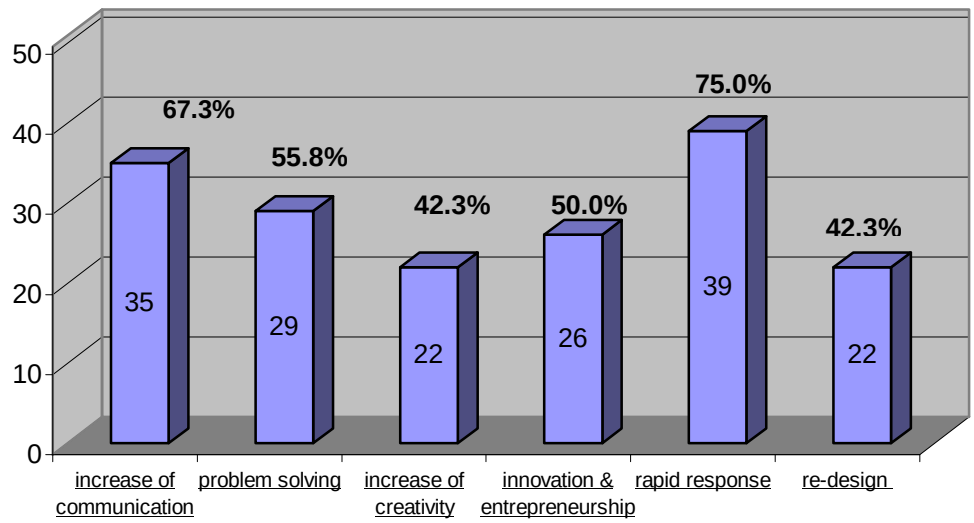


Figure 4.11 Competitive Power & IT

The next question was about trained personnel on information systems of organizations. Results can be seen in Figure 4.12 below. 3.8% of firms have not trained personnel on information systems. Thus, firms in Turkish electronic sector work with engineers on information technologies in a great degree, experts follow

them. However, share of working technicians seen as less in electronic sector. This result is parallel to the result of question 3.

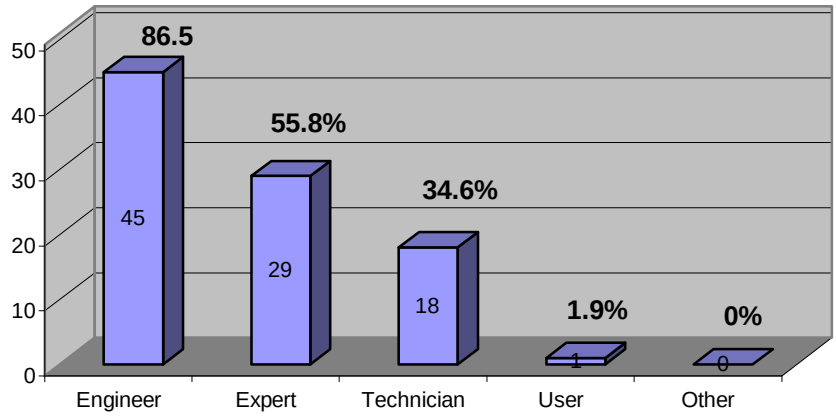


Figure 4.12 Trained Personnel

It was asked in the 18th question, related to the previous question, whether firms perform training to the personnel on use of information systems technologies and improving user capability in order to provide becoming more efficient and effective users. According to the recent studies, training on information technology reduces personnel costs with respect to efficiency, quality, and risk reduction. Results revealed that 65.4% of firms performs training, but 34.6% of firms does not. According to this result, companies in Turkish electronic sector comprehend the importance of training. In fact, use of information technologies and following recent technological developments force the organizations to consider the importance of training. On the other hand, this result includes a contradiction to the result of 10th question. Training was seemed as remaining behind of new enterprises and investments in point of strategic plans.

The 19th question was whether building infrastructures of information systems, which will support and develop existing operations, contribute to long-term productivity and rapid adoption to changes. Firms are pointed out the positive choice as share of 86.5%, but 13.5% of firms are not in agreement with them. In the light of this information, it can be claimed that to increase the productivity and to adapt rapid

changes, which is the main issue in the age of technology, forces organizations in Turkey to use of information technologies.

It was aimed with the last question of this part to evaluate the positive effects of use of information technologies in point of view of organizations. Use of information technologies is generally evaluated as leading to positive performance impacts. IT tools usually made a positive contribution to operations of organizations. Generally, use of IT affects positively. These results are seen in Figure 4.13. The effects of IT on increasing communication, causing new business opportunities and gaining new abilities based on projects, improving capability, increasing performance and efficiency seem more effective than activating project management. Positive effects of IT on increasing communication also support the result of 16th question. The cause of activating project management's lower rate may be related not to apply project management in the organizations.

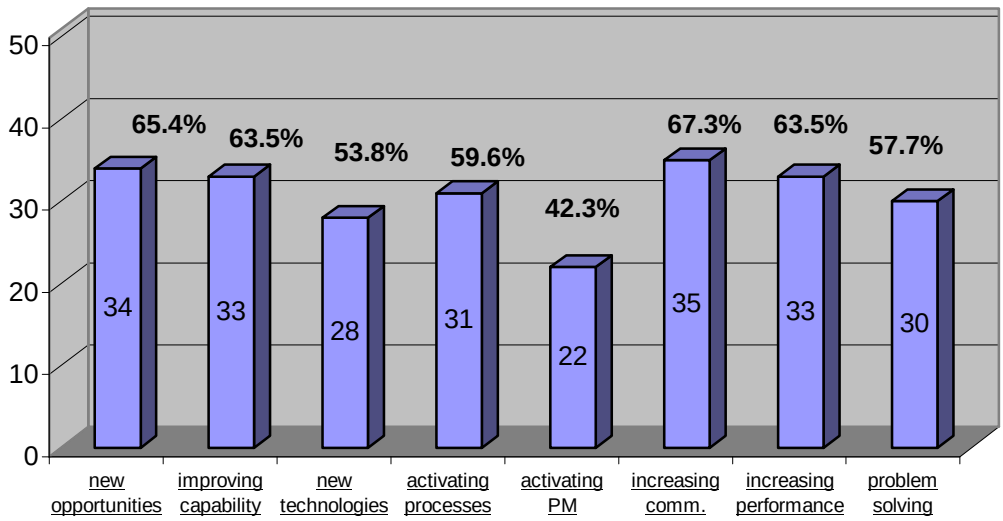


Figure 4.13 Positive Effects of IT

4.2.3 Project Management Applications

For the third part, questions from 21 to 32 are related to the project management applications and communication techniques. 5 questions, from 27 to 31, are especially related to the project communication management applications.

The first question of the third part was whether organizations apply project management principles. Project management is the application of knowledge, skills, tools and techniques to project activities with respect to project requirements. This approach is a method to manage project, and sometimes used to describe management of ongoing operations. This approach treats many aspects of ongoing operations as projects to apply project management techniques to them. Thus, project management methods are not applied prevalently. But, it can be stated that electronic firms in Turkey, in general, as share of 92.2% benefit from the project management methods and applications in different rates, as seen in Figure 4.14.

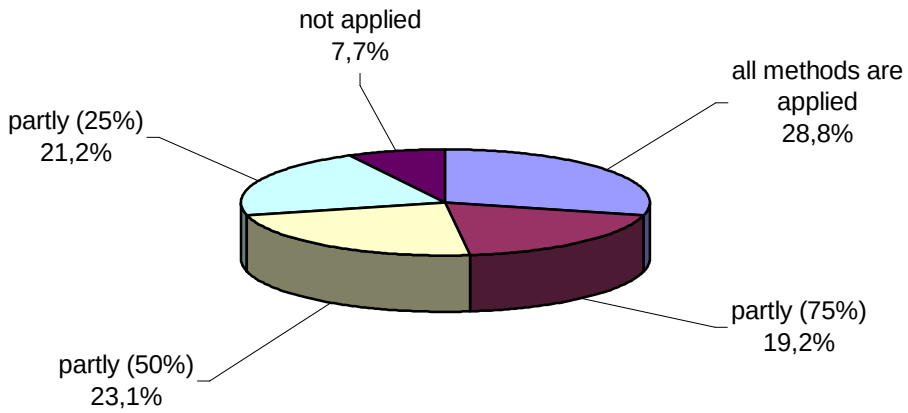


Figure 4.14 Distribution of PM Application

The following question was which main project management processes are applied. Project management is accomplished through the use of processes that are initiating, planning, executing, controlling, and closing. The project team manages the work of projects as to these main processes. The shares of firms that apply project

management process are seen in Figure 4.15 below. It can be concluded that all processes have importance for organizations when applying project management. However, this result involves some contradiction with the previous question, since the rates of project management processes application are more than the rates of project management applications. The cause of this may be not to perceive entirely the difference between project management applications and ongoing operations of their own organizations.

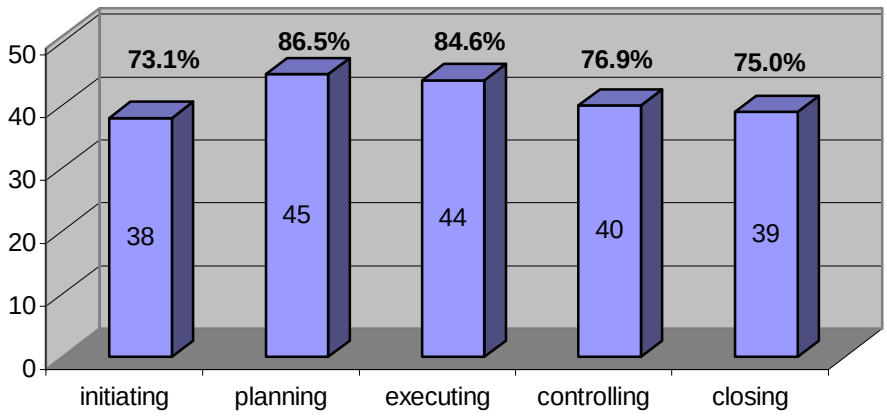


Figure 4.15 Application of PM Processes

The 23rd question was which project management techniques are used. Gantt chart is a common tool for displaying project schedule information. PERT analysis, a network analysis technique, is one of means for evaluating schedule risk on projects. Critical path method (CPM) is used to develop and control project schedules. One of common approach for gathering information from experts to make predictions about future developments is the Delphi technique. Network diagrams represent the activities and connect them with arrows by showing dependencies. Results are shown in Figure 4.16. It can be observed from the results that Gantt chart and network diagrams are used more widespread than CPM. According to rate of Delphi technique, it can be concluded that Delphi technique may not be needed for performing activities or may not be known by the organizations.

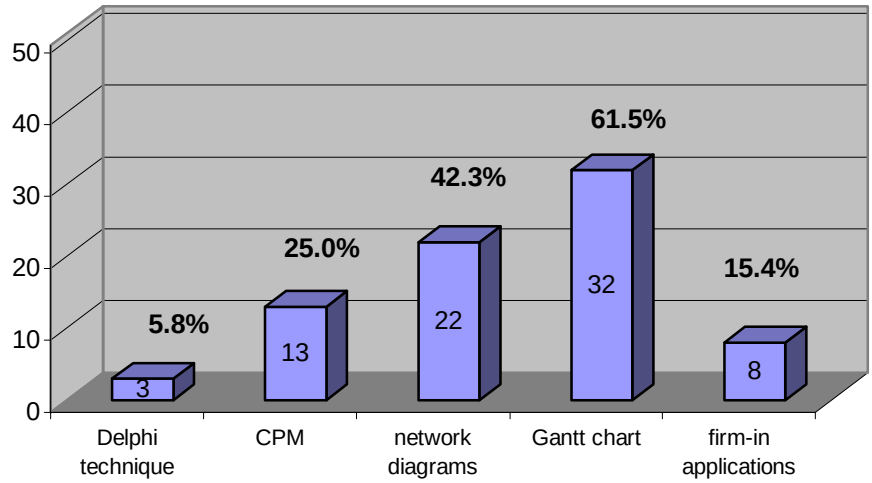


Figure 4.16 Distribution of PM Techniques Application

It was asked the project management software programs that are used in the organizations, in the 24th question. Project management software assists in managing projects. Most of organizations use project management software to perform many project management functions, such as determining project scope, time, cost, assigning resources, preparing project documentation, and so on. Results show that 17.3% of firms clarified not to use any project management software program. In a great degree of firms clarified to use Microsoft Project, as share of 78.8%. 2 firms, as share of 3.8%, use Primavera, only 1 firm (1.9%) uses Gran PM, and 1 firm (1.9%) use special designed program for project. Thus, Microsoft Project is used prevalently by the organizations in Turkish electronic sector. In fact, use and type of software programs for project management can change depending on needs and types of project. Many project management software products are available today. Microsoft project is well-known and the most widely used computerized project management tool both in Turkey and in the world. Use of Microsoft project ease some applications, for example project control and tracking, detailed scheduling, early project planning, communication, reporting, etc. Microsoft project is mid-range tool for multiple users and multiple projects, prices range from about $60 to $600 per user. It may be more suitable for electronic sector than other industries.

It was asked the positive results of project management software programs in the following question, as an extension of question 24. Results in Figure 4.17 show that

project management software help to increase communication and work rapidly. This result also supports the result of 16th and 20th questions that is related to increase of communication by using IT. The rate of applying international standards, delivering product on time and within budget, and increasing customer satisfaction are seen as lower than others. In general, it can be claimed that use of project management software programs affects positively both the projects and the activities.

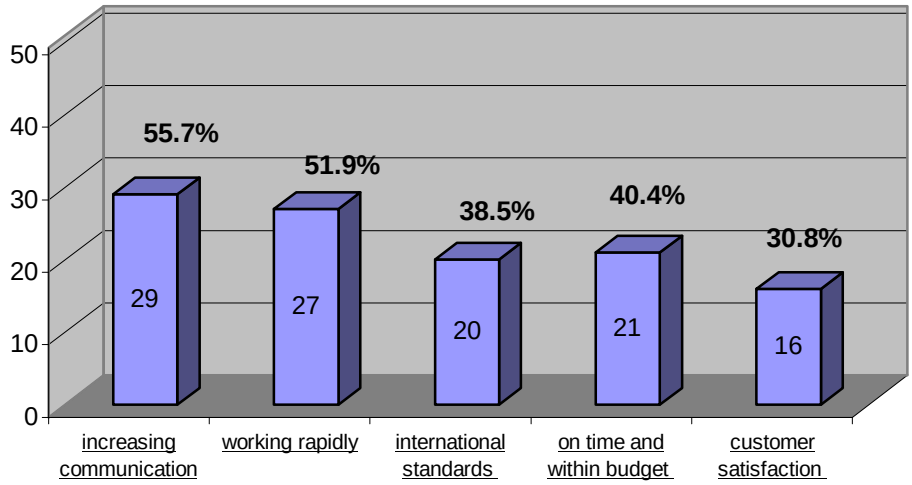


Figure 4.17 Positive Effects of PM Software

The question 26 was whether firms perform training to the personnel on project management. Training provides participants and organizations to develop specific skills to achieve proper application of project management. This result, shown in Figure 4.18, is parallel to the result of 18th question. This data shows us that organizations in Turkish electronic sector have started to perceive the importance of project management and training. On the other hand, according to this result project management is assumed to be understood and learned by engineers and managers. These rates are parallel to the rates of question 3 and 17 in point of working engineer and technician personnel number.

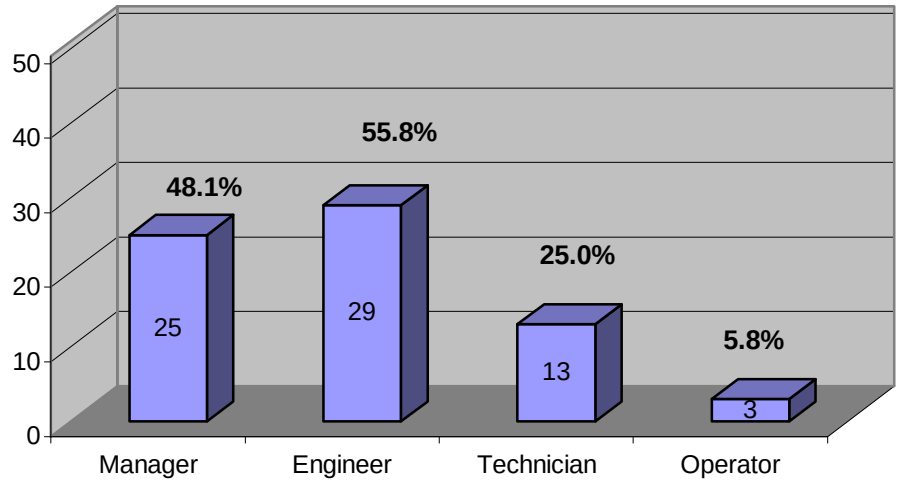


Figure 4.18 PM Training

The following 5 questions are related to the project communication management applications. Question 27 was which main processes of project communication management are applied. Project communication management (PCM) describes the processes required to ensure timely and suitable generation, collection, dissemination, storage, and disposition of project information. PCM provides the links among people involved in the project, ideas, and information that are necessary for project success. PCM has four processes that interact with each other and the other processes of project management knowledge areas. Results can be seen in Figure 4.19. It can be observed that project communication management is not applied completely, as including all processes in Turkish electronic sector. Communication planning has an importance more than other processes; information distribution and administrative closure follow it. This result supports the results of question 11 and 12 in point of having not a systematic communication policy in the organizations. This result is also close to the result of question 14 and 15 in point of performance measurement.

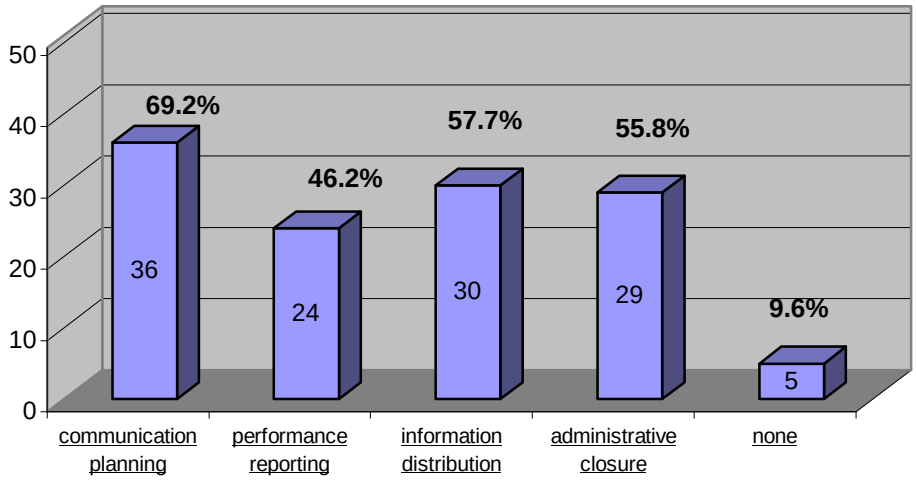


Figure 4.19 Distribution of PCM Application

It was asked which processes of communication planning are taken into consideration, in the next question. Communication planning includes determining information and communication needs of stakeholders; who, when, how needs what information. Results, as seen in Figure 4.20, show us there is no a comprehensive communication planning applications for the organizations. Communication requirements have an importance to perform communication planning process more than others.

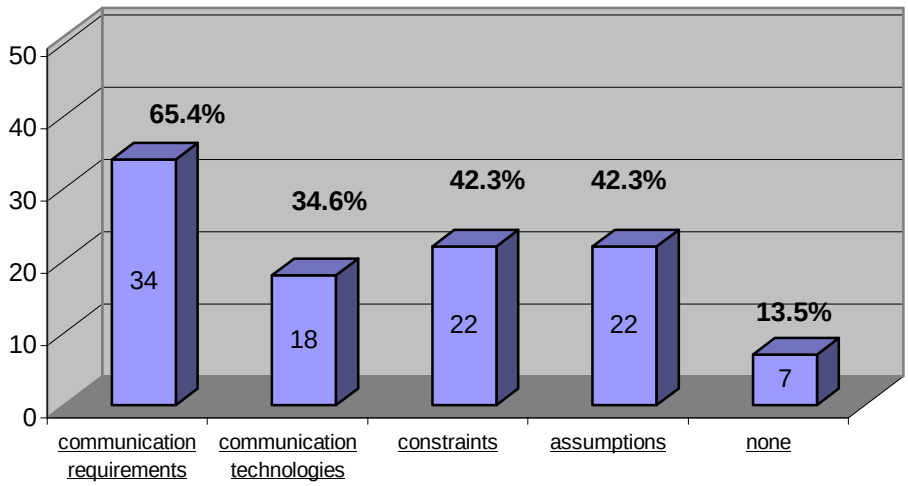


Figure 4.20 Communication Planning

Being used tools and techniques of information distribution were examined with the 29th question. Information distribution includes making needed information available to project stakeholders in a timely manner. This involves implementing communication plan, and responding to unexpected requests for information. As seen in Figure 4.21, in general, it can be stated that tools and techniques of information distribution process are used. However, it can be claimed that results are contradictory with the results of question 27, since the rates of use of information distribution tools and techniques, which are communication skills such as written and oral, formal and informal communication, and information distribution methods, such as fax, electronic mail, and videoconferencing, are more than applying information distribution process. On the other hand, rate of applying information distribution methods can be assumed as parallel to the result of question 7 as use of communication tools. This can be concluded that companies in Turkish electronic sector may not be aware of project communication management methods and difference of ongoing operations in their organizations.

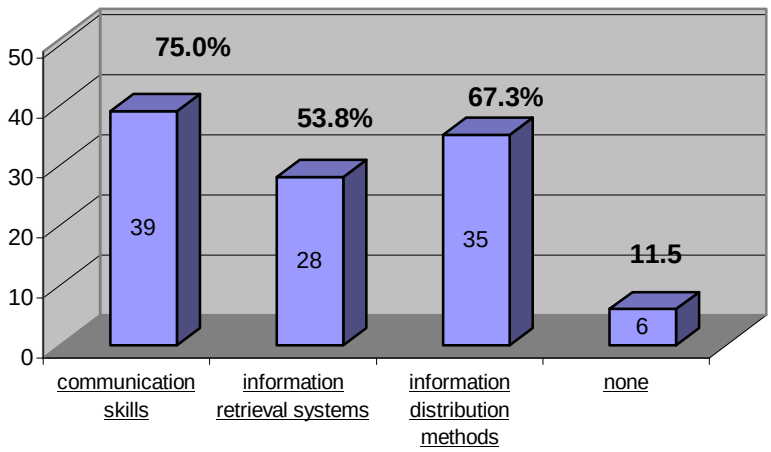


Figure 4.21 Information Distribution

The next question was related to use of tools and techniques of performance reporting. Performance reporting involves collecting and disseminating performance information on scope, schedule, cost, and quality to provide stakeholders with information about project in point of objectives and resources. Results are shown in

Figure 4.22. It can be observed that electronic companies in Turkey pay attention to performance reviews application on a large scale. However, other processes can be negligible for performance reporting process of organizations. There is a contradiction between the rate of performance review for this question and the rate of performance reporting for 27th question. Moreover, this result is not parallel to the results of question 14 and 15 from the point of view of performance measurement. This can be concluded that performance review is a more subjective tool as compared to others. In other words, firms in Turkish electronic sector do not use objective measures of performance reporting. It might indicate the lack of controlling and monitoring. Thus, organizations and people who perform project communication management applications are not perfect on the project activities and processes, yet.

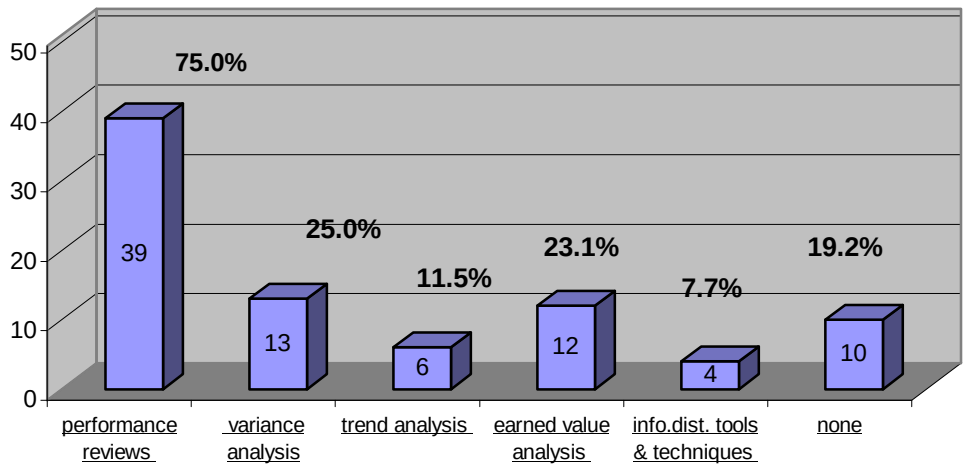


Figure 4.22 Performance Reporting Tools

The last question of being related to project communication management was which processes of administrative closure are applied. The project or phase requires closure, after either achieving objectives or being terminated. This process consists of documenting project results to formalize acceptance of the project product by the customer. It includes collecting project records, reflecting final specifications, analyzing project success and effectiveness, and archiving. Results are shown in Figure 4.23. Results show that organizations take into consideration documentation and archiving more than performance analysis and efficiency measurement. In the

light of all the results related to project communication management, it can be claimed that organizations in Turkish electronic sector do not apply whole project communication management processes exactly and they do not perceive the importance of PCM. Organizations may perform project communication processes partially to complete activities, but they do not carry out all processes systematically. Therefore, it can be concluded that there is no systematic and established project communication applications in companies in Turkish electronic sector.

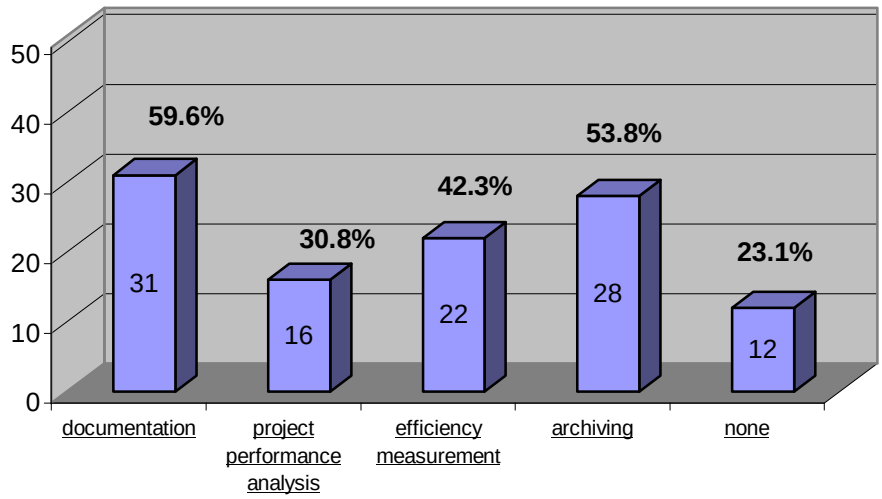


Figure 4.23 Administrative Closure

The last question of this questionnaire, question 32, was how project management applications affect the project success about completing on time, conformance of quality, customer satisfaction, rapid adaptation to change, being within budget, and convenience to strategic plans of organization, as positive, negative or no influence. Results, as seen in Figure 4.24, show that firms generally have the positive opinion about project management on completing projects on time. But, it is expected that all firms be in consensus on positive effects of project management applications. It can be concluded that respondents may not know about the results of project management applications or project management methods may not be applied exactly in their organizations.

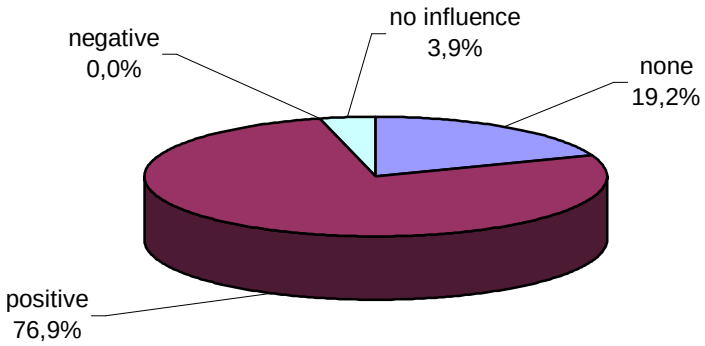


Figure 4.24 Effects of PM Application to Completing Projects on Time

It is seen the similar picture with the previous one for this result, as shown in Figure 4.25. In great degree of firms consider positive effects of completing on time more than conformance of quality, and no influence on conformance of quality more than completing on time. But, firms which reluctant to commit any idea are more.

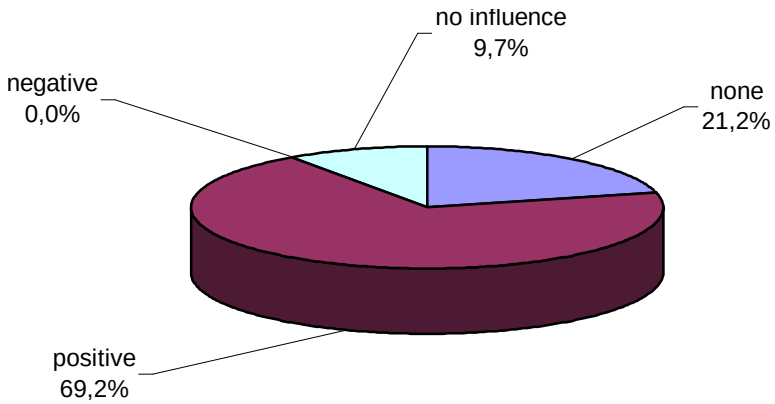


Figure 4.25 Effects of PM Application to Conformance of Quality

Figure 4.26 shows results below. Most of firms have the positive opinion about project management applications on customer satisfaction. On the other hand, it can be claimed that this result is not sufficient to draw a conclusion about positive effects of project management on customer satisfaction, since it is expected more firms in

consensus on this. But, 38.5% of firms do not agree that project management provides customer satisfaction.

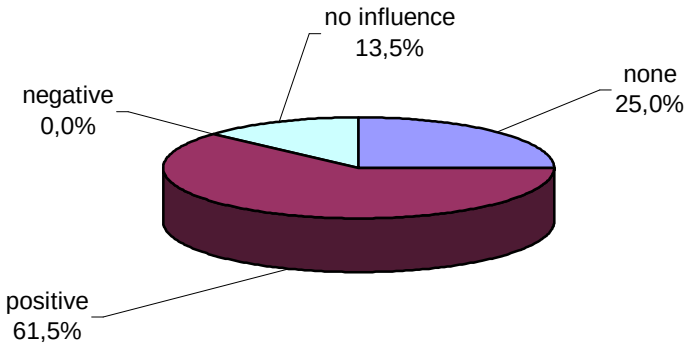


Figure 4.26 Effects of PM Application to Customer Satisfaction

These results, as shown in Figure 4.27 below, are less than expected. Besides, 1 firm thinks project management affects negatively to rapid adaptation to change, only 53.8% of firms clarified positive results of project management applications. 46.2% of firms are not in agreement. Either firms in Turkish electronic sector do not apply project management methods properly in their organizations or companies do not evaluate the performance of project results or organizations do not inform project team about project results.

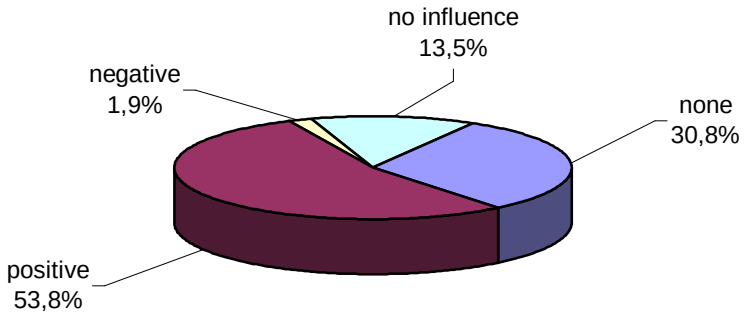


Figure 4.27 Effects of PM Application to Rapid Adaptation to Changes

Results are in Figure 4.28. It is seen the similar picture with the previous one for this result. Results are less than expected, since 51.9% of firms do not agree with the positive effects of project management applications on completing projects within budget. However, one of the main goals of applying project management is completing projects within budget. If this can not be provided, then it can be stated that project is not successful.

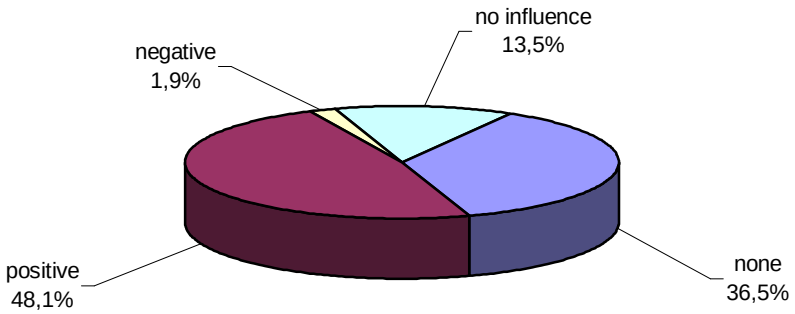


Figure 4.28 Effects of PM Application to Completing Projects within Budget

According to this result, as seen in Figure 4.29, it can be observed that project management do not affect positively on strategic plans of organizations in Turkish electronic sector as share of 53.8%. This result is much less than expected; since project management applications should be executed throughout firms' strategic plans and also strategic plans of companies should be reflected to the activities and processes of project management applications.

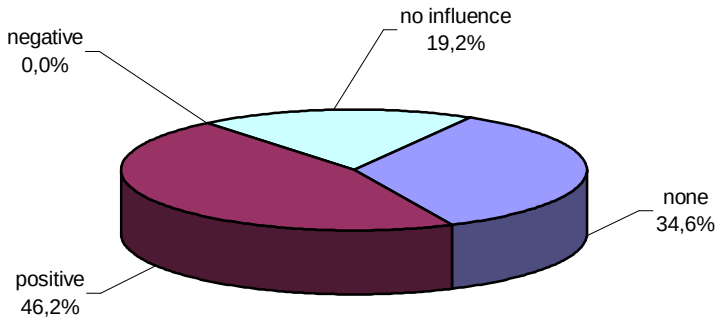


Figure 4.29 Effects of PM Application to Strategic Plans of Organizations

As a result, it can be concluded these results that project management methods and techniques are applied in several levels, but not entirely. This result supports the prediction on conclusion of question 20. The reasons and conclusions will be discussed in section 4.4.

4.3 Observations

In this section, it will be analyzed and emphasized interesting points that are observed when results of questionnaires are evaluated. Some inconsistencies and contradictions will be disclosed below.

It is observed for the 4th question that "other" option, choice of "c", was pointed out either additionally right along with software, telecommunication, system design, hardware, computer equipments by perceiving in the mean of sector, such as energy, defense electronics or only another choice as other sectoral products, such as other electronic products.

Question 7 is about using communication tools and has 9 options related to prevalent tools such as fax, internet, intranet, network, etc. The "c" option of question 29 involves similar tools related to information distribution tools and techniques. It is observed that these two questions were perceived independently, since some respondents who pointed out one, do not pointed out the other.

Question 11 and 12 are related to communication policy of companies. Some respondents pointed out question 11 but not question 12, or vice versa. However, these two questions are dependent to each other. If there is a communication policy for the question11, then way of determine communication policy must be pointed out. If there is no communication policy in the organization, there should not be a way to determine it. Similarly, question 11 is dependent on question 27, option "a". If there is a communication policy in the organization, then communication planning is important. If question 11, 12 is pointed out, then question 27, option "a" must have

been take into consideration. Likewise, question 28 is about communication planning and also related to question 11.

Question 14 is about performance measurement of project management and communication management, and it is related to question 15. Some respondents pointed out question 14 but not question 15, or vice versa. If performance measurement is not performed, then question 15 must not be pointed out. If performance measurement is made, how it is performed must be marked. Likewise, question 14 is related to question 27, option "b", and question 30. Some respondents pointed out question 14 but not question 27, option "b", and question 30, or vice versa.

Question 16 and question 20 are multiple-choice, and have 8 options. One of the 8 options of question 16, option "a" and question 20, option "f" is related to increasing communication. However, on some questionnaire question 16, option, "a" was pointed out but question 20, option "f" was not, or vice versa. Similarly, question 16, option "e" is about capability of rapid response to developments, and question 19 is related to rapid response to changes based on information technologies. Likewise, question 16, option "f", and question 9 are about re-design of main processes related to IT. But, it is observed incoherence between these questions on some questionnaires.

Question 21 asked whether project management is applied in the organizations. The next question asked which main processes of project management is applied. It is observed that question 21 was marked as partly, whereas all processes were pointed out in question 22. Likely, question 21, option "a" was marked, which means all methods are applied, but none of the project management techniques in question 23 was pointed out. Moreover, some respondents clarified that project management is applied, whereas they do not comment on the results of project management applications.

Question 24 asked whether project management software programs are used. Question 25 is related to results of using project management software programs,

namely the two questions are dependent on each other. Although some clarified not use any project management software, they pointed out results of using software programs. If question 24 is not marked, question 25 must not be pointed out.

Question 27 is about four main project communication management processes, and the next 4 questions are related to the specific applications of these processes for every process respectively. It is observed that question 27, option "b" is not marked, whereas question 30 is marked which are related to performance reporting. Although, both question 27, option "c" and question 29 are related to information distribution, some respondents pointed out one, but not the other. Similarly, question 27, option "d" and question 31 are about administrative closure and depend on each other. However, some marked question 27, option "d", but not question 31. There is an inconsistency between the questions mentioned above.

Table 4.2 Cross-Tabulation for Observations

Related questions	Inconsistent points and Observations
4	"other" option had been pointed out by perceiving in the mean of sector or other sectoral products
7-29(c)	Communication tools and information distribution tools
11-12-27(a)	Communication policy and requirements, and communication planning
14-15-27(b)	Performance measurement and its methods, and performance reporting
16(a)-20(f)	Increasing communication
16(e)-19	Capability of rapid response to technological developments
16(f)-9	Re-design of main processes related to IT
21-22	Project management applications and main processes
21(a)-23	Project management applications and techniques
21-32	Project management applications and its impacts
24-25	Project management software programs
27(b)-30	Performance reporting
27(c)-29	Information distribution
27(d)-31	Administrative closure

All observations were taken into considerations during the evaluations of data and corrections are done if necessary.

4.4 Discussions and Conclusions

In this section, the results of the responded questionnaire by electronic companies in Turkey were analyzed. For the first part, organizational structure of firms, it was concluded that a great degree of electronic firms in Turkey operate project type, and mass production for various products. Firms take into consideration operating focused on customer more than operating focus on process. Another result was appeared in this study that projectized firms apply project management as share of 61.5%, non-projectized firms apply project management as share of 30.8%, non-projectized firms do not apply project management as share of 7.7%. Thus, project management application processes have started to become widespread in Turkish electronic sector, but not completed yet.

It was appeared from the results that firms operating on only software projects work with low number of personnel. Besides firms operating project type or mass production with the several activities such as production, design, engineering, R&D, marketing right along with software work with more personnel in respect of organization's capacity. Another result was that technician and operator number is too low, while engineer number is high. It is observed for 21.1% of companies, that engineers much more than technicians. In general, the share of technicians in organizations is approximately less than 35%, and of engineers is approximately more than 50%. It was concluded from these results that if engineer is much more then technicians, then organizations do not need to employ technicians, and engineers do technicians' job. Although Turkey has a young and dynamic population, sector needs qualified personnel that meet this necessity. This conclusion is supported from Erdil (1996) who stated that the industry faces with the lack of technicians who serves as a bridge between the engineers and workers. It is hard to find qualified personnel in certain areas. In order to meet the needs of industry, there is an urgent necessity for these personnel and educational institutions.

Firms in Turkish electronic sector operate at most projectized and mass production (various) as focused on customer on software, and system design and hardware projects with engineering, R & D, and design activities. It could not be established relation with the organization structure and organization activities, and project management application.

For the second part, use of information technologies in Turkish electronic sector, it is appeared that internet and network systems are used for communication prevalently. Video-conferencing technology is seen as not widespread in Turkish electronic sector. This indicated that firms in Turkey mostly use internet instead of video-conferencing to execute communication activities even for international projects. According to the study of Moenaert, et al. (2000), the implementation of a videoconferencing system reduces budget of the innovation traveling about 75 percentages. The study of Alavi and Leidner (1999) supports the results of this survey. They concluded the results of their study that the Intranet is the primary means of displaying and distributing knowledge in organizations with 90% of the organizations using browser tools. The other most common tools are electronic mail. Data of Knowledge Management Systems (KMS) with various tools are as follows: electronic mail 84%, WWW server 42%, video-conferencing 23%. They concluded that knowledge management initiatives should be directly linked to explicit and important aspects of organizational performance (e.g., customer satisfaction, product/service innovations, time to market, cost savings, competitive positioning, and market shares). They resulted from their survey that integrated and integrative technology architecture is a key driver for KMS. The need for integration of the various tools may lead to the dominance of the Internet and internet-based KMS architectures.

All firms in Turkish electronic sector use information systems technologies in their organizations. They are in agreement that use of information systems technologies affect redesign of main business processes such as production, design, research and development, marketing, etc. It is claimed that use of information technologies has become indispensable more than necessity for companies in Turkey, even for all business world. In addition, use of information technologies result in the redesign of

the main processes. According to the study of Zarchry, et al. (2001) the last decade of 20th century, the field of technical communication is experiencing a radical reconfiguration. The language and delivery methods of technical communication are shifting, while at the same time new alliances are emerging. They claim that to work effectively, professionals in technical communication find it necessary to immerse themselves in fields and collaborations often considered external to technical communication—human-computer interaction, instructional technology, business information systems, product design, ergonomics, and management.

Another study belongs to Hameri and Puittinen (2003), and they stated that the communication automatically keeps project partners at all times aware of changes to critical deliverables in the project workspace, so that the changes can be propagated to all deliverables and stakeholders concerned**.** The communication system provides powerful tools for information circulation, thorough which deliverables are submitted for review and commenting, and ultimately requested for approval. Work co-ordination and distribution of project tasks also takes place through the communication tools in the project workspace.

WWW-enabled tools are all accessible from anywhere in the world with a standard www-browser from any workstation connected to the internet, an extranet or a company internal intranet. Global access enables co-operation and project teams to deliver projects in virtual project workspaces.

Results revealed that firms pay attention strategically to new enterprises and investments in a great degree. However, communication management and training remain in the background for companies in Turkish electronic sector. Hayne and Pollard (2000), observed in their study that consultants view `using IS for competitive advantage' as the single-most critical issue; interview data of their study showed that most consultants are engaged in convincing management to apply technology strategically and push the envelope on strategy. They suggested that IS managers the world over, need to pay more attention to software development and technology application. Besides, developing countries would be well advised to plan for increased telecommunications' infrastructures. According to them not only are

firms faced with increasing advances in personnel computing technology, but also great improvements in networking capability are near.

Furthermore, it can be suggested that firms in Turkish electronic sector must also plan the budget by more reserving especially for communication technologies and training, together with new enterprises and investments. Previous theoretical and empirical studies support the importance of investments of communication and information technologies and training. Pena-Mora, et al. (1999) identified that the investments in an IT program is divided into hardware, software, training, support, and personnel saved. In the case study used for this research, personnel costs were more than 60% of the total IT investment. The personnel were un-trained employees who will become the users of the technology, semi-trained professionals who will be part of the administration and support staff, pre-trained experts to take the lead in the implementation, and expert consultants to assist and/or architect the implementation. They observed that the composition of the personnel have a large influence on the training investment and the success of the IT strategy. According to Ballantine and Stray (1998) survey for UK componies, the IS/IT budget allocation within the organizations ranged from £0 to £160 million, with a mean allocation of £7.4 million (median allocation of £1.3 million). The cost of the most recent IS/IT project varied from £10 000 up to a maximum of £5 million, with a mean and median cost of £404 800 and £150 000, respectively. They concluded that under half of the companies surveyed take account of both inflation and taxation (47% and 46% respectively), while only 29% take account of the opportunity cost of the IS/IT investment. Zmud, et al., (1994) stated in their study that IT use is defined as the application of IT within an organization's operational and strategic activities.

Previous theoretical and empirical studies suggest that poor time performance is often an indication of poor communication between people involved in the process. It is claimed that communication must be effective, that is, an information source must be able to codify knowledge and to locate the relevant receivers of information, who, in turn, must be receptive to this information. In addition, communication must also be efficient, that is, given the effectiveness requirements, the cost of communication

must be minimized and information leaks must be avoided. Thus, in coping with these communication requirements, a company may employ multiple strategies.

Results indicate that firms in Turkish electronic sector generally have communication policy to define who, when, how people access which information easily and it is determined depending on different priorities. 34.6% of organizations clarified not to have any systematic communication policy, but the requirements of project contract are the most important factor to determine it. Firms take into consideration completing activities and processes in respect of requirements and business necessities, but not take up communication systematically and comprehensively all processes. It is claimed that firms do not perceive the importance of communication policy and the requirements of systematic communication in Turkish electronic sector.

After having analyzed the internal information needs of the project, it is then important to identify points of communication and data sharing between different projects or organizations that are related in strategic alliances or owner-contractor relationships. An investment in intra-project communications has to precede any investment in inter-project communications. The development of efficient external communication links has to be based on a sound information infrastructure inside the project. For a good understanding of what processes of the project can benefit the most from the use of IT, it is useful to know what links exist between different processes and functions inside the project. Müller (2003) concluded that increased relationships with customers lead to more frequent communications. The examination of this study showed that organization structure has no significant impact on communications preferences of IT project managers. He also claimed that it did not confirm organizational structure's impact on communication. This study also supported the result above that it could not be established relation with the organization structure and activities of organization. As a result, since communication is one of the most important factor that affects directly the organizations' and projects' success, it is suggested that firms in Turkish electronic sector should be more oversensitive about communication policy and communication management.

Results indicate that firms in Turkish electronic sector take note of evaluations and performance measurement of project and communication management applications, and have an importance, but it should become prevalent. Performance measurement of communication activities has importance mostly with respect to project requirements and contract. But, in broad sense, communication activities are executed only to serve needs of organizations.

It is appeared from the results that firms in Turkish electronic sector generally follow the recent innovations and developments for the information systems technologies and adapt to their organizations if necessary. Moenaert, et al. (2000) claim that the adoption of the information systems technologies and communication capabilities contributes to the success of an international new product development project, as measured by the quality of the product, the productivity of the development, and the lead time to market. Alavi and Leidner (1999) suggest that knowledge management benefits will only be realized by organizations that are not only technologically adept, but that make the long term investment to align the cultural, managerial and organizational elements for knowledge management.

Use of information technologies provides competitive power and advantages in Turkish electronic sector for increasing communication, problem solving, intervention on time, innovation and entrepreneurship, reconfiguration of main processes, and especially for rapid response capability to recent developments. On a large scale of increasing communication through easily access to inner and outer information systems communication network provide competitive advantages to firms. At the same time this shows us one more, use of IT increase communication in the organizations. Problem solving and intervention on time, and innovation and entrepreneurship can not be underestimated from the standpoint of the providing advantages of IT.

These results supported by Zmud, et al. (1994), IT use involves the extent to which IT takes the form of cost reduction, management support, strategic planning, and competitive thrust applications: cost-reduction applications reduce the cost of business activities; management support applications assist managers' efforts to

monitor, control, and design business activities; strategic planning applications support managers' efforts to formulate business strategies; and competitive thrust applications establish competitive advantage in the market place. Findings of Zmud, et al. (1994) indicate that managerial IT knowledge is crucial for bringing about high levels of IT use within business units. As conjectured, managerial IT knowledge apparently does facilitate the rich information exchanges and joint problem solving among IT and line managers that are critical in enabling an organization to move beyond the more obvious IT applications toward applications that provide "higher-order" business value.

Zmud, et al. (1994) also claim that the exchange of information among IT providers (both internal and external) and line managers is as important in creating opportunities to leverage IT as is the role of overlapping information/knowledge exchanges for product and process innovation. Learning is fostered by the ability of managers to discuss problems or opportunities effectively, exchange information openly, and possess a sufficient common degree of understanding about the information to be able to jointly work together toward common ends.

According the results of this study, it is claimed that companies in Turkish electronic sector comprehend the importance of training. In fact, use of information technologies and following recent technological developments force the organizations to consider the importance of training. On the contrary, this result includes a contradiction to the strategic business planning of organizations in Turkish electronic sector. Training was seemed as remaining in the background of new enterprises and investments in point of strategic plans. Pena-Mora et al. (1999) observed that the composition of the personnel have a large influence on the training investment and the success of the IT strategy. IT training generates benefits that are in the form of trained personnel and software methodologies developed for all organizations. Pena-Mora et al. (1999) claim that the returns of IT training in productivity, quality, and risk reduction are of primary benefit to the organizations and projects. Their return value is value added to the project itself, after the deployment phase is complete.

Results indicate that use of information technologies contributes to increase productivity and to adapt rapid changes in Turkish electronic sector. It is claimed that firms in Turkish electronic sector benefit from information technologies in their organizations in order to gain advantages for new opportunities, improving capability, utilizing new technologies, activating both processes and projects, increasing communication and performance, and problem solving. These issues are also accepted to provide competitive advantages. The effects of IT on increasing communication, causing new business opportunities and gaining new abilities based on projects, improving capability, increasing performance and efficiency are seen more effective than activating project management. The cause of the lower rate of activating project management will be discussed later. Maybe it is related not to apply exactly project management principles in the organizations.

Previous theoretical and empirical studies support the contribution of IT with various aspects. According to the study of Moenaert, et al. (2000), the adoption of information systems infrastructures enables the innovating firm to lower communication costs, maintain information secrecy, and improve network transparency, knowledge codification and knowledge credibility. Pena-Mora et al. (1999) claim that the primary returns from an IT investment are increased productivity, increased quality, and risk reduction. Their effect is also felt throughout the development and deployment phases of the project.

Mohamed and Stewart (2003) claim that IT tool made a positive contribution to operational indicators such as document transfer and handling, enhanced coordination and communication between project participants, and reduced response time to answer queries. Overall, they perceived the operational perspective as being where the web-based system derived the most value. However, project participants were not overly satisfied with the level and frequency of IT training and support provided. Goodhue, et.al (1995) concluded that characteristics of the individual (training, computer experience, motivation) could affect how easily and well he or she will utilize the technology. Differences between systems have influence on whether a user has the authority to access data; it is much more likely that job level will influence authority.

Hameri and Puittinen (2003) observed that the main benefits obtained from using the WWW are increased customer satisfaction through faster response and efficient communication, and the simple and efficient support service organization. The results of the case study of Hameri and Puittinen (2003) show that a WWW-enabled approach for delivering projects works conveniently, and also delivers benefits. They concluded that the added value of the WWW in project delivery stems from its power of being a rich and global communication medium. The WWW brings rich business information securely and directly without intermediaries to the people who need it when they need it, and wherever they are. They claim that WWW in itself enhances and enables efficient project communication between partners, and supports the communication aspects of efficient project business. Such partners can reach all of the information gathered, and draw conclusions about the project performance.

For the third part, project management applications, according to results of this survey it can be stated that project management methods and techniques are not applied completely. It can be concluded that, on large scale of electronic firms in Turkey (92.2%), benefit from the project management methods and applications in various levels. Moreover, results show that all processes have importance for organizations when applying project management. However, it is observed an inconsistency between the project management applications and processes, since the rates of project management processes application are more than the rates of project management applications. The cause of this may be not to perceive entirely the difference between project management applications and ongoing operations of their own organizations.

In general, it is appeared that mostly used techniques are Gantt chart and network diagrams, and preferred software program is Microsoft Project in Turkish electronic sector. In fact, being used techniques and software programs for project management can change depending on needs and types of project. Furthermore, firms utilize software programs in order to gain some advantages, such as increasing communication throughout project life cycle for both project and organization, providing work speedily and easily, providing possibility for applying international

standards, facilitating of product delivery on time and within budget, and increasing customer satisfaction. Data show that organizations in Turkish electronic sector have started to perceive the importance of project management and training. On the other hand, according to the survey, project management is usually assumed to be understood and learned by engineers and managers.

It is observed that project communication management is not applied completely, by including all processes in Turkish electronic sector. Communication planning has an importance more than other processes. This result supports of having not a systematic communication policy in the organizations. Moreover, results indicate that there is not a comprehensive communication planning applications for the organizations. Communication requirements have an importance to perform communication planning process more than others. In general, it can be stated that tools and techniques of information distribution process are used. However, there is a contradiction, since the rates of use of information distribution tools and techniques, are more than applying information distribution process. Thus, it can be concluded that companies in Turkish electronic sector may not be aware of project communication management methods and difference of ongoing operations in their organizations. According to data, electronic companies in Turkey pay attention to performance reviews application on a large scale. However, other processes can be negligible for performance reporting process of organizations. Thus, organizations and people who perform project communication management applications are not perfect on the project activities and processes, yet. Results of this survey also show that organizations take into consideration documentation and archiving more than performance analysis and efficiency measurement. In the light of all the results related to project communication management (PCM), it can be claimed that organizations in Turkish electronic sector do not apply whole project communication management processes exactly and they do not perceive the importance of PCM. Organizations may perform project communication processes partially to complete activities, but they do not carry out all processes systematically. Therefore it can be claimed that there are no systematic and established project communication applications in companies in Turkish electronic sector, yet. The reasons of these

results may be related to subjective performance evaluation, poor monitoring and controlling, lack of university-industry cooperation, and limited financial resources.

The research of van Ruler (2000) supports these results in respect of project communication management and training in his study. Van Ruler (2000) concluded that although communication management may well be gaining a more acknowledged place within organizations, its position is still very marginal. According to data, time was almost not spent for the production of communication plans. Survey has shown that the communication management departments of large companies spend comparatively very little time on research-based and research-led communication planning. The respondents in that survey, devoted most of their time to media production and activities related to presentation, representation, and contact management. The conclusion to be drawn from this survey is that communication management may well have a place within most of the respondent organizations, but that in practice the profession revolves mainly around editorial work and not around planning or consultancy. In briefly, the survey showed that in most organizations communication management is a part of job specialization, but a fairly marginal activity to which those with neither qualifications nor experience-based expertise are appointed.

In the light of this survey, an education in communication is not the norm. Van Ruler (2000) concluded that the current generation of those responsible for communication management has not been trained for the job in hand and cannot fall back on any practical experience. He concluded that the organizational communication profession is undifferentiated with editorial work and press relations as its core tasks at every level. In addition, specialist training is far from being the norm. The professionalization phase has not yet begun, either in terms of education or of vertical and horizontal labor differentiation. From these studies he concluded that the increased attention paid to communication as a strategic variable in communication management theory has not (yet) had an effect on the actual position of communication experts and their work. There are very few organizations where the communication expert intervenes at a policy level. Also, executives with training or

experience in communication are still seldom appointed to positions of responsibility within the profession.

Moenaert, et al. (2000) claim that certain level of project protocol is needed to avoid conflicts and inefficiencies. According to their study, the formalization of innovation activities is an important factor to the improvement of communication between R&D, marketing and production in an international product development project. Because formalization forces all parties involved to exchange information at regular time intervals. Without formal activities, like action plans and project review meetings, communication depends on the discretionary (ad hoc) behavior of the team members. They suggest that a major source of problems concerns the non-involvement of relevant units and individuals during the product specification and strategy formulation activities. Their data shown that even in big firms, limitations in manpower and priorities towards local activities often severely bound the intention to share information.

Hameri and Puittinen (2003) stated that project information includes all pieces of human documentation that describes the product (drawings, models, specifications, etc.) and the project management with its processes (schedules, resource plans, quality manuals, organizational chart, minutes, reports, budgets, etc.) According to Hameri and Puittinen (2003), the conceptual product framework bases on project activities from the point of view of processes, structures, and communication, which all add up to a project business environment. Hameri and Puittinen (2003) stated that by using WWW-based tools to support projects workspaces can be set up and rolled out very rapidly. Project partners can join in on workspaces on demand without specialized software and they can work on several projects for different clients at the same time, since the medium is open and available to all companies, large and small.

In general, firms in Turkish electronic sector have the positive opinion about effects of applying project management on completing projects on time and within budget, conformance of quality, customer satisfaction, rapid adaptation to change, and convenience to organization's strategic plans. The survey of Center for Business Practices supports these results. According to that survey, implementing project

management improves organizations expectations on the order of 50% in project/process execution, 54% in financial performance, 36% in customer satisfaction, and 30% in employee satisfaction. It is concluded that organizations implementing project management would be at a competitive advantage. According to the responses of the survey, project management adds value to organizations for all industries, and all size organizations. The measures in this study revealed that significant gains such as completing projects on time, project schedule, conformance of quality and requirements, customer satisfaction, and project budget are provided. It is appeared that the implementation of project management is new to the most of the organizations.

However, the rates of project management advantages decreases from completing projects on time, conformance of quality, customer satisfaction, to rapid adaptation to change, completing projects within budget, and convenience to organization's strategic plans respectively. Whereas, the main purpose of project management is completing projects on time and within budget with high quality by providing customer satisfaction and reflecting organization's strategic plans. This can be concluded that either firms in Turkish electronic sector do not apply project management methods properly in their organizations or companies do not evaluate the performance of project results or organizations do not inform project team about project results. The conclusion to be drawn from this survey is that organizations in Turkish electronic sector are at the beginning of project management methods and principles.

This analysis was performed to examine the hypothesized relationships and the empirical investigations. Results show that internet and network systems are mostly used to provide communication in Turkish electronic sector. Information technology has a great importance, and strategic plans of organization include the investments and new enterprises related to IT. Companies have started to perceive the importance of communication, but not implement systematically. Therefore, the proposition that firms in Turkey, which apply project management principles in their organizations, have communications policy can be rejected.

All firms have the perception of the competitive advantages brought about information technologies, because of the positive contributions of IT to organizations. Thus, the other proposal that following new technologies, and benefiting from information and interactive communication technologies provide to increase performance, create new business opportunities, and contribute to improve customer satisfaction, respond more quickly to changing market conditions, and better control of processes can be accepted.

Furthermore, it is drawn a conclusion that training and communication are not accepted providing gain to organizations, and direct return of training and communication investments has not been comprehended. Mostly engineers benefit from the training for organizations that perform training. This can be evaluated as a normal result of being engineers more than technicians in organizations. On the other hand, it can be claim that project management is new but widespread at various levels for most companies in Turkish electronic sector. Organizations utilize the information technology not only for their ongoing operations, but also for their project management applications. Although use of IT help to the implementation of project management, project management can not be effective and efficient sufficiently if organizations, project managers, and project team do not apply project management methods and principles properly. This can be stated in the same way for project communication management.

In the light of the results in this study, it may be claimed that communication management and performance measurement are not performed properly, just to meet the requirements and needs of projects or ongoing operations in Turkish electronic sector. In this context, the hypothesis of this study that applying a good communication management, determining how to communicate, and use of communication tools and techniques provide organizations to perform project activities successfully thanks to effective flow of information cannot be accepted for Turkish electronic sector.

Many studies agree that one of the major factor to affect the success of any project is a failure to communicate. Organizations and especially project managers should aim

for stable communication practices with their customers, achieved through focus on clearly understood project management methodologies and good relational norms. The successful completion of the project depends on the accuracy and timing of information exchange between the project team.

CHAPTER 5

CONCLUDING REMARKS

In this study, the prevalence of project management applications and how much benefit is gained from the information technology at project communication management applications were investigated for Turkish electronic sector. The objective was to determine the levels of project management applications of firms, the usage of communication tools and information technologies; to draw a common picture of firms about strategies, policies and approaches on communication and project management by using information technologies and communication tools, and to evaluate the conformity of them to project management principles. Furthermore, it was intended to identify the advantages and disadvantages brought by the applications project communication management principles and techniques.

The proposition in this study was that firms in Turkish electronic sector, which apply project management principles in their organizations, have communication policy in order to communicate effectively and increase efficiency of projects. The other proposition was that following new technologies, use of information and interactive communication technologies provide to increase performance of projects, and create new business opportunities. In this context, the hypothesis of this study was to apply a good communication management, to determine how to communicate, and use of communication tools and techniques provide organizations to perform project activities successfully because of effective flow of information. Additionally, use of information technology contribute to improve customer satisfaction, respond more quickly to changing market conditions, and provide better control of processes, since

these tools and techniques help to complete processes as in conformity with quality requirements, in timely manner, and within budget.

The research model was developed with a designed questionnaire in order to evaluate the project management practices in Turkish electronic sector. It was aimed to assess the prevalence of project management applications and the benefits of the information technology at project communication management applications. The sampled companies are the member of TESİD (Turkish Electronics Industrialists Association) and SASAD (Defense Industrialists Association), and some other firms operating in electronic sector. The questionnaire was sent out by e-mail to a selection of 154 firms, 80 members of TESİD, 64 members of SASAD, and 10 firms that work at METU Teknokent (Middle East Technical University, Technopolis) were visited to fill the questionnaire forms by hand. The questionnaire was designed with 32 questions that were categorized into three definable robust perspectives, which can be defined as organization structure of companies, the utility of information technologies in those companies, and lastly use of project management tools and techniques especially for project communication management. Responses totaled to 52 out of the 123 firms reached, response rate is 42.3%. Thus, this representative sample size is large with respect to firm sizes in the sample, and descriptive statistics were reported.

In the light of the results in this survey, project management application processes have started to become widespread in Turkish electronic sector, but not completed yet. When the ratios of project type organizations and functional organizations in Turkish electronic sector are compared, result shows that organizational structure of some organizations is functional, although these firms operate as project type. This includes inconsistency for these organizations and may influence project success adversely. Functional organizational structure is not proper for organizations operating project type, since functional organizations include hierarchy, project manager's authority is little or not, and they work part-time on projects. Projects are essentially horizontal, but the functional organization is configured on hierarchical bases, and it is vertical. There is no one person maintaining oversight for the management of the project for functional organizations. This structure can create

some problems for projects. In order to reduce harm to the project's need, it may be provided having the project managed on a total systems basis, or it may be provided having specific designation of authority and responsibility for the project when the functional organizational structure is used. And also, it may be taken some time to train the functional representatives that are working to support the project in the basics of project management processes and techniques. An important part of corporate strategy is an appropriate organizational design for the implementation of projects. In some cases, a company may modify its organizational design to strengthen specific delineations of project authority and responsibility criteria. It may be suggested that in response to the need to manage projects better, some companies should undergo organizational realignment.

It was revealed that most of the firms in our sample is mid-size firms It was observed for companies in general that engineers are much more than technicians. Firms in Turkish electronic sector work with engineers on information technologies in a great degree, experts follow them. However, share of working technicians seen as less in electronic sector. It was concluded from these results that while engineer is much more then technicians, then organizations do not need to employ technicians, and engineers do technicians' job. It may be suggested that there is a need for technicians in Turkish electronic sector that have a role as a bridge between engineers and operators, four years educated for practical operations. In this case, engineers may allocate more time for research and developments.

It was revealed that electronic firms in Turkey have a major priority and pay attention to R&D, engineering and design activities in their organizations. Production, marketing and software activities also have importance sequentially. However, based on these results it is difficult to distinguish the firms according to their areas of activity since percentages of operating activities are close to each other. There is incoherence between this result and the problems of Turkish electronic sector, since R&D and design were seem as the major problems of Turkish electronic sector. In this case, it may be stated based on the results of this survey that firms in Turkish electronic sector pay attention to perform all activities, which are R&D, engineering, design, production, marketing, and software. On the other hand, all

activities may not have the same dynamic structure and productivity in the same organizations or allocated budgets by the organizations may not be the same for all activities.

In summary, firms in Turkish electronic sector operate at most projectized and mass production (various) as focused on customer on software, and system design and hardware projects with engineering, R & D, and design activities. It could not be established in relation with the organizational structure and organizational activities, and project management application. It should be underlined that companies of which organizational structure is functional in spite of operating as project type, are seen as needing re-arrangement for their organizational structure for proper management.

The countries, which have the fastest growth rate at total factor efficiency area, are expected to use information technology and communication technologies the most prevalently in their economies. For Turkish electronic sector results indicated that firms generally use internet instead of video-conferencing to execute communication activities even for international projects. The cause of this may be related to the financial or size of projects. In addition, companies are in agreement that use of information systems technologies affect re-planning of main business processes such as production, design, research and development, marketing, etc. In this context, it was concluded that use of information technologies has become an indispensable element more than a necessity for companies in Turkey, and use of information technologies result in the redesign of the main processes. It was revealed that building infrastructures of information systems, which will support and develop existing operations, contributes to long-term productivity and rapid adoption to changes. It can be claimed that to increase the productivity and to adapt rapid changes, which is the main issue in the age of technology, forces organizations in Turkey to use of information technologies.

When strategic business plans related to the use of information technologies were investigated for Turkish electronic sector, it was disclosed that in general firms pay attention strategically to new enterprises and investments. However, communication

management and training remain behind in the view of companies in Turkish electronic sector. Therefore, it was suggested that firms in Turkish electronic sector must also plan the budget by more reserving especially for communication technologies and training, right along with new enterprises and investments.

Firms in Turkish electronic sector generally have a systematic communication policy, and determine it depending on different priorities, especially with respect to internal/external organizational communication, international communication and marked-based communication in their own organizations. The requirements of project contract are the most important factor to determine it. However, financial communication-investor relations and communications research lag behind to determine communication policy. According to the results of this survey, financial communication seems having little importance as a determinant for communication policy, maybe they do not have an access to financial markets. Moreover, labor relations are not to be assumed as a determinant. Not taking labor relationships into account as a determinant may be an indicator of weakened working standards, and regression of earned social security after the crises in Turkish electronic sector. Owing to constriction of production, downsize of firms, and increase of unemployment, it may be pretended not to see the situation of work force. Employees might not be assumed an asset of firms, and employees might keep quite, because of lay offs and increased unemployment. It was concluded that firms take into consideration completing activities and processes in respect of requirements and business necessities, but not take up communication systematically and comprehensively all processes. Furthermore, results indicated that university-industry cooperation has not been established yet in the context of communication management policy. In addition, benefiting from consulting of companies is far from serving needs of determining communication policy. In the light of the data, it is claimed that firms do not perceive the importance of communication policy and the requirements of systematic communication in Turkish electronic sector.

All projects and operations need to communicate information, since the informational needs and the methods of distribution vary organization to organization. Identifying the informational needs and determining a suitable means

of meeting these needs, namely a communication policy is an important factor for success. In this context, the cooperation between universities and industry should be established. The universities may take an active role as consultant and may increase the capacity for training to companies.

According to results of this study, firms in Turkish electronic sector generally follow the recent innovations and developments for the information systems technologies and adapt to their organizations if necessary. Moreover, it was appeared that use of information technologies provides competitive power and advantages to companies in Turkish electronic sector for increasing communication, problem solving, intervention on time, innovation and entrepreneurship, reconfiguration of main processes, especially for rapid response capability to recent developments. Providing competitive advantages to firms of increasing communication through easy access to inner and outer information systems communication network is conspicuous. At the same time, this supports that use of IT increases communication in the organizations. On the other hand, it was surprising that the rates of increasing creativity and re-design of main processes are less than expected. Whereas, one of the main functions of IT to help increasing creativity for both capability and productivity, and use of IT brings along with re-design of main processes. Moreover, there is a contradiction with another result above, since firms were in agreement as share of 94.2% that use of information systems technologies affects re-planning of main business processes. Furthermore, innovation and entrepreneurship require creativity. Competitive advantages of using IT is, perhaps, mostly perceived from the point of view of increasing communication, rapid response capability, and problem solving. It might be stated that information technology can not be used in the way of increasing creativity in Turkish electronic sector, since Turkey generally transfers technology from abroad, production of technology and innovation is not effective to locate in the world market and to compete. If this proposition is assumed true, then it may allocate more budget for R&D activities and innovation.

On the other hand, in the development of new products, services, and processes in organizations there is a need to provide an organizational focal point through which resources can be directed to keep abreast of changing technologies. New

technologies result in systems changes functions such as manufacturing, R&D, marketing, finance etc. Modification of organizational products, services, and processes is required to accommodate the inevitable changes that effect all organizations today. The business chance identifies a series of changes for the conversion of inputs to outputs, which represent an integrated assessment. Policies, procedures, rules, standards, and the manner in which resources are used are changed. The business process change can be defined in terms of performance objectives and goals that must be defined and must be capable of measured. Thus, it might be concluded that competitive advantages of using IT may not be perceived in respect to re-design of main processes in Turkish electronic sector, in spite of changes in the organizations.

It was revealed in this survey that project management methods are not applied prevalently and properly in Turkish electronic sector. But, companies in general benefit from the project management methods and applications at various levels. The cause of this may be not to perceive entirely the difference between project management applications and ongoing operations of their own organizations.

In general, it was appeared that mostly used project management techniques are Gantt chart and network diagrams, and preferred software program is Microsoft Project in Turkish electronic sector. In fact, being used techniques and software programs for project management can change depending on needs and types of project. Many project management software products are available today. Microsoft Project is well-known and the most widely used computerized project management tool both in Turkey and in the world. Use of Microsoft Project ease some applications, for example project control and tracking, detailed scheduling, early project planning, communication, reporting, etc. Microsoft Project is mid-range tool for multiple users and multiple projects, prices range from about $60 to $600 per user. It may be more suitable for electronic sector than other industries. According to results, it can be claimed that use of project management software programs affects positively both the projects and the activities. According to the survey, project management is usually assumed to be understood and learned by engineers and

managers. Project team members can improve their productivity when teams are trained on how to use the applications.

In the light of the results in this study, it was concluded that project communication management is not applied properly; firms in Turkish electronic industry do not to have a systematic communication policy in the organizations. It is concluded that companies in Turkish electronic sector might not be aware of project communication management methods and difference of ongoing operations in their organizations.

In the light of these results it may be stated that firms in Turkish electronic sector do not use objective measures of performance reporting. It might indicate the lack of controlling and monitoring. Control is the process of monitoring, evaluating, and comparing planned results with actual results, to determine the progress toward the project cost, schedule, and technical performance objectives, as well as the project's strategy. The basis of effective project monitoring, evaluation, and control is an explicit statement of project objectives, goals, and strategies that provide standards against which project progress can be evaluated. Performance reporting keeps stakeholders informed about how resources are being used to achieve project objectives. Performance observation is the receipt of sufficient information about the project to make an intelligent comparison of planned and actual performance. Information on project performance can come many sources, such as formal information reports and reviews of project's performance, formal project meetings, informal talking and listening to project team, conversations, etc. These sources should be used and evaluated as objective tools. Monitoring means to keep track of and to check systematically all project activities. This enables the evaluation and appraisal of how things are going on the project. Monitoring and evaluating functions provide the intelligence for the members of the project team to make informed decisions about the project performance. Every level of management should receive the information it needs to make decisions about the projects and to take corrective actions if necessary.

As a result, the results of this study indicate the lack of controlling, monitoring, and objective performance evaluations, then organizations and people who perform

project communication management applications are not perfect on the project activities and processes, yet.

It is claimed that there are no systematic and established project communication applications in companies in Turkish electronic sector, yet. The reasons of this situation may be related to be not given priority to communication management in strategic business plans, subjective performance evaluation, poor monitoring and controlling, lack of university-industry cooperation, and limited financial resources. Not to work in virtual teams that transcend distance and time zones in projects may be thought as some other causes. It might be stated that projects in Turkey are dependent foreign resources in point of technology transfer, and Turkey strive to located in the technology world market. Therefore, the capacity and budget of projects in Turkish electronic sector may be limited in the result of technology dependency. This might be resulted in limited applications of management principles and international standards.

It was concluded that either firms in Turkish electronic sector do not apply project management methods properly in their organizations, or companies do not evaluate the performance of project results, or respondents may not know about the results of project management applications in their organizations, since organizations do not inform project team about project results. The conclusion to be drawn from this survey is that organizations in Turkish electronic sector are at the beginning of project management methods and principles. As a result, the implementation of project management is new to the most of the organizations, and project management methods and techniques are applied in several levels, but not entirely.

The successful completion of the project depends on the accuracy and timing of information exchange between the project team. An organization today that wants to remain competitive in providing its customers with continually improving products, services, and organizational processes give more attention to use project management and also project communication management concept and processes.

When the situation of Turkish electronic sector is considered and evaluated in general, it may be stated that Turkish electronic industry oriented towards export. After the crisis in 2000, Turkish electronic industry has started to recover, both the demand of imported inputs and export have increased together with the increase in production. However, Turkish electronics sector has some vital problems in general, such as information sharing, design, R&D, raising and orienting human resources, adequacy of legal infrastructure and institutionalizing. In spite of industrialist give a lot of attention to the quality and competition; it could not be accomplished to produce new technology for new areas, owing to inadequacy of infrastructure investments, and technology production problems. One of the main qualities of Turkish electronic sector that should be changed is the ratio of intellectual proprietorship on native contribution of products, which was 20-25% in 2000 but decreased to 5% in 2003, according to report of VIII. Development Plan of Five Years (2001-2005). In this context, regulations directed towards the ratio of native intellectual proprietorship have been started, but there is a need for effort from firms. These regulations may bring along with the standardization.

Although data showed that the ratio of R&D and design activities are high in this study, the R&D activities are not sufficient enough to make the Turkish electronic industry competitive in the world markets. Turkish electronic industry has a structure of following and implementing technology behind producing technology since technological infrastructure is not sufficient enough. Investments and credits may provide important opportunities for R&D activities in Turkish electronic industry.

As a result of crises and regression in the economy, difficulties have increased for this sector, and international competitive power of Turkey has weakened. Turkish electronic sector need for technological developments of which production and competitive power are high, depending on structural reforms in order to reach stable economy. Turkish electronic sector should have a new structure using qualified and well-trained work force, improved R&D-produced technology, located in international world market by creating original design and trademark, contributed to social prosperity by producing adding value, increased competitive power, and used high-technology as widespread.

If stable policies are applied, these problems can be solved. A special export incentive and fund system may be formulated for electronics industry to distribute amongst the private sector firms carrying out serious research and development activities. Following stable and decisive policies may improve technology production in Turkish electronic industry. It will be provided to transform information society of Turkey in long-term if the main element of the technology policy are implemented prevalently. The improvements in this sector may have impacts on the better project management and especially project communication management applications.

Constraints of the study are in the small sample size of only 52 respondents (42.3%). Further studies, using more extensive and broad qualitative methods, are recommended to improve confidence in the results. Further comparative research of this issue would be useful for sector in particular and for Turkish economy in general.

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APPENDIX A

QUESTIONNAIRE

METU
Science &Technology
Policy Studies
Research Center

Project Management and Usage of Information Technology for Project Communication Management in Turkish Electronic Sector

This investigation is performed for a scientific research that is administered by METU-STPS Research Center with a subject of "Project Management and Technology in the Firms". The data confidentiality of the firms will be protected and names of the firms will not be disclosed.
Please point out X near the boxes of choices that you chose.

Please clarify the name of the firm:.....
Please clarify your title in the firm:.....
Phone number:.....
E-mail address:.....

1. What kind of operations does your company operate from the below?

☐ a) project type ☐ d) mass production (for one product)

☐ b) mass production (for various products) ☐ e) service

☐ c) focused on process ☐ f) focused on customer

2. How many personal does your company have?

☐ a) 1-10 ☐ b) 11-50 ☐ c) 51-200 ☐ d) 201-500 ☐ e) more than 500

3. How is the distribution of personnel?

a) Manager (.....people)
b) Engineer (.....people)
c) Technician (.....people)
d) Operator (.....people)
e) Unskilled personal (.....people)

4. What kind of projects does your company operate?

☐ a) Software, consulting ☐ d) Telecommunication

☐ b) Computer equipments ☐ e) System design, Hardware

☐ c) Other.....

5. Which activities does your company operate from the below?

☐ a) Production ☐ d) Design

☐ b) Engineering ☐ e) R&D activities

☐ c) Software ☐ f) Marketing

6. What is the organizational structure of your company?

☐ a) Matrix ☐ b) Functional ☐ c) Projectized ☐ d) Mixed

7. What <u>communication tools</u> are used in your organization?

☐ a) Internal publications (procedures, standards etc.)

☐ b) External publications

☐ c) Fax

☐ d) Video records

☐ e) Videoconferencing

☐ f) Electronic media, internet

☐ g) Intranet

☐ h) Network,

☐ i) Other: .....

8. Are information systems technologies (telecommunication-computer technologies, hardware, software, etc.) used in your organization?

☐ a) Yes ☐ b) No

9. Does use of information systems technologies affect re-planning of main business processes (production, design, R&D, marketing, etc.)?

☐ a) Yes ☐ b) No

10. Which strategic business plans are planed related to the use of information systems technologies from the below?

☐ a) new enterprises ☐ d) investment

☐ b) budgeting ☐ e) training

☐ c) communication management ☐ f) it is not planed

11. Is there a systematic or standard organization's communication policy in order to define who, when, how people access which information easily?

☐ a) Yes, this policy is determined according to below priorities:

- ☐ Inner-outer organizational communication
- ☐ Market-based communication
- ☐ Financial communication-entrepreneur relations
- ☐ Relations of employee market
- ☐ Relations with social environment
- ☐ International communication
- ☐ Communication investigations
- ☐ Other: .....

☐ b) Communication policy is determined through the requirements of project contract

☐ c) No, there is no a defined communication policy.

12. For the determination of communication policy and supported applications (analyze, design, software, delivery).....

☐ a) firm benefits from consulting services.

☐ b) firm cooperates with universities.

☐ c) firm entirely determines communication policy within its work processes.

☐ d) Other:.....

13. Does your company follow the recent innovations and developments for the information systems technologies and adapt to your own organizations if necessary.

☐ a) Yes ☐ b) No

14. Does your company make performance measurement in the point of view of schedule, cost and quality for effective project and communication management through performance reports and use of information technologies?

☐ a) Yes ☐ b) No

15. How is performance measurement of communication activities made in your company?

☐ a) within the requirements of project contract

☐ b) only within the firms systematically and continuously

☐ c) by providing communication with customer

☐ d) by using cost-benefit analysis

☐ e) Other: .....

16. Which areas from the below do provide competitive power with respect to use of information technologies?

☐ a) increasing of communication through easily access to inner and outer information systems communication network

☐ b) problem solving and intervention on time

☐ c) increasing creativity

☐ d) innovation and entrepreneurship

☐ e) rapid response capability to recent developments

☐ f) re-design of main business processes related to innovation

☐ g) Other: .....

17. At which level trained personnel on information systems do work in your organization?

☐ a) Engineer

☐ b) Experts who graduated from university

☐ c) Technicians

☐ d) Only users

☐ e) Other: .....

18. Does your company perform training to the personal on use of information systems technologies and improving user capability in order to provide becoming more efficient and effective users?

☐ a) Yes ☐ b) No

19. Do building infrastructures of information systems, which will support and develop existing operations, contribute to long-term productivity and rapid adoption to changes?

☐ a) Yes ☐ b) No

20. What are the positive effects of use of information technologies?

☐ a) causing new business opportunities and gaining new abilities based on projects

☐ b) improving capability (main system analysis, design, etc.)

☐ c) causing new opportunities by following, learning, using, and producing new technologies

☐ d) activating the management and work processes

☐ e) activating project management

☐ f) increasing communication

☐ g) increasing performance and efficiency

☐ h) solving problems and intervention on time

21. Does your company apply project management principles?

☐ a) Yes, it is applied all methods and procedures

☐ b) Partly, its is applied by using some methods (%75)

☐ c) Partly, its is applied by using some methods (%50)

☐ d) Partly, its is applied by using some methods (%25)

☐ e) No, it is not

22. Which main project management processes are applied?

☐ a) Initiating

☐ b) Planning

☐ c) Executing

☐ d) Controlling

☐ e) Closing

23. Which project management techniques are used?

☐ a) Delphi technique

☐ b) CPM: critical path method

☐ c) Network Diagram (PERT Analyze, ADM: Arrow Diagramming Method, PDM: Preference Diagramming Method etc.)

☐ d) Bar chart (Gant Chart)

☐ e) Other: .....

24. Which software programs are used for project management in your organization?

☐ a) Not used

☐ b) Microsoft Project

☐ c) ITF Project Management

☐ d) WorkLenz

☐ e) Pertmaster

☐ f) Privera

☐ g) Gran PM

☐ h) AceProject

☐ i) Vertabase

☐ j) Project Workbench 3.1

☐ k) SuperProject 2.0

☐ l)Other:.....

25. What is the positive results of project management software programs from the below?

☐ a) It increases communication throughout project life cycle

☐ b) It provides work speedily and easily

☐ c) It provides applying international standards

☐ d) It facilitates product delivery on time and within budget

☐ e) It increases customer satisfaction

26. Does your company perform training to the personal on project management?

☐ a) Yes, the task of participants is: ☐ b) No

- ☐ Manager
- ☐ Engineer
- ☐ Technician, expert
- ☐ Operator
- ☐ Other: .....

27. Which main processes of project communication management are applied?

☐ a) Communication planning

☐ b) Performance reporting

☐ c) Information distribution

☐ d) Administrative closure

28. Which processes of communication planning are taken into consideration?

☐ a) Communication requirements

☐ b) Communication technologies

☐ c) Constraints

☐ d) Assumptions

29. Which tools and techniques of information distribution are used?

☐ a) Communication skills such as written and oral, formal and informal communication

☐ b) Information retrieval systems such as electronic databases, project management software

☐ c) Information distribution methods, such as fax, electronic mail, and videoconferencing, intranet etc.

30. Which tools and techniques of performance reporting are used?

☐ a) Performance reviews

☐ b) Variance analysis

☐ c) Trend analysis

☐ d) Earned value analysis

☐ e) Information distribution tools and techniques

31. Which processes of administrative closure are applied?

☐ a) Documentation of project results

☐ b) Project performance analysis

☐ c) Efficiency measurement

☐ d) Recording and updating project archive

32. How does project management applications affect the success of the project?

☐ a) Completing on time:.....……	☐ positive	☐ negative	☐ no influence
☐ b) Conformance of quality:....…..	☐ positive	☐ negative	☐ no influence
☐ c) Customer satisfaction:.....……	☐ positive	☐ negative	☐ no influence
☐ d) Rapid adaptation to change:….	☐ positive	☐ negative	☐ no influence
☐ e) Being within budget:.....….	☐ positive	☐ negative	☐ no influence
☐ f) Convenience to strategic plans of organization……..…	☐ positive	☐ negative	☐ no influence

THANK YOU