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A typology of project management: emergence and evolution of new forms

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Traditionally, project management has focused on the management of projects on a single location either within one organization or among two or more organizations. Recently, however, emerging trends are changing the way projects are organized and managed, creating new challenges in project management research and practice. This paper has two objectives. First, it proposes a classification of project management types based on the number of projects and sites involved and investigate the consequences of such schema. Second, the evolution of projects across three levels is discussed. © **1999 Elsevier Science Ltd and IPMA. All rights reserved**

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Introduction

A number of business and technical forces are changing the fundamentals of project management as it had been developed over the past decades. First, advanced Information and Communication Technologies (ICT) enable cooperation in a distributed mode. Technologies like groupware and videoconferencing are increasingly becoming feasible for organizations to use in international projects.[1] Second, globalization of markets and competition necessitate integration of global managerial and business processes in corporations.[2] This corporate integration is achieved by people working from geographically distributed sites in a given project.[3] Corporations expect organizational teams to cooperate on an international scale, dealing with business problems with a global impact.[4] Third, organizations are increasingly adopting a strategy of global sourcing, not only in innovative sectors like microelectronics and the semi-conductor industry, but also in the area of financial and business services as well as manufacturing and engineering operations. As these strategies require intensive cooperation between the organizations involved in these exchanges, projects including professionals from multiple organizations will occur. Fourth, cooperation from distributed sites around the world enables organizations to benefit from differences of time zones between locations. Improvement of project cycle time becomes feasible in such a distributed environment. Fifth, multinationals increasingly organize their R&D activities around globally distributed centers of excellence.[5,6] Coordination of activities between these centers and integration with business operations require close cooperation of professionals. Thus, multinational organizations tap into local sources of competence and leverage this knowledge on a global scale.[7] Globally distributed projects enable realization of these benefits and increase corporate performance.

The confluence of these trends has given rise to new forms of organizations which, enabled by advanced ICT, are labeled 'virtual organizations'.[8,9] The focus of this paper is not on the level of these organizational forms, but on the level of projects that increasingly occur within or between these types of organization. These so-called 'virtual projects' involve people cooperating from internationally distributed sites and even different organizations.[10] Professionals working geographically distributed, participate in multi-cultural and cross functional projects with a global focus.[11,12]

These virtual projects pose new challenges to project management practitioners and researchers.[13]

Although practitioners' literature describes these new projects and ways of cooperating from a human resource perspective,[14] existing project management literature has paid scarce attention to these new phenomena. Currently, the literature is investigating the different dimensions and taxonomies applicable to these new developments. Agreement in this area is a prerequisite for the development of concepts, tools and methods required for different kinds of projects.

The paper contributes to this discussion in two ways. First, it introduces a typology of new forms of project management. Rooted in existing project management literature, the model comprises two core dimensions capturing the essence of new challenges to project management: single versus multi-site projects, and single versus multiple projects.* Second, the paper identifies patterns of evolution across project forms.

For both practitioners and researchers the paper bears relevance. First, the framework and evolution model serve as a guideline for practitioners to map the type of project they are engaged in, and to determine which critical issues arise in different types of projects. New methods and tools can be developed that fit in different types of projects. Second, the model supports researchers in project management to structure research and considers how their expertise fits in the typology. In addition, the typology identifies new patterns for research in project management.

In the next section different types of projects will be described and characterized. Relevant project management literature will be presented, followed by a discussion of how the typology developed by the authors extends the current dialog. A characterization of the emerging types of projects as well as a model of evolution across new project forms will complete the paper.

Project management literature

Most projects discussed in the project management literature fall under two categories: single projects[15] or multiple projects[16,17] managed concurrently. The overwhelming number of projects presented in the literature as well as most of the practical and theoretical developments on projects is centered on single projects. This is generally also true for books on project management.[18] A key characteristic of a single project, even though there may be subprojects, is that all its integrating parts are closely interdependent and share the same objective. However, Turner[19] mentioned that the current knowledge base on the management of projects emanates from large capital construction projects responsible for only 10% of the projects. This was one of the reasons that interest in multiple project management started to appear recently. Ferns[20] proposed the name 'programme management'—or program management to use a U.S. term—to the management of a cluster of projects. Turner and Speiser[21] elaborated on the types of information systems needed for programme management. In some cases, the literature presents programs as a set of smaller projects that need to be managed concurrently by the same management team.[17] In fact, Van der Merwe[17] proceeds to detail a methodology of how to manage those projects. Programs may also include medium size projects, as Turner and Speiser[21] noted.

Another important difference between single and multiple project management or programs is that, as their name suggests, multiple projects may be occurring in multiple sites, whereas single projects are mostly located in a fairly defined geographical area. Other research trends are also appearing that are related to site multiplicity. For instance, interest has appeared on international team project management involving cross-cultural relationships.[22] In particular, Schneider[22] mentions pre-programmed problems that French–German projects are likely to have. International cooperation also involves problems with the team culture.[23] However, the question of managing multiple sites from where these different cultures originated was not broached. The general assumption is that these project managers would be in the same geographical location.

Trends in industry suggest that there are new organizational needs and forms that are generating projects that do not fit in the categories of single or multiple projects. For instance, Kumar and Willcocks[24] describe a software development project where most of the developers were in India, whereas the client was in the U.S. In this case, although the objective of developing an information system was clearly the same for both locations, they were separated by thousands of miles, 12 time zones, and by cultural and religious differences. Thus, the project can be characterized as a single project in which multiple distant sites are involved.

If the same software company were developing information systems projects with clients located in Europe, U.S. and perhaps Japan, then the definition of their practice would change to program management but with an additional twist: each of these projects can be occurring in multiple sites. Again, this case cannot be neatly categorized in either of the two categories presented in the literature above. Although on a different scale, it would be essentially the same problem as the 2000 projects Van der Merwe[17] cited, which were all managed concurrently in a large geographic area in South Africa.

Typology of new project management forms

When one considers these possibilities it becomes clear that a new categorization of project can be developed. In this paper we propose the categorization presented in *Figure 1*. The dimensions that projects differ from each other are: (a) single versus multiple projects; and (b) the number of sites that these projects encompass.

Turner[19] defines a project as 'an endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives' (p. 8). Therefore, one project can be performed in several

*The authors acknowledge the fact that the distinction between intra- and inter-organizational projects poses an additional challenge to the new forms of project management. However, it is considered beyond the scope of this article to include this dimension.

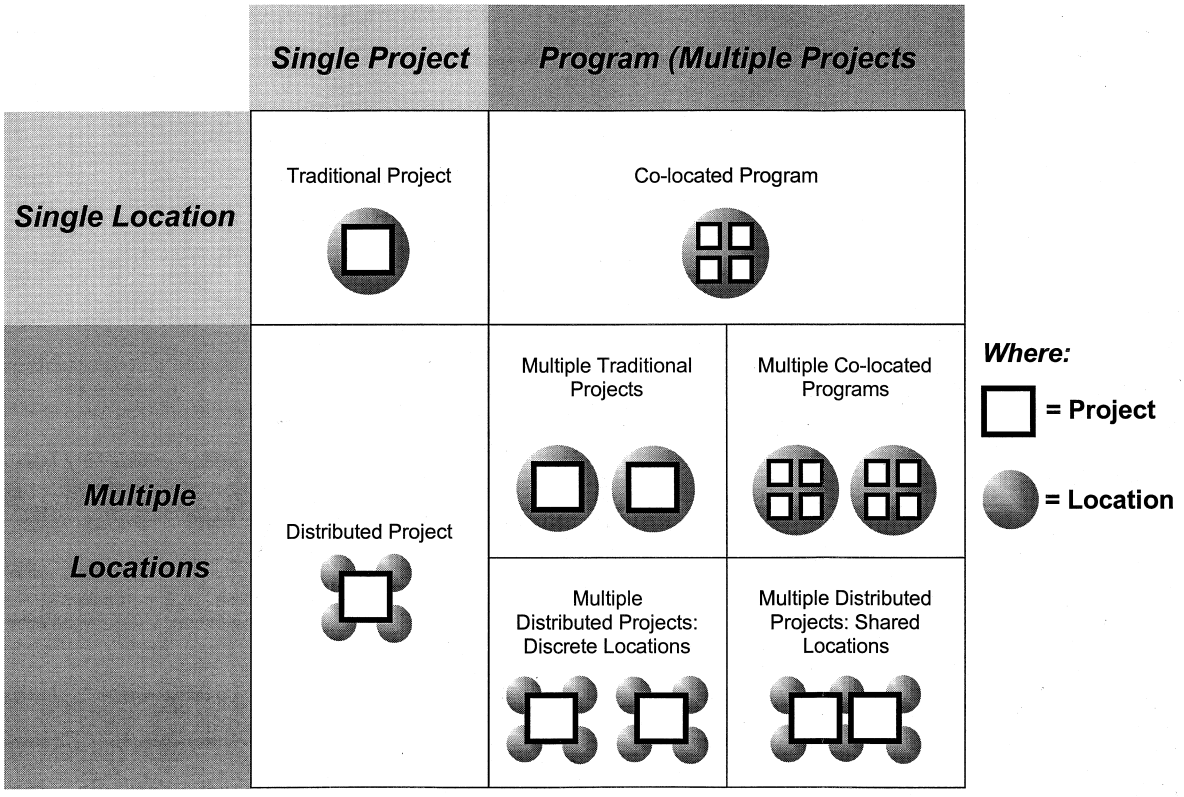

Figure 1 Project Management Typology.

sites concurrently, as long as the correspondent actions share the same objectives.

A site is defined as a physical location or a set of physical locations that are close to each other and where professionals are located who are involved in the project.* 'Closeness' is used here subjectively, i.e., whichever distance the project participants deem to be close enough to be called 'close'. Management of these projects is assumed to be located in any of the sites or nodes. The different cells can be described the following way:

Traditional project management. This is the most common project type, and it is typically described in traditional project management textbooks. Therefore, no further comments will be added.

Co-located program. In this case, there are multiple concurrent projects, all of them operationally co-located in a single geographical place. Turner and Speiser[21] elaborate on this situation, defining program management as 'the process of coordinating the management, support and setting of priorities on individual projects, to deliver additional benefits and to meet changing business needs'. They also note that some of these projects can be interdependent, because they deliver related objectives and share common deliverables, information, resources and technology. Moreover, there is a need to negotiate priorities on resource allocation across projects very frequently. Since most of these resources are co-located, scheduling and allocation—although complex—do not require large geographical movements of resources with the accompanying problems and costs. Ultimately, the objective in managing programs is the global optimization of the parent company's needs as compared to local optimization in traditional single project management. Similarly, Van der Merwe[17] mentions that the key difficulties of program management center on allocating resources over a large number of projects in an efficient way. One should note that although both Turner and Speiser[21] and Van der Merwe[17] did not assume co-location of projects in a program, they did not discuss the consequences of distance among the projects in the program. Therefore, co-located programs are a particular case of programs as described in their papers. The more general case is described next.

Multiple co-located programs. In this case, the difficulty is aggravated by the fact that sets of projects (or programs) are now in geographically distant sites. The distance may create communication problems among the project managers and also among program managers (if more than one). Face-to-face communication may not be possible. In addition, sharing of resources requires more careful scheduling, since in emergencies a resource cannot be requested and moved seamlessly from one project to the next if they are in different distant sites. The easiest path to quasi-global optimization in this case may be the result of local site optimization. True global optimization requires much more effort.

*We are making a simplifying assumption here. In fact, one could think of several aspects related to projects that could be distributed. The one mentioned here is operation, but control and planning could also be either centralized or distributed.

Multiple traditional projects. It can also be thought of as a subset of the above, with the exception that there is only one project in each site. Most of the traditional project management considerations apply: the key issue is scheduling. However, there is a potential need for sharing resources to achieve true global optimization, and then the caveats discussed above come into play.

Distributed projects. In this case a single project encompasses several sites. This situation occurs for several reasons, among them scarcity or complementarity of resources, convenience, cost, monitoring capacities, and quality. A large U.S. multinational company recently was faced with the problem of developing a 'European' ordering and billing system. Talent resources were scarce, and two possibilities were the most likely candidates: (1) invite all the expert analysts from each of the involved countries to spend one year in a secluded location to develop the product, or (2) leave everybody where they were and have them work at a distance on the same project. The first option was a lot more expensive considering the family relocation costs (round trip), plus the fact that by being plucked away from their natural environment, their knowledge could slip away or become obsolete. The natural choice was to find a way to run the project in a distributed fashion. In order to facilitate this, hardware for development was installed in a central location (Brussels) and excellent communication lines were made available to all members of the project. Moreover, monthly face-to-face meetings were scheduled among the project managers—each responsible for a different function from the system—from different countries. This particular solution also addressed cost and convenience issues.

As this software development effort exemplifies, a distributed project has many benefits. On the other hand, there are also many problems or costs. The principal issue is the heightened need for communication and coordination of the separate pieces of the same project being developed in different areas. This extra coordination is necessary to schedule the different activities over several sites and concurrently trying to allocate resources. In principle, the only person who has a bird's eye view of the overall situation is the project manager. There is no overlap of people across sites. Meetings across sites and different parts of the project are, most of the times, accomplished by project managers who are in charge of more than one site. Team members also communicate to clear doubts or create a better relationship with other off-site project members. Interdependence across sites is considerable due to their shared needs for the same resources. On the other hand, it is relatively small considering the more general cases that will be discussed next.

A critical difference between distributed projects and the prior programs or traditional projects of various types is related to the focus on the coordination mechanisms. The former types of projects tend to concentrate on inter-site coordination or boundary spanning across sites, whereas the latter tend to concentrate on intra-site coordination mechanisms—or boundary spanning across projects. Finally, the potential for considerable synergy between the different sites in charge of different parts of the same project is clear. The down side is the transaction costs associated with this need for coordination and communication.

Multiple distributed projects: discrete locations. This is the case where many distributed projects as described above are managed by the same project manager. Key issues are very similar to those in distributed projects, with the exception that now the boundary spanning efforts become more inter-site in nature than previously. There is no assumption made about the interdependence between the projects, and therefore potential synergies are not necessarily explicitly recognized or managed. Inter-site resource allocation and sharing has similar problems to other program forms such as multiple co-located programs and multiple traditional projects.

Multiple distributed projects: shared locations. This is the general case of the previous category. The fact that some locations are shared simplifies the boundary spanning efforts of individuals who may be participating in more than one project concurrently, helping them to recognize similarities and synergies across projects. Moreover, resource allocation/sharing is somewhat simplified for the same reason. Possible advantages could include lesser cost due to avoidance of effort or resource duplication. On the other hand, one should be aware that politically it may be more difficult to negotiate and schedule resource allocation, a problem shared with all the program forms.

Evolution of project forms: a three level model

After examining the categorization presented in *Figure 1*, an interesting question can be raised. How is it likely that these project forms may evolve with business needs, time and the availability of better information technology tools? In this section, we propose that there are a few more likely paths where this evolution may happen, strengthening the argument comparing the different forms. But most important, one can make predictions about which change path is easier to a company involved in project management that decides to change from one project type to another. *Figure 2* depicts a three-level model of the evolution of project forms.

A first observation is that all paths only change one level at a time—there are no paths that move directly from level A to level C. In other words, the evolution paths depicted in *Figure 1* seem to suggest that one can evolve from one site to multiple sites or from one project to multiple projects, but not both concurrently (which would characterize a double change). Double changes would include the paths 1–3, 1–4 and 1–7. Since competence can be built more easily when one level change is performed at a time, double changes are more likely to spell trouble and should therefore be strongly avoided.

Two paths emerge almost immediately. On the left (paths 1–2–3 and 1–2–4) there are distributed project forms, and on the right (paths 1–6–4 and 1–6–7) there are multiple project or programs but without spanning of multiple sites. These left and right paths are first elaborated and clarified with some examples. We then proceed with the remaining patterns in the center 1–5–3, 1–5–4, and 1–5–7.

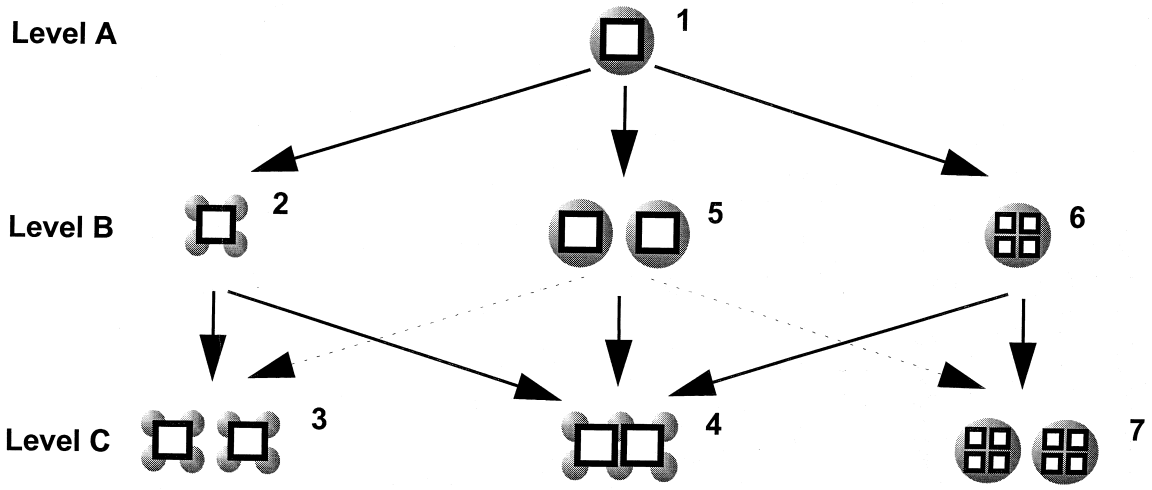

Figure 2 Evolution of Project Forms.

Left hand evolution patterns

Analyzing the left path, one can think of paths 1–2–3 or 1–2–4 as a natural progression. A given single project (1) starts being worked on in several sites simultaneously, (2) and from that point there may be a multiplication of projects, which may (4) or may not (3) share common locations. With this evolution we have an increase in need for coordination, due to a higher number of projects. This coordination may be somewhat eased by the sharing of locations across projects (4). On the other hand, resource allocation and sharing becomes harder as the number of sites increase. Depending on the project, shared locations could imply a little more ease in sharing resources because of the ability of a resource to straddle boundaries. The existence of shared locations also creates a counter argument: the actual allocation could become more difficult because of the need to carefully schedule hand-overs.

A good example may be software development. For instance, a large specialized software developer in the U.S. was hired to develop a rather complex satellite tracking system. In the beginning, the project was located only at headquarters, characterizing it a single project at a single location. Once project managers developed a good idea of what the project entailed, they subcontracted pieces of the software to a Canadian government owned company plus another organization in the U.S. East Coast. This characterizes the movement from form 1 to form 2. As the project went along, several tools (such as specialized metrics to assess productivity of distributed projects) were developed, and eventually this know-how applied to other projects that this software developer was making for other clients, characterizing a move from form 2 to form 3 or 4 (depending on which project those tools were used).

Right hand evolution patterns

The evolution patterns on the right (1–6–4 and 1–6–7) can be seen as mirrored from the two left hand paths. The 1–6–4- path involves a complex evolution. It starts with a single location with multiple independent but co-existent projects (form 6). Then, multiple sites become the norm; some of these sites are working on the same project (form 4). Other than inter-level evolution, this is arguably one of the cases where the knowledge gap may be highest. A large U.S. health products supply company was in this situation. The strategy group at headquarters was concentrated in several separate acquisition projects (form 6). One of those projects received the go-ahead from top management. Experts from all the different manufacturing, marketing and logistic divisions that were necessary to prepare a consistent evaluation of the European company to be acquired started working in earnest. Some of them joined the project from their original locations across the world (including Japan, several countries in Europe, and the U.S.), others actually moved temporarily to a central European location. Some of these experts were concurrently working on other assessment projects, characterizing form 4. Interestingly, in this case a specific project moves along the change path (or 'evolves'), and this particular company was experienced in such project evolution.

By contrast, in the second subpath the increasing number of projects does not involve geographical distribution *within* a project. For instance, a construction company could start other building sites that are adjacent to the first one or even in the same city, characterizing a co-located program. When the coordination and resource sharing is figured out by the program manager, then there may be an opportunity to replicate the same pattern in different distant locations. It could be that the same company decides first to build more on a different city, and eventually that business grows to several sites in that same city.

Paths in the center: hybrid forms

The evolution pattern on the center (1–5–3, 1–5–4 or 1–5–7) is an interesting hybrid situation. The subpath 1–5 is the result of growth of a company or division,

and the natural tendency to have more projects concurrently, although these projects are still single in nature and in different sites. This could be the case for a construction company that is building two sites in different cities or even countries. Starting at project form 5, let us suppose a situation where a company is working on two sites with one project per site. Any possible change path would imply moving to multiple projects in at least one of those sites. Some of those projects could be relatively independent (5–7) making the transition easier. In this case, the organization needs to improve their know-how on prioritization among projects on the same site, and problems with resource sharing start to appear. The 5–3 change path involves more complexity. Each project is now done in several sites, and the problem is less of prioritization but more of scheduling resource sharing and coordination across several sites, a different skill than the one involved in evolutionary path 5–7. Finally, path 5–4 is the most complex to acquire know-how. It has the same issues as path 5–3 but adds the problem of how to manage the local interdependencies across the shared discrete locations between the two projects.

The development of world cars, or automobiles that are produced by subsidiaries of the same multinational company in almost the same form in many countries, is an example of a 5–4 path. Until 10 to 15 years ago, cars were developed in one given country, and after being in production for some time, machinery was exported and production of essentially the same car (although adapted to local conditions) would start. Therefore, they were multiple traditional projects (5). Then both GM and Ford started their 'world car' project, where many subsidiaries were given the opportunity to participate in the design of the car—or in fact, a family of cars, if we consider the different body models that could share the same platform.[25] Some of these teams were working on more than one of those projects, since these families shared most components and manufacturing issues. By the same token, the procurement for parts to be used in those cars is done worldwide, potentially looking for more than one supplier for each given part, to be used in more than one production plant.

Another example of the center pattern is a Total Quality Management (TQM) project or program. Often, such projects start at corporate headquarters from multinationals (1). However, in order to ensure worldwide consistency and competitive impact, such quality improvement programs are implemented in geographically distributed regional headquarters or subsidiaries.[26] Hence, as a spin-off from the headquarter-concept, multiple TQM projects are initiated reflecting the evolution pattern 1–5. A number of trajectories becomes then feasible. For example, project teams starting at regional headquarters (5) progressively include members from local subsidiaries (1–5–3 or 1–5–4). In addition, regional headquarters may implement TQM by starting on their location quality improvement programs to enhance simultaneously the quality of business processes, products and departments (path 1–5–7).

Consequences of the typology and evolution model

Several important issues stem from the typology presented above. The main consequence is that it shows the clear distinctions among different types of projects and therefore suggests that different techniques may need to be developed to deal with the added complexity embedded in the projects described.

Furthermore, it seems reasonable that some projects that start their life in any given quadrant may end up moving to a different quadrant. Therefore, predictions on what paths are more likely add value for two reasons: One, because whichever techniques are developed or adapted to the new situations may take that evolution in consideration; two, because there is a knowledge gap to move from one project type to the next. In some evolution paths, this gap is too wide to be bridged and therefore the likelihood of failure higher. Suggestions on this issue were proposed.

Finally, it creates a whole set of new research and practical questions. What are best practices in these areas? What are the key pressing problems that need to be addressed by better techniques in these areas? What can be done to implement alternative solutions that will deal most efficiently with the problems in this set of projects?

Conclusions

The contribution of this paper centers on a proposed categorization of project management that goes beyond the standard categorization of single and multiple project management. It becomes clear that for each different category a whole different set of problems and potential project management techniques may apply.

In particular, the existence of distributed projects is described and due to their importance and expected future predominance, we make the case that it is relevant to understand the problems and possible solutions associated with them. As with any other projects, there are benefits and costs to distributed projects. We discussed in this paper some of the reasons why distributed projects make sense as well as some of its main difficulties. Research as well as practical questions linked with this categorization are also described.

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