

Project Management in the Realm of Explorative Research

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Abstract

Traditional models of project management view a project as a sequence of developmental phases which includes planning, monitoring and evaluating the outcome. This study argues that this conception is based on several assumptions about the project environment such as a hierarchical organization. Yet, in environments where research is mostly about exploration as opposed to product development these assumptions mostly do not hold and I will illustrate the differences. Since the environment is different, one might assume that the way projects are organized is different, too. I will investigate this assumption and point out the distinctions by illustrating some instances of an exploratory project. Finally, I will discuss the consequences of my findings for the management of innovation since models of innovation management are built on the traditional project management approach.

Keywords : project management, innovation management, explorative research, organic projects

Introduction

In an economy which is often likened to a global war or to a tumult in the market place [5, 13], the management of innovation is of significant importance. This paper investigates the roots of innovation management. Hence it starts with investigating projects as the micro-mechanism of innovation management, and it looks at exploratory research that provides companies with cutting edge inventions.

Most management studies are based on interviews or surveys, conducted primarily with top and middle management. The data are collected from an outside (the analyst's) perspective. Ethnographers call this an 'etic' view [7]. In contrast, this study is based on an 'emic' view [7]. An emic view is concerned with understanding what is relevant for the participants in the observed research center. This paper is based on two years of ethnographic studies that I conducted as a participant observer at a research center [A-RC] engaged in basic and applied research. I was a participant in the sense that I was a 'common' member of the local research community. I took part in meetings, talks etc., doing 'observation' in terms of generating fieldnotes (about 200 typed pages with notes on project reviews, meetings, general observations etc.), collecting documents such as e-mails, proposals, talk slides, conducting interviews and having informal conversations. I started out with conducting 12 open-ended interviews about 90 min each with researchers and area managers. The interviews asked questions about project selection, team formation, project organization and what differentiates a project from other activities. These interviews were taped and fully transcribed. Analyzing these data and comparing them with main stream literature on project management, which I will call 'traditional', I found significant differences regarding the notion of what a project is, as well as to how it is organized. On studying these differences I noticed that the traditional model is based on some assumptions about the organizational environment of projects. However, the approach

for managing projects suggested in the traditional model is rooted in these assumptions. Based on these initial findings I generated research questions for my study: Given that A-RC's organizational environment is different – how different is its project organization and management? Given that the models for innovation management are built on the traditional notion of project management – what are the consequences for the management of innovation in an exploratory environment? These research questions served to focus my observations. Besides generating fieldnotes I conducted 13 more open-ended interviews (about 90 min each) with a different set of researchers, project and area managers and one lab manager. These interviews also were taped and transcribed in full.

This paper will briefly outline the traditional model, explore its assumptions, and show how the suggested approach for managing projects is based on these assumptions. I will compare these findings with the results of my ethnographic fieldwork at A-RC and illustrate the differences. Following up on several well-known studies [e.g. 2, 4, 10, 12] which argue that hierarchical forms of organization are inappropriate for complex and unstable environments, I investigate the consequences of flat hierarchy for the organization and the management of projects. In conclusion, my study raises questions about what these differences mean for the management of innovation in exploratory environments.

The Traditional Model of Project Management

Traditional models of project management view a project as a sequence of developmental phases, which include planning, monitoring and evaluating outcomes [8, 9, 14, 15, 16]. These models define a project as "...a temporary endeavor undertaken to create a unique product or service. 'Temporary' means that every project has a definite beginning and a definite end." [15] Activities can be clearly divided into projects and non-projects: "Operations and projects differ primarily in that operations are ongoing and repetitive while projects are temporary and unique." [15] However, this view, and the suggestions for managing projects, is based on several assumptions which I will explore.

Projects as Hierarchical Organizations

In traditional models, projects have to be authorized by management. These models assume a clear role division between the management level and the employee level as is typical for hierarchical organizations: ideas either come from the management level, or must at least be approved there, whereas lower level employees carry them out. In the traditional model, a project is not initiated by a non-management employee having an idea and starting to work on it. Traditional models assume that projects are structured like the larger organizational model: a project manager is placed on top of the hierarchy, roles and tasks are assigned. The official role of the project manager implies the legitimization for assigning tasks to team members. In the case of conflicts, diverging opinions or time pressure, the project manager is officially legitimized and expected to make decisions.

Projects as Entities with Defined Objectives and a Customer

The conventional model defines projects as having “a definite beginning and a definite end.” This definition is based on the notion that a project has a customer and is grounded on a contract fixing the deliverables and the term of delivery. It is assumed that it is known from the start where the project is heading. The project trajectory has a teleological quality: it represents a development process oriented towards pre-set goals (teloi). This assumption is clearly represented in Milton Rosenau’s notion of the “Triple Constraint, “which”...defines all projects. The Triple Constraint consists of a performance specification, a time schedule, and a money or labor hour budget.”[16]

The Suggested Approach

Traditional models typically distinguish between the project life cycle and the process cycle. The project life cycle defines the beginning and the end of a project, what technical work should be done in each phase and who should be involved. The goal of each project phase is the completion of one or several deliverables. The conclusion of a project phase is usually marked by a review of key deliverables and project performance in order to (a) determine if the project should continue into its next phase and (b) detect and correct errors cost effectively [15]. The process cycle defines how the project will be done in terms of initiation, planning, execution, controlling and closing processes. The model’s main emphasis lies on planning, assigning and executing tasks. These activities entail control, since the project is supposed to stay on time, as well as on budget and scope. By defining planning and control as management functions, traditional models place most of the responsibility on the project management and thus on the top of the hierarchical pyramid. They assume a hierarchical setting, distinguishing between management and execution.

In summary, projects based on traditional models are assumed to be a formal and top-down enterprise. They are the machinery for rolling out a series of specified tasks, in a pre-programmed teleological fashion following milestones. Their base lines are defined by a time schedule, and a money or labor hour budget. The project management approach is grounded in these implications of the organizational environment. In order to sum up my findings I state that:

Hierarchy (org. structure) + Customer & Contract (known objectives) => Traditional Project Management Approach

However, the findings of my investigations at A-RC suggest that there are significant differences between project settings typical for a research environment and the traditionally assumed project setting.

Projects in an Exploratory Space

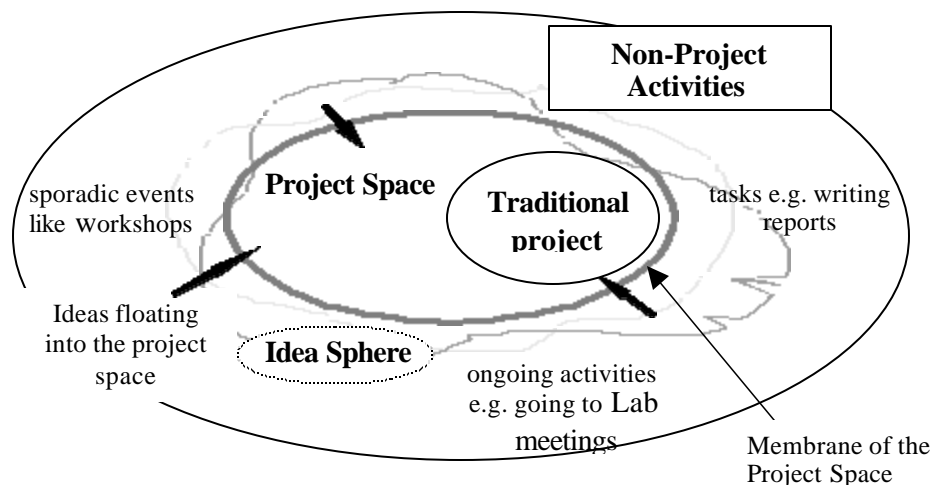
A-RC’s project environment is quite heterogeneous, covering a spectrum from ‘organically grown’ projects starting with an employee having an idea to management initiated projects which roughly follow the traditional project management approach. The following observation is focused on the organic project type since this is the predominant project form at A-RC and, moreover, the characteristic feature of an exploratory research environment. What is most striking about the vast majority of activities at A-RC is that they do not fulfill Rosenau’s

Triple Constraint project definition. We could ask if projects exist at all. As a matter of fact management and researchers like the one quoted below talk about the difference between tasks and projects, too:

“I have things which are sort of tasks or things I’m pursuing but one part of my brain says ‘Yeah, those are projects, too, as long as they have some goals and you can tell whether they’re making progress. So I have a paper I want to write for the [X1] Journal. Is that a project? Well, not really. It’s just something I want to do. ... You know usually a task has some well defined end stage and I just do this. ... I have a task to do for [the X-project] which is to do a final report. It’s not a project. A project has an idea and some themes and some energy and a task is something which you know you’ve got to get this done and it’s going to be there.”

The respondent states that something “*is not really*” a project though it is important. At first glance his world seems to be divided into project activities and non-project activities. Non-project activities are things like ‘ongoing activities’ (e.g. lab meetings), ‘tasks’ (e.g. writing reports), sporadic events (e.g. workshops). Ongoing activities are repetitive events. A task is an executive process with a “well defined end stage”, something “which has to be done“. In contrast to this a project has an “idea” and embodies creative action. Besides project and non-project activities I encountered what I will call an ‘idea sphere’. The boundaries between the idea sphere and projects are fuzzy and probably best characterized as a permeable membrane. Out of the idea sphere either an autonomous project might evolve or already existing projects might be enriched or the idea vanishes after some time.

Summing up, non-project activities embrace project activities: in the outer region of the non-project activities we find activities categorized as ongoing activities, tasks and sporadic events. In the inner region we see the idea sphere divided from the project activities by a membrane. The notion of a project in the traditional model, quoted in the beginning of this paper is shown as an impermeable space in the diagram. In the diagram below I use the metaphor of a ‘project space’ in order to illustrate that the definition of a traditional project is too narrowly conceived to represent the project I observed in practice.



¹ [X] omissions serve for reasons of anonymity

Moreover, the notion of a project at the A-RC is much more amorphous than that of the traditional model. When people are allowed to structure their work space mostly independently and are on principle free to start working on ideas if they have the time to do so, the flow between the idea sphere and the project space is smoother than in hierarchical top-down driven environments. Most projects at the A-RC are growing out of ideas:

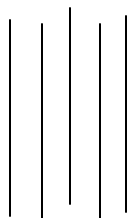
“From my point of view projects come about because someone gets an idea or passion and they say ‘I want to explore this.’ And it comes about because there are opportunities that are presented.”

This has been described in the management literature as an “organic style” [2]. The fact that idea sphere and project space are not separated by management decisions entails several important issues. These organically grown projects are not entities starting at a certain point in time but are assembled out of pieces flowing in the activity space and the idea sphere of people. Hence it is hard for them to say when a project has started, how much time they spent on their projects, and how many projects they are working on:

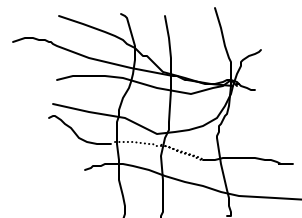
I2: “Can you measure how much time you invest in each of these projects?”

R: “It’s very hard to tell. It’s very interlinked. I also spend part of my time just following other people’s work, reading papers. And then, when you’re reading a paper and you’re asking many different questions in many different conversations something random will come up and it will fit something: ‘Ah, that works here.’ So for that work, now you can say: ‘Oh, that must have been a percentage of my time. I start working on that project.’”

The boundaries of project and non-project space are rather blurry. Labeling something a project seems to be more an issue of assembling pieces of work in hindsight. This is not only true for projects on the level of individuals but also for those on the organizational level. Projects, for example, that evolve into successful platforms attract and incorporate contributions from other projects; smaller projects cluster around them. The traditional model views projects as autonomous entities, each of them with its own project life cycle. In contrast, projects in the A-RC are typically widely interrelated. Thus they form a closely meshed network looking like the interwoven structure of a carpet.



Projects in the traditional model



Projects at the A-RC

² I: interviewer; R: respondent

In contrast to the goal-oriented teleological character of projects in traditional models the character of organically grown projects is evolutionary. Organic projects have what I call a ‘project identity’: their goals might be meandering, mostly according to the findings of the research. However, the space for these movements is set by the capabilities of the team members and the necessity to place oneself into the context of the overall organization. In such a setting it is not always clear where projects end: there are projects that are ‘asleep’ for some time and might either wake up once again or fade away, or sometimes parts of one activity regain life, nurturing another activity so that the project life cycles overlap.

So far, we dealt with projects on the level where actual work is being done and thus staid within the field, which is also covered by the project notion of the traditional model. However, exploring A-RC’s project environment, I found that a project serves also an official, representational function within the political and administrative structure which is blinded out by traditional models:

“Often one piece of technology development that you can think of as one project might be viewed as part of several other projects. [...] It’s just not a one to one mapping of a technical thing that involves a lot of people from a lot of labs in sort of a high level concept of what’s a project and what is a research plan. It’s not straight forward. So the contracting process will come along and say ‘okay, what project is [researcher A] working on?’ and mark [the y-project] and the contracting process will come along and say ‘okay what project is [the respondent himself] working on?’ and mark [the z-project]. And if you look one level below these names which are in different portfolios of research you will see that we’re actually working on the same piece which had a totally different name from both of those. It was the [x-project].”

Conducting research in an exploratory field means dealing with a heterogeneous audience, necessitating placing the project into a context that is meaningful to them. The question ‘What is a project?’ has thus to be reframed as ‘What is a project for *whom*?’. From this representational view we see the project carpet from yet another perspective. Activities are divided into projects for representational purposes. However, this neat division is delusive since these projects are closely meshed and even overlap each other.

Looking closer at the organizational environment I found two major differences regarding the traditional model: 1. a flat organizational environment and 2. the absence of an end customer who pays for the product. Yet, these are the foundations of the traditional project management approach. If my assumption stated before is right then the traditional project approach should not apply. In the following I will explore these issues by portraying the case of a project team which is typical for A-RCs setting.

The Consequences of Dealing with a User Instead of a Customer

This project, designing software for an internet service, took the approach typical for A-RC, growing organically out of an idea about what might be useful. At the point of the interview nine people worked on the project. When starting out the people on the project had a customer in mind instead of being bound to a ‘real’ one by a contract. A prototype was generated and set out at A-RC. The prototype was used by several individuals and some projects built on top of the

technology. Even though we could say that the project had thus ‘real’ customers I prefer to speak of ‘users’. The difference between the end customer assumed in the traditional project model and our user is twofold. First, in contrast to the end customer, the user of a prototype usually does not provide the funding for the project. Second, the project team is not formally committed to serve the user. There is no contract laying down the user’s requirements nor is a deadline specified for deliverance. The consequences of this arrangement is illustrated in the statement of a team member describing the relationship between user and project team like this: “we satisfy the request if it’s reasonable to do so.”

However, even if not formally bound by a contract, the team was quite responsive to user requests. Individual team members, for example, committed themselves to supporting other project teams that used the prototype – though not by making a formal statement but by just doing it. The commitment to user support is necessary since otherwise one risks losing the feedback from outside. Yet, there are some drawbacks for project planning. The project leader stated:

“The goals of the project change quickly enough that the plans become obsolete. People would look at a plan like this and they’d say ‘Oh but this doesn’t even include the thing that I’m working on this week. And I know that thing is very important because a user explicitly asked for it. Or it’s a bug that’s in the current release of the version and users are complaining about it.”

It is widely acknowledged that project plans are changing, having to be adapted to the actual progress and changing requirements. However, the difference between the changes the traditional model assumes and the changes project members in an environment involving users is its volatility. It is not possible to include user requests like fixing a bug into the project plan since nobody knows when they will occur. The project team obviously faces a dilemma: Being committed to make their system useful for A-RC’s community and to improve it, they respond to their users. Users and project team being co-located means that occurrences like encountering each other in the hallway or the cafeteria as well as personal relationships add to the urgency of satisfying user request. The consequence is that researchers rather help out users than stick to the preset plan. Under these circumstances project priorities might be shifting quickly, especially on the level of individuals. Project planning becomes quite challenging since short term or middle term goals might be constantly changing. Even more, there are also situations in which long term goals might shift. In our case, the team redirected its project in favor of a customer from outside who might have provided funding. However, finally, this customer backed off so that the goals needed once more to be adjusted.

Team Formation in an Organization with Flat Hierarchical Structures

The traditional model of project management assumes a hierarchically structured organization. A hierarchical system does not necessarily represent a context of order and obedience in its negative sense. First of all, hierarchy means that there is an explicit set of roles. The project manager does not need to justify giving an order to a team member or making decisions in the case of conflicts, diverging opinions or time pressure. This formal setting helps to structure expectations. Experimental studies show that officially appointed group leaders spent

less time to defend their power and position and encountered less objections to their leadership than leaders who emerged on their own [17, 19]. In contrast to the setting of traditional models where teams are staffed by management, teams at A-RC's are mostly not staffed in an official sense. Rather, new team members are recruited by participants. The organizational structures at A-RC tend to be flat in hierarchy. Team structures are not set up but grow in a process, which is comparable to the findings of Homans [6] and Blau [1] concerning informal groups. Both studies note that a process of power differentiation occurs through a series of interactions among group participants. In the course of time, some members emerge who are both more willing and more able to make important contributions to goal attainment and thus generate power. Thus, in contrast to the traditional setting, the position and role of a team member wearing the official hat of the project manager is quite ambiguous in terms of being able to assign tasks or to make decisions for the team. Assigning tasks to somebody in a project might simply make this person change projects and pushing people into projects might make them leave for other places. As a consequence, getting somebody to do what he or she is not inspired to do anyway is a difficult tightrope requiring negotiations, bargaining and relying on personal connectivity.

The leader in the above mentioned project knew very well that he was not in the position to assign tasks to other team members for execution. He tried to distribute them through a more implicit process by suggesting or asking team members to take over certain tasks. Sometimes, he volunteered to work with them in order to motivate them. Besides this, work got distributed by team members themselves asking each other for help or voluntarily and unofficially taking over responsibility for certain areas in the project.

The traditional model assumes that the project manager drives the action by planning, assigning tasks and controlling their execution. In contrast to this the person officially appointed to be the project manager at A-RC is rather a project leader. The project leader's function is to negotiate work, summarize what has been achieved, trying to keep the team focused without having the power to make the plan or to control, to represent the project to upper management, to get funding and the like. The person wearing the project manager hat is not necessarily the one driving or guiding the technical discussion where the actual work gets done. The technical leader of a project is the person with the largest technical expertise. Who this is, is, however, not always obvious. Somebody's technical leadership might be constantly challenged by other team members. On a content level this turns out to be useful since more aspects and possibilities get illuminated than if a technical leader were appointed would break down the tasks, and the rest of the team would just follow. However, it might as well be problematic if decisions are questioned over and over again.

Discussion

The overall goal of projects in the traditional model is to satisfy the end customer's requirements as well as possible within time and budget. Requirements are determined early, aiming to focus the project space quickly. Therefore a hierarchical organizational structure is necessary that includes a project manager who is legitimized to assign tasks and make decisions. In contrast to this, research projects in an environment like A-RC are in their initial phases about exploring an idea, which means that they are opening the space of possibilities. This is only possible because they do not have a customer.

Top-down management in its strongest form assumes that all the necessary information and knowledge can be centralized at the top so that the ‘right’ plans and decisions can be generated. Facing the enormous complexity and uncertainty in exploratory research, it is questionable if all the knowledge necessary to make decisions can get passed upwards. Even more, assuming that parts of this knowledge are implicit, it is questionable if and how implicit knowledge can be made explicit [11]. In summary, in a complex environment, one brain can no longer cope with the information needed to make all the decisions [3]. Dealing with a complex and unknown space, flat hierarchies are favorable since they empower and even ask everybody to contribute to the creation of ideas a notion that Mintzberg [10] formulates in two hypotheses: “The more dynamic the environment, the more organic the structure” and “The more complex the environment, the more decentralized the structure.”[similar 2, 4, 12]. However, it should not be overlooked that engaging more people in organizing means increasing the already existing complexity and intensifying an already fast changing pace. The ‘cure’ contributes at the same time to the intensification of the symptoms.

The traditional model views projects as defined entities. Yet, taking an emic view I found that projects are clear-cut entities only from a top-down view (e.g. the research plan) or from the hindsight. Besides this project boundaries are blurry. Projects, seen from the perspective of actual work being done as well as from a representational, official perspective are closely interwoven, forming what was called a ‘project carpet’. The consequences deriving from these observations of the project environment for the management of innovation are significant and raise numerous questions:

Regarding the Research Strategy Formation

Development funnel models like that by Clark and Wheelwrights [18] are based on the assumption that projects are clearly defined entities. These project entities are moving through a narrowing funnel, passing several screening and reviewing phases in which the project selection process takes place. However, taking on the notion of a closely interwoven network structure of projects, which I called a ‘project carpet’, it is first of all ambiguous how to define the boundaries of the projects moving through the funnel. The projects in the research portfolio, which would typically be the ones used for the development funnel model are not necessarily congruent with the projects we would see looking at the actual work of people. Moreover, taking up the notion of a project carpet instead of project entities entails the question in how far the stopping one project threatens other, actually ‘healthy’, projects.

Regarding the Measurement of a Project’s Value Proposition and Success

Given that parts of abandoned projects might live on in other activities, we have to ask: Is this project a failure because it was abandoned or is it not a success since at least parts of it are used? Besides this, the development process is two-fold: not only is the actual idea of the project elaborated but also the argumentation for its value proposition which is in the beginning mostly an intuition. In an explorative environment we are not dealing with the space of objectivity and rationality assumed by traditional models. Thus, opinions about the value proposition of projects might differ widely. Due to this, the perception of a project often changes as soon as the people in the top management change.

Regarding the Measurement of Innovation Cycle Time

If the start of a project in explorative research is not a given or 'objective' date but rather a matter of (subjective) definition, what does this mean concerning the measurement of innovation cycle time? What does it mean for the measurement of the innovation cycle time that some parts of abandoned projects might live further on in other projects? Is the time that was spent on the abandoned project to be included or not? Probably yes, but who could measure it precisely?

Conclusions

My paper investigated two types of projects: the traditional model of project management and the exploratory organic project type. The second project type is widely ignored in management literature. Even the literature on R&D management is based on the traditional approach of project management and is practically synonymous with the management of product development. R&D managers typically say that they are aware of the differences between exploratory research and product development. However, there are numerous cases in which R&D managers try to implement in exploratory research what traditional project management and product development literature offers, and one might wonder why. I believe that it is important to grasp the assumptions on which these models are based in order to get to an explicit knowledge of when to use them and when not. This is even more important when considering that some teams and their projects will start out as exploratory enterprises but then might move into applied research or even development. For the team this means moving from an environment of flat hierarchies into a space covered by traditional models and thus assuming a hierarchical organization. My future research will investigate if and how teams master this challenging transition.

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