Job Analysis for IT Project Management? An Initial Investigation

Charles R. Johnston

Business Computer Information Systems
College of Business Administration
Midwestern State University
3410 Taft Blvd.
Wichita Falls, Texas 76308-2099
Phone: 940-397-4361
Fax: 940-397-4280
E-mail: chuck.johnston@mwsu.edu

ABSTRACT

Information Technology (IT) project management has received an intense level of attention since the publication in 1995 by the Standish Group of their CHAOS study detailing the dismal success rate of IT projects. The need for improved management practices was emphasized. The basis for these practices had been established over the previous 50 years, in a wide variety of industries, under the job description of "project manager." The primary professional organization for project managers is the Project Management Institute (PMI). It has defined the project management profession from a common processes and knowledge areas perspective and certifies Project Management Professionals (PMPs) in all disciplines, including IT. This paper addresses the adequacy of a somewhat generic definition of project management extended to IT projects. Do we need a more formal approach utilizing the established techniques of job analysis to definitively characterize IT project management (A search of the literature has failed to find any such efforts in the public domain.)? What degree of specificity is appropriate? The relevant literature of project management, IT project management, and job analysis is reviewed in an initial investigative attempt to answer these questions.

INTRODUCTION

Projects are undertaken to accomplish a specific goal. This goal is unique, or it is not a project by definition. Projects are characterized by having definable starting and ending points and therefore are temporary in nature. Although not required, projects usually involve more than one individual and demand that resources be consumed in their accomplishment. These resources are normally not unlimited and produce budget constraints that must be considered in addition to project schedule and project scope constraints. The goals of projects can vary greatly. They can be personal as well as organizational. Personal activities such as selecting a school for your children, buying a home, and restoring a car can be treated as projects. In fact, approaching them as projects often produces much better outcomes than if they are not given more consideration than our other daily routine tasks.

Organizational projects perhaps encompass an even broader spectrum. Traditionally, large scale endeavors in the construction and defense industries have been recognized for decades as projects. They begin at some point in time with contractual agreements and attempt to produce a finished product on time and within the established budget. With the passage of time, product development in general has become much more complex. Everything from new toothpastes to new computer based information systems essentially go through this same development process that takes them from a concept to a finished product. Recognizing a commonality of process, and a need for more than simply reporting schedule and budget information to management, led to an increasing interest in whether or not the treatment of all these dissimilar efforts as projects might be beneficial to organizations. The Information Technology (IT) industry was not immune to this inquiry.

By the early 1990s, organizations in the United States were spending huge sums of money on IT projects. The information age was well underway. Federal and state governments, the travel industry, banking, and retail merchandising, to name just a few, were involved in countless software development projects. Reports of massive failures of these projects were constantly emerging. In 1995, a landmark study of this situation entitled "CHAOS" was published by the Standish Group. Based on success being defined as meeting schedule and budget targets, the study found an IT project success rate of 16.2 percent! In addition, over 31 percent of IT projects were cancelled before completion and 52.7 percent of projects were projected to cost 189 percent of their original budgets. With approximately $250 billion per year being invested in these projects, the selection of the name for the study was obvious and appropriate. Also obvious was the need for better management of IT projects.

To varying degrees, organizational projects inherently contain significant risk (It might be argued that if there is little risk in proceeding with a project, there is little need to be concerned about its outcome.). Much of the risk is associated with schedules and budgets. Will the projects be completed on time and under budget? If not, what will be the consequences to the organizations? The very importance of information technology in today's business environment places most IT projects in areas of strategic importance to organizations. As such, the consequences of failure of a particular project may mean the failure of the enterprise itself. How much greater risk can exist?

Failure of IT projects was not new to the 1990s. Attempts have been made to identify more specific risks associated with these types of projects. McFarlan (1981) identified primary risks as people (lack of required skills and experience), structural (with respect to the effects on users and procedures within the organization), and technological (using new technology). Combining these factors with the common project concerns of scope, time, and cost force the consideration that managing IT projects to successful conclusions is an exercise in managing *all* the factors affecting the risk of failure. Most IT projects simply cannot be allowed to result in an outcome considered to be a failure. What then is this job of managing IT projects successfully?

PROJECT MANAGEMENT

Much has been written about project management and the responsibilities of a project manager. The Manhattan Project to develop the atomic bomb during World War II is generally recognized as the beginning of modern project management practices. The extremely large scale and critical

nature of several military projects have stimulated the development of classical project management techniques still used today. Included are Gantt charts for task scheduling and network diagrams enabling the identification of project tasks which determine the overall durations of projects. The computerized power of such techniques was well understood by the 1970s, but widespread use was not practical due to the costs involved. With the 1980s came the personal computer and the availability of what has become a constant progression of increasingly sophisticated project management software applications. The power of these scheduling and tracking techniques have since been recognized and adopted by virtually all organizations producing unique work products in the course of their operations.

With over half a century of experience working through projects of every type and size having passed, the job title of Project Manager has become accepted and somewhat commonplace. As with any job title, it can mean different things in different organizational settings, often differentiated by the amount of authority over the project given to the project manager. However, it has also become apparent that enough common factors are present in all projects that the job title of project manager implies certain skills and responsibilities associated with being one. As a result, *project manager* is today considered more than just a job title. It is considered to be a profession. The primary professional organization for project managers is the Project Management Institute (PMI).

PMI now has more than 100,000 members worldwide, up from 70,000 just three years ago. A major portion of its growth in recent years has been from IT professionals. Why has this happened? The Standish Group's second follow-up study on information technology projects in 2000 (2001 CHAOS Report) found significant improvements in the performance measures previously collected. Of particular note were cost overruns of 45 percent, compared to 189 percent in 1994, and a success rate of 28 percent, up from 16 percent. The study attributed the increase in the success rate not only to greatly reduced project costs, but also to more skilled project managers utilizing improved project management practices. IT had discovered the benefits of professional project management applied to its projects.

What are the common factors present in all projects that must be successfully managed? The PMI has characterized project management in a generic manner in its *Project Management Body of Knowledge (PMBOK) Guide 2000*. If you want to examine the job of a project manager, you must look at *what the project manager does*. The necessary skills to accomplish the tasks of project management can be considered separately from the tasks themselves. In concentrating on the job, we will minimize inferences about the skills required for the job and deal with the activities of managing a project. These activities, or processes, are organized into what is referred to in the PMBOK Guide as Project Process Groups. In addition to the process groups, the *PMBOK Guide* characterizes the project management elements with which the project manager must deal as Knowledge Areas. Without making the previously mentioned inferences with respect to required skills, the grouped activities can be mapped to the *PMBOK Guide*'s Project Management Knowledge Areas to produce the overall relationships illustrated by Table 1 taken from Schwalbe (2002, pp. 46-47). The summary representation of the table can be viewed as the consensus perspective of project management as defined by the PMI after many years of contributed input to that organization. It can be used as a basis for thinking about the job of an

IT project manager. Is project management really just project management regardless of industry context?

JOB ANALYSIS

There are acceptable methods for establishing the parameters of a job. Job Analysis (JA) has been around in various forms since early in the twentieth century. It was comprehensively defined by McCormick in 1976 (pp. 652-653) as the collection of data on job tasks and work procedures, more abstract behaviors like decision making, interactions with machines and materials, evaluation methods, working conditions and compensation systems (job context), and personnel requirements such as skills and physical abilities. Since then, industrial and organizational psychologists have watched it evolve from simply identifying and rating job tasks to include a wide variety of worker related aspects such as regulation compliance, discrimination lawsuits, and personnel functions (Harvey, 1990, p. 72).

At the same time, some definitional confusion developed due to the combining of the *application* of collected data for personnel purposes with the *collection* process making up traditional job analysis. Harvey (1990, p. 74) suggested an updated definition of job analysis to help this situation by eliminating the inference of required personnel traits for the job. Furthermore, he maintains "that the term job analysis should be applied only to methods whose goal is the description of work behavior, independent of the characteristics of the employees who attempt to perform the job" (p. 80). This is the more limited definitional approach used for this paper.

With this in mind, the concept of a job and how it fits into organizational structure should be briefly explored prior to proceeding. A *position* can be thought of as one of the most easily defined structural elements within an organization. Position is the term recognizable as encompassing everything associated with what an individual is expected to do on a daily basis. Positions are specified and filled in order to conduct organizational activities. A *job* is abstracted at a higher level wherein several positions with very similar work behaviors can be considered to fall under one job title and be subject to a single job analysis (Henderson, 1979, p. 134). An example appropriate for the concerns of this research would be a large construction management firm that had many project management positions all bearing the job title of project manager. While the specifics of the individual positions might vary according to project size and type, the work behaviors of all these project management positions could be very similar. If so, a single job analysis for the project manager job title at this firm might be acceptable.

Knowledge Area	Project Process Group				
	Initiating	Planning	Executing	Controlling	Closing
Integration		Plan Development	Plan Execution	Integrated Change Control	
Scope	Initiation	Scope Planning		Scope Verification	
		Scope Definition		Scope Change Control	
Time		Activity Definition		Schedule Control	
		Activity Sequencing			
		Activity Duration Estimating			
		Schedule Development			
Cost		Resource Planning		Cost Control	
		Cost Estimating			
		Cost Budgeting			
Quality		Quality Planning	Quality Assurance	Quality Control	
Human Resources		Organizational Planning	Team Development		
		Staff Acquisition			
Communications		Communications Planning	Information Distribution	Performance Reporting	Administrative Closure
Risk		Risk Management Planning		Risk Monitoring and Control	
		Risk Identification			
		Qualitative Risk Analysis			
		Quantitative Risk Analysis			
		Risk Response Planning			
Procurement		Procurement Planning	Solicitation	Contract Administration	Contract Close-out
		Solicitation Planning	Source Selection		

Table 1: Project Management Activities as defined by *PMBOK Guide* 2000

But if we want to look at project managers in other construction management firms as well, we must continue to abstract to even higher levels. The *job family* is conceptually a collection of jobs similar enough to be able to be grouped together for traditional industrial and organizational psychology purposes, such as developing performance appraisal forms that can be used for several jobs. At this level, when you begin to reach across organizational boundaries and even business types, the familiar term *occupation* also emerges. Descriptions such as chef, truck driver, attorney, carpenter, professional engineer, and *project manager* illustrate not only the great variety of what are considered occupations, but also make it clear at this level the potential for dissimilar work behaviors that exists within broad classifications. For this reason, job analysis becomes progressively more imprecise at levels of aggregation above the basic position construct. This does not mean it has no value at those higher levels, only that its application and interpretation of results must be carefully considered.

IT PROJECT MANAGEMENT

The importance of IT project management was characterized at the beginning of the paper. The general evolution of project management practices has resulted in a generic listing of tasks common to project management as defined by the PMI and shown in Table 1. Is this listing sufficient to adequately describe the *job family of IT project management*, or to include IT project management in the overall *occupation of project management* as set forth by the PMI?

Every project is unique to varying degrees. Regardless of industry context, some are just more difficult to complete successfully than others. Because of the previously cited high failure rate of IT projects, they have been characterized as inherently risky and rarely successfully completed as measured by meeting schedule and budget constraints (Olson, 2004, p. 8). IT projects often involve the latest technologies and require enhanced technical expertise on the part of the project manager. It is also often difficult to maintain a clear focus on the ultimate objectives in a volatile information technology environment. However, many of the factors cited in the literature as critical to IT project success can be related directly to the project management activities of Table 1. For instance, some of the critical success factors from a survey of more than 400 projects by Pinto and Slevin (1989) could be related to PM activities as shown in Table 2.

Critical Success Factors	Table 1 Related Project Management Activities				
Clear Objectives	Scope Planning	Scope Definition			
Plan/Schedule	Plan Development	Activity Definition	Activity Sequencing	Activity Duration Estimating	Schedule Development
Personnel	Organizational Planning	Team Development			
Technical Tasks	Staff Acquisition				
Monitoring and Feedback	Scope Verification	Scope Change Control	Schedule Control	Cost Control	Quality Control
Communication	Communications Planning	Information Distribution	Performance Reporting		
Troubleshooting	Risk Monitoring and Control				

Table 2: A Partial Mapping of Table 1 Activities to IT Project Critical Success Factors

Missing from direct relationships with the Table 1 project management activities are user involvement and top management support. Together with stating project objectives in a clear and concise manner, these are the most mentioned keys to successful IT projects. Without adequate user participation, IT projects often fail (Engler, 1996; Amoako-Gyampah and White, 1997). The importance of top management support has been extensively researched. Notable studies include Jarvenpaa and Ives (1991) and Newman and Sabherwal (1996). While fostering user involvement and top management support might be included in planning and communication efforts, they should be recognized as significantly independent from these factors and worthy of emphasis as important aspects of IT project management. Some other identified activities of successful IT project management include (Northwest Center for Emerging Technologies, 1999):

- Stakeholder Analysis – Managing relationships, meeting needs
- Cost/Benefit Analysis – Working with the basis for project initiation
- Developing Project Documentation – Developmental, operational, historical
- Leading the Team – Delegating, offering incentives, empowering, disciplining, conflict resolution
- Negotiating – For resources, defending estimates
- Using Cost Management Software – Meeting organizational requirements
- Resource Allocation – Human resource loading and leveling
- Contingency Planning – Mitigating risk, establishing viable alternatives
- Participating in Project Phase Reviews – project status, go/no-go analysis

Most of these other more specific job functions of IT project management can be fit somewhere into the Table 1 listing of general project management activities. However, it is clear that they fall at a lower level of abstraction.

POSSIBLE IT JOB ANALYSIS APPROACHES

While the goal of job analysis in this case is to definitively establish the significant activities associated with the IT project management job family, job analysis can also be the first step in eventually being able to identify individuals possessing the skills and abilities required for successful job performance. Developing training programs and instruments to later assess both these programs and employee performance are often outgrowths of being able to define the primary characteristics of a job.

Whetzel and Wheaton (1997, p. 4) offer a comprehensive discussion of available job analysis methods. The methods are separated into deductive and inductive approaches. Deductive approaches include Functional Job Analysis, FJA (See Fine (1989) and Fine and Wiley (1971) for additional information on this technique.) and the Occupational Information Network, O*NET (Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1995). Deductive methods utilize their own particular sets of descriptive variables to generalize job requirements. More specific requirements are then developed based on the taxonomy of variables and method employed.

Inductive methods include Job/Task Inventory and the Critical Incident Technique (Flanagan, 1954). Detailed information is gathered with respect to what workers do and what they need to know. This information is then generalized at a higher level of abstraction to define job requirements. As project management is founded on a task orientation, it is natural when considering IT project management to look toward an instrument abstracted at the task level to describe work behaviors. These types of instruments have often manifested themselves in the form of *task inventories*. A high level of behavioral/technological specificity being desired (to establish the relative importance of the tasks in the instrument inventory) indicates an IT task inventory rated using relative-time, relative-importance, and/or percent-time scales as appropriate. Such an instrument would have to be custom constructed.

The process of developing an appropriate instrument would be very similar to the system requirements portion of the analysis phase of the Systems Development Life Cycle (SDLC), with which everyone in IT is familiar in some form. Information about the job family of IT project management can be sought by examining existing literature, observing IT project managers at work, interviewing them, and surveying them, just as you would do with the stakeholders of a new IT development project to establish system requirements.

The issue then becomes what questions to ask about the job family of IT project management. This has been termed the *job analysis philosophy* (Cornelius, Carron, and Collins, 1979). Harvey (1990 p. 81) put this in perspective by stating that “The core issue is whether we desire highly technological, job specific listings of job behavior versus descriptions that locate jobs on a common metric that is constant across even task-dissimilar jobs.” When considering the job family of IT project management across many organizations, a more generalized description is appropriate, but as pointed out previously, specific, important task identification is the goal. So,

this job analysis effort would fall somewhere between being too IT organizational specific and too occupationally generalized as per the PMI's *PMBOK* definitions. Therefore, in confronting the methodological choice, prior research and subject matter experts (SMEs) must be comprehensively utilized so as to encompass all the *job behaviors* significant to IT project management. The proper level of abstraction would consider all IT project management jobs as basically *not* task-dissimilar (a job family within the IT field).

CONCLUSIONS AND DESCRIPTION OF FURTHER RESEARCH

By being able to fit most IT project management activities into the *PMBOK* framework of Table 1, including the IT project management job family in the more general occupation of project management appears to be reasonable. It is also evident that at the lower job level of abstraction, the practice of IT project management would benefit from a well defined representation of the task *behaviors* making up IT project management. Job analysis at this level, even with its recognized limitations, could help pull together the various research efforts into a comprehensive listing of the most important aspects of IT project management at the current time.

The development of an instrument to better define the job family of IT project management based on the well established practices of job analysis is currently underway. It will consist of a task inventory rated using appropriate scales. Measuring job information in a quantitative manner provides the opportunity to assess the quality of the gathered data. By checking the information for reliability, an appropriate degree of confidence can be established for further use of the data. Establishing the reliability (or consistency) of the job information is the basis for discussing the usefulness of the results of the job analysis. A brief review of the literature suggests that the calculation of interrater reliability coefficients and the standard errors of measurements for the instrument items are probably most appropriate for an IT project management job family analysis instrument administered across a broad range of organizations.

Formalized attempts to establish the validity of collected job analysis data are rare (Whetzel and Wheaton, 1997, p. 24). The assumption is generally made that if the information is reasonably reliable, it is also acceptably valid. Thoroughness in constructing the measurement instrument is necessary to insure content validity. Developing a comprehensive inductive job/task inventory instrument, as has been discussed, requires extensive probing of all aspects of the IT project management environment. Such an approach, combined with pilot testing and further refinement, should result in a content valid instrument. Issues of construct validity are generally not of concern in this initial job analysis effort.

In summary, refining the definition of the IT project management job family using the proven methods of job analysis will provide a solid foundation for further research and application of the information developed. It is hoped that the initial effort and reporting of results will facilitate an increased understanding of the critical aspects of this job family within the broader context of project management in general.

REFERENCES

Amoako-Gyampah, K., and White, K. B. (1997). When Is User Involvement Not User Involvement? *Information Strategy* (Summer), 40-45.

Cornelius, E. T., Carron, T. J., and Collins, M. N. (1979). Job Analysis Models and Job Classification. *Personnel Psychology*, 32, 693-708.

Engler, N. (1996). Bringing in the Users. *Computerworld* (November 25), www.computerworld.com.

Fine, S. A. (1989). *Functional Job Analysis Scales: A Desk Aid*, (Milwaukee, WI: Sidney A. Fine)

Fine, S., and Wiley, W. W. (1971). *An Introduction to Functional Job Analysis*, (Washington, DC: Upjohn Institute for Employment Research)

Flanagan, J. C. (1954). The critical incident technique. *Psychological Bulletin*, 41, 237-358.

Harvey, R. J. (1990). Job Analysis. In M. D. Dunnette and L. M. Hough (Eds.), *Handbook of Industrial and Organizational Psychology*, vol. 2 (Palo Alto, CA: Consulting Psychologists Press), 71-163.

Henderson, R. (1979). *Compensation Management*, (Reston, VA: Reston).

Jarvenpaa, S. L., and Ives, B. (1991). Executive Involvement and Participation in the Management of Information Technology. *MIS Quarterly*, 15, no. 2, 204-257.

McCormick, E. J. (1976). Job and Task Analysis. In M. D. Dunnette (Ed.), *Handbook of Industrial and Organizational Psychology*, (Chicago: Rand McNally), 651-696.

McFarlan, F. W. (1981). Portfolio Approach to Information Systems. *Harvard Business Review* (September-October), 142-150.

Newman, M., and Sabherwal, R. (1996). Determinants of Commitments to Information Systems Development: A Longitudinal Investigation. *MIS Quarterly*, 20, no. 1, 22-54.

Northwest Center for Emerging Technologies (1999). *Building a Foundation for Tomorrow: Skills Standards for Information Technology, Millennium Edition*. (Belleview, WA)

Olson, D. L. (2004). *Introduction to Information Systems Project Management*, second edition, (New York: McGraw-Hill/Irwin).

Peterson, N. G., Mumford, M. D., Borman, W. C., Jeanneret, P. R., & Fleishman, E. A. (Eds.). (1995). *Development of prototype Occupational Information Network (O*NET) content model* (Vols. 1-2), (Salt Lake City: Utah Department of Employment Security).

Pinto, J. K., and Slevin, D. P. (1989). Critical Success Factors in R & D Projects. *Research in Technology Management*, 31-35.

Schwalbe, K. (2002). *Information Technology Project Management*, second edition, (Boston: Course Technology).

The Standish Group (1995). "CHAOS." www.standishgroup.com/chaos.html.

Whetzel, D. L., and Wheaton, G. R. (1997). *Applied Measurement Methods in Industrial Psychology*, (Palo Alto, CA: Davies-Black Publishing).