Can Continuous Process Improvement (CPI) be Applied to Projects that are Temporary and Unique?

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Abstract

Projects are defined as temporary and unique by the Project Management Institute Body of Knowledge (PMI BoK). Continuous Process Improvement (CPI) assumes incremental improvements over time. If a project is temporary and unique, how can we incrementally apply CPI over time? How do we develop lessons learned from a temporary project and how and when do we apply them?

Projects are further defined by the PMI BoK to include process groups and individual processes. The concepts of Total Quality Management (TQM) and CPI are related to management processes as evidenced by the fact that TQM in some companies is called Process Management. A conceptual framework is proposed that applies CPI to individual Project Management (PM) processes. This model shows that repeatable project management processes can be continuously improved.

The author applied these concepts to the projects in a large consumer based Information Technology (IT) group. The result was a significant increase in projects meeting their completion time, budget and performance objectives.

I. Projects Defined

PMI BoK defines projects as temporary, unique and progressively elaborated (see Table 1).

These definitions result in a sequential set of activities that have a beginning and an end. As such, when a project is completed, it is finished and is not repeated or duplicated.

Classic example of a temporary, unique and progressively elaborated project is building a home or constructing a factory or production unit. These projects have a beginning, an end with specific steps. Also most of these are longer term projects which work against any type of improvement.

PMI BoK emphasizes that different time frames, owners, etc. make projects unique and that "the presence of repetitive elements does not change the fundamental uniqueness of a project's work" (PMI BoK [section 1.2.1]). Examples given to prove this point include repetitive tasks within a project, such as multiple prototypes, multiple geographic areas, etc. These do not make the whole project repetitive, only some subtasks.

II. Project Management Process Groups

PMI BoK goes on to define process management processes that can be organized in five basic groups. Figure 1 is the process flow diagram included in PMI BoK [fig. no. 3.1] and contains the five groups. Note that the flow diagram is SEQUENTIAL and has a beginning and an end which is consistent with the definitions above.

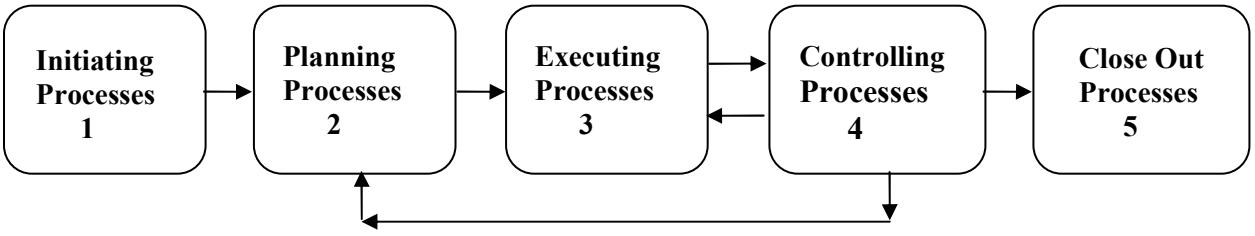

Figure 1. Project Management Process Groups

III. Project Management Individual Processes

PMI BoK states that "projects are composed of processes." and "A process is a series of actions bringing about a result." (PMI BoK [section 3.1]).

There are 17 major individual processes that make up the five process groups described in Figure 1. These 17 processes are enumerated in Table 2. Each of these processes has sub processes.

IV. Total Quality Management (TQM)

Total Quality Management (TQM) or whatever a similar management system is called (see Table 3) is both a philosophy and a set of guiding principles with the goal of continuously improving an organization. TQM applies quantitative tools and techniques (like 6 sigma) to improve an organization's processes. TQM is a disciplined approach that includes listening to the voice of the customer, establishing a CPI model and documenting the results.

V. The Management Cycle

Management has been characterized as a cycle that includes functions such as:

- Planning
- Organizing, Directing and Controlling
- Analysis and Feedback

The management cycle is shown as a cycle to indicate the continuous nature of management (see Figure 2). That is, plans are made, then executed and then analyzed to determine whether the plan meets its goals/objectives. The results of the analysis are fed back to change the plans for the next cycle. Fiqure 2 also shows where the 5 PM basic process groups fit in the management cycle.

Critical to this construct is that the analysis and feedback processes are robust so that management can learn from its successes and failures.

A hallmark of a learning organization is the robustness of its audits, critiques and analyses that help the organization learn and improve.

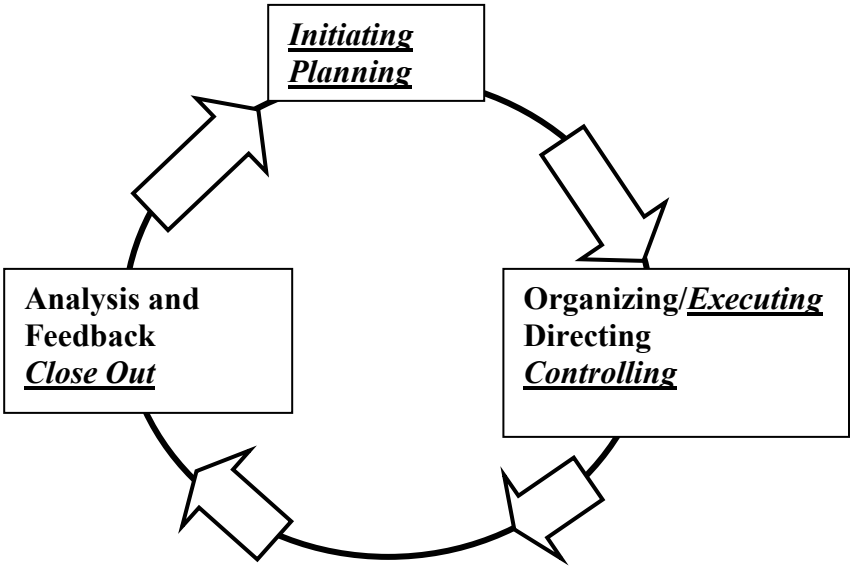

Figure 2: The Management Cycle – *5 Project Management Groups*

VI. Continuous Project Management Processes

If projects are temporary, unique and sequential how then can we apply the concept of Continuous Process Improvement?

The answer is to consider the individual project processes as repeatable from project to project (see Figure 2 and 3). All projects have to determine their scope, charter, work breakdown structure, work packages, time schedule, budget, performance metrics, closing audits, etc. Each of these processes is repeated for every project. While the project may be temporary and unique the individual processes are repeatable and could be considered a continuous set of similar activities.

VII. Project Management Processes as Continuous Activities

Thus we propose to view the individual project management processes as repeatable in order to apply the CPI model to improve them.

The first challenge is to make sure we have robust evaluations during the project life as well as robust audits at the end. These will generate a body of knowledge sufficient to determine "defects" or practices that prevent the project from meeting its prime objectives (time schedule, cost and performance).

Figure 3 illustrates two opportunities for CPI. The first is to use the lessons learned from previous projects to improve later projects. That is, use P1 for P2; P2 for P3, etc. The second opportunity is to review and develop lessons learned from all the individual processes (Initiating, Planning, etc. – see Table 2). These suggestions could then be applied to improving these specific processes in later projects. That is, analyze and determine lessons learned for 1.1, 2.1 …N.1 and apply to future Initiating processes.

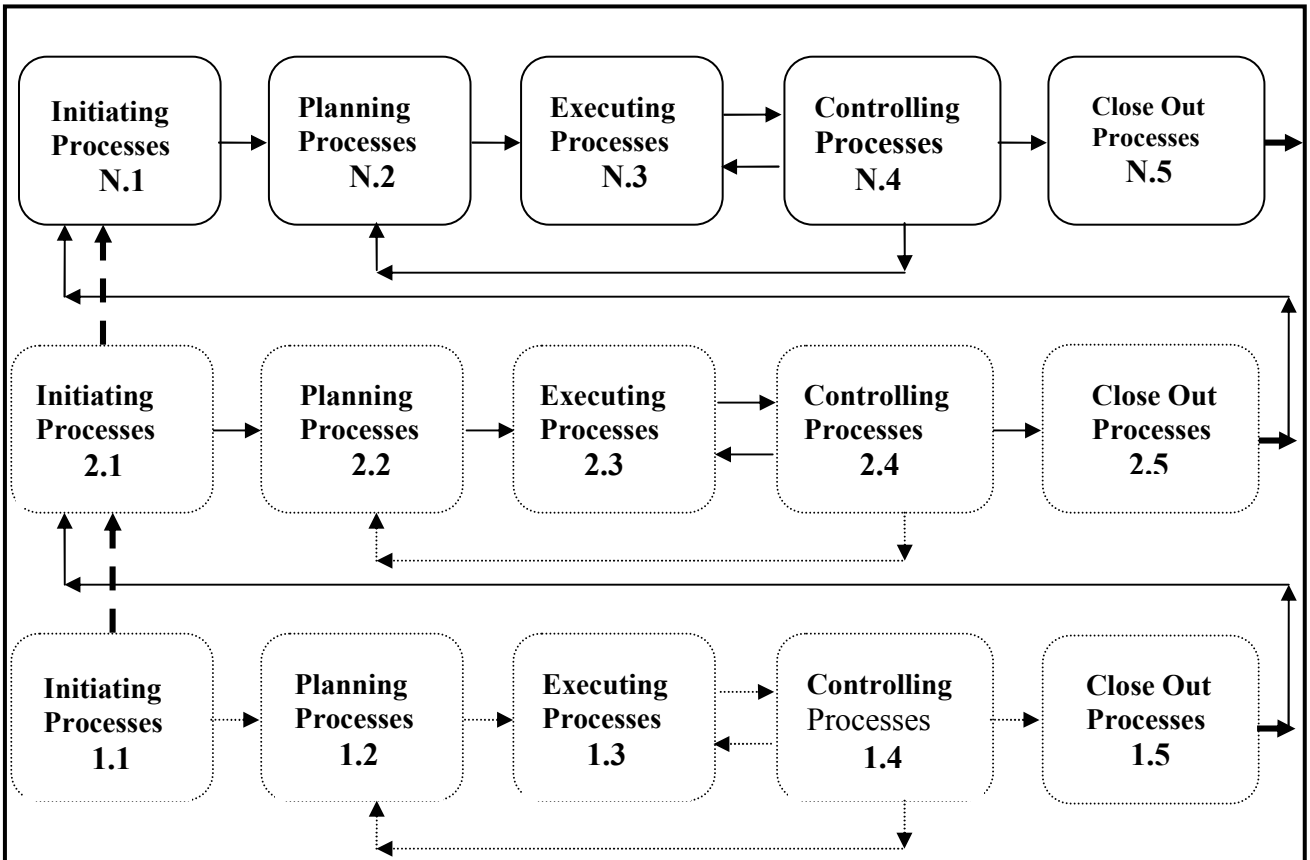

Figure 3. Project Management Process Groups – Continuous Model

VIII. CPI During a Project's Life

Figure 3 does not preclude trying to improve projects as they progress. The practical problem with this approach is that it is very difficult to know what the "defects" are until after they occurred and it is too late to remediate that specific problem. Exacerbating this problem is that most of the metrics are static and "end of project".

There are some instances in larger projects with repetitive tasks that may allow some CPI during a project's life. Recognizing this problem, many organizations purposely subdivide larger projects into smaller ones so they can evaluate their successes and/or failures in a sequential manner. Some examples include the scaling projects in chemical process industries, test marketing, etc.

Another approach is to develop predictive metrics that can be used to forecast a project's success or failure. The author developed a report card approach to accomplish this (Merino, Jun 1996; Merino, Koen, Oct 1996).

IX. Implications for Project Management

Many companies which use project management do not have a TQM/CPI activity related to projects. And many companies who have both TQM/CPI programs do not apply these to project management activities. A major reason for this lack of CPI for projects is the mind set that projects are one-time and TQM is continuous. Hopefully, applying this paper's concepts will overcome this problem.

There is a second problem in applying CPI to projects. It is the lack of a robust audit and/or feedback analysis. In some companies this is caused by the relatively small size and dynamic nature of the projects. In both cases the lack of robust analysis and accountability results in a lack of data that can be used to provide improvement recommendations. To achieve CPI one needs to develop metrics and measure the results in order to analyze, improve and control the process.

The concepts in this paper were applied to projects in an Information Technology function of a large consumer based company. This company had a TQM/CPI program and used project management extensively in the IT area. However, because of the reasons above, they did not apply CPI to PM. When they did apply the concepts in this paper, substantial improvements in meeting key project objectives such as completion time, budget and performance were achieved.

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Dr. Donald Merino is the Alexander Crombie Humphreys Professor of Engineering Economics at Stevens Institute of Technology. He teaches Engineering Economics, Project Management, Total Quality Management, Decision Sciences, Strategic Business Planning and Concurrent Engineering.
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Table 1: Project Defined as per the PMI BoK
Temporary, Unique and Progressive Elaboration (Pg. 5 2000 Ed.)

"***Temporary*** means that every project has a definite beginning and a definite end. The end is reached when the project's objectives have been achieved, or when it becomes clear that the project objectives will not or cannot be met, or the need for the project no longer exists and the project is terminated."

"Projects involve doing something that has not been done before and which is, therefore, ***unique.***

Progressive elaboration is a characteristic of projects that integrates the concepts of temporary and unique. Because the product of each project is unique, the characteristics that distinguish the product or services must be progressively elaborated. ***Progressively*** mean 'proceeding in steps, continuing steadily by increments,' while ***elaborated*** means 'worked out with care and detail, developed thoroughly'.

Table 2: Project Management Processes:	**(PMI BoK Sections)**
Initiating Process	
• **Scope Initiation**	**(5.1)**
Planning Processes	
• **Scope Planning and Definition**	**(5.2, 5.3)**
• **Activity Definition, Activity Sequencing, Activity Duration Estimation,**	

Schedule Development	**(6.1 – 6.4)**
• **Resource Planning, Cost Estimation, Cost Budgeting**	**(7.1 – 7.3)**
• **Project Plan Development**	**(4.1)**
• **Risk Management Planning**	**(11.1)**
Executing Processes	
• **Project Plan Execution**	**(4.2)**
Controlling Processes	
• **Performance Reporting**	**(10.3)**
• **Integrated Change Control**	**(4.2)**
Closing Processes	
• **Contract Closeout**	**(12.6)**
• **Administrative Closure**	**(10.4)**
Reference: PMI BoK – 2000 Edition; Pg. 32 – 37	**17 Processes**

Table 3: What's in a Name?
All the following share a common philosophy and a set of guiding principles

TQM	**= Total Quality Management**
TCQ	**= Total Quality Control**
CWQC	**= Company Wide Quality Control**
CPI	**= Continuous Process Improvement**
PM	**= Process Management**
6 Sigma	**= 6 Sigma Limits**