
Planning, Scheduling and Controlling the Efforts of Knowledge Workers¹

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I. INTRODUCTION

Why Are We Here?

The one common factor which brings us together at this meeting, which I hope is the first of many productive sessions of this type, is our interest in projects. As we get acquainted with each other in these two days, we will find that we represent a very wide variety of organizations, industries, agencies, special backgrounds, and specific personal interests. Nevertheless, we are all interested in projects, and that's why we are here: to talk about projects, and the management of projects.

What Are Projects?

Since projects are the central focus of our interest, I believe it is germane to ask that question at this point, since all of the speakers and panel discussions that are to follow will be dealing with some aspect of projects and project management.

¹Editor's note: *Second Editions* are previously published papers that have continued relevance in today's project management world, or which were originally published in conference proceedings or in a language other than English. Original publication acknowledged; authors retain copyright. This paper by Russell Archibald was presented at the first conference ever sponsored by or held in the name of the Project Management Institute (PMI®), conducted at the Georgia Institute of Technology in Atlanta, Georgia, USA in October 1969. In addition, it was the first paper presented that day, making this the first paper ever presented or published for or by PMI. Amazingly, it is just as relevant today as it was in 1969, the year that PMI was founded. It is republished here with the author's permission.

Projects are complex efforts:

- To achieve specified results within a schedule and budget
- That typically cut across organizational and functional lines
- That are unique, and not completely repetitious of some previous effort.

This definition of projects has weathered considerable exposure, but I would welcome your reaction and improvement on it. Perhaps this is a project which the Project Management Institute should take on: development of a sound definition of a project in systematic terms.

The Management of Projects

Managing projects is, without question, a difficult job. It is a rare organization these days that is satisfied with its performance on projects in meeting the schedule and budget, achieving the desired quality of the end result, and controlling the effort without too many buckets of blood sloshed around mahogany row.

Managing projects is considerably different from managing stable organizations. The traditional concepts we learn in the graduate business school don't apply very well when it comes to projects. In fact, severe conflicts usually exist between organization or functional or line management on one hand, and project management on the other. Project management requires special concepts, tools, procedures and systems, and we will be hearing about some of these later in this conference. We must be careful of over-developing these areas without commensurate development of a sound understanding of them, and of the needed skills to use them effectively.

Managing projects requires two basic categories of skills which are relatively new, at least in some industries. These are:

- Skills in managing projects
- Skills to operate and develop the project management systems which support the Project Manager.

These skills must be developed in each organization concurrently with the systems, but we frequently have failed to recognize this fact. Project Management is emerging as an important area of management specialization throughout institutional, governmental, business and industrial areas. In some industries or agencies, it is well-known and well-established (if not always well-liked or well-understood!) In others, it is a brand new idea. I would venture to predict that project management will take its rightful place on the charts in most organizations within the next few years, along with financial management, production management, marketing management, engineering management, and general management.

What is Project management?

Project Management is based on three key concepts:

- Central responsibility for the total effort, held by the Project Manager
- Central planning and control of the total effort, accomplished by several project management support functions serving the Project Manager, and utilizing specialized tools, techniques and systems
- Decentralized performance of the work by various people in diverse organizations, in response to certain types of direction from the Project Manager.

II. PROJECTS AND KNOWLEDGE WORKERS

Many Types of Projects Exist

In the group attending this conference, we represent many different types of projects. The most striking differences relate to the nature of the end results or products of the projects. These include power plants, new consumer products, computer software systems, high-rise buildings, and many other diverse products. But it is surprising to note that the fundamental management characteristics of all of the projects are very similar.

Manual vs Knowledge Workers

One common characteristic of projects is that they utilize many different types of human skills. In thinking about these skills, we can make one key differentiation, between manual workers or skills, and knowledge workers or skills:

- Manual workers obviously work primarily with their hands, bodies and muscles; they create physical (hardware) products, operate machines and use physical tools.
- Knowledge workers primarily use their minds rather than their hands; they create non-physical (software) products, such as ideas, data, information, reports, designs, plans; their product comes out of their mouths or through a pen.

Granted, manual workers use knowledge in their work, and in many cases are more intelligent than knowledge workers. I wish to use the above differentiation (for which I am indebted to Peter Drucker, as a matter of fact, for pointing out this fundamental difference in his book, “The Effective Executive”), for our discussion purposes, and hope that there is no derogatory inference in the definitions set forth.

In most projects, we find that a much higher proportion of knowledge workers are involved during the earlier phases of the project, while in the final phases there may be a higher proportion of manual workers (if indeed the project uses any manual workers). The conceptualization, design, procurement, construction, commissioning, start-up and initial operation of a process

plant is typical of many projects which use both types of workers. There will be no manual workers at the beginning, but several hundred during the construction phase. Knowledge workers will be involved throughout.

Total Project Planning

My experience indicates that many of the failures of project management can be traced back to the lack of total project planning. Typically, we tackle one particular phase of a project, such as field construction. We may even argue that we tackle the phase which has the highest ratio of manual to knowledge workers.

Total project planning means the integration of all phases of the project life cycle; concept, definition, design, development (construction), implementation (start-up). However, this integration requires the planning and scheduling of the efforts of knowledge workers. It means backing up-stream to the origin of the project, and inter-relating the knowledge worker phase with the later, more easily planned phases. I have found that large amounts of time are squandered in these earlier phases, and the final phases always get the squeeze and have to suffer as a result. We want the critical path traced all the way back to the very source point of the project, if possible.

Only when the total project approach is used will the full benefits of Project Management be realized. Therefore, we must develop the required capabilities to plan and schedule the efforts of knowledge workers.

III. NEEDED: A NEW VIEW OF PLANNING AND SCHEDULING FOR KNOWLEDGE WORKERS

Our attempts to plan and schedule the efforts of knowledge workers frequently are not very successful. We have all heard the painful reaction of our fellow knowledge workers:

"You can't schedule creativity:"
"I don't have time to plan - I have to get some work done!"
"Too much paperwork"
"Good idea for all the others, but not for me; I'm different"
"You don't understand our problems".

I believe our difficulties here stem from two sources:

- The inherent nature of people related to planning
- Our planning and scheduling approach.

Inherent People Difficulties With Planning

Inherently, most people do not like to plan openly in concert with others. It is difficult, creative work. It is revealing, and most people don't like to lay their technical or business soul bare to be seen and abused by others. I am afraid that if I produce a plan, I will be irrevocably committed to it, and will lose my professional freedom of action. I believe that planning will somehow eliminate my ability to create, invent, and leave my mark on the effort.

Finally, and very importantly, the very word "schedule" connotes a shop or field, non-professional activity. If the word "planning" is bad, the word "scheduling" is infinitely worse. I resent being scheduled, because I resent my professionalism being treated in the manner of a production line worker. I also look on any person, even if he seems to be a professional person, who is in the scheduling business as one who is very suspect, at least.

Our Approach to Planning and Scheduling Compounds the Difficulties

In addition to the inherent people difficulties, we—those of us who are in the project management and the general management business—compound the problems and difficulties by our approach to planning and scheduling the efforts of knowledge workers. In most, if not all, cases, our approach:

- Does not sufficiently recognize the inherent human dislikes which are involved
- Does not recognize the differences between planning and scheduling manual and knowledge work
- Uses the same people from the same part of the organization to plan and schedule both manual and knowledge work
- Puts this part of the organization in the wrong place, and drags this important function down to the level of shop control.

The result of all this is that project planners and schedulers are not viewed as professionals. They in turn become more involved in the mechanics of project management systems, to prove their professionalism perhaps. This in turn widens the gap with knowledge workers, and the project support people continue to lose contact with the people doing the work on the project.

We must break this chain of events by developing a new view of knowledge work planning and scheduling, leading to the recognition of the professional nature of this function.

IV. A RECOMMENDED APPROACH

Study the Function

In developing the new view which is needed, the first step would be to study the function of planning and scheduling the efforts of knowledge workers, with the following purposes:

- To recognize the true nature of this function
- To identify its primary characteristics
- To identify the underlying human problems

Describe the Function

Based on the studies performed, describe this function and its basic characteristics in such a way that all concerned will more fully understand its nature.

Differentiate This Function From Manual Work Planning and Scheduling

A prime objective of the study and description would be to differentiate it from manual work planning and scheduling, so that an improved approach may be developed.

Recognize and Promote the Professional Nature of This Function

As a result of the differentiation and separation from manual work planning and scheduling, we will be able to recognize and effectively promote the professional nature of this function.

Utilize the Project Management Institute

The Project Management Institute provides the potential for accomplishing a number of things in this regard, as a means for:

- Performing the study and analysis required
- Documenting a common body of knowledge in this and other areas of Project Management
- Developing the professionalism of project planners
- Encouraging knowledge workers to enter this field
- Developing improved skills, tools, techniques and systems
- Promoting the interests of people performing this function
- Conveying a sound understanding of this function to the rest of the world.

V. WHERE DOES CONTROL FIT IN

To this point, we have been discussing planning and scheduling almost exclusively. What about control?

Control of Knowledge Work

This control is exercised by both the Project Manager and the organization or functional managers. The plan and schedule provides the framework for control, and the information or project management system provides the information to the managers needed for control. The system does not exert direct control, and neither should the project planner who is serving the Project Manager.

Project Planning Function Is Analogous the Financial Controller Function

Project planning and control is analogous in many respects to the financial controller. The controller plans the chart of accounts with direction from the General Manager; develops the supporting systems; and manages the accounting department which operates the financial information system. But organizational or line managers actually control their own departments, using information (and perhaps responding to pressure) provided by the financial controller.

In a similar manner, the chief project planner (or perhaps project controller?) plans the project with direction from the Project Manager; develops the supporting systems; and manages the department which operates the project management system. But the Project Managers actually control their own projects, in cooperation with organizational managers, using information (and perhaps responding to pressure) provided by the project planner.

The auditor function, well known in the financial area, is rather confused in the project management area. Perhaps some of our difficulties stem from our attempts to make the project planner audit his own functions.

Control of Knowledge Work Comes From Within

Except in rare cases, the project manager must achieve control in a participative management environment. He cannot dictate by force, and does not have total authority, for many reasons.

In such an environment, control comes from within. This is especially true with knowledge workers. Thus, if the project is properly planned and scheduled, and the knowledge workers have participated in this function by cooperating with their professionally recognized brethren (the project planners,) these knowledge workers will exert individual control on their activities to conform to the plan and schedule.

In such a desirable situation, the Project Manager anticipates problems caused by unforeseen circumstances, outside-directed changes, and so on, and alerts all concerned to the need for

revision to the plan and schedule as far ahead of the event as possible. Organizational managers then concern themselves with the direction of the tasks in their area of specialization, the handling and supervision of their people, their departmental performance and conflicts with other projects.

VI. CONCLUDING REMARKS

We started out by focusing on projects and their management as our common cause at this conference and briefly discussed the basic characteristics of projects and project management. I believe we all agree that project management is growing in importance or else we wouldn't be here today. To summarize several of the primary points which I would like to convey:

- Project management requires different skills to:
 - Manage projects
 - Plan and schedule projects
- Projects involve both manual and knowledge workers
- Total, integrated project planning and scheduling is vital to realization of the full benefits of Project Management
- Planning and scheduling of knowledge work is required to achieve total project planning
- A new view of this function is needed to overcome present difficulties
- The professional nature of knowledge work planning and scheduling must be recognized
- The Project Management Institute can be valuable in this regard
- Control of knowledge work evolves from the plan.

I believe that the approach outlined can be of significant value to the field of project management, and can help to accelerate the proper recognition of project management as an important area of management specialization.

About the Author



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When this paper was presented in 1969 Russ was 45 years of age. It reflects his previous two years as the Project Engineer (Captain, Senior Pilot) for pressure and temperature control systems for all USAF bomber aircraft within the USAF Air Research and Development Command ; then the Project Controls Manager for the POLARIS Solid Rocket component at Aerojet General Corp for two years (where the first computerized PERT system was developed); plus four years in project management consulting as President of CPM Systems, Inc., in California. In 1967 he was co-author (with Richard Villoria) of [*Network Based Management Information Systems \(PERT/CPM\)*](#), Wiley, one of the first books to appear on project management. Now 93, with careers spanning more than 70 years, Russ has had broad international experiences in piloting and designing aircraft, corporate engineering, operations, and program and project management. His three project management related careers have been *Military/Aerospace (19 years)*, *Corporate Engineer & Executive (17 years)*, and *Management Consultant (34 years to date)*. Russ has consulted to a wide variety of large and small organizations in 16 countries, has trained thousands of people in project management, and has resided in the USA, France, Mexico, Venezuela, Panama Canal Zone, and Peru with Marion, his wife of 70 years. For the past 23 years they have resided in San Miguel de Allende, Guanajuato, Mexico.

Russ is founding member number 6 of the [Project Management Institute/PMI](#). After presenting this first PMI paper in 1969 he was President of the PMI Southern California Chapter in 1991-2, founding member of the PMI Mexico City Chapter in 1996, and in 2006 was awarded the PMI *Jim O'Brien Lifetime Achievement Award*. A PMI Fellow and Certified Project Management Professional, he co-authored with Prof. Dr. Jean-Pierre Debourse the 2011 PMI research report [*Project Managers as Senior Executives*](#). He was also a founding member in 1970 and is an Honorary Fellow of the [Association of Project Management](#) (APM/IPMA-UK).

Russ is co-author with his grandson Shane Archibald of [*Leading and Managing Innovation-What Every Executive Team Must Know about Project, Program & Portfolio Management*](#)(2nd edition CRC Press 2015, 1st edition 2013 also published in Italian, Portuguese and Spanish); author of [*Managing High Technology Programs and Projects*](#) (3rd edition Wiley 2003, also published in Italian, Russian, and Chinese), has contributed chapters to 15 books edited by others, and presented 88 papers at many PMI, IPMA and other conferences in many countries. He holds BS

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