Development and Implementation of Project Management Plan

Learn from Production Management?

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(Some notes on articles: *'What is Dynamic Scheduling?'* and '*Questionnaire Survey on Dynamic Scheduling in Construction'* by Amer Fahmy, MSc; Tarek M. Hassan, PhD; Hesham Bassiony, PhD, in the PM World Journal, May 2014, Vol. III, Issue V.) – A contribution

I have read with consideration the articles written by Fahmy, A., et al. The article brings to readership an important subject – improvement in updating of project management plan. Here is my understanding of the subject.

Summary

In first article, *What is Dynamic Scheduling?,* Fahmy, A., et al., describe meaning of dynamic scheduling then its categories, rescheduling policies, strategies, techniques, as well as dynamic scheduling architectures and applications. In 'Introduction' authors define meaning of dynamic scheduling. They wrote:

> Dynamic Scheduling is the process of absorbing the effect of real-time events analyzing the current status of schedule and automatically modifying the schedule with optimized measures in order to mitigate disruptions. (Fahmy, A., et al., 2014a, p.1)

In other sections of this article authors present literature review relevant mostly for dynamic scheduling in manufacturing ('Dynamic scheduling categories', 'Dynamic scheduling applications') and scheduling in general where some of those may apply also in construction ('Rescheduling policies', 'Rescheduling strategies', 'Rescheduling techniques').

The article put forward an automatized and optimized update of project management plan. So, the part of a project that is not completed, i.e., that follows immediately after data date, should absorb the changes from project activities recorded at data date. This procedure comes to a continuous, automatized and optimized time / resource distribution for activities after data date.

In second article, *Questionnaire Survey on Dynamic Scheduling in Construction,* Fahmy, A., et al., describe the questionnaire intended to survey the application and perspectives of dynamic scheduling and associated software in construction industry. In 'Introduction' of this article authors extend the meaning of dynamic scheduling by defining the purpose of related software. They authors wrote:

> The main function of the new software is to work in the background on the progressing / open front activities and try to establish alternative solutions in case one or more of these activities is somehow disrupted. So, for any disruption which might happen, the planner will find few readymade fully optimized (time / cost / resources) alternatives to choose from;

> these alternatives will be generated based on his previous settings of the mass of changes to the schedule expected with the optimization processes and what kind of optimization he is searching for. (Fahmy, A., et al., 2014b, p.2).

The authors describe the purpose, design and communication of questionnaire, as well as the survey's statistics, various interest and suggestions of project management community on development and integration of dynamic scheduling into practice. The survey should help in design of applicable functional specification for a dynamic scheduling model and corresponding software, as well as in facilitating how the proposed tool should work.

However, the authors did not describe development and implementation of *project management plan** in real life. To support the authors' initiative that contributes to improvement in updating of project management plan I will describe:

Characteristics of project management and production management, as well as their differences, that may change our views when we think about new dynamic scheduling.

A long-lasting dynamic pattern in development and implementation of project management plan, which should be acknowledged and then improved.

Key factors in development and implementation of project management plan, which may also determine a scope and procedures of dynamic scheduling.

A list of some suggestions and questions related to dynamic scheduling, which may improve mutual understanding between the authors of the articles and potential users.

The following pages may help interested parties to find a common understanding when discussing foundation, scope and contribution of dynamic scheduling in automatized and optimized update of project management plan.

Project management planning problems cannot be solved by production management knowledge

Whenever I hear that project managers look at *production management* as a source for a solution of *project management* problem I must remind to substantial differences between two management concepts. While *project management** has theoretical and methodological foundations for development and implementation of project management plan, (Abdomerovic, M., 2012, p.5, 7), that can be used in *management** science, including production management, however, the attempts to use production management knowledge for project management problems is not a good idea.

For further explanation of project vs production it is necessary to have in mind a *repetitive production project*, one that goes in production after has been developed. This type of project passes through *product development phase* and *product production phase.* Although there are many phases within a project life span, (Wideman, R. M., 2004, p.55, 66), those two phases are very important for this analysis. Product development phase depends on project management knowledge while product production phase depends on production management knowledge.

There is no analogy between the two management knowledge; the project management knowledge is created to help management of unique endeavor while the production management knowledge is created to help management of repetitive effort. Product development phase, i.e., prototype, consists of a unique set of activities that are performed one time only while product production phase consists of the same set of activities for each product. The difference is substantial; any project, as well as the development phase of a production project, has unique and unsteady logic while production phase of production project has repetitive and stable logic. The development phase of production project is typically considered a project and is managed consistently by project management methodologies. And production phase of production project is considered a production and is managed by production management methodologies.

The analogy between the *mass* production (producing a number of same doors, hats, cars, toys, shoes, …) and the *repetitive* projects (building a number of similar apartments, miles of transmission lines, roads, pipelines, …) has been described more than five decades ago and this is not a problem. But the basic difficulty here is when we try to draw symmetry between two different types of knowledge; between *product development management* and *product production management.* This is exactly what actors from the *Critical Chain (CC)** novel did and consequently they were not able 'to figure out how to manage projects better'.

The CC silently abandons CPM (Critical Path Method) or PDM (Precedence Diagram Method) network diagrams and its linked features; floats management, resources management and multi project management. The *CC relies exclusively on production management knowledge to presents its project management approach*. It uses the Lead Time Chart (LTC) to show the logic for product development phase of a production project. Both the network diagram and the lead time chart have the roots in Graph theory, i.e., network diagram in the *transportation networks* graph, (Berge, C., 2001, p.71-85), while the LTC in the *tree networks* graph, (Berge, C., 2001, p.152-164). The network diagram can show variety of relationships between activities while the LTC is limited to display parent-to-child (children) relationships only and such has not flexibility required for project management or product development phase of production project.

Therefore, the CPM or PDM network diagram is still best basis for development and implementation of project management plan. Here are some excerpts that support this view:

The Line of Balance (LOB) users recognize the positive influence of CPM from its early days. In his voluminous study Lumsden uses advantages of CPM over LTC for product development phase of repetitive projects.

> [The] very presence of the network techniques as an established logical discipline of today's management has led to an awakening interest in the Line-of-Balance method and in particular to its application on repetitive work such as housing. It has been found that the power of logical networks combined with the principles of the Line-of-Balance method provides a microscopic picture of any repetitive project … . (Lumsden, P., 1968, p.1).

The excerpt from Fleming and Koppelman book, where authors comment the system criteria of ANSI/EIA 748 – Earned Value Management System, shows that CPM is here to stay. For example, the EVM Criterion 6 is defined as:

> *Schedule the authorized work in manner that describes the sequence of work and identifies the significant task independencies required to meet the requirements of the program.*

> And a piece from authors comment for the above criterion explains: … Nowhere in any of the criteria is it specified that a particular scheduling techniques must be used. However, the criteria do require that contractor scheduling systems must reflect interdependencies and constraints. Since only Critical Path Method (CPM) schedule show such relationships, a strict interpretation of this criterion might suggests that EVM requires the use of some type of a CPM network schedules. (Fleming, Q. W., and Koppelman, J. M., 2000, Appendix 1).

The PMI's The Practice Standard for Scheduling states:

> Scheduling methods provide the framework within which schedule models are developed. One of most common is the *critical path method* (CPM). … The *Critical Path Method* (CPM) is a schedule network analysis technique … used to determine the minimum total project duration and the earliest possible finish date of the project as well as the amount of scheduling flexibility (the amount of float) in scheduling network. … (PMI, 2007, p.8).

Besides, overwhelming number of standard contracts cover for decades, directly or indirectly, the CPM based Contract schedule as a tool for projects management. This material is described usually at contract's Specifications category, Division 1 – General Requirements.

Project problems are often used as overture to launch a new project management idea. With this packet also comes blaming of project management methods for bad project results and searching for a solution in other management areas. But other management areas, e.g., global automobile production, which records extraordinary recalls that cost automobile industry $ 40 billion/year, (Wikipedia, 2014, p.9), does not blame its production management knowledge; or financial management, which estimating models records historic disappointments, (Taleb, N. N., 2010, p.44), have Nobel laureates and ensure high seats in management science. However, project management still has to be recognized as a branch of *management**. We have to show that methodological base for development and implementation of project management plan, its research and development, are in good condition but needs more and better education. Otherwise, we will endlessly looking in other management areas to solve project management problems and sending confusing messages to management world.

Development and implementation of project management plan was always dynamic

By normal development and implementation of project management plan I understand the documentation and actions that respond to requirements for project planning; comply with contractual and management requirements for project planning and helps develop project in organized manner. Project management plan, like any analytical documentation, e.g., architectural, mechanical, electrical, software, or other design, can never be precise as actual events; however, it must be developed, used and updated by professionals and according to regulations and/or best practice. Project management plan was always prescriptive, dynamic, or tagged with some other attribute to describe its basic characteristic. There was always awareness that any changes in project progress, including progresses without any deviation from plan, must be recorded. Any misuse of existing know-how and usual contractual regulations for development and updating of project plan should not be considered as normal approach.

Probably the most serious misunderstanding of project management today relates to project management plan, a substantial project management procedures and documentation that are

generally applied and advanced through decades. Therefore, let's remind to some important facts about project management plan. Each project must have a plan that contains, beside other activities, minimum one activity for each *schedule of values** item (Means, 1991, p.497; AIA, 2004, Forms G702 and G703). For example, a five millions construction project may contain up to one thousand activities, while a five hundred millions construction project may contain up to ten thousand activities. Small projects are planned with more detail schedule value, while big projects allow allocation of bigger schedule value. During development of project management plan the construction manager has the responsibility for defining the level of details, the reporting levels, the contents, forms and sorts of the reports for project plan. He is also responsibility for extensive review of the development logic and time estimate of the project activities.

After the *original* project management plan has been developed, approved and derived into initial *baseline* and initial *current* project management plan, then its implementation is less creative and more routine job. During implementation of project management plan the construction manager is responsible to create and withstand environment where reviews and maintenance of the plan shall be of prime interest for stakeholders. To maintain baseline plan and current project plan updated we must always have a detail understanding of *project management feedback**.

So, once developed, project management plan is rarely exact as its actual events. In reality, the implementation of project management plan, which is an instrument for management of *dynamic nature of project*, passes through comprehensive and continuous updating. After the performing organization's initial baseline plan is accepted, it becomes referred to as 'Performing organization's Contract schedule'. Its activities, logic, relationships and other attributes may not be changed, added or deleted without the consent of both, Client and Performing organization. During *implementation of project management plan* the original plan may change exceptionally.

Between two or more successive project updates the baseline plan stay the same but the current plan, that record day-to-day development of project events, changes. If changes in current plan change the contract then baseline plan will change as well. Differences between baseline plan and original plan show value of approved *change orders**, while differences between current plan and baseline plan show the value of *pending change** orders or other changes that may or may not change contract. The status, progress and forecast of each activity, positioned between last two updates of the current plan must be recorded, organized and disseminated to stakeholders for further actions; payment requests, compilation of list of current issues, as well as consequential management of scope, time, resource, cost, quality, procurement, risk and other.

Implementation of project management plan requires intensive management of changes; once a construction manager settles all conditions about particular issue, he moves to discover and settle next critical issue. This procedure also leads to ongoing improvement of logic and estimates to complete a project. Although we cannot guarantee that project will be completed according to original plan; however, *we can guarantee that project management plan has a capacity to control project status, progress and forecast according to the contract.* So, Contractor performs work according to contract documents that control project dynamic; progress of time and price estimated to complete the work as specified. A contractor must know what the contract demand of him and construction manager must know what to request and expect of contractor. If contractor failed to accomplish work planned for current week, then

construction manager leads action to get required output by the mid of next week. But there are cases where time and/or cost contingencies and liquidated damage have been exhausted, disputes and litigation between contractual parties proceed and bankruptcy of Client and/or Performing organization may follow.

One often repeated phrase is that 'project was not completed to baseline plan' asserts that we speak about failed project. Then again truth is that baseline plan is changing by approved change orders that become part of the contract. Here are some excerpts about this notion:

Recently Pickavance describes the new contract document, the Chartered Institute of Building's International Construction Contract (http://www.ciob.org.uk/CPC). In one of related articles author reiterates view that a failure to achieve project on target cannot be used as indication for project failures because target plan is not fixed. He wrote:

> Historical reporting of failure to achieve a notional fixed target is not an effective way to manage time on complex projects in which, inevitably, the target does not remain fixed. (Pickavance, K., 2013a, p.1-2).

International standard, for System and software engineering – Software life cycle processes, recognizes a dynamic nature of projects. For example it defines baseline as:

> Specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development and that can be changed only trough formal change control procedures. (ISO/IEC 12207:2008(E), IEEE Std 12207-2008, Terms and definitions).

Some of these and other materials that running for decades provide the orientation to performing organization about the minimum requirements for development and implementation of their plans. The key is in understanding of the requirements and in creating environment for their application. We must understand first the *forms and meanings of project management plan*; distinguish the relationships between original plan, baseline plan and current plan. We must know: how scope changes, pending and approved, are added/subtracted and handled in plans, how actual work accomplished during current period is recorded and compared to baseline plan, how work forecast for next reporting period is controlled, how current and expected delays impact the plans, how change in development logic, as well as added, modified and deleted activities and milestones impact the plans and actions of stakeholders, how to relate the plan with approval for the work done and payment requests? Besides, we must show how requests for information, field order, claims and corrective measures are handled, how contract time including all contract milestones are changed? Without considerations of the above parameters of project plan the project status, progress, forecasts and *change control**, as well as management of changes, that are so common in project business, could not be achieved.

But good project management plan is not sufficient; its value is relative and depends of project manager's understanding and attitude regarding planning matters.

Typical day of construction project manager and project planner

The implementation of project management plan, i.e., conducting everyday review of project documentation and works and coordination between different parties involved, can be

understand better if we see *how looks a typical day for a construction manager*. He is at the site by 7am to study project documentation and work that should be performed during that day; at 8am he conducts meeting with contractors' representatives to review issues and gives directions for work; at 9am conduct meeting with project team to review issues and gives directions for work; at 10am he visits construction site; at 12am he is at lunch with project manager and/or client representatives, or a contractor to relax and settle actual issues; at 1pm he studies all aspects of accomplished and planned work for this day; at 2pm meets selectively individual members of project team (client representative, project manager, a contractor, a member of safety and security, chief accounting, negotiators for procurement of material and equipment, designers, planners, quality controllers, etc,) to discuss the issues, receives information and gives direction; at 3pm he visits project site again and prepares for tomorrow 8am meeting. Construction manager is the last to leave the office, usually about 6pm, with his headphone and binder that will keep him busy for a while.

At these meetings *all documentation is updated and authorized*, at least changes are marked in by pencil and signed, so it can be used to discuss related conditions of very specific issues of that day. The meaning of construction manager's daily commitment, to keep competent supervision and certainty of project development, is fairly supported by comprehensive and updated project management plan. *Project planner* collects data, presents his issues and receives directions, if any, daily at 9am and 2pm meetings. Daily meetings and visits to site are essential for keeping stakeholders focused on most important issues. In addition, project planner conducts each Friday, from 10am to 2am, weekly meeting with contractors' representatives to confirm daily collected data and results about weekly status, progress and forecast of project schedule value items, as well as to fine-tune contractors plans. At these meetings team members distinguish works on non-critical activities from works on critical activities to assess project plan. But a number of non-critical activities, which are 7 to 9 times bigger than number of critical activities, greatly determine project cost and cannot be excluded during assessment of project budget, actual cost, earned vale and estimate to complete cost. At these meeting team members also discuss the out of sequence progress, introduction of new activities, deletion and modification of existing activities, required and actual progress on critical activities, change of critical path, floats trends and other current issues. Weekly meeting, which are facilitated by daily meeting, results in an integrated project assessment and project plan update. Based on the above, project planner prepares weekly report of project status, progress and forecast for plan and quantities/costs of project and its structural parts. Project planner meets construction managers each Friday at 4pm to discuss the weekly report.

It is a fact that some managers look at project planner solely as skilful user of sophisticated software. This is disappointing. Imagine a simple project; a five thousand sq. ft. apartments building, where architectural design is developed and updated by an architect experienced in AutoCAD software and practiced in healthcare projects; or where project plan is developed and updated by a mechanical engineer experienced in Primavera software and practiced in power plant projects. There is no doubt; both architect and planner will deliver deficient documentation. Reliable plan depends: first on project manager who must understand what contractual requirements for project plan are; and second on planner who must have working experience on similar projects and capability to communicate with her/his pears, as well as to know how to develop and update a sustainable project plan according to contract documentation. Both construction manager and planner must understand limitations of project management plan and have ability to respond to requirements for changes.

The development of project planning skills is a long process. For example, you want a project planner who understands project management processes, product development processes, contracts and management requirements, design and procurement documentation and can compile these conditions into a simple, sufficient and reliable report for senior managers. But then you must think about person who has a graduate degree, at least five year experience in relevant industry, five years cost / scheduling experience and corresponding software, appropriate professional certification and attitude.

So, where we are now?

An automatized and optimized update of project management plan is good idea. If authors define an algorithm that can advance, automatize and optimize most of know-how we currently applying during updating of project management plan then such solution can have a progressive influence to project management.

To approach the problem, an automatized and optimized solution for update of project management plan must have capacity to:

> Adapt a unique set of project activities given in form of CPM or PDM network diagram.
>
> Handle settings, in form of contracts and agreements, which govern update of project management plan.
>
> Contain fundamental elements of good practice for update of project management plan.
>
> Take account on management expectation and limitation of technical solutions during update of project management plan.
>
> Include criteria that can interactively handle reaction of those affected by automatized and optimized update of project management plan.
>
> Apply model in cases when activities are not resource loaded but with cost or time attributes only.

These concerns must be starting point before a new and phased solution for an automatized and optimized update of project management plan is suggested.

Besides, there is the human factor in project management that will always play decisive role. Though, a new approach should never offer more than business logic of decision makers want and can assimilate. As authors acknowledge:

> Features and policies of any dynamic scheduling system in construction will always be subjective to the project's conditions and the project management strategy. So, the Dynamic Scheduling section of the survey was introduced to cover the gaps of the literature with respect to the practical implementation within construction industry. (Fahmy, A., et al., 2014b, p.3).

The 'automatically modifying the schedule' after a data date assumes, I guess, that project resources allocation will change. Consequently, this may change 'economic time' for an activity,

which requires a new time/resource estimating approach. A dynamic scheduling idea is to cope with 'mass of changes to the schedule', which requires development of more sophisticated estimating databases and additional flexibility in management of resource allocation. This open another questions, just to mention few; how often we respond to real time event, how often we are willing to reorganize resources just to comply with results of automatized and optimized updates, does automatized modification of project plan triggers excessive control of results and reorganization of work to come, can we in condition of automatized and optimized update of project management plan think about stability of project plan?

There are several notions within the text that overstate perspective or scope of dynamic scheduling. For example:

> [In] real world … real-time events extremely disrupt the integrity of schedule … if the responsible project management team does not act dynamically to mitigate the impact … schedule can become very easily neither optimized nor realistic. (Fahmy, A., et al., 2014a, p.1).

Most of real-time events, excluding unpredictable events and misuse of existing know-how, are just normal project conditions handled regularly and included into realistic depiction of project as whole. For example, if customer decides to add new ticket counter, for a baggage handling project in progress, then project sales, architect, mechanical, electrical, control, procurement, planner and other professionals have to update their documentation. It is just a systematic and continuous dealing with changes, so the role of dynamic scheduling has to be thought again.

> The results of the survey are to be used to identify the practical features of a new dynamic scheduling model for construction enterprises and an associated software tool for real-time scheduling in construction projects. (Fahmy, A., et al., 2014b, p.9).

Now authors remind us that we talk about an integrated solution; the 'model for construction enterprises'. This is idealistic situation. So, it is challenging here to define a decision making process, e.g., how a model of resource management can function forth and back; from enterprise's resource management to a project resource allocation to an activity resource definition and back from automatically updated activity to automatic project resource allocation to automatic enterprise resource management? But this is another standard project management procedure, known as top-down planning and bottom-up verification of the plan, so the role of dynamic scheduling has to be considered again.

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Notes
Terms

Change control Overall change control of the project is summarized in control of project variances: budget variance, cost variance and schedule variance. Variance for the change orders, the contingency and the pending change orders cost accounts are just some of building blocks in the total of variances which comes from variances of all project cost accounts.

Change order Written authorization provided to a contractor approving a change [in a current contract] from the original plans, specifications, or other contract documents, as well as a change in the [current contract] cost. With the proper signatures, a change order is considered a legal document. (Means, 1991, p.107). [Change orders follow after owner requests changes, or when deficiency in conditions, documentation, or workmanships has been recorded. Change orders usually increase original contract price and completion time].

Contingency Amount included in the construction budget ['used at the owner's discretion'] to cover the cost of unforeseen factors related to construction. (Means, 1991, p.137). Time allowance included in project schedule to cover the time lost resulting from change orders or other unexpected conditions. Time contingency activity is placed at the end of critical path.

Particle - *In a project management system**, a *particle** articulates a general character of project management knowledge in terms of the most detailed and unique element of system structure. A particle evolves from common and generally known elements of projects and their environment and can be identified with an element of *factual project documentation**. For example, the particle 'resource assignment' can interface with factual project document containing information about 'assignment of people', assignment of money, assignment of space, etc. Particles are not only progressive and definite knowledge of project management, but also the building blocks of project management system logic and higher structural elements and context of a project management system. The level of particles is the only platform where we can fully explain any aspect of any project management system.

Open end particle – A process element that indicates distinct project result and such has not successor relationship. However, project management overlaps other disciplines and open end particle may fill as open start to some other discipline.

Open start particle – A process element that has not predecessor relationship. However, project management overlaps other disciplines and open start particle may indicate to result of some other discipline.

Relational particle - Conditions at the point in time that controls how an output particle is related to an input particle or particles. To be relational both output and input particle must have the same name, content and properties.

Project management The application of *project management system** for the development of a *project management plan** and the implementation of project management plan as intended expressly or implicitly by the plan. *Project management system logic** can be applied in practice as a template to facilitate development and implementation of project management plan. Project management starts the moment that a project is formally authorized and ends when the project is handed over to the customer and operations management starts.

Project management feedback Project management processes (*planning, executing and controlling*) related sequentially in terms of their output/input. The processes have to be applied to all activities, or to a part of an activity, during implementation of project management plan. (See for details: Abdomerovic, M., 2012, Note, Project Management Feedback).

Project management system A structure of general character of project management knowledge observed at projects and their environments in terms of *particles**. This structure is a supplement to purpose, explanation and understanding of structural elements of project management system and project management system as a whole. Project management system is used to help project team in development and implementation of *project management plan**.

Pending change order An estimate of expected cost and time that will change the project current contract soon. It is a synonym to 'request only' for price and time of a change, or 'bulletin'.

Project management plan Organized, formal and approved project documentations that help manage requirements, conditions, organizations, communities, individuals, problems and solutions related to a project, project context and environment. The documentation address objectives, funding, policies, strategies, governance, authorizations, economies, behaviors, as well as the methodologies to analyze, identify, quantify, qualify, synthetize, sense, update and communicate information for project elements, events, activities and their attributes (description, contract, organization, responsibility, relationships, duration, scope, time, quality, standards, regulations, cost, resources, risks, changes, claims, status, progress, forecast, success, failure, audits, codes, etc.) and other issues for normal, unusual, uncertain and emergent situations during project life span. Project management plan consists of two global stages; the development of project management plan and the implementation of project management plan. The development of project management plan starts the moment that a project is formally authorized and ends when the project management plan original plan is approved. The implementation of project management plan starts with activation of feedback loop (executing, controlling and back to planning) to project activities and ends when all project activities are completed. During implementation of project management plan we use and update three forms of plan; original plan, baseline or target plan and current plan. The original plan may change exceptionally, the baseline plan stay the same between two successive updates and change with change orders, but the current plan, that record day-to-day development of project events, changes each update.

Project management system logic - A characteristic of project management system, which shows how *project management system** is integrated by means of relational *particles**. Integration was initially revealed by analysis of logic-based network of system particles and then by synthesis to build the understanding of a bigger picture of system logic and the system as a whole. System logic presents step-by-step development of a project management system and can be used in practice as a template for development of a *project management plan** and a *project management feedback**. System logic is always unique and integrative because it is defined by a set of unique and relational elements of the system content.

Schedule of values (cost breakdown) A listing of elements, systems, items or other subdivisions of the work, establishing a value for each, the total of which equals the contract

sum. The schedule of values is used for establishing the cash flow [and application for payment for work completed on a contract] of a project. (Means, 1991, p.497).

Readings

Critical Chain (CC)

The 'Critical Chain' (CC), (Goldratt, E. M., 1997), is 'a business novel', not necessarily based on the facts and not certainly a record of past events. The actors in Critical Chain (CC) are controlled by idea to explain product development management by principles and practice of product production management. But this was bad approach and its consequences can be traced all way throughout the book. They use the 'Theory of Constraints' (TOC), (Goldratt, E. M., 1990), to support CC and pass project management paradigm shift into Genemodem company. To sail comfortably trough this effort, they obviously use a code of creative distraction. In fact the background scene of the novel consists of continuous contrasting with *scientific project management**; whenever is needed to conceive or construct a next CC step then its preamble problems some project management procedure. But its scenario aimed to create a new project management method did not go so smoothly. The CC starts as deterministic project management procedure, develops as logical production management process and finishes in arbitrary tone. During this endeavor, intended to find out 'how to manage projects better', Assistant Professor Silver Dr. Richard, students and Genemodem's executive vice-president Isaac Levy, have acknowledged the real difficulties in their approach to project management and leave the scene without viable solution.

The CC may be applicable in cases where unique project is small and has simple and stable logic. But as soon as we have a need to clarify complex relationships for development phase of a repetitive product, i.e., prototype, where project dynamic and changes are recognized essential for its management then CC is suboptimal approach. In that case the CPM or PDM network diagram and its linked features; floats, resources, cost and other management components should be used.

Management

We should have more visions that can show the project management as a source or at least in symmetry with other management approach. Here are some excerpts from Drucker's book about general structure needed to manage business objectives:

> There are three specific ways to find out what kind of a structure is needed to attain the objectives of a specific business: activity analysis; decision analysis; relations analysis. (Drucker, F. P., 1970, p.234-235).
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> To substitute typical functions for an analysis of the activities actually needed is dangerous mental laziness and in the end causes double work. For only a thorough and careful activities analysis can bring out what work has to be performed, what kind of work belong together and what emphasis each activity is to be given in the organization structure. (Drucker, F. P., 1970, p.236).
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> The second major tool to find out what structure is needed is an analysis of decisions. What decisions are needed to obtain the performance necessary to attain objectives? What kind of

> decision are they? On what level of the organization should they be made? What activities are involved in or affected by them? … (Drucker, F. P., 1970, p.237). A decision should always be made at the lowest possible level and as close to the scene of action as possible. More over, a decision should always be made at a level ensuring that all activities and objectives affected are fully considered. The first rule tells us how far down a decision *should* be made. The second how far down it *can* be made, … . (Drucker, F. P., 1970, p.240-241).
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> The final step in the analysis of the kind of structure needed is an analysis of relations. With whom will a manager in charge of an activity have to work, what contribution does he have to make to managers in charge of other activities and what contribution do these managers, in turn, have to make to him? … Indeed, the first thing to consider in defining a manager's job is the contribution his activity has make to the larger unit of which it is a part. In other words, the upward relationship must be analyzed first and must be establish first. (Drucker, F. P., 1970, p.241).

The details of the abode notions will vary from industry to industry. However, common to all projects is the need to analysis the list of the activities and achieve the sequence of decisions for activities indicated in work of a project. We should observe in the above passages that Drucker's structure, to manage the objectives of a specific business, i.e., the *activity analysis, decision analysis* and *relations analysis,* may well be accomplished by using the fundamental project management approach for development of project management plan; i.e., top-down planning and bottom-up verification of the plan. In top-down planning we use Work Breakdown Structure (WBS) to reach the activity level and analyze the content of a plan. In bottom-up verification of the plan we use CPM to relate activities and synthetize the content of the plan for its verification at higher management levels. We can see here a clear symmetry between project management system and business management system. The collection of project management knowledge presented in the PMBOK Guide is good example where the above principles can be validated. But PMBOK Guide discusses the synthesis of its knowledge throughout a series of fuzzy illustrations (PMI, 2008, p.40) and general statements (2008, p.21-22, 40-41) rather than use of inputs and outputs of its processes to analyze and synthetize its content (Abdomerovic, M., 2009b, p.135-191, 209, 228-230, 232, 237-239). So, the fundamental project management approach for development of project management plan can be used as general approach for analysis and synthesis of a business contents in management science.

Scientific project management

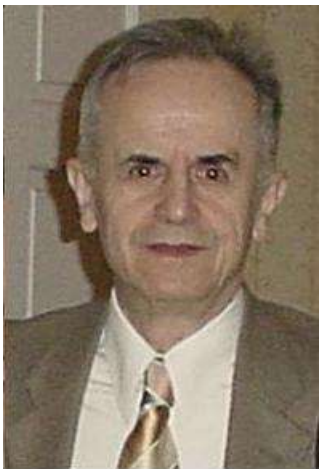
The project management is simultaneously a field of intensive applications and diversified development, great results and some failures; similar to other management areas. Actual needs from practice are oriented to project management knowledge and in many cases answer is there. But sometimes use of the same knowledge disappoints with adverse results. Both good and bad results make project management preferably set for fierce discussion and excited development. As new development was not always served in digestible form or did not used properly or presents a bad compilation of existing knowledge then it may be abandoned and indicated start of better application and new research. Such diversified story of project management community was presented by Bredillet. His editorials in Project Management Journal, 2006 - 2012, describe history, development and way we are going in shaping project management and project management community. Here are some excerpts from his editorial, which summarizes most of his thoughts published earlier:

> "Modern project management started as an offshoot of operations research, with the adoption of optimization tools developed in that field, and some members of the community have continued to present it as such. However, … project management has now grown into a mature academic discipline of some diversity and complexity. At least nine school of thought in project management can be identified," … (Bredillet, C. N., 2010c, p.4).
> "Initially, advanced study in project management in universities was located in school of engineering or construction, and then in school of computing. So it was viewed as a technical subject. More recently, project management has also been incorporated into school of business or management, and so is now gaining recognition as a branch of management." (Bredillet, C. N., 2010c, p.5).

Bredillet's see project management as potentially integrated field although we know that level of integration at this time may relate to some project management knowledge areas, e.g., scope, time, cost, quality and procurement. He wrote;

> "[Project] management would be one of integral function: the knowledge field is made up of different elements, each of them being able to be defined (for example, cost control, scheduling, communication, quality, information system, temporary group, ets.)." (Bredillet, 2010c, p.9).

About the Author



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Muhamed Abdomerovic, Dipl. Eng., is a civil engineer specializing in project management. Mr. Abdomerovic belongs to tradition that renewing our half century history of scientific project management. He has more than forty years of experience in the application of scientific principles to project management. In working on variety of projects in the information technology, construction, the process industry and the energy sectors he has gained broad insight into the project management theory and practice. Mr. Abdomerovic is currently an independent consultant. He was previously project planner with Vanderlande Industries, master scheduler with FKI Logistex's and program manager with Luckett & Farley. Prior to these positions he worked with Energoinvest and was responsible for the design and implementation of systems for management of large-scale development projects. He began his project management career in Vranica as a construction manager.

Mr. Abdomerovic has been an active participant in the development of the project management profession and has published many professional journal articles on project content, time, cost and integration management. He has also published articles in six proceedings of Project Management World Congresses and has published four books. His current research activities cover several aspects of project management including development and implementation of project management plan, process relationships, knowledge integration and compilation of project management system logic. Mr. Abdomerovic joined The International Project Management Association in 1972 and was for decades a member of the Project Management Institute. Mr. Abdomerovic graduated from the University of Sarajevo with the Diploma of Civil Engineer. He was consecutively recertified as PMI Project Management Professional (PMP) from 1998 to 2010. He can be contacted at mabdomerovic@insightbb.com