The underlying theory of project management is obsolete

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Abstract

In prior literature, it has been generally seen that there is no explicit theory of project management. We contend that it is possible to precisely point out the underlying theoretical foundation of project management as espoused in the PMBOK Guide by PMI and mostly applied in practice. This foundation can be divided into a theory of project and a theory of management. We link theories to the body of knowledge by comparing prescriptions derived from theory to prescriptions presented in the PMBOK. Secondly, we show, by a comparison to competing theories and by an analysis of anomalies (deviations from assumptions or outcomes as implied in the body of knowledge) observed in project management practice, that this foundation is obsolete and has to be substituted by a wider and more powerful theoretical foundation.

Introduction

In a recent report on the future of project management and its professionals (Project Management Institute 1999), several global trends, such as technological advancements and the accelerated global change, were identified, in relation to which project management can take a leading role in facilitating and enabling the changes involved. The report also contains, in an appendix, a concise study on the development of bodies of knowledge in the professions (Fugate & Knapp 1998). One key aspect found is that the development of a body of theory is typical of a well-established profession, such as law, medicine, architecture, accounting, and nursing. Mastery of theory, along with mastery of practical skills of the field, is a hallmark of professionals. Indeed, according to Fugate and Knapp, reliance on the theoretical is the single most important factor distinguishing a profession from a craft.

However, surprisingly, this issue of the theoretical does not figure in any way in the above-mentioned main report on the future of project management (Project Management Institute 1999), even when the future of the profession of project management is in the focus. Research literature on project management reveals that this omission of the theoretical is no incidental phenomenon: in their analysis of project management research, spanning forty years, Kloppenborg and Opfer (2000) have nothing to report on the theory of project management. This extraordinary silence on the theoretical is puzzling; it is either conceded that there is no theory of project management, or it reflects the opinion that the theoretical is not significant from the point of view of project management.

In this paper, based on a wider study on the theory of project management (Koskela & Howell 2002), we argue that both of these two views are wrong. We show that project management as practiced today rests on an implicit and narrow theory that must be developed, extended and enriched. Indeed, it is the poverty of current theory that explains the other problems of project management, such as frequent project failures (Kharbanda & Pinto 1996), lack of commitment towards project management methods (Forsberg & al. 1996) and slow rate of methodological renewal (Morris 1994). Thus an explicit theory is the crucial and single most important issue for the future of the project management profession.

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[1] Koskela, L. and Howell, G., (2002), The Underlying Theory of Project Management is Obsolete. Proceedings of the PMI Research Conference, 2002. Pg. 293-302.

The underlying theory in the present doctrine of project management is analyzed based on the Guide to the Project Management Body of Knowledge (PMBOK Guide) of PMI (Duncan 1996). Of course, there are certainly other formulations about the primary characteristics of project management, and it can be argued what the true doctrine of project management should be; however, for the purposes of this paper, the PMBOK Guide provides for a useful summary of that doctrine.

The paper is structured as follows. First, it is discussed what do we, as practitioners and scientists, do with a theory of project management. Then, we reconstruct the underlying theory of project management by comparing the prescriptions and principles of the doctrine of project management to those implied by existing theories of operations management. Having then the theoretical foundation of project management at hand, we investigate whether it is the best available and empirically valid. We discuss the implications of this evaluation of the theory of project management. To conclude, we consider the impact of the observed deficiencies of the underlying theory of project management on the practice, profession and evolution of project management.

Theory of project management

Let us first clarify the basic issues. What are the constituents of a theory? What do we require from a theory of project management? Why do we need a theory?

A theory consists primarily from concepts and causal relationships that relate these concepts (Whetten 1989). It is possible to broadly characterize a target theory of production/operations management (Koskela 2000). This characterization applies also for project management, being a special type of production/operations management. A theory of project management should be prescriptive: it should reveal how action contributes to the goals set to it. On the most general level, there are three possible actions: design of the systems employed in designing and making; control of those systems in order to realize the production intended; improvement of those systems. Project management, and indeed all production, has three kinds of goal. Firstly, the goal of getting intended products produced in general. Secondly, there are internal goals, such as cost minimization and level of utilization. Thirdly, there are external goals related to the needs of the customer, like quality, dependability and flexibility.

An explicit theory of project management would serve various functions. In prior research, the following roles of a theory have been pinpointed (Koskela 2000):

- A theory provides an explanation of observed behavior, and contributes thus to understanding. A theory provides a prediction of future behavior.
- On the basis of the theory, tools for analyzing, designing and controlling can be built.
- A theory, when shared, provides a common language or framework, through which the co-operation of people in collective undertakings, like project, firm, etc., is facilitated and enabled.
- A theory gives direction in pinpointing the sources of further progress.
- When explicit, testing the validity of the theory in practice leads to learning.
- Innovative practices can be transferred to other settings by first abstracting a theory from that practice and then applying it in target conditions.
- A theory can be seen as a condensed piece of knowledge: it empowers novices to do the things that formerly only experts could do. It is thus instrumental in teaching.

What is the underlying theory of project management?

In prior literature, it is generally seen that there is no explicit theory of project management (Shenhar 1998, Turner 1999). However, it is possible to find statements from the PMBOK Guide or the work of leading scholars on project management that approximate the definition of a theory or from which a theory can be deduced. Based on such core statements, we proceed in two steps. First, we crystallize the prescriptions (for action) and explicit principles of project management regarding a specific aspect or part of the project management process. Secondly, we compare this crystallization to the principles and prescriptions of candidate theories and identify a corresponding theory.

The PMBOK Guide states that projects are composed of two kinds of processes: project management processes and product-oriented processes (which specify and create the project product). Project management processes are further divided into initiating, planning, execution, controlling and closing processes. Let us first concentrate on the theory of the project proper (product-oriented processes), and then on the theory of management, covering the core processes of planning, execution and controlling.

Theory of project

In the following, we take the crystallization of Turner (1993) (also referenced in the PMBOK Guide) as a starting point for a reconstruction of the theory of project. According to Turner, scope management is the *raison d'être* of project management. He defines the purpose of scope management as follows: (1) an adequate or sufficient amount of work is done; (2) unnecessary work is not done; (3) the work that is done delivers the stated business purpose. The scope is defined through the work breakdown structure (WBS).

What does Turner say, from a theoretical point of view? Firstly, he (implicitly) claims that project management is about managing work; this is the conceptualization. Secondly, he claims that work can be managed by decomposing the total work effort into smaller chunks of work, which are called activities and tasks in the PMBOK Guide. Thirdly, he claims that this conceptualization and the principle of decomposition serve three essential purposes of project management. Even if not mentioned by Turner, there is an important, but implicit assumption associated with decomposition, namely that tasks are related if at all by sequential dependence.

Indeed, a review of the PMBOK Guide reveals that activities and tasks are the unit of analysis in the core processes of project management, like scope management, time management, and cost management, and that their management and control is centralized. This is also supported by the description of Morris of the classic - and still current - project management approach as follows (Morris 1994):

> ...first, what needs to be done; second, who is going to do what; third, when actions are to be performed; fourth, how much is required to be spent in total, how much has been spent so far, and how much has still to be spent. ... Central to this sequence is the Work Breakdown Structure (WBS)...

When we compare this crystallization of project management to the theories of operations management in general, it is easy to recognize that it rests on the transformation theory (or view) of production, which has dominated production thinking throughout the 20th century. For example, Starr (1966) formulates:

> Any production process can be viewed as an input-output system. In other words, there is a set of resources which we call inputs. A transformation process operates on this set and releases it in a modified form which we call outputs…..The management of the transformation process is what we mean by production management.

In the transformation view, production is conceptualized as a transformation of inputs to outputs. There are a number of principles, by means of which production is managed (Koskela 2000). These principles suggest, for example, decomposing the total transformation hierarchically into smaller transformations,

tasks, and minimizing the cost of each task independently. The transformation view has its intellectual origins in economics. The popular value chain theory, proposed by Porter (1985), is one approach embodying the transformation view. An explicit production theory based directly on the original view on production in economics has been proposed by a group of scholars led by Wortmann (1992). However, mostly the transformation view has been implicit – so embedded in thinking and practice that it has formed the basis of an invisible, unspoken paradigm that shapes behavior.

Theory of management

The PMBOK Guide divides project management processes into initiating, planning, execution, controlling and closing processes. Let us concentrate on the core processes of planning, execution and controlling (Exhibit 1). A central idea is that these processes form a closed loop: the planning processes provide a plan, that is realized by the executing processes, and variances from the baseline or requests for change lead to corrections in execution or changes in further plans.

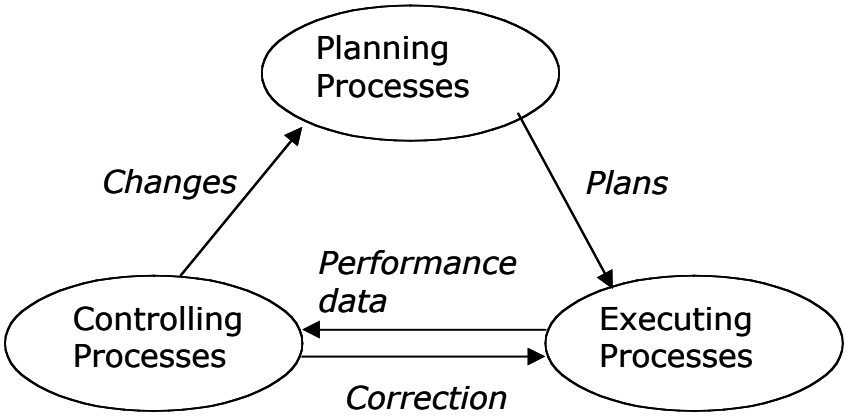

Exhibit 1. The closed loop of managerial processes in project management according to the PMBOK Guide.

Theory of planning

The planning of projects is thoroughly described from the point of view of different knowledge areas in the PMBOK Guide. The planning processes are structured into core processes and facilitating processes. There are ten core processes: scope planning, scope definition, activity definition, resource planning, activity sequencing, activity duration estimating, cost estimating, schedule development, cost budgeting and project plan development. The output from these processes, the project plans, make up an input to the executing processes.

The planning processes dominate the scene in the PMBOK Guide: in addition to the ten planning processes, there is only one executing process and two controlling processes. The emphasis is on planning, with little offered on executing especially.

Comparison to theories in the general field of operations reveals that the perspective is that of management-as-planning (Johnston & Brennan 1996). Here, it is assumed that the organization consists of a management part and an effector part. Management at the operations level is seen to consist of the centralized creation, revision and implementation of plans. This approach to management views a strong causal connection between the actions of management and outcomes of the organization. By assuming that translating a plan into action is the simple process of issuing "orders", it takes plan production to be essentially synonymous with action.

Theory of execution

How is the project plan executed? On this aspect, the PMBOK Guide is puzzlingly brief-worded. The only direct reference to the actual interface between plan and work is with regard to work authorization system, which is presented by four sentences:

> A work authorization system is a formal procedure for sanctioning project work to ensure that work is done at the right time and in the proper sequence. The primary mechanism is typically a written authorization to begin work on a specific activity or work package. The design of the work authorization system should balance the value of the control provided with the cost of that control. For example, on many smaller projects, verbal authorizations will be adequate.

The underlying theory of execution turns out to be similar to the concept of job dispatching in manufacturing where it provides the interface between plan and work. This concept can be traced back to Emerson (1917). The basic issue in dispatching is allocating or assignment of tasks or jobs to machines or work crews, usually by a central authority. According to a modern definition, job dispatching is a procedure that uses logical decision rules to select a job for processing on a machine that has just come available (Bhaskaran & Pinedo 1991).

Obviously, dispatching consists of two elements: decision (for selecting task for a workstation from those predefined tasks that are ready for execution), and communicating the assignment (or authorization) to the workstation. However, in the case of project management, that decision is largely taken care in planning, and thus dispatching is reduced to mere communication: written or oral authorization or notification to start work. Here, the underlying theory seems to be the classical theory of communication (Shannon & Weaver 1949), where a set of symbols (voice or written speech) is transmitted from sender to receiver.

Theory of controlling

The PMBOK guide divides the core process of controlling into two sub-processes: performance reporting and overall change control. Based on the former, corrections are prescribed for the executing processes, and based on the latter, changes are prescribed for the planning processes.

Here we consider only performance reporting, based on performance baseline, and associated corrections to execution. They clearly correspond to the cybernetic model of management control (thermostat model) that consists of the following elements (Hofstede 1978):

- There is a standard of performance
- Performance is measured at the output (or input)
- The possible variance between the standard and the measured value is used for correcting the process so that the standard can be reached.

This thermostat model is identical to the feedback control model as defined in modern control theory (Ogunnaike & Ray 1994).

Discussion

Project management seems to be based on three theories of management: management–as planning, the dispatching model and the thermostat model. The first is evident from the structure and emphasis of the PMBOK Guide. The second is apparent from the discussion of execution in that Guide. The third is very clearly embodied in the closed loop of planning, execution and controlling as depicted in Exhibit 1. Neither theory comes as a surprise. Management-as-planning has been the widely held – even if most often implicit - view on intentional action in organizations up to now (Johnston & Brennan 1996). The dispatching model, closely associated with management-as-planning, has been common in industrial engineering from the beginning of the 20th century. Likewise, the thermostat model has been the dominating view on management in the 20th century (Giglioni & Bedeian 1974). These ideas were all current when project management emerged. Together they form the theoretical foundation of present management practice.

Is the underlying theory of project management adequate?

In which way is our position improved after explicitly defining the theoretical foundation of project management? There are at least two direct benefits. We can investigate whether a theory is the best available and empirically valid.

Firstly, we can study whether the principles or assumptions of the theory have been shown to be invalid or incomplete by other theories, whose validity we rather must accept. Here, we compare different theories and operate mainly in the sphere of theories. Secondly, we can search for anomalies observed by scholars or unanticipated results observed in the use of methods based on the theory. In this case, our source of evidence is the encounter of the theory and the empirical world.

Note that these tests have different strengths and weaknesses. The comparison between theories is dependent on the existence of alternative theories. The test of empirical validity is a strong one if the question is of a genuine scientific experiment. In managerial sciences, observation from cases must often make do. However, together these tests, especially if their results converge, provide an indication of the adequacy of a particular foundation.

Is project management based on the best available theory?

Theory of project

We argue that the theory of projects as transformation is not the best available; rather it has to be augmented; this becomes rather clear when we remind that competing theories of production (projects are just special instances of production) have existed even before the emergence of project management.

Another concept of production was presented already in the framework of early industrial engineering. The flow view of production, firstly proposed by the Gilbreths (1922) in scientific terms, has provided the basis for JIT and lean production. This view was firstly translated into practice by Ford (1926); however, the template provided by Ford was in this regard misunderstood, and the flow view of production was further developed only from 1940'ies onwards in Japan, first as part of war production and then at Toyota. As a result, the flow view is embodied in JIT and lean production. In a breakthrough book, Hopp and Spearman (1996) show that by means of the queueing theory, various insights, which have been used as heuristics in the framework of JIT, can be mathematically proven.

The major difference between the transformation view and the flow view is that the latter includes time as one attribute of production. Because time is affected by the uncertainty in the production process, as well as interdependencies between tasks, the focus is directed towards uncertainty and linkages, which are not acknowledged in the transformation view.

Regarding the goals of project management, the flow view especially addresses the goal "unnecessary work is not done". In the flow view, the basic thrust is to eliminate waste from flow processes. Such principles as lead time reduction and variability reduction are promoted. Thus, the managerial prescription is completely different in comparison to the transformation view; for example, the former suggests reducing uncertainty, whereas the latter accepts the existing uncertainty.

Still a third view on production has existed from the 1930'ies. In the value generation view, the basic thrust is to reach the best possible value from the point of the customer. The value generation view was initiated by Shewhart (1931) and further refined in the framework of the quality movement but also in other circles. Cook (1997) has recently presented a synthesis of a production theory based on this view. Axiomatic design developed by Suh (2001) advances further the principles along which requirements should be assigned to product subsystems, a significant issue of value generation.

The major difference between the transformation view and the value generation view is that the customer is included in the conceptualization of the latter. Whereas the transformation view assumes that customer requirements exist at the outset, and that they can be decomposed along with work, the value generation view admits that at the outset, customer requirements are not necessarily available or well understood, and that the allocation of requirements to different parts of the (project) product is a difficult problem.

The value generation view provides for an explanation on the third goal of project management, delivering the business purpose. Principles related to rigorous requirement analysis and systematized flowdown of requirements, for example, are forwarded. Again, the prescription is very different in comparison to the transformation view, which more or less accepts the requirements as they are.

It has been argued that these three concepts of production are not alternative, competing theories of production, but rather partial and complementary (Koskela 2000). What is needed is a production theory and related tools that fully integrate the transformation, flow, and value concepts. As a first step towards this, we should conceptualize production simultaneously from these three points of view: transformation, flow and value. The utilization of the transformation model only leads not only to a passive neglect of principles of the flow and value generation view but to an active violation of these principles.

Theory of Management

Theory of planning

There is another approach to management, called management-as-organizing, which has been presented as a counterpart to management-as-planning (Johnston 1995, Johnston & Brennan 1996). Here it is assumed that human activity is inherently situated, i.e. a response to the situation in question. Thus, the structured nature of the environment may contribute to purposeful acting. Another important difference to the management-as-planning model is that the agent consists of interacting sub-units, i.e. they are capable of sensing, planning and acting. Instead on central representation, it is assumed here that there are several representations for different sub-units. Communication is non-hierarchical, based on interaction between sub-units. In this approach, management involves design, co-ordination and enabling of otherwise autonomous activities. Especially, management is focused on structuring the physical, political and

cultural setting of action. It is important to note that it is not a question of internally consistent theories, but of theoretical orientations, that have implicitly been used. Also it is noteworthy that the approach of management-as-organizing is not exclusive; rather representations and plans are accepted as one possible basis of purposeful action.

The proponents of the management-as-organizing model have presented several strands of critique against the management-as-planning model (Johnston & Brennan 1996). First, it has been held that it is not generally possible to maintain a complete and up-to-date representation of the current circumstances and the plan to change them. Secondly, the absolute separation of management and execution is not seen to adequately correspond to organizational reality. Thirdly, the plans push tasks to execution without taking the status of the production system into account. The two last aspects mean that this model "leaves the task of management essentially uncoupled from everyday activity" (Johnston & Brennan 1996). Also the model implies that the process and outputs of planning are not questioned.

Theory of execution

There are two types of critique against the dispatching theory of project management. The first strand of criticism addresses the assumption that the inputs to a task and the resources to execute it are ready at the time of authorization. This criticism starts from the theory of planning – management as planning. In that approach, the unproblematic realization of tasks pushed by the plan to the execution is assumed. However, as discussed above, it is very difficult to maintain an up-to-date plan, and thus the tasks pushed by the plan do not correspond to reality, i.e. their prerequisites in terms of predecessor tasks (or other inputs) do not necessarily exist. This leads to the situation that a major share of tasks to be commenced, when pushed by the plan, chronically lack one or more of their inputs. In fact, this phenomenon is so pervasive that Johnston and Brennan (1996) say of the management-as-planning approach: "that this approach works at all is largely attributable to tacit knowledge and improvisation at the operational level."

The second strand of criticism addresses the way action is thought to flow from authorization of a task. It is assumed that the task is fully understood, started and completed according to the plan once authorized. The dispatching model could be compared to starting an engine, which will run at a known rate utilizing planned resources; commitment of those responsible is implicitly presumed. This starting is achieved through communicating the authorization, that is giving orders to the responsible. However, this view has been challenged by the language/action perspective (Winograd and Flores 1986). They argue that the work in organizations is coordinated through making and keeping commitments. The commitment cycle begins with an offer or a request, followed by a promise, performance and declaration of completion. Thus action is coordinated by the commitments people make rather than by central control acting through commands. (In the language action view, orders are understood as strong requests and even here commitment arises from the promise to follow it.)

The language action perspective reveals two basic shortcomings of the dispatching model. Firstly, in dispatching, there should be two-way communication between the controller and the executors. Secondly, it is necessary to consider the commitment of the executor; a job will actually be started and completed only if the executor is committed to realize it.

Theory of control

In addition to the thermostat model, there is another theory of control, one that addresses learning and improvement. Here, the question was originally about an experiment for quality improvement, where the validity of a specific hypothesis is checked. Then, according to the outcome of the experiment, the improvement method is possibly amended (Shewhart & Deming 1939):

> Let us recall the three steps of control: specification, production, and judgement of quality. […] In fact these three steps must go in a circle instead of in a straight line[…]. It may be helpful to think of the three steps in the mass production process as steps in the scientific method. In this sense, specification, production, and inspection correspond respectively to making a hypothesis, carrying out an experiment, and testing the hypothesis. These three steps constitute a dynamic scientific process of acquiring knowledge.

However, this can be generalized: all operations can be treated as hypothesis testing, rather than those specified as experiments in advance. Then every operation must be specified, i.e. the hypothesis made explicit – this is exactly what is done in the Toyota Production System (Spear & Bowen 1999). In this way, the root causes for problems can be found, and performance improved.

This "scientific experiment" theory of control reveals a fatal shortcoming of the thermostat model, which addresses returning to the standard performance using the resources at hand, but with different intensity. The thermostat model does not address finding reasons for deviations, and eliminating those root causes.

Empirical evidence – anomalies

Due to space limitations, we consider here only empirical evidence from one application domain, construction. We search for such anomalies observed by scholars or unanticipated results observed in the use of methods based on the theory which indicate that the implicit theory of project management is not empirically valid.

Theory of project

Let us first consider evidence related to the lack of flow conceptualization. Wiest and Levy (1969) hold it questionable whether the precedence relationships of project activities can be completely represented by a noncyclical network graph in which each activity connects directly into its immediate successors. Supporting empirical observations abound. Cooper (1993) claims that rework typically represents the bulk of development project expenditures and time: in design of large construction projects, there are typically from one-half to two and one-half rework cycles. Friedrich et al. (1987) strongly criticize the customary notion that large projects can be measured using yardsticks viewed as simple summations of individual yardsticks taken discipline by discipline, system by system, or component by component. Thus, the overall effects of revisions, repairs, and rework on large projects can be very significant, even when the individual impacts on specific functions and disciplines appear small and within "normal" acceptable practices.

Regarding the lack of value generation conceptualization, evidence is abundant alike. Research shows that as late as the start of construction, significant uncertainty remains as to what is to be constructed – thus, customer requirements cannot be taken as given and unproblematic (Howell et al. 1993). Indeed, Sahlin-Andersson (1992) challenges the view that big collaborative projects could be realized on the basis that basic intentions and restrictions are first clarified and then means are derived out of them. Rather, commitments, dependencies and expectations developing in the process of interaction drive the project to realization. Ambiguity regarding objectives may be beneficial, because participants can relate the project a meaning according to their interest and contexts

Theory of management

Theory of planning

Fondahl (1980) points out that it is practically not possible – or at least it is very difficult - to maintain an up-to-date plan. He describes the resulting situation illuminatingly:

> One of the major failures in the application of networking techniques has been the failure to utilize the dynamic potential of these procedures. All too often, however, only the original plan and scheduling data are ever produced. They continue to cover the office wall long after they are obsolete and bear little resemblance to the current progress of the job.

Thus, the empirical evidence supports the theoretical argument of the impossibility of maintaining a complete, up-to-date plan.

Theory of execution

It is illuminating to contrast an engineering prescription for dispatching and an anthropological account of the situation when this prescription has been implemented. Fondahl (1980) recommends the following procedure for execution based on the implementation of a critical path network – it is easy note that this is the very idea of dispatching:

> Issue weekly memos to lower-echelon managers and subcontractors who have activities in progress during the week. These should provide updated start dates, details on methods and resource utilization, and current activity duration estimates.

Applebaum (1982) describes the resulting duality of management on the construction site:

> ...we have virtually two separate organizations; one for the management function and one for getting the work done. The two organizations do not coordinate their work, and they are characterized by different goals and viewpoints.

Ballard and Howell (1998) found that in conventionally managed construction, a realization rate of 50 – 60 % is typically found for weekly tasks. Largely this low rate could be explained by missing inputs or resources during the execution of the task.

These observations are fully in line with the theoretical argument that in the management-as-planning approach execution must rely on informal management in order to succeed in general. Tasks pushed to execution lack chronically inputs. That execution is managed informally seems to be a direct consequence from the underlying theory of management.

Theory of control

The kind of control advocated by the project management methodology plays in practice a minor and different role compared to the prescription (Loid 1999). In studied projects, meetings have formed the basis for the major part of the decisions. Financial performance data have been in supplementary functions, such as confirming the picture of how the work is proceeding through other channels and providing statistics on performed work that can be used in future projects. This reflects the lack of the learning function in the thermostat model: it is easier, speedier and more illuminating to directly consider deviations in task execution and to learn about their causes than through the performance metrics.

Discussion

First we reconstructed the underlying theoretical foundation of project management by comparing core elements of project management prescriptions to existing theories in operations management. We found that project management is based on a theory of project and on a theory of management, consisting of three subtheories. Then we evaluated this underlying theoretical foundation of project management through two sources of evidence: (1) competing theories; (2) empirical validity. The evidences from these two sources are strikingly consonant, indicating that the underlying theoretical foundation of project management is deficient: better or complementary theories can be found. No single part of the theoretical foundation can be judged adequate. The deficient foundation leads directly to several kinds of problems in practical project management. Those problems are thus self-inflicted, caused by the very theories and methods we are relying on.

The deficiencies of the theory of the project and of the theory of management reinforce each other and their detrimental effects propagate through the life cycle of a project. Typically, customer requirements are poorly investigated at the outset, and the process of requirement clarification and change leads disruption in the progress of the project. The actual progress starts to drift from the plan, the updating of which is too cumbersome to be done regularly. Without an up-to-date plan, the work authorization system transforms to an approach of informal management. Increasingly, tasks are commenced without all inputs and prerequisites at hand, leading to low efficiency or task interruption and increased variability downstream. Correspondingly, controlling by means of a performance baseline that is not based on the actual status becomes ineffective or simply counterproductive. All in all, systematic project management is transformed to a facade, behind which the job actually gets done, even if with reduced efficiency and lessened value to the customer.

How can this situation of (to varying extent) counterproductive methodology, based on an implicit and deficient theoretical foundation, have lasted so long? The longevity of project management in its original form must be due to the lack of an explicit theory. Of course, practitioners have observed shortcomings of the methodology, but without the underlying theory, it is almost impossible to have access to the deficient assumptions or to argue with advocates of the methodology. On the other hand, alternative methods developed from practical observations and needs, have not had a theoretical explanation, which has slowed down their diffusion.

It is no exaggeration to claim that project management as a discipline is in crisis, and that a paradigm change, long overdue, has to be realized. The thrust of this paper is not in presenting a new theory of project management. However, the novel theories, found to be more powerful than the implicit underlying theories or complementary to them, provide pointers to a new theoretical foundation, and they can be used for the renewal of the project management methodology (Exhibit 2). Progress may be achieved through two routes. Firstly, based on new theories on operations management, new project management methods may be developed and tried out. Secondly, advanced practice (which deviates from the present doctrine) may be consolidated and explained theoretically, which leads to new understanding and possibly to further refinement of that practice.

Subject of theory		*Relevant theories*
Project		Transformation Flow Value generation
Management		
	Planning	Management-as-planning Management-as-organizing
	Execution	Classical communication theory Language/action perspective
	Controlling	Thermostat model Scientific experimentation model

Exhibit 2. Ingredients for a new theoretical foundation of project management

Conclusions

We have put forward empirical evidence and theoretical explanation, which suggest that the present doctrine of project management suffers from serious deficiencies in its theoretical base. Firstly, it rests on a faulty understanding of the nature of work in projects, and deficient definitions of planning, execution and control. Secondly, the theoretical base has been implicit. It can be argued that these shortcomings have led to three classes of problem.

Firstly, project management has not achieved the goals set to it: it does not perform in a satisfactorily way. In small, simple and slow projects, the theory-associated problems could be solved informally and without wider penalties. However, in the present big, complex and speedy projects, traditional project management is simply counterproductive; it creates self-inflicted problems that seriously undermine performance.

Secondly, the lack of theory has rendered education and training more difficult and has hampered effective professionalization of project management. Lacking theory, project management cannot claim, and will not be granted a permanent and respected place in higher education institutions. Also, the lack of an explanation of project management, to be provided by a theory, has slowed down the diffusion of project management methods in practice.

Thirdly, the renewal of project management has been hampered by the lack of theory. Anomalies, deviations from theory-predicted outcomes, have been observed long since in project management, but their cause has been misinterpreted and the project management community has not acted on them. The important functions of a theory, regarding continual validity testing and giving direction for further progress, have neither from the viewpoint of research or practice been realized.

The present evidence is strong enough for the claim that a paradigmatic transformation of the discipline of project management is needed. The transformation required implies that a more intimate relation between theory and practice must be created in project management. Theory and practice have to be developed concurrently, similarly to other science-based fields, where theory is explicated, tested and refined in a continuous dialog between the scientific and practitioner communities.

All said can be summarized shortly: the future of project management is dependent on its theory.

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