APPLYING A SIX SIGMA TOOL IN PROJECT MANAGEMENT METHODOLOGY.A THEORITICAL APPROACH

Konstantinos St. K ousouris[1], George J.Besseris[2],

Postgraduate Program M Sc in Technology M anagement City University of Seattle, Seattle, WA, USA
1) *Project Manager, BSc. in B.A, M Sc. in P.M, PM P candidate. mangroove_k@yahoo.gr, konstanti noskousouri s@gm ail .com*
2) *PhD in Chemical Engineering, Quality Advisor. besseris@yahoo.com*

Abstract: Project Management methodology is based on three major constraints related with the project deliverable. These constraints are the time, the budget and the resources needed for accomplishing a project. While projects becoming more complex a new constraint occurred and is related with quality issues and how projects are satisfying the customer¶s (internal or external) needs. Quality management is one of the knowledge areas of Project Management and targets to meet customers¶ expectations by providing high quality results.Six Sigma is a quality methodology initiated in projects both in industry and service sector. The integration of Quality and Project Management comes in the form of Project Quality M anagement. The aim of this paper is to examine how a Six Sigma tool can be used in Project Quality M anagement system while a project is undertaken.
*Purpose: Presentation of SIPOC diagram in the Project Management methodology. **Methodology/Approach:** Research*
***Findings:** How S.I.P.O.C diagram can be applied in the Project Management methodology.*
***Originality/Value:** Contribution to Total Quality Management and Project Management literature*
***Keywords:** Project Management, sector, customers, suppliers, processes, six sigma, total quality management*

1. INTRODUCTION

Project management day by day is getting involved in business operations and separated from a restricted management philosophy. The major constraints of project management methodology time-resources and budget provide accurate business solutions while a project is undertaken. Project management offices in major organizations are getting familiar with these constraints and are setting as primary goals to follow these principles. The large scale projects and the complexity of the new era environment revealed a new constraint that should take under consideration in order to the project or projects have a successful end. This constraint is quality.

Despite the fact that quality is a part of the nine knowledge areas of project management methodology, quality remains a major issue that should be organized, planned and controlled by project managers during a project life cycle. The new trend in worldwide bibliography related with project management is to examine how quality is involved in the project management methodology.

2. PROJECT MANAGEMENT

Our global civilization is changing rapidly. The growing demand for complex, customized goods and services, the exponential expansion of human knowledge and the global production-consumption environment considered as factors critical in the development and application of project management .

Project management is described both as an art and a science.

Project management is a discipline responsible to plan, organize and manage resources and successfully bring about completion of specific project goals and objectives.

The global change is accomplished through projects. A project is a temporary endeavor undertaken to create a unique product, service or result.

According to PM BOK guide edition fourth Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

Project management is accomplished through the appropriate application and integration of the 42 logically grouped project management processes comprising the 5 process groups.

These 5 process groups are:
- Initiating.
- Planning.
- Executing.
- M onitoring and controlling.
- Closing.

By defining project¶s characteristics it is obvious that a project:

- Creates a unique product service or result.
- Temporary, has define beginning and define end.
- Has a specific objective or outcomes.
- Ends when project objectives/deliverables have been achieved. x Has an approved budget and limited resources.

Many firms recognize that disciplined project management can:

- Reduce cost and increase the value delivered for projects and services.
- Set project and delivery management standards without micromanaging delivery.
- Gain buy-in and support across all levels of the organization.
- Achieve a balanced level of continuous program management maturity improvement.
- Automate processes and reporting using appropriate software tools and a centralized repository.

Authors through time gave definitions regarding project management. Breyf ogle, (2003) stated that "*Project management is the management, allocation and timely use of resources for the purpose of achieving a specific goal'*. The triple constraint-project scope, time and cost are the key factor for project¶s success. "The principles of project management can be applied to any type of project and to any industry. Companies that sell products or services ought to have good project management practices¶. (Kerzner 2006). Meredith and M antel (2006) recognized three primary forces behind project management:

- 'The growing demand for complex customized goods and services.
- „The exponential expansion of human knowledge.
- „The global production-consumption environment.

They continued with the statement that project management is being recognized as a valuable path that many organizations follow in order to achieve growth and maintenance in the market.

The Project Management Offices that already existed in the organizations now are in the front line of every organization¶s action related with the growth and stability. The level of success of this effort depends on how rapidly the constraints of project management-time, resources and cost- will be adapted both from the employees and the higher management.

Examples where principles of project management are initiated can be found in many subsectors of financial industry. In real estate the project management tasks continue to present challenges. Therefore real estate companies attempt to increase project management efficiency and quality by implementing new standards and procedures. The Project M anagement Institute through studies such as the OPM 3

(Organizational Project M anagement version 3) provide strategies in a challenge environment which can provide solution to key difficulties.

2.1. Project Quality Management

Projects are closely related with customers. Customers are part of the project and it seems that projects are becoming customer driven in order to achieve customer satisfaction. While the wide debate continues on the role and function of the customer in project quality management there will be no such debate in the future as the customer becomes a full partner and member of the project team.

One basic characteristic of Operational Management is Project Management and how its techniques are beneficial for an organization. Project Quality Management as a division of Project Management provides the basis for achieving projects goal and leads to customer s satisfaction. The Project Quality Management presents the quality attributes that assist to customer satisfaction.

Barkley and Saylor (2001) noted that project quality management „*is the process of integrating and managing quality into the core project management process rather than using quality tools simply to inspect and appraise the work after the fact'*.

According to (PMBOK Guide 2004) "*Project Quality Management processes include all the activities of the performing organization that determine quality policies, objectives and responsibilities so that the project will satisfy the needs for which it was undertaken'*.

In a customer driven project the techniques, the practices and the tools, of Total Quality Management can be used in order to provide customer satisfaction. The success of the project depends on the professionalism that employees must have and that the customer is projects voice (Barkley & Saylor, 2001).

In many organizations around the globe both project management (P.M) and total quality management are separated (T.Q.M).This disadvantage affects customer satisfaction. From the early 1990¶s organizations started to adapt project management practices in combination with the total quality management philosophy.

Both Total Quality M anagement and Project Management can provide a systematic, disciplined, flexible adaptable approach for producing deliverables, improving organizational performance and moving toward continuous improvement, focused on customer satisfaction. (Barkley & Saylor, 2001).

The Project Quality M anagement Processes includes:

- **Quality planning:** identifying which quality standards are relevant to the project and how to satisfy them.

- **Quality assurance:** evaluating overall project performance to ensure the project will satisfy the relevant quality standards.
- **Quality control:** monitoring specific project results to ensure that they comply with the relevant quality standards while identifying ways to improve overall quality.

Customer Driven Project Management

The modern quality management is customer centric. The key factors are:
- Customer satisfaction.
- Prevention over inspection.
- M anagement responsibility.
- Processes within phases.

The competitive market is the main characteristic of the word economy. Products and/or services are available in the market but that no means that all being sold. Customers nowadays are more selective than ever.

They buy this product or/and service which meets their highest requirements and expectations. Now day¶s customers have more options in choosing that is appropriate for their needs, what is suitable.

Organizations from their side in order to maintain the existed customers and attract new ones change their policies regarding the offer of products and services. The Project Quality M anagement practices are critical for long term growth of the organizations. Therefore every project that is initiated is customer centric and customer driven. Customer¶s role is very important and the received feedback is related with project¶s success. Customers are more market conscious than ever.

3. QUALITY MOVEMENT

Total Quality Management (TQM), a buzzword phrase of the 1980¶s has been killed and resurrected on a number of occasions. The concept and principles are back into existence through the evolution of the M anagement Quality System standards. The technological evolution of the past two decades led many organizations to change their strategy and create products and services according to the customer needs and perceptions. This technological challenge increased the global emphasis on quality management and its divisions. Quality on products and services became the most important success factor. The competitive market forced many organizations to adapt quality principles and offer to customer products and services with high quality standards. Joseph M.Juran noted that ``*the twentieth century was the century of productivity the twenty-first century will be the quality century'*.

The quality concept requires observing the final outcome, which could be a product or a service, from the customer¶s perspective.

In other words the processes must be determined from the outside-in. By this way the organization can understand better the customers needs what customer feels about a product or service and what expects the final outcome could be. Quality cannot be defined unless there is any relation with a function or object.

It is a subjective attribute and depends on customers perception and expectation. In order the quality of a product or service be measured or be improved many different techniques and tools and processes were developed and are still developing to achieve customers satisfaction. Few of techniques and processes are:
- Statistical Process Control (SPC).
- Zero Defects.
- Six Sigma.
- Quality Cycles.
- Quality Management Systems (ISO 9000).
- Theory of Constraints (TOC).
- Malcom Baldrige National Quality Award.
- Design of Experiments (DoE –Taguchis L9, L12 experiments).
- Fishbone Diagram – Ishikawa.

The above tools techniques and processes were established with success in the heavy industry in the past years providing the best outcomes to customers and satisfying their needs.

The challenge of the 21 century is how these techniques can pioneer to more sectors, to more industries such as the health care and financial. Services seem to be now days one of the core needs of individuals.

The high quality services is the new challenge for industry and from the early 90s theories from Quality Gurus started to involved in the service sectors.

After the financial crisis of September 2008 the quality principles are tend to be more important than ever in order to be gain again trust between customers and financial organizations .

3.1. Six Sigma

Six Sigma is a disciplined methodology that uses data and statistical analysis to measure and improve a company's operational performance by identifying and eliminating "defects" in manufacturing and service-related processes. Commonly defined as 3.4 defects per million opportunities, Six Sigma can be defined and understood at three distinct levels: *metric, methodology* and *philosophy*. As a business management strategy, originally developed by M otorola, which today enjoys wide-spread application in many sectors of industry, Six Sigma seeks to identify and remove the causes of defects and errors in manufacturing and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization ("Black Belts" etc.) who are experts in these methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified financial targets (cost reduction or profit increase).Processes that operate with "six sigma quality" are assumed to produce defect levels below 3.4 defects per million opportunities (DPMO).

Six Sigma's implicit goal is to improve all processes to that level of quality or better. The goal of Six Sigma is to increase profits by eliminating variability, defects and waste that undermine customer loyalty. Six Sigma is a methodology that provides businesses with the tools to improve the capability of their business processes. This increase in performance and decrease in process variation leads to defect reduction and vast improvement in profits, employee morale and quality of product. Six Sigma in many organizations simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process -- from manufacturing to transactional and from product to service.

3.1.1. Six Sigma and Project Management

Organizations started paying attention improving their operational management practices both Six Sigma and Project Management methodology have revolutionized the world of business and generated growth in organizations. Six Sigma as an operational system improves the business system using various statistical aspects toimprove quality standards. Project management methodology is capable to determine project process by identifying constraints and resolving them.

The application of Six Sigma methodology in project management assists every project manager's

effort developing strategies that are based on performance metrics and minimize complexities and uncertainties. Project Management itself is a process and by adding Six Sigma methodology this process could add value to an organization. By integrating Six Sigma in projects boosts stakeholders and customer confidence that project objectives are clearly understood.Project Management by itself is a process and by adding Six Sigma methodology could bring value and are best applied within the organization.Benefits can be identified by applying Six Sigma methodology in Project M anagement process some of these are listed above:

1. Projects linked to bottom line benefits and customer focused approach.
2. Improvements in project tasks over long run, thereby minimizes repeated problems
3. Better budget, schedule and quality awareness at each phase of project management.
4. Improvement in quality of projects and product delivery.
5. Development of staff skills.
6. Better time management.
7. Help to clarify project objectives and prioritization of project tasks.
8. Improvement in the lead time in new product developments.
9. Improved customer confidence in delivering project on time, within budget and improved quality.

3.2. S.I.P.O.C process

A**S**upplier**.I**nput**.P**rocess**.O**utput**.C**ustomer diagram is a tool used by a team to identify all relevant elements of a process improvement project before work begins. It helps define a complex project that may not be well scoped, and is typically employed at the Measure phase. It is similar and related to Process Mapping, but provides additional detail.

The **SIPOC** tool is particularly useful when it is not clear:

- Who supplies Inputs to the process?
- What specif ications are placed on the Inputs?
- Who are the true Customers of the process?
- What are the Requirements of the customers?

How SIPOC works:

The work flow is left to right – but we should think right to left. The system must have a purpose – to achieve something. The purpose is best defined from customer perspective – what does customer gain from interaction. The customer doesn't buy product / service simply to own it – but as a means to gain benefit. Feedback is necessary on the benefit in order to improve quality

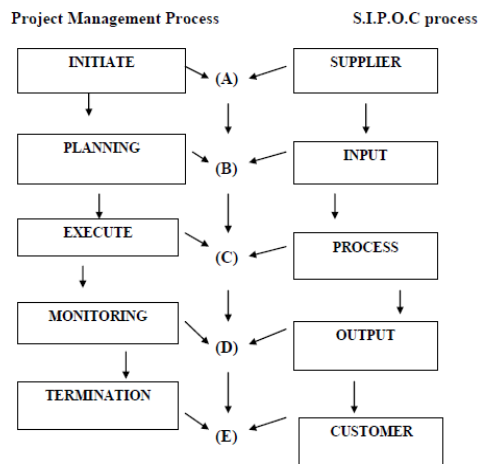| Supplier | Input | Process | Output | Customer |

S.I.P.O.C process

- **SIPOC – Suppliers and Input**
1. Systems have internal and external suppliers
2. Important to deal with complete supply chain – not just last supplier
3. Choice of supplier has impact – harder to deal with nonselective suppliers
4. M ost internal suppliers are nonselective
5. Some external nonselective suppliers – regulatory bodies
6. Leading the system involves working out win-win strategies with suppliers – help them to become system-focused suppliers – asking what is needed but is not supplied? What is supplied but not needed?
7. M anagers are the ultimate internal suppliers – definition, meaning, plans, priorities, equipment, materials, methods, environment – work on the system and in the system

- **SIPOC – Process**
8. Converts inputs to outputs
9. Involves an internal chain of steps – internal customers & suppliers
10. Define attributes of one step that are important to the next – key quality characteristics
11. Continuous feedback between process steps – to confirm characteristics are met and / or identify other characteristics
12. Focus on processes that add value to the customer
13. Process rhythm through teamwork – enjoy work, know job well, know each other, care –

management to understand importance of teamwork & create the environment for it.

- **SIPOC – Output**
14. Net result of the system¶s processes
15. We get what the process is capable of giving us – to improve output means improving the processes
16. Process must be appropriate to scale – cannot increase output simply by increasing effort – must redesign processes.

- **SIPOC – Customers**
17. Customers are those who gain or fail to gain from the purpose of the system
18. Custom er-in thinking not "product-out" approach
19. Customer –in mentality characterized by thoughtfulness – what else can we offer? – And continuous search to understand customers
20. Customer Chain - from our immediate customers - through intermediate customers – to end users

4. S.I.P.O.C AND PROJECT MANAGEMENT.

The target of this paper is to make a correlation between S.I.P.O.C process and Project Management primary process. The project life cycle ought to follow five basic steps so the project will accomplished with success.S.I.P.O.C diagram is a five steps process too. The following diagram analyzes the correlation between these two processes:

Initiate: The initiation stage is the most crucial phase as it determines the objectives, scope, purpose and deliverables to be produced – if not undertaken well, the whole project is doomed. This is where you list clear goals that you want to achieve through a project charter. The project charter consists of project scope, project authority and participants, and critical success factors. The charter is a short document that will define what the project team will deliver through a preliminary delineation of roles and responsibilities, what resources are needed, and why it is all justified. It also represents a commitment to dedicate the necessary time and resources to the project and will serve as a reference document for the future of the project. Key to this stage is a thorough understanding of your current business environment and future needs, and ensuring all necessary controls are incorporated to ensure that the final product will meet the specifications of the project charter.

Phase (A) of the framework is similar in both methodologies which involves the identifying the project and supplier's objectives. In this phase the purpose is to define and determine the nature and the scope of the project and also supplier's role. In this phase if it is not performed well the final outcome will unlikely meet customer's need's/project success. In this framework the supplier is the project owner, the project manager and the stakeholders who are involved in the project life cycle.

Planning: The planning phase is the time-consuming phase as you lay your project groundwork and design your system. Here we fill in all the details of your 'to do' list – a quite specific list that identifies scope, tasks, schedules, risks, quality and staffing needs in order for your goals to be met. Planning involves dissecting the project logically into clear and simple tasks and sub-tasks that can be sequenced on a timeline or calendar and assigned to specific people. Once you have your task list, you can assemble a workable order with measurable points of completion (milestones) – this will be your Work Breakdown Structure (WBS). Once your WBS is planned, you will need to detail the Organizational Breakdown Structure that specifies who is involved and who needs to be referred to. Scope planning (specifies the in-scope requirements), resource planning (determines who does what when), and budget planning (details costs incurred) and Project Schedule Development (exhaustive schedule of activities with their sequence of execution) are worked out. The Initiation phase can also define some facilitating processes necessary for successful completion that will need to be planned for here, such as procurement, communication; quality and risk management planning. Effort well spent in planning will save countless hours of confusion and rework in the subsequent phases. Project planning ensures that team members understand their responsibilities and

your expectations of them. At the end of this design stage, the project sponsor, management, end user and business requirements should all be satisfied.

Phase (B) of the framework characterized by detailed analysis of the basic elements that would be used in the process. Thus it must be defined clearly the project needs, the requirements that ensure project success, the estimated time, and the estimated cost of the project. Planning is vital in this phase. It begins with setting the project goals, identifying bottlenecks in the project tasks, cost estimating/budgeting, and risk management. The basic consideration in project planning is the work breakdown structure that divides the project into work packages and identifies the project subsystems interfaces to be managed. In this framework Input is equal with all the planning actions that project manager have to do in the early phase of the project life cycle.

Execute: This is the process phase where the 'to do' list becomes active and your best-laid plan is implemented with the bulk of your money being spent and most of your resources kept busy 'executing' the project. Most resources will point you towards project management software now if you aren't using something already – it doesn't need to be complex or expensive but it will keep you on top of everything. This is where the project manager's skills will truly come into play as good communication becomes essential (including keeping project stakeholders informed), people and resources need to be coordinated, and all costs, risks, changes and quality controls need to be effectively and efficiently managed (to name a few). The project manager is responsible for performance measurement which includes finding variances between planned and actual work, cost and schedule. Nothing must be neglected, even minor issues, if unnoticed, can cause major impact on cost, schedule and risk as well as deviating the project from its original goals.

Phase (C) of the framework is the combination of the execution stage of project management discipline and the stage of S.I.P.O.C process. In this phase the project management team directs the performance of the planned activities tasks interfaces that exist within the project. Deliverables produced as outcomes from the processes and work performance information about the completion status of the deliverables is collected as a part of this phase. In this phase process is similar to measurement. The focus here is to establish the relationship between customer's specifications, quality, and project's accurate methodology.

Monitoring: The entire process must be observed, measured and checked to ensure that potential problems are identified in a timely manner and this stage should provide feedback between phases so that corrective action can be taken. By watching work progress, you are keeping an eye on the original

project goal to ensure your project sticks within the original project scope. Controlling effectively means that the ongoing project activities (where we are) are checked with monitoring of project variables (cost, effort, time, quality) against the project management plan and the project performance baseline (where we should be). Corrective action is identified to properly address issues and risks (how can we get on track again).

Phase (D) of the framework is determined the performance of the project process targeting to achieve project¶s goals. In project management methodology monitoring describes the actions that ensure that project¶s goals are achieved. Monitoring defines that during the project process all the resources are used without additional cost and the deadlines were kept. In S. I .P.O.C process output indicates the final outcome of the process before the outcome arrives to customer. Quality is vital in this phase and additional quality control check ensures that the final outcome will meet customer¶s expectations.

Termination: Once we have finalized all activities across all of the process groups and the end product is accepted, we can officially close the project. Before popping the sparkling wine and patting ourselves on the back, we have some administration to do which includes archiving all the relevant files and information, closing any contracts and documenting the lessons learned. Lessons learned are integral to this final phase and the most important question is: Did the project deliver its intended end-product within the time and budgetary limits set? The answer provides a stepping stone to execute the next project with much more efficiency and control. Project managers mostly depend on their project management software for closure and good software can save you a lot of time here. If you have kept good records, this phase will probably be your shortest and once the stakeholders have all signed off, that congratulatory pat and glass of bubbly is well-deserved.

Many internationally recognized standards exist to manage a project – there is a Guide to the Project M anagement Body of Knowledge, or PMBOK® as developed by the Project Management Institute, or the second version of Projects IN Controlled Environments known as PRINCE2, to mention only two.

Various project management methodologies also exist, such as the systems development life cycle (SDLC), rapid application development (RAD); joint application development (JAD). There are also a number of charting methods, such as the Gantt chart and Project Evaluation and Review Technique (PERT) chart that have been developed as tools to create a graphic representation of a project plan and its current status. However, all these tools and methods will need to enter and complete the five process stages outlined above to manage the project effectively and find true success

Phase (E) of the framework is the last stage where the project is determined and customer receives the final outcome. In this phase lessons learned and analysis of the gains from the project outcome are presented.

5. SUMMARY

The aim of this paper is to start a debate on how these two management systems can be used and generate organizational growth.

Six Sigma and Project Management are relatively related, depending on the perspective used. The similarity between project management methodology and S.I.P.O.C process tend to prove that both Project Management and Six Sigma system can interact in such way to ensure organizational growth. Applying quality management techniques issues can be analyzed and resolved and efficient processes can be designed and implemented.Total Quality Management is actually a critical ¨business objective that needs constant focus to ensure that the defined objective is achieved. Project Management as a business philosophy focuses to project objectives.Overall the framework is an attempt to combine project management methodology and a Six Sigma tool. Six Sigma targeting customer needs and project management methodology targets the systematic approach of those tools that will achieve customer´s and project goals.

The author in this paper tries to combine a more managerial aspect of Six Sigma rather than the statistical part of it. It may be implied that analyzing data requires the use of statistics, but it is not implied that analyzing data must include

Project Management tools and practices. The S.I.P.O.C process seems to be closer to the managerial aspect of Project Management. Author tends to generate the thoughts of global society for further study of this mixture

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