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Original Citation

Koskela, Lauri and Howell, Greg (2001) Reforming Project Management: The Role of Planning, Execution and Controlling. In: 9th International Group for Lean Construction Conference, August 2001, National University of Singapore.. (Unpublished)

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REFORMING PROJECT MANAGEMENT: THE ROLE OF PLANNING, EXECUTION AND CONTROLLING

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ABSTRACT

In this paper, we focus on the need for reforming the role of plans, execution (or action) and control in project management. We argue that the present style of project management, as described in the Guide to the Project Management Body of Knowledge (PMBOK Guide) of PMI, is based on two underlying theories in this regard: management-as-planning (for planning and execution) and the thermostat model (for control). Unfortunately, both theories can be shown to be heroically simplistic and insufficient from the point of view of project management reality. In consequence, the practice of project management suffers from three shortcomings. The vague interface between planning and execution is the cause for two of them. First, the role of planning is not realistically defined, and short term planning (that is critical from the point of view of execution) is customarily poorly carried out or simply neglected. Secondly, there is no systematic way of managing execution, i.e. taking into account the actual conditions of the real world as higher level plans are translated into short term plans and then into action. Thirdly, control is too narrowly seen as measuring and taking corrective action, rather than as a process of learning. These arguments are justified by empirical data and theoretical discussion.

KEY WORDS

Project management, plan, execution, control.

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INTRODUCTION

We contend that project management, as it is presently practiced and taught, suffers from two major theoretical problems. One problem is related to the understanding of *project*, the other to the understanding of *management*. We critically discussed the first problem in a recent paper (Howell & Koskela 2000). This paper treats the latter problem: how should management in projects be understood?

The paper is structured as follows. First, the nature of management in the present doctrine of project management is analyzed based on the Guide to the Project Management Body of Knowledge³ (PMBOK Guide) of PMI (Duncan 1996). Next, project-related management anomalies (deviations from expected results) are reviewed. Then, the focus is turned to a theoretical analysis aimed at explaining these anomalies. We will show that these anomalies can be explained by uncovering the underlying theoretical foundations of present project management and by comparing it with alternatives. We conclude that a broader theory of management is required along with methods and guidelines for implementation.

MANAGEMENT IN THE PRESENT DOCTRINE OF PROJECT MANAGEMENT

The PMBOK Guide states that projects are composed of two kinds of process: 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 concentrate on the core processes of planning, execution and controlling (Figure 1).

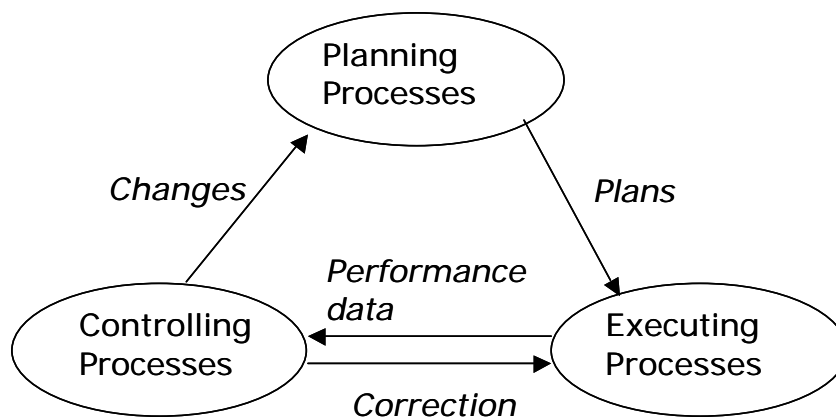


Figure 1. Managerial processes in project management according to the PMBOK Guide.

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

³ The term Project Management Body of Knowledge (PMBOK) describes the sum of the knowledge within the profession of project management (Duncan 1996). The report PMBOK Guide identifies and describes that subset of PMBOK that is generally accepted. Of course, 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.

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. A distinction is made between the project plans proper and the project performance baselines.

EXECUTION

How is the project plan executed? On this aspect, the PMBOK Guide is puzzlingly brief-worded. The core process of executing is not divided into sub-processes. The only direct reference to the actual interface between plan and work is with regard to the work authorization system, which is discussed by the following 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.

CONTROL

The core process of controlling is divided 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.

INTEGRATION MANAGEMENT

It is easy to see that the primary processes form a closed loop: planning processes provide a plan, that is executed by the executing processes, and variances from the baseline or requests for change lead to corrections in execution or changes in further plans. It is stressed that the project management processes interact and overlap in ways not detailed in the PMBOK Guide. Especially, project integration management refers to the integrative application of the three processes of project plan development, project plan execution and overall change control.

ANOMALIES

Unfortunately, empirical accounts of project reality transmit a rather different image. Anomalies, deviations from doctrine-predicted outcomes, abound.

PLANNING

Laufer and Tucker (1987) find several troubling phenomena from planning in construction projects. First, the motivation for planning may come from outside sources: legal consideration and owner's requirement. Secondly, the primary internal motivation for planning is often control, rather than execution. Thirdly, the significance of control is corrupted by the separation of execution from planning, and in practice planning becomes a way of explaining, after the fact, what has happened. Thus there is almost total degeneration of the role of planning (Laufer & Tucker 1987): the role of planning is transformed from initiating and directing action before it takes place (as suggested by theory) to influencing

and regulating operations while in progress (as intended in practice) and to follow-up and status reporting (as realized in practice).

Research on other project contexts provides for similar evidence. The social science oriented research into projects has often found that the primary function of project planning (and control) is to provide legitimization for the project (Christensen & Kreiner 1997, Blomberg 1998).

EXECUTION

Regarding the findings on planning, it comes not as a big surprise that a historically invariant observation on execution is that formal plans, if they exist, are often ignored. One of the first studies of the problems of the construction industry is contained in the Report on Elimination of Waste in Industry (Anon. 1921). Planning and material control were characterized as follows:

The average building contractor has no calendar of operations except the dates of starting and finishing a job. He largely regulates deliveries on materials by visits to job, or through statements received from the job superintendent.

The Tavistock Institute (1966) found that the building industry depends to a large extent on the application of an informal system of behaviors and management to work adequately. The formal system (contracts⁴, plans, approvals⁵ etc.) does not recognize the uncertainty of and interdependence between the operations of the building process. The informal system of management is geared towards handling uncertainty and interdependence, but it produces a climate of endemic crisis, which becomes self-perpetuating.

This results in a duality of formal management and informal management. These have been aptly described by Applebaum (1982):

...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.

Brousseau and Rallet (1995) take it as given that there are two counterproductive organizational principles in construction: decentralization of decision-making and informal coordination.

CONTROL

The project management process appears at first reading to be a system steered by feedback when in reality control as described in the PMBOK Guide causes problems. Firstly, control stimulates explanation rather than correction. Supervisors in most cases challenge the validity of the standard as a basis for control. They are distracted from today's and tomorrow's tasks in order to produce a historical record of yesterday's problems and a justification for what happened (Laufer & Tucker 1987). Because these efforts identify which party erred, redesign of the planning system itself is overlooked.

Secondly, control leads to manipulation of action (Kim & Ballard 2000). In order to make cost variance positive, managers try to decrease the actual cost of work performed as much as possible. Managers may manipulate sequences to make the performance seem good. They may reduce the capacity; however, this leads to overload which makes the work flow less reliable. Work is selected to assure the cost or schedule report looks good

⁴ According to Tavistock (1966), building programmes (schedules) are agreed on by a collusion in acceptance of unreality by all parties.

⁵ "It is a fallacy to assume that a manager can approve plans comprising hundreds of interrelated decisions if the plans were prepared by a staff specialist without the manager's active, significant involvement." (Laufer & Howell 1993).

even if this means doing work first that earns highest value but is of no use downstream. Pipefitters refer to this as “Show Pipe,” that is the pipe that is installed quickly either because it lacks proper supports, is out of sequence, or simply has a high ratio of hours earned to expended.

Thirdly, this kind of control destroys the possibilities for collaboration. Increased monitoring at the activity level lead to greater pressure to assure its performance against budgets. This makes it more difficult to move resources between activities to improve project performance. Schedules show simple sequential relationships between activities and contracts give owners and general contractors the right to change the sequence and timing of each activity. Activity managers are held accountable for local results even though they lack the authority to assure them. As a result, each manager works to maximize his interests with little regard for others.

Fourthly, control may give a wrong interpretation of performance. 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 effects of specific functions and disciplines appear small and within “normal” acceptable practices.

Fifthly, it has been contended that control does not always succeed in revising the plan after variances have been detected. Bowen (1992) argues that in new product development projects, dogmatic adherence to a predetermined schedule easily leads to premature decisions.

DISCUSSION

In comparison to the normative advice of the PMBOK Guide, empirical evidence provides for a very different view on project management. The normative advice suggests that the three functions of management form a closed loop. By contrast, empirical evidence indicates that there are disconnects at the critical interfaces between these functions:

- Planning is not done for execution but for other purposes; the planning system itself is not in control.
- Execution does not try to realize plans, as lower level plans are not tested against reality.
- Control leads to negative impacts on execution, rather than correction.

What may be the reason for these anomalies? First, we cannot exclude the possibility that poor implementation of project management principles is the reason in some cases. Secondly, the reason may be related to a poor theory of project (production) (Howell & Koskela 2000). The normative advice suggests that a project is a series of sequentially related activities, when in reality activities are often interdependent. Plans prepared under this system and adjusted by control cannot cope with the combined effect of multiple interacting changes. Starting from this false premise results finally in projects that are “out of control” merely due to the cumulate effects of changes and impacts.

However, we argue that there is another important reason: the paucity of the underlying management theory in project management. The negative impacts of these two fundamental reasons interact and reinforce each other.

THEORETICAL ANALYSIS

UNDERLYING THEORIES OF MANAGEMENT OF PRESENT PROJECT MANAGEMENT

In prior literature, it is generally seen that there is no explicit theory of project management (Shenhar & Dvir 1996). However, we hold that it is possible to point out the underlying theory of project management, which can be divided into a theory of project and a theory of management. We have earlier discussed the underlying theory of project (Howell & Koskela 2000). Here we focus on the underlying theory of management.

Planning

Comparison to theories in the general field of operations reveals that the question is about management-as-planning (Johnston 1995, Johnston & Brennan 1996). Here, management at the operations level is seen to consist of the 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 a simple process, it takes plan production to be essentially synonymous with action.

Execution

There is in the PMBOK Guide indeed a massive bias towards the managerial aspects of projects, at the expense of the ordinary project work that creates the product. There is no articulated theory of execution proper. The passage on work authorization implies that each activity will just be given notice to proceed. However, translating from plans to action is only possible if resources are actually available and interdependence between activities low.

Control

This is 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.

Note that this thermostat model is not directly compatible with the management-as-planning model. According to the PMBOK Guide, a plan is not as such a standard of performance; rather, in the framework of planning, the performance baseline is separately devised.

Discussion

Thus, it seems that project management is based on two theories: management-as planning and the thermostat model. The former is evident⁶ from the structure and emphasis of the PMBOK Guide. The latter is very clearly embodied in the closed loop of planning,

⁶ This emphasis is also very evident in the book of Devaux (1999) where only one chapter of eleven is discussing tracking and controlling the project; all other ten chapters discuss planning or general issues of project management. Says Devaux: "Theory divides the process of managing a project into two parts: Planning and tracking. Project management, it is said, is about planning the work and then working the plan." Devaux adds that also the tracking process is essentially about planning, namely replanning.

execution and controlling as depicted in Figure 1. Neither theory comes as a surprise. Management-as-planning has been the widely held – even if most often implicit - view on intentional action up to now (Johnston & Brennan 1996). Likewise, the thermostat model has been the dominating view on management in the 20th century (Gigliani & Bedeian 1974).

CRITICAL CONSIDERATION OF THE UNDERLYING THEORIES

Since the 1980's, these underlying theories of project management have been subjected to criticism. The central question is, whether the anomalies presented above can be explained by means of these critical observations.

Planning

There are several strands in the 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, i.e. plan. Secondly, this model assumes that the organization consists of a management part and an effector part. This means that there is centralized mode of management. 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 questioned⁷.

These views are compatible with the anomalies mentioned above, especially the difficulty of maintaining the plan, and the other roles of planning than preparation of execution.

Execution

One could say that behind the conventional project management, there is no theory on execution in general, except that the question is about the unproblematic realization of tasks pushed by the plan to the execution. Possible small variances are detected by control, and corrected in further execution; bigger problems are handled by changing the plan.

Nothing could be further away from reality! In many project contexts (construction, product design and development) there are several inputs to most of the tasks. If the availability of these inputs is uncertain, the probability that there is one input lacking is a product of the individual uncertainties (Koskela 2000). This leads to the situation that a major share of tasks to be commenced, according to the plan, chronically lack one or more of their inputs. Thus one of the functions of execution would be to assure the integrity of tasks in terms of inputs.

In fact, 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.” Thus, the observed phenomenon that execution is managed informally seems to be a direct consequence from the underlying theory of management.

⁷ This is visible in the PMBOK Guide's definition of control: performance reporting appears to assume that the outputs of prior planning stages are without error, and change is mostly due to outside forces. Thus the performance of the planning system itself is not and cannot be measured.

Control

Let us first note that the theory of control, as defined, is not directly compatible with the theory of planning (and execution). Control is focused on time and costs at aggregate terms, rather than on tasks. Thus, in fact, the closed loop of Figure 1 consists of two separate layers, which may, or may not, be consonant. However, taking the factual separation of planning and execution, and the difficulties of maintaining an up-to-date plan into account, the possibility of a discrepancy between the performance baseline and the factual plan is very real, as exemplified by the critique on simple summation of individual yardsticks.

There is a second result from this separation. Control does not focus on tasks planned but on aggregate performance in terms of cost and time. Performance data collected by control may be manipulated by manipulating the way tasks are carried out. The anomaly described above follows.

But there is also a third, important implication. The thermostat model can be literally understood as a valve that regulates, according to the measured temperature and the set standard, the inflow of hot water into the thermostat. This is a very simple mechanism. In a project context, it is unrealistic to look for such a valve, by means of which the performance could be corrected. Rather, we need to *learn* the reasons of poor performance, and to act on these reasons. The thermostat model lacks this aspect of learning and improvement (Laufer & Koskela 1991); rather the attention is directed towards justification of variances.

NEED FOR A WIDER THEORETICAL FRAMEWORK

It is evident that a wider theoretical framework is needed for understanding and realizing management in projects. It is not a goal of this paper to outline such a wider theoretical framework. However, it is appropriate to state here that one does not need to start from scratch, even if our present state of understanding is far from complete. Elsewhere (Koskela 2001) it has been argued that the managerial model of the Toyota Production System, as interpreted by Shingo (1988), contains four sub-models, which together remove the deficiencies detected in the management-as-planning approach, at least in a production control situation found in manufacturing. The model of Shingo consists of

- Management-as-organizing
- Management-as-planning
- Management-as-adhering
- Management-as-learning.

The adaptation and application of this theoretical framework to project management provides for one possible starting point.

CONCLUSION

We have put forward empirical evidence and theoretical explanation, which suggest that the present doctrine of project management suffers from serious deficiency in its theoretical base. It rests on a faulty understanding of the nature of work in projects, and deficient definitions of planning, execution and control. 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.

While the contours of these theoretical problems will be more sharply defined in the future, the present evidence is strong enough for the claim that a paradigmatic

transformation of the discipline of project management is needed. Unfortunately, the present endeavors of the project management community are based on very different assumptions: it is seen that the classical theory of project management is mature and provides no major research opportunities (Morris 2000).

However, the transformation required implies that a more intimate relation between theory and practice is required in project management. 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 further refinement of that practice. The works of Laufer (1997), focusing on consolidation, and of Seymour and Rooke (2000), focusing on explanation⁸, provide examples of the latter route.

REFERENCES

- Anon. (1921) Report on Elimination of Waste in Industry. *Mechanical Engineering*, September, pp. 579 - 583.
- Applebaum, H.A. (1982) Construction Management: Traditional versus Bureaucratic Methods. *Anthropological Quarterly*, vol. 55, no. 4: 224-234.
- Blomberg, Jens (1998) *Myter om projekt* [Myths on projects]. Nerenius & Santérus Förlag, Stockholm. 130 p.
- Bowen, H. (1992) Implementation Projects: Decisions and Expenditures. In: Heim, J. & Compton, W. (ed.): *Manufacturing Systems: Foundations of World-Class Practice*, National Academy Press, Washington. Pp. 93-99.
- Brousseau, Éric & Rallet, Alain (1995) Efficacité et inefficacité de l'organisation du bâtiment. *Revue d'Économie Industrielle*, n:º 74, 4e trimestre, pp. 9 - 30.
- Christensen, Sören & Kreiner, Kristian (1997) *Projektledning: att leda och lära i en ofullständig värld*. [Project management: to manage and teach in an imperfect world] Academia Adacta, Lund. 126 p.
- Devaux, Stephen A. (1999) *Total Project Control*. John Wiley & Sons, New York. 318 p.
- Duncan, W. (Director, Standards Committee) (1996). *A guide to the Project Management Body of Knowledge*. PMI Publications, Sylva, NC.
- Friedrich, D.R., Daly, J.P. & Dick, W.G. (1987) Revisions, Repairs, and Rework on Large Projects. *Journal of Construction Engineering and Management*, Vol. 113, No.3, pp. 488 - 500.
- Gigliani, G.B. & Bedeian, A.G. (1974) A Conspectus of Management Control Theory: 1900-1972. *Academy of Management Journal*, Vol. 17, pp. 292-305.
- Hofstede, Geert (1978) The Poverty of Management Control Philosophy. *Academy of management Review*, July, 450-461.
- Howell, Greg and Koskela, Lauri. (2000) *Reforming project management: the role of lean construction*. Paper presented at the Eighth Annual Conference of the International Group for Lean Construction (IGLC-8), 17-19 July 2000, Brighton.
- Johnston, R.B. & Brennan, M. (1996) Planning or Organizing: the Implications of Theories of Activity for Management of Operations. *Omega, Int. J. Mgmt. Sc.*, Vol. 24, No. 4, pp. 367-384.
- Johnston, RB (1995) Making manufacturing practices tacit: a case study of computer aided production management and lean production. *J. Opl. Res. Soc.* 46, 1174-1183.

⁸ To be accurate, Seymour and Rooke endeavor to discover the theory *in* practice, rather than the theory *about* practice.

- Kim, Yong-Woo & Ballard, Glenn (2000) *Is the Earned-Value Method an Enemy of Work Flow*. Paper presented at the Eighth Annual Conference of the International Group for Lean Construction (IGLC-8), 17-19 July 2000, Brighton.
- Koskela, Lauri (2000). An exploration towards a production theory and its application to construction. Espoo, VTT Building Technology. 296 p. *VTT Publications*; 408. WWW: <http://www.inf.vtt.fi/pdf/publications/2000/P408.pdf>
- Koskela, Lauri (2001) *On new footnotes to Shingo*. Paper to be presented at the Ninth Annual Conference of the International Group for Lean Construction (IGLC-9), 6-8 August 2001, Singapore.
- Laufer, Alexander (1997) *Simultaneous Management: Managing Projects in a Dynamic Environment*. Amacom, New York. 313 p.
- Laufer, A. & Tucker, R.L. (1987). Is construction project planning really doing its job? A critical examination of focus, role and process. *Constr. Mgm. and Econ.*, 5, 243 - 266.
- Laufer, Alexander & Howell, Gregory A. (1993) Construction planning: Revising the Paradigm. *Project Management Journal*, Volume 24, No. 3, pp. 23-33.
- Laufer, Alexander & Koskela, Lauri (1991) *Control of Construction Projects - Philosophy, Roles and Measures*. Unpublished manuscript.
- Morris, Peter W.G. (2000) Researching the Unanswered Questions of Project Management. *Project Management Research at the Turn of the Millennium*. Proceedings of PMI Research Conference 2000, 21-24 June 2000, Paris, France. Pp. 87-101.
- Seymour, David & Rooke, John. (2000) *Commitment Planning and Reasons Analysis*. Paper presented at the Eighth Annual Conference of the International Group for Lean Construction (IGLC-8), 17-19 July 2000, Brighton.
- Shenhar, A.J. & Dvir, D. (1996) Toward a typological theory of project management. *Research Policy* Vol. 25, No. 4, p. 607 -.
- Shingo, Sh. (1988). *Non-stock production*. Productivity Press, Cambridge, Ma. 454 p.
- Tavistock Institute. (1966) *Interdependence and Uncertainty*. Tavistock Publications, London. 83 p.