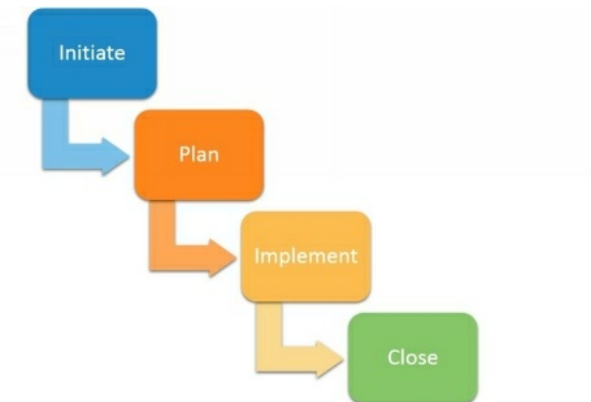


Methodologies in Project Management



Dr. Firend Alan Rasch

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Every effort has been made to make this book as complete and as accurate as possible. However, there may be mistakes, both typographical and in content. Therefore, this text should be used only as a general guide. Furthermore, this book contains information based on the author's research and experience that is current only up to the printing date. Thoughts and opinions may change.

Introduction

One common and essential characteristic of a project, is that it is a temporary endeavor, to achieve certain outcomes (deliverables) and to help achieve organizational/stakeholders' objectives, with defined beginning and end. Methodologies applied in projects, tends to directly influence the efficiency and effectiveness of project outcomes. Consequently, affecting the cost, quality, scope, time and outcomes. Mistakes happens regardless of the methodology applied. The first rule in project management is that "Nothing goes as you plan" (Firend, Al. R., 2019).

Methodology is defined as "*strictly defined combination of logically related practices, methods, and processes that determine how best to plan, develop, control and deliver a project throughout the continuous implementation processes until successful completion and termination.*" (MyManagement-Guide). There are numerous definitions of methodology in project management. However, there is a shared fundamental principle across all definitions. That is, methodology in project management helps project managers

direct the project, and keep it in track. Methodology help organizations to achieve outcomes that aligned with strategic objectives. This is especially true when considering that projects are expensive, changing and time consuming in nature.

All projects have three main components that a Project Manager (PM) constantly struggle with; cost, time, and quality. Various approaches to project methodology are the means of organizing and directing projects. These components are limitations that shape projects in the form of outcomes, deadlines and resources. As such, choosing the right methodology help achieve desired objectives and set outcomes in a most efficient and effective manner. There are six common types of project management methodologies. Each part will be discussed with explanation of its sub-parts.

This body of work is written while working in California's Silicon Valley as project manager, and teaching project management to MBA students. The intent of this work is to clarify the various methodologies applied in project management and simply these concepts to those

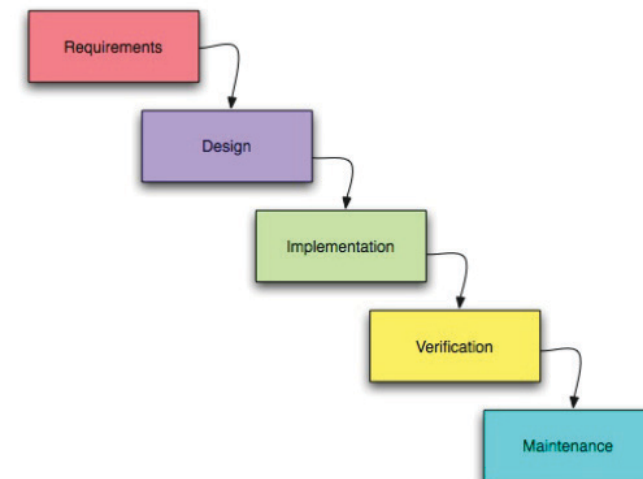
learning project management, and to those studying it. A study on critical success factors has been included at the end of this book to illustrate the importance of culture and the role cultural values play in defining project successes and failures for the benefit of the reader.

Firend Alan Rasch, PhD

Sequential Methodologies

Waterfall

Waterfall methodology is a system of Project management where each phase depends on the deliverables on the prior event. “Similar to the direction water flows over the edge of a cliff, distinct end points or goals are set for each phase of development and cannot be revised after completion.” This method is based on five non-overlapping stages.



The first type of project management methodology is the traditional, sequential. The most common type method is waterfall.

Waterfall help achieve objectives of a project through sequential steps. It is the simplest type. The logic of application and understanding of requirements in waterfall methodology is easy. The order of tasks is crucial, since the first task should come before the second. This method is best applied in projects that are related to physical result. For example, multistory house construction. It is important to note that any changes in the stakeholders' requirements, can lead to essential changes throughout the projects. Stakeholders cannot change requirements once the project has started. Example of successful project that used waterfall method is the US department of defense software systems.

Requirement: During this stage, requests for the project are analyzed and written down, such as deadline and guideline. This is where the project is defined and every-

thing is planned out.

Analysis: In this stage, the financial and technical resources are tested for feasibility before the start of the project completely

Design: In this stage the focus is on technical implementation – to design technical necessities such as data and programming language.

Implementation: This stage is about using the prior stages' results to try and implement the logic to make the project work

Verification: This is where testing of the project comes to place and analyze if there are any possible issues that may face the project. If the project is verified, then it continues forward.

Maintenance: This is where the project has been completed and is ready to live in the real world, this is where maintenance is needed to let it work for as long as necessary.

Advantages of Waterfall methodology:

- Simple and straightforward that allows everyone in the team to be aware and move forward toward the aim.
- It is easy to follow and organize even with big groups of people
- Allows for managerial control based on the deadline that is provided
- It clearly defines the objectives and deliverables.

Disadvantages of Waterfall methodology:

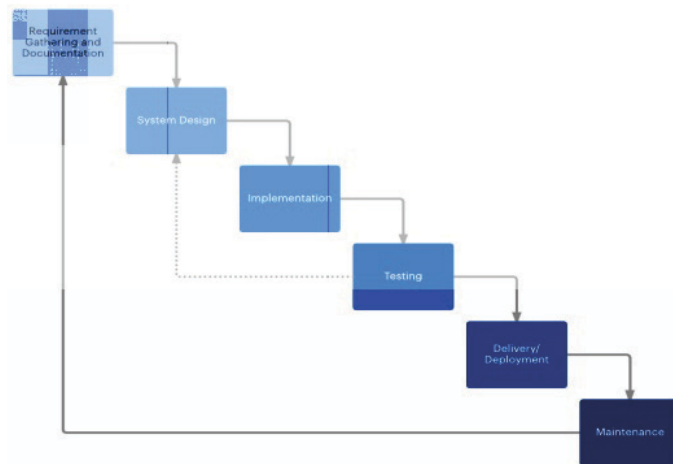
- If there is a mistake the entire project needed to start over to make it right.
- Testing is at the end of the cycle
- Reducing efficiency by not allowing stages to overlap
- Not recommended for complex projects.

Applications of Waterfall Methodology in Software Development

The waterfall process is widely used in the software developing industry, which was introduced in 1970 by Dr. Windon W. Royce. The waterfall model shows the importance of steps to be taken throughout the software development life cycle (SDLC). It is also known as the linear-sequential life cycle model. It is sequential; each

phase has to be completed in order to move onto the next stage without overlapping, the waterfall management does not allow you to return to a previous stage. The only way to revisit a phase is to return to stage one and start again. This has its advantages and disadvantages in my point of view and will be elaborated more in this report. Many years ago, this methodology was used to develop enterprise applications such as HRMS (Human Resource Management System), Supply chain, Inventory, and others. Even though nowadays some organizations prefer the Agile methodology, but the Waterfall is still highly used in the military and aircraft programs as they have strict standard and requirement that they have to follow. In these industries, the conditions are known well in advance and are very specific about the deliverables. This model is also preferred in the banking industry and healthcare sectors.

The six stages



("What the Waterfall Project Management Methodology Can (and Can't) Do for You", 2019)

1. Requirement – this is the initial phase where all the requirement is analyzed and documented for future use. In this stage, it has to be documented what the application should do but not how it should be done. At the end of this phase, the requirement should be clear and communicated to the members, ensuring each one is clear on what is expected of them.
2. Design – in this phase, the team members starts with designing the specification such as hardware and program language, without coding as of yet.
3. Implementation – this is when the information from the specification above is used, and the programmers start with coding to create a functional product. This is usually done in small

pieces and integrated at the end of this phase.

4. Testing – in the testing phase, the trial of the product takes place, and if any issues arise should be reported. For severe problems, the project will have to return to phase one.
5. Delivery/ Deployment – this is when the team submits the deliverables, and the product is complete and ready to be released.
6. Maintenance – this is when the clients may report any issues, and if the problems are significant, they may need to go back to phase one, otherwise provide maintenance to the product.

Advantages of Waterfall Methodology

This is a strict system; it is highly used in manufacturing and construction industries because in these projects, the phases have to be in a sequence. The first step in a project is planning and setting an explicit requirement. All of this information needs to be documented and communicated to everyone that is involved in the project. Documentation is a priority in the waterfall project management methodology; this has to be done in each phase. A 2017 report from LiquidPlanner showed that 25.5% of manufacturing companies currently use waterfall, according to ("What the Waterfall Project Manage-

ment Methodology Can (and Can't) Do for You," 2019). One of the most significant benefits of waterfall project management is it only functions through documentations in each phase; therefore even if there are changes in the team members during the project cycle, they can continue and pick up from where they had left from. Another benefit is that it clearly shows the progress of the project, and makes a project easy to manage. You can track where the project is at any given time and where it should be. As Patrick Rockwell, who is the subject expert, correctly says:

"Though less common these days, when your end product's requirements are fixed yet time and money are variable, choose the waterfall method. I like to imagine a scientist doing research for a big company—through trial and error, he'll likely restart his whole process many times and at different stages to get the coveted final result. Through waterfall project management this behavior is anticipated and even preferred! This enables members to adjust and re-think their approach time and time again" from: ("What the Waterfall Project Management Methodology Can (and Can't) Do for You", 2019).

Disadvantages of Waterfall Methodology

The waterfall project management can be problematic if the requirement is not clear, whereby the user has an idea of what they want but is not absolute. In this case, they will face the issue of returning back to phase one several time during the cycle as the waterfall methodology is strict and the outcome of one phase acts as the input for the next step sequentially (Householder & Firend, 2006).

This methodology is not adaptable to change, therefore its best suited for the project which is well defined in the beginning. Without this in mind, the project will face more cost and will need more time as it keeps going back to phase one which will cause a delay in execution stage this can negatively impact both the user and the project. Another disadvantage is risk and uncertainty; therefore, it's not suitable for complex and object-oriented projects.

Conclusion

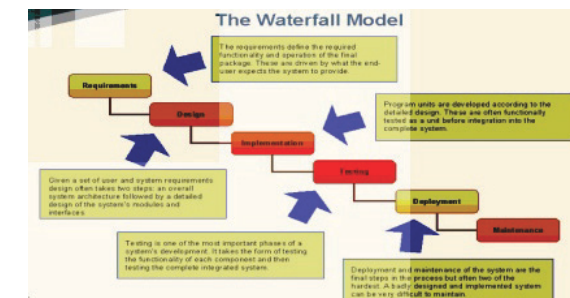
In conclusion, I would recommend waterfall methodology for industries that have a detailed requirement, with a few changes in the course of development (Firend, 2006). This project needs to have a defined outline and already know what they want in their outcome. Such industries include military, banking, or healthcare. It is also used in construction industries when they have the same logic of going according to the plan. Each project is different, and the industry must identify what their aims and objectives are, and then choose a methodology that will make their project successful.

Success Case: Waterfall Methodology

Waterfall Helps manage a Drought

Case: State of emergency was announced in San Joaquin Valley, California because of shortage in rain, that affected farmers, residents, and businesses harmfully in the area. **Project Manager:** Mike Carbajal, Capital project planning manager launched a \$500 million to diversify its water system. The city planner needed to make a better environment for the people, so he brought

construction engineers and made Gino Rapagna a senior manager for the project to fix the issue. Rapagna chose to use waterfall approach to solve this problem. As a result of their technique and decision, they managed to fix the issue and their effort succeeded in the project in 2013 and managed to make more projects with more benefits. “You could use agile methods to problem solve day-to-day issues, but you need a phased approach to manage a project of this scale and to keep it all on track.” Said Mr. Rapagna, the senior project manager. He mentions that in construction fields, managers use waterfall methodology to have a successful outcome on a bigger scale.



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Agile Methodology



Agile is one of the most popular methods in project management. This method was developed in 2001. Its groundbreaking ability to transfer value from projects to stakeholders helped its implementation popularity. Agile approach emphasizes adequate and continuous decisions making, continuous testing and continuous integration of phases.

What is Agile

Agile originated in the world of IT projects but is now used in both IT and non-IT environments; it can be applied both to projects and to business operations. Underpinning agile is the well-documented observation that

most organizations are wasteful in how they invest their resources, especially of time money and people. Agile is all about the elimination of this waste, and by the waste, we mean anything that is not important to the organization.

This broad definition of waste taken by agile means that all of the following are wasteful

- Delivering work late
- Projects whose scope includes items of dubious value
- Business processes that add little or no value
- And rework

Now obviously no organization sets out to be inefficient, and yet research shows that time and time again current management methods often lead to waste just like these examples, and it's precisely these management methods that agile seeks to transform to the benefit of both the organization and to the individuals working there.

The Core Elements of Agile

The agile approach, whether applied to projects or to business operations include the following essential elements:

Prioritization

The first and most crucial element of agile is to prioritize those things that are important to the organization. Now this sounds obvious, but it has some less obvious consequences it means:

- Challenging existing activities to eliminate those that add little value
- And to include new activities that do add value: This can be a difficult discipline to learn but very powerful when your organization is truly able to focus on what's valuable, if in doubt about what's valuable to your organization put yourself in your customers shoes, what's important to them is probably essential to your organization to. Using this thinking, it's possible to create a hierarchy of importance from crucial right down to unimportant.
- Focusing efforts where they'll add most benefit or eliminate most waste: now again this sounds obvious but it can have some profound implications, for example let's think about how this might impact project work, compared to a traditional project which says what do we want and now let's estimate how long it will take, an agile project says how long have we got now let's deliver what we can the most important stuff first.

And it's this last point that leads on to the second essential element of agile.

Time-boxing

Time-boxing means we agreed on a fixed amount of time that we'd spend on the things that an organization needs.

- Agile projects are a fixed duration
- spend a fixed amount of time doing each process

Time-boxing coupled with the ability to prioritize what's necessary; it is a pragmatic solution to the problems of overrunning projects or process improvement initiatives that deliver diminishing returns.

Time-boxing means we deliver the biggest bang for our buck, which is what most organizations want; however, there are a couple of other essential elements of agile is to work well.

Collaboration

Working in an agile way requires close collaboration between people who have a need "let's call them customers" and people who build what's needed or suppliers. Successful agile working requires customers and suppliers need to form a highly collaborative team: this is important because experience shows that only with high levels of collaboration is communication effective enough to

deliver beneficial solutions.

Team Empowerment

The final essential ingredient is that agile expects team members to be empowered to make decisions without always having to refer to others, this is important because agile is fast-moving and it can only make rapid progress if team members are empowered, skilled, and willing to take accurate decisions within their teams.

Now clearly there's more to agile than just these four elements but learn to do these four elements effectively, and your organization will be well on its way.

The Four Barriers to Progress

As such, what are the common roadblocks to agile progress? Here are four common barriers, being aware of these now can help us think about how we might avoid them;

The first barrier is fear of change: every leader knows that there are significant shortcomings with traditional management methods, but there is a reluctance to change be-

cause organizations have grown used to accepting their flaws or being able to work around them, for example, organizations have grown used to adding contingency to project estimates because they have learned that project usually cost significantly more and takes substantially longer than expected initially, but having the courage to change to an agile approach can completely eliminate this problem.

The second common barrier is fear of loss of control: traditional managers are taught to exercise control over their responsibilities through the detailed delegation of tasks and reporting of progress, but agile managers learn to delegate high-level objectives only and let the team work out the best way to meet them. Traditional managers often perceive this as a loss of control, but in reality, the controls are merely different not lost.

The third barrier is the reluctance to implement a top-to-bottom culture change: for agile to work well an organization needs to be ready to embrace the approach from the most senior level downwards, in this respect agile is no different from any other management ap-

proach, everyone in the organization must be prepared to walk the walk not just talk the talk.

The final common barrier is where reward structures run counter to the agile approach: we've seen that agile values core components such as close collaboration in teams and yet many reward structures run counter to this by rewarding individual contribution over teamwork. For agile to work well, all these factors need to be aligned, or you risk sending mixed messages.

New Habits to Acquire

From a management perspective, what are the behaviours that you'll need to acquire and share in your teams to lead in an agile way, here are three keys ones to be starting with:

The first habit is to learn to prioritize according to business need to recognize that not everything is of equal importance to the organization, for example when leading an agile project to accept that delivering the important stuff on time is usually better than providing a vast wish list but delivering it late.

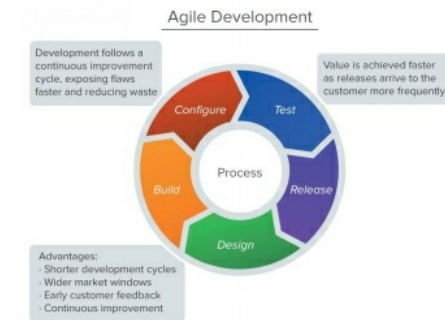
Secondly to learn to truly empower your teams: this means getting comfortable with setting high-level objectives and then being ready to step back and let your team get on with it, so long as your team is delivering results then that's fine, they don't need detailed control from you, of course, you may still need to step in, but that should only be to remove a roadblock to their progress or to clarify objectives.

Finally, to promote innovation and learning: this means listening to the ideas that your team comes up with and being prepared to act on them, and possibly being prepared to accept the occasional failure as team members learn and innovate, your team will become stronger as a result.

The four main value this method offers are; being customer oriented, quick response to changes, contract negotiation and individuals and interactions over processes and tools. The common theme between different elements that shape agile method is that the goals or de-

liverables are totally clear, prevents obscurity from happening, and that it is customer driven since it allows for changes throughout the lifetime of the project. Agile methodology has the following frameworks; Scrum, Kanban, Extreme Programming, and Adaptive Project Framework. The change management process focuses on changes and alteration within the project phases, with emphases on risk and control of changes.

Agile refers to a set of values and principles that govern a style of software development that encourages iterative, collaborative and results-focused development. Agile is the umbrella for several popular methods such as Scrum, XP and others. It's a kind of venture administration prepare, primarily utilized for computer program advancement, where requests and arrangements advance through The collaborative exertion of self-organizing and cross-functional groups and their clients. Many graceful ideas emerged in the 1970s. Studies and reviews were conducted on an agile way to show their reactions against the traditional approach or progress of the project.



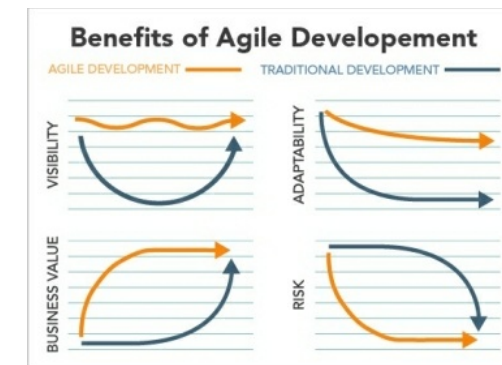
History of Agile method:

In 1970, Dr. William Royce published a paper discussing the management and development of large software systems. The paper outlined his specific ideas on successive development. His presentation stated that a project could be developed much like a product on the assembly line. Each stage of development must be completed before the other phase begins. The idea of developers first needs to assemble all the requirements of the project. The next step was to complete all the designs and architecture. Then comes the code. The sequence continues in full increments. Upon completion of these phases, there

is little or no communication between the specialized groups that complete each step of the project.

There are many benefits of the Agile project management:

1. Methodology Agile ways can have the difference in managing work more efficiently and doing the work more effectively while delivering the highest quality products within budget constraints.
2. While Agile teams work as a unit and can better interact with the inevitable changes that come with most projects, there is one aspect of project management that is often overlooked by Agile teams: visual management.
3. Utilizing visual administration, Dexterous groups can improve their capacity to work successfully by displaying information in a visual instead of in a spreadsheet or wiki arrange. This way, it is less demanding to get it venture points of interest and alter administration.



Major benefits of visual project management for Agile include:

- Ability to scale
- Increase team efficiency
- Clarity of project details
- Ability to adapt to changes

Agile Team Structure:

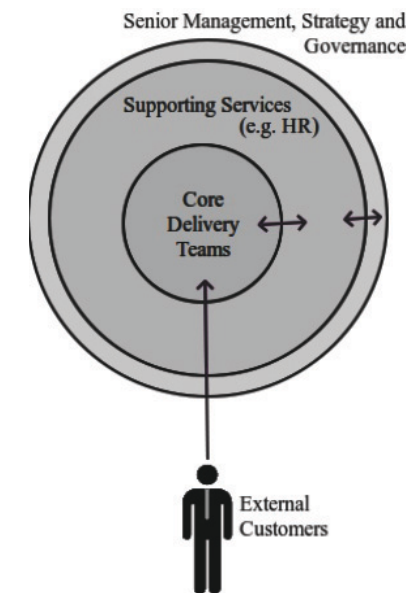
Multifunctional teams are the heart of your organization and must contain all the essential skills required to

meet the requirements of their customers. When your teams determine that additional skills are required to submit new requirements, you must have the power to recruit or transfer staff with the skills to their team. New teams can be easily established by allowing the team to self-organize from existing teams (or direct recruitment) around a new set of customer requirements.

Temporary teams can also be dynamically created outside traditional hierarchies and departments. This is extremely important for delivering project-based results, or for developing typical R&D products. After you submit their requirements, you can either convert the temporary teams to a new partition or move them to an existing partition

This differs from traditional hierarchy or matrix management structures, where one team will begin the process, and in the predetermined stages, requesting input or delivery from another team. By passing work between silos, the strict matrix organizational structures lack firm ownership of the work, causing poor interdepartmental communication, and increasing delays in the

overall process.



Case study on Agile Methodology:

LEGO began its journey to agility by introducing

changes at the *team level*. There were 20 product teams working at the organization at the time. At first, just 5 teams were transformed into self-organizing Scrum teams. Then, bit by bit, the remaining 15 teams followed in their footsteps.

The result of that initial change was that although individual teams had become Agile, they still couldn't cooperate effectively together. To make that happen, LEGO followed the Safe. At the program level, you've got a team of teams (also known as Agile Release Train, or ART for short).

At LEGO, the team of was meeting every 8 weeks for a big room planning session, which lasted for one and a half days. During this meeting, teams showcased their work, worked out the dependencies, estimated risks, and planned for the next release period.

There's also the *portfolio level*, which is the top layer of the system. This is where you've got long-term business plans, stakeholders, and top management.

Such division into organizational levels is typical for the SAFe framework.

The result:

- Once you've enabled engineers to oversee their claim work, say farewell to the armed force of "managers with spreadsheets." You'll be able halt doing over the top documentation and other ineffective hones. Developers now give more accurate estimates, and the outcomes have become more predictable. Previously, the person who shouted the loudest could get their work done faster. Now, with visibility taken to the extreme, decisions are based on real necessity.
- Nothing beat face-to-face communication and the positive effect it has on group morale.
- Especially the communication that happens amid LEGO's enormous room events
- Especially the communication that occurs during LEGO's big room events.

Case in Agile at IBM

IBM is one of the biggest technology companies in the world known for creating computer hardware and intel-

ligent systems. Agile Scrum played a crucial role in improving IBM's business operations so much so, that it offers its own management software that incorporates agile development environment called IBM Rational Team Concert.

IBM began by identifying three areas of change:

- Process
- People
- Tools

The end result was that IBM witnessed improvements across the board, in metrics such as on-time delivery, defect backlog, beta defects fixed before GA, maintenance, and innovation.

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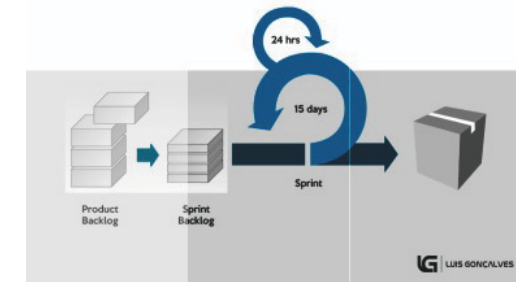
SCRUM Methodology

Scrum approach in project management proposes that projects development should follow a series of sprints. As in the case of agile methodology, sprints are defined as timeboxed amounting to a maximum of one month long each. Generally, time boxes tend to last about two weeks. During which, an agile Scrum-Sprint, whereby the Scrum team deal with small set of characteristics of an idea to test functionality.

Difference Between Agile and Scrum

Agile describes a set of directed values and principles that applies dull method and approach to software development. **Scrum in the other hand**, is more of a specific set of guidelines that must be followed when involved in **Agile** software development for instance.

Scrum Process - Overview



Source: <https://luis-goncalves.com/what-is-scrum-methodology/>

Application in software development

The Scrum Product Owner is assigned a task of developing a new software project. He first starts by collecting engineering requirement, then moving on to architect cases, customer representative and finally other important stakeholders. The product owner prioritizes each of the task and writes them down in the backlog to have an estimation of the completion of each task and the breakdown of each level. As per Scrum's methodology, the event are sectioned into sprints.

Sprint 1: Day 0

The Scrum product owner present the product backlog during the sprint meeting, where they decide with the

team the most important task and prioritize from one to eight and the feasibility of completing each of them. Now, the scrum master writes down each task on a card at the task board for the teams to pick which one they want to work on.

Sprint 1: Day 1

Early in the morning the entire team meet up to discuss the update on their task, what has been done so far, an estimated timeline for completion of the task, they put it on the sprint task board and what every person is planning to do. A problem arises with a licenses of a software tool. They put the problem on the board and they carry on with the rest of the work until this issue is solved.

Sprint 1: Day 2

The entire team is having their daily meeting discuss their project. An issue occurs, they call the Scrum product owner to discuss and solve points and how to get back on track.

Sprint 1: Day 28

For the final day of the project, the entire team get together with the Scrum Product Owner for a sprint review

meeting. The team prepare the software implementation and the Scrum Product Owner checked each of the requirement to see if features falls within the expectations. Six out of the eight task were completed. Two had to re-done or re-factored, the team re-grouped the next morning to talk about the issues during the first sprint and the feedback they got from the scrum product owner in order to fix it.

Sprint 2: Day 1

Because two tasks had to be re-done, the Scrum Product Owner adds it to his backlog and a second sprint commence.

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Critical Path Methods (CPM)

Critical Path Methods (CPM), which is a subcategory in the traditional, sequential methodologies was developed around 1950s and based on the idea that in order to achieve a task, the previous (proceeding) task should have been done already. Any postponement in a given task in the critical path, will results in parallel delay in the project. Any project can have one or more critical path ways.

CPM has four fundamental elements. They are; critical path analysis, float determination, early start and finish calculations, and late start and late finish calculation. Within this process, the critical paths will be determined. Knowing the critical paths, allow managers to set priorities and allocate resources more efficiently. This

process helps determine the most important tasks to perform and prioritize them accordingly. Such methodology supports rescheduling, in favor of optimizing performance of the team, with the objective of getting the jobs done on time. Example of critical path method is bright hub project.

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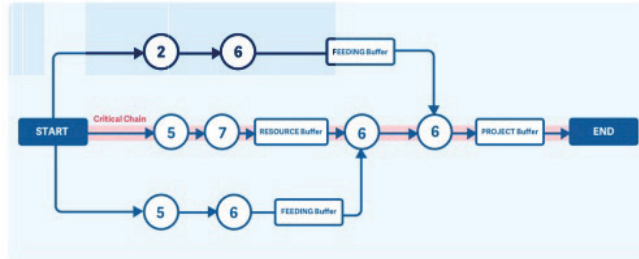
Critical Chain Project Management (CCPM)

Critical chain project management is another subcategory in the traditional, sequential methodologies. This method emphasizes the input *resources* that are needed for project's performance. This method starts with identification of the most important tasks to be done in a project. The crucial tasks to be conducted are determined first, so that enough resources are allocated to ensure that those tasks have priorities for meeting better defined deadlines.

This method developed as a result of numerous projects that faced over budgets, and inaccurate-deliverables.

For example, Harris Semiconductors business is to produce semiconductor Wafers. By using

CCPM, Harris Semiconductors can reduce the time required for finishing each stage and manage the problem of going over budget.

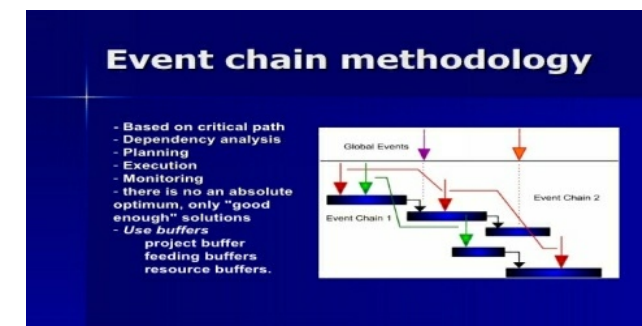


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Event Chain Methodology (ECM)

Event chain methodology (ECM) helps with assessments of available risks that are out of the scope of the projects. By taking such risks into consideration, stakeholders are more aware and prepared of possible risks. ECM method can include processes, such as identification of uncertainty that is useful for risk and response planning. Qualitative and quantitative analysis and risk monitoring are characteristics of this method.



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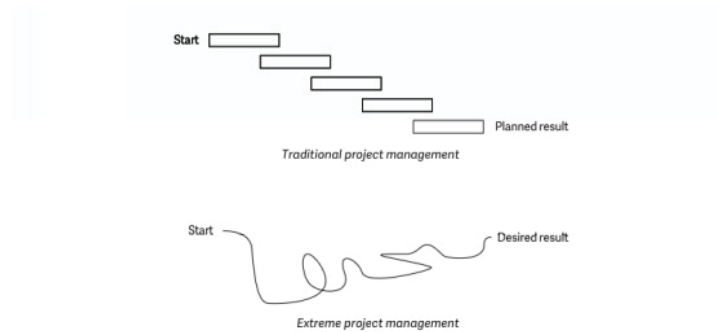
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Extreme Project Management (EPM)

Extreme project management is quite opposite to water fall method, since it allows project managers plenty of room for changes during implementation and for a project to continue forward. Final products, services, quality issues and budgets, can change, to meet changing needs as they emerge.

This process-based is a methodology emphasizes the collection of processes, leaning as you go, streamlining and minimizing wastes. EPM approach project management through braking down and identifying, eliminating unnecessary parts, and delay factors. The ultimate objective is to use minimum labor, less cost and less time to produce maximum output. This methodology helps in defining policies, that guide the operations of the organization. Amongst the benefits of this style is that it increases value-added activities, which leads to cost reductions.



Source: <https://activecollab.com/blog/project-management/extreme-project-management-xpm>

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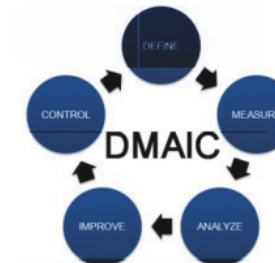
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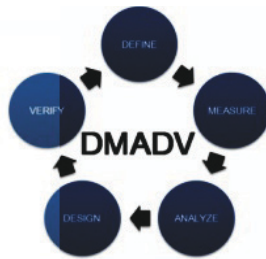
Six Sigma

Six Sigma is a methodology that is concerned with quality development, throughout the phases of the project, by calculating and controlling possible defects and/or bugs. The aim is to have final deliverables with zero defect. Six Sigma is most suitable for manufacturing and production. It uses the following two approaches:

DMAIC which stands for; define, measure, analyze, improve and control.



DMADV which is define, measure, analyze, design and verify.



From statistical point of view, the term “Six Sigma” is defined as “having less than 3.4 defects per million opportunities or a success rate of 99.9997% (these computations assume a 1.5 sigma shift in the process mean, 1.5 to account for long term variation) where sigma is a term used to represent the variation about the process average. Antony, J, Banuelas, R. (2002). In the business world, Six Sigma is defined as a *“business strategy used to improve business profitability, to improve the effectiveness and efficiency of all operations to meet or exceed customer’s needs and expectations”* Antony, J, Banuelas, R. (2002).

Six Sigma was heavily used in 1980s by Motorola, in depicting the whole approach towards management. Six Sigma is used in big organizations such as GE and Motorola in developing the processes which are efficient in

completing projects and in staying relevance to their organizations. The Six Sigma method was used successfully by many organizations like Boeing, DuPont, Toshiba, Seagate, and many others.

The Six Sigma method concentrates on analyzing requirements of customers in a better way and eliminating the waste and defects in the organization. The objectives of Six Sigma is achieved by intense knowledge on engineering, statistics and project management besides systems and process within the organization. Six Sigma objectives are in improving “organization's products, services and processes across various disciplines, including production, marketing, finance, and administration.” (Anbari, F.T. 2000).

The benefits of Six Sigma include “better understanding of changing customer requirements, improvement of quality and delivery, reduction of waste, reduction of cost, development of robust products and processes, enhancement of competitive position, and sustained competitive advantage through continuous improvement of

all business systems in the organization.” Six sigma projects are quality improvement projects and six sigma projects. Six Sigma project management tools consists of “project identification and selection methods, basic team development approaches, basic project planning and control tools, and post project evaluation methods.” Organizational Structure through Six Sigma is basically through **The Six Sigma Project Management Structure** Where there are various titles are provided on the name of belts. The Black Belts work on full time Six Sigma Projects. The Green Belts work on part-time Six Sigma projects. (Anbari, F.T. 2000)

DMAIC road map for Six Sigma

The important tool for Six Sigma approach is DMAIC road map to develop project through scientific method. The core tool to the Six Sigma approach is the DMAIC roadmap, which is a more scientific method for project development. It's a flexible, formalized problem-solving process that includes the following five steps: Define, Measure, Analyze, Improve and Control. The DMAIC cycle serves to define a process “to im-

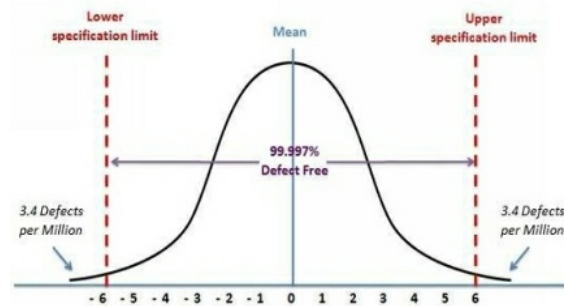
prove, measure the baseline and target performance of the process, analyze the process data to determine the key process inputs that affect the outputs, improve the process to optimize the outputs, and, finally, to control the improved process for sustaining the improvement”. (Andersson et al. 2006:287; Foster 2010:429; Su et al. 2006:4).



Six Sigma Table and a graph explaining the meaning of various levels of Six Sigma.

Sigma Level	Defect Rate	Yield
		Percentage

2 σ	308,770 dpmo (Defects Per Million Opportunities)		69.10000 %
3 σ	66,811 dpmo		93.330000 %
4 σ	6,210	Dpmo	99.38000 %
5 σ	233	Dpmo	99.97700 %
6 σ	3.44	Dpmo	99.99966 %



Source: Dr. Maruti Prabhakar Rapaka. *Int. Journal of Engineering Research and Application* www.ijera.com ISSN: 2248-9622, Vol. 7, Issue 1, (Part -5) January 2017, pp.49-52\

Applications of Six Sigma:

According to (Maddox, 2004), many companies have started using Six Sigma in improving processes related to marketing. GE and DOW have been utilizing Six Sigma in developing new product and customer support in reducing cost, enhance profitability and performance.

Research by (Brewer and Bagranoff, 2004) on Six Sigma methodology, which made path towards accounting function and made contribution towards error reduction to process invoice, cycle time reduction and optimization cash flows. The research made by (Donnelly, 2007) on Six Sigma in creating new standardized process on services related to accounts payable at *The U.S. Coast Guard Finance Center*, revealed that level of customer satisfaction was improved after using Six Sigma concept.

Many organizations applied Six Sigma in reducing “variability in cycle times, error rates, costs, “days to pay” of accounts payable, and improve employees’ productivity ratios” (Brewer and Bagranoff, 2004; McInerney, 2006).

Case Study in Six Sigma

Company A: Solar Cell Manufacturer

Background: The first case represents a Solar Cell manufacturing company based in southern part of India which manufactures different types of solar powered products. They have a customer base throughout the country and outside. Since the demand for non-conventional energy is increasing, this is a fast growing organisation. This company employs around 850 people. The company has developed a good quality culture where every employee feels the importance of quality in everything they do. Although the company has been quite successful in implementing Six Sigma across the manufacturing operations, it has extended the applications of Six Sigma to non-manufacturing operations such as HR and Finance.

Six Sigma Organisational Infrastructure: Company A has embarked on Six Sigma journey for over 7 years. The senior management team in Company A has proposed a long-term plan to ensure that all employees participate in Six Sigma methodology. During the first year of the

Six Sigma program, 22 projects across the manufacturing operation were selected. These projects were assigned to Black Belts in the company. This company today has over 2 Master Black Belts, 3 Six Sigma Champions, 32 Black Belts, 60 Green Belts and over 100 Yellow Belts.

Barriers/Challenges to implementation: There was strong resistance from shop floor workers and some supervisors towards the Six Sigma journey in the early days of its adoption. There was a clear lack of understanding of the benefits of Six Sigma and the need for change using Six Sigma as a catalyst for change. The senior management team decided to provide a one-day awareness program for the people on the shop floor so that they understand the expectations and the need for the Six Sigma initiative within the company. Moreover, an Executive awareness was also introduced to all senior management team so that they understand the importance of Six Sigma and the benefits Six Sigma can be brought into the business.

Benefits of Six Sigma: There were a number of benefits reported from a direct application of Six Sigma methodology from Company A. These included:

- Improvement in the yield of the printing process – yield was improved by close to 4% from the use of DMAIC methodology and resulted in savings of over \$140k per annum.
- Reduction of rejection or rework rate from a number of projects was reported across the company – one project has looked into the high rework and rejection rate of solar cell panel lantern. The application of DMAIC methodology has helped the company in reducing the rework and rejection rate from 18% to nearly 5% and saved over \$65k per annum.

Commonly used tools and techniques of Six Sigma: The Six Sigma Black Belts and Green Belts have used a number of tools and techniques across a number of projects. Based on the interviews, it was found that the most commonly used tools and techniques were:

- Supplier-Input-Process-Output-Customer analysis (SIPOC)
- Cause and Effect Analysis or Ishikawa diagram
- Cause Validation Plan
- Control Charts (Individual chart, P-chart, U-chart etc.)
- Hypothesis tests (2 sample t-test, F-test, Kruskal-Wallis test (non-parametric test), etc.)
- Graphical tools to understand variation and patterns (Histogram, Box-plot, Dot plot, etc.)

Impact of Six Sigma on Business Performance: One of the questions asked by the researchers to two Six Sigma champions was about the impact of Six Sigma on Business Performance. In fact, both Six Sigma champions explicitly stated that Six Sigma did have a positive impact on Business Performance. It was reported that there has been a significant improvement in customer satisfaction on two performance indicators (on-time delivery to customers and cost of poor quality) consistently across the business as a result of the DMAIC projects. The two champions also reported that Six Sigma has a direct impact on process innovation. In other words, they have agreed

that Six Sigma fosters incremental innovation for many of their business processes today.

Case: Microsoft Corporation



Industry

Microsoft Corporation is an American multinational technology company who develops and manufactures computer software as well as personal computers and similar services. Microsoft is one of the largest companies in its field mainly known for its software products, such as Microsoft Windows.

Win/Loss review process

Microsoft started using Six Sigma methodology after noticing a shortage in their win/loss review process. This process was taking place in order to understand who their sales team was competing against in terms of opportunities. They wanted to know who they are winning or losing against. This process was important for Microsoft because growing opportunities was affecting revenue and grow value of their stakeholders. In conclusion, Microsoft used define, measure, analyze, improve

and control phases for a better win/lose process.

Six Sigma Phases



Define Phase

In this phase, with the help of leadership, Microsoft wanted to build a business case to address the issues. They conducted several researches and surveys to have a better understanding of their win/loss process mainly to know who their main beneficiaries were, and how this process was being handled. Sales teams were seen as customers and further research was done to know what was requested from this process.

Measure Phase

After targeting sales teams as customers, Microsoft conducted a wide survey within their company on account manager and sales specialists who are the individuals that could own specific opportunities. The purpose of this survey in measure phase was to capture the voice of customers.

Analyses Phase

In the analyses phase, Microsoft created a diagram called Fishbone. They used this diagram to generate theories faster and understand the causes and effects of the current win/loss process of the company. Furthermore, it was used to identify which areas could have been causing deficiency in the current process. Through the brainstorming received from the experts, Microsoft was capable of developing potential causes.

Improve Phase

The information from the earlier phases helped Microsoft design an enhanced win/loss process. Thirteen regions were used for a formal pilot project to test and design new process and sales model. The focus of this new design was to move closer to the points that the opportunities were being closed. On the contrary, the former process was more focusing and depending on whether the opportunity was a loss or not.

Control Phase

Microsoft created and documented a control plan to make sure that the new process was efficient and under control all the times. The focus of this control plan

was to make sure in sales review meetings of the company, win/loss process was strongly concentrated on. By having a series of measurements and identifications on owners who collected and represented the data, strong adoption of win/loss process was achieved.

Challenges

It was difficult to understand the impact of Microsoft's competitive position in the market due to the sparse competitive intelligence from sales teams. "To complicate matters, an additional outcome classification, "disengage," was used as a convenient alternative to what might have otherwise been either a loss or a potential win that was walked away from too soon" (Rick Marcet, *"Win/loss Reviews"*).

Issues:

Issues faced by Microsoft was that field leaders owned their business and had different practices. They were disconnected from the centralized process given by Microsoft. They used different strategies and methodologies

in which some of them focused mainly on losses and others on wins. There was no strong adoption nor an efficient method of analyzing win/loss process by field sales teams.

Solutions

Microsoft hypothesized that a more efficient win/loss review required focusing mainly on front-line sellers rather than corporate stakeholders to have a better experience in collecting and analyzing insights on actual basis. Furthermore, this was believed to eliminate redundancies and develop understanding of same source data (Rick Marcet, “Win/loss Reviews”).

Results

By applying Six Sigma phases, Microsoft was able to reduce shortage in their win/loss review process as well as having a stronger adoption on the subject matter. This showed Microsoft that front-line sellers play an important role in understanding the win/loss process. Moreover, they have better knowledge in recognizing sales efforts and that this process is mainly driven by them.

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Lean Methodology



Lean methodology is mainly used in manufacturing but it's also best suited for businesses and organizations that are looking to do things differently. The main goals are maximizing customer value and minimizing waste. It focuses on creating more value for the customer by using fewer resources. It comes from the Japanese manufacturing industry, its core value comes as the waste is less, the quality improves while production time and cost are less. Lean methodology encourages maximizing customer values of product or service while minimizing the waste and resource. As the waste is reduced, so the cost and time of the production will be reduced and then the quality improves.

The definition of lean varies depending on the different sources, for example “In the United States, the predominant thought is that Lean is a system of tools and techniques for reducing waste and adding value in every process. In Japan, Lean is considered a mindset and not a set of tools.” (Quality-one.com, 2015). But all the different definitions have the same core meaning that I mentioned above.

There are three types of waist and they are known as the 3M's: Muda, Mura, and Muri. Muda is about how to remove waste. it is an activity or a process that does not add any value and it can be a physical waste of your time or a waste of resources. It is characterized into seven: transport, inventory, motion, waiting, overproduction, over-processing, and defects.

Mura is about the flow and how should everything, which concerns eliminating vacancies in the workflow process at the scheduling and operation level, flow evenly. Finally, muri, which means removing overload in order to the work to go faster. The Japanese version of lean manufacturing is called “Kaizen”.

Lean manufacturing had put Japan in general and the Toyota Motor Corporation in specific on the map. The way Toyota does business is truly remarkable. Along with its subsidiary companies and suppliers, Toyota was able to obtain incredible increase in production process with maximize termination of waste and maximize profit. Lean manufacturing principles forgetting a quality improvement process at minimum cost and are also important for training, assessment, evaluation of your organization. There are two reasons for why it is important to have lean group meetings for successful lean manufacturing. It is a good opportunity for first line employees and managers to decide on improvement activities. Second, it is a powerful method team building exercise and employee motivation.

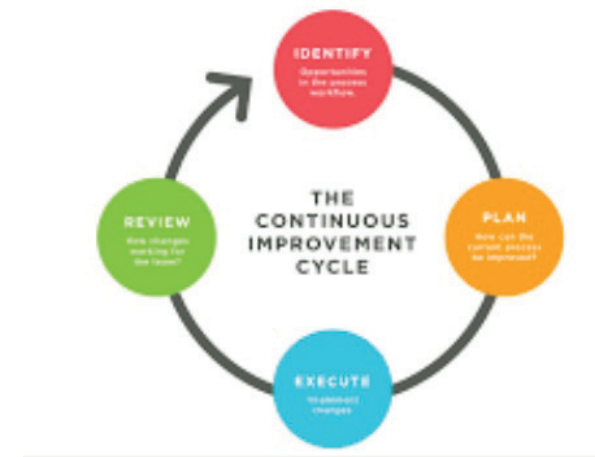
Another important point lean manufacturing is standardization because it can improve the process and make it more effective. There are three steps so that standardization principles be implemented effectively which are establishing, teaching, observing. Another successful example of lean manufacturing is INTEL who are known

for their computer processors. The industry demanded zero bugs so the company adopted lean techniques to provide a higher quality product. Microchips used to get to the factory in three months, such ideology help the company lower that number to less than 10 day. The company realized that producing higher quantity and lower quality was not the way to improve profits and increase customer satisfaction. Therefore, they added quality control factors and waste reduction techniques with which both made profit.

A third example of a company that used lean manufacturing is NIKE. NIKE gained less waste and higher customer value but also they reduce by 15% of poor labor practices in their overseas manufacturing planet by valuing the worker more than the previous labor practices. This made the employee feel more significant and valued and the company was highly valued as a whole.

Kaizen, which is continuous small steps toward improvement, is a key building block for lean approach initiative. Kaizen is not a set of tools; rather it means a culture change that encourages daily basis small improve-

ments which leads to process optimization and waste elimination. So, if people implement kaizen culture, they go toward lean implementation. Thus, involving employees in the improvement activities lead to build employee morale which is good for the corporation productivity.



The history of lean methodology goes back to the middle of 20th century when the famous Japanese motor corporation Toyota tried to solve the problem in their product delivery by inventing a new project management system which is called Toyota production system. The main goal was to improve product delivery by eliminating waste.

The major lean principles are based on eliminating all forms of waste to increase customer value. Toyota production system created the definition of wastes, which defined as any action that doesn't positively increase the functionality of the final product. It identified three types of wastes: **Muda, Muri, and Mura**. **Muda** refers to any process or activity that doesn't add value; it can be a time or resource waste which includes the seven original wastes: (transport, inventory, motion, waiting, overproduction, over-processing, and defects). **Mura** is about (unevenness, fluctuations, variation) in the workflow process at a scheduling and operation level. **Muri** Means overburden which causes slowing down in the process of the work. Each of the elements of Muda, Mura, and Muri should be eliminated in the organizations by using the so called lean project management.

The following are the main **five-steps for implementing** lean techniques which are not always easy to achieve:

1. Specify value by the customer.
2. Identify all the steps in the value stream and eliminate any step that doesn't add value.

3. Create product flow smoothly toward the customer.
4. Then, allow customers to pull value from the afterward upstream activity.
5. Unnecessary steps should be removed.



Applications

Lean methodology can be applied in every business and every process as the way they think and do. Lean methodology is not a rough program; rather it is a way of thinking which the entire organization can take advantage of. "Many organizations choose not to use the word lean, but to label what they do as their own system, such as the Toyota Production System or the Danaher Business System. Why? To drive home the point that lean

is not a program or short-term cost reduction program, but the way the company operates. The word **transformation or lean transformation** is often used to characterize a company moving from an old way of thinking to lean thinking. It requires a complete transformation on how a company conducts business.” (Lean.org, 2019).

Malaysian automotive components manufacturer is an example for Real implementation of Lean manufacturing approach. This company achieved a successful of lean manufacturing implementation which later was awarded by Malaysia Japan automotive industries co-operation (MAJAICO) in year 2007. *MAJAICO is a 5-year project introduced under the Malaysia Japan economic partnership agreement (MJEPA) to improve the Malaysian automotive industry to become more competitive in the global market. “The main function of MAJAICO is to introduce continuous improvement activities in manufacturing companies mainly through total implementation of lean manufacturing.” (Muslimen et al., 2019). The following figure shows the profile and the achievements of the company through the years of implementing lean manufacturing. (Muslimen et al., 2019)

The company’s focus of lean manufacturing is on reducing inventory level because inventory is the source of other wastes of their company. The inventory level reduction is explained through this diagram by the authors of the case study of LM implementation by this company.

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KANBAN Methodology

Kanban methodology understanding

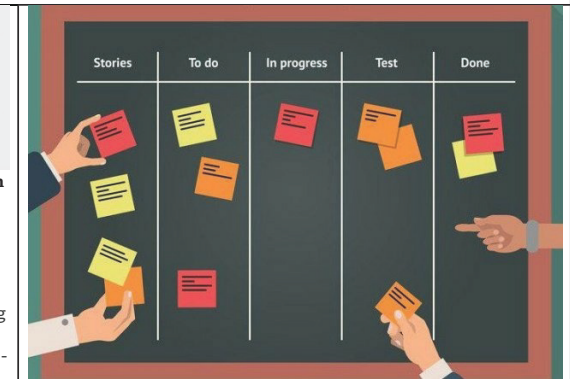


Multiple teams using Kanban

What is Kanban

Kanban is one of the methods of managing the projects, it mainly focuses on how the project will deliver without overloading the working team. It is designed to support the cross-functionality of the team and will help the team members to be more effective. Its main steps start with visualizing what the team wants to do, then prioritize and limit the workload to do it efficiently and effectively, and finally, after finishing the current work to choose the next most important thing to do, these steps are enhancing the workflow.

It is Japanese invent that means visualization or even cards, the same cards that we use today to stick on board at the workplace or even refrigerators at home. Toyota company and specifically line-workers used this method to arrange and organize the steps in the manufacturing process. Because this method is visual it allowed the workers and the working teams to communicate and organize the work easily, as the board and cards show



Kanban board and tools for the management of projects.

Kanban using advantages

Advantages of following and using the Kanban method:

- + Kanban is a very clear process, the ease of information passing between the team leads to more clarity and alignment between the working team.

+ Using this method makes it easy to manage to follow, one look to the board and the management or team member can understand what's going on, when and where things are standing, this saves a lot of time for the management and team members.

- + As everything is visualized over the board, so this will make

things easy to the team members to follow the projects.

- + The ease of making changes at any time and when change is required for the projects.

+ It increases the team spirit and motivation and leads to more cross-functionality between different departments or members which will lead to more effectiveness. [2][3]

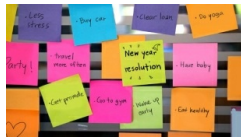
Kanban for Individual

This method considers also one of the best ways to arrange individual work, as Kanban is an easy, practical and consider to be good learning

Kanban main disadvantages

The main disadvantage of Kanban method is the variety of customer need and demand, as the Kanban is the best method for production of small and steady output, but when the demand of the customers starts to change, or the project affected by the season (high or low season),

you what to do, what is in progress and what is done. Using this method reduced the waste during manufacturing, reduced the time and increased their efficiency and effectiveness. [1][2][3]



Kanban Personal.

system that can help to arrange our daily to-do list. This way will increase productivity and will arrange the overwhelming to-do list that we have every day. It is good practice at work and home.

here the Kanban tends to be insufficient.[3]

Kanban Framework is a work management system that maximizes efficiency and help to visualize it. *Kanban* stands for the Japanese word of *visual*. Most of tasks at works are invisible, as such, Kanban help to visualize the work and tasks that are invisible to us and to the others. Kanban also help keep others on board for the duration of the subject. Kanban further help to change the organizational culture, through visualization.

Because Kanban is suitable for self-managing and collaborative small teams, it can be utilized in many projects across different organizations across the non-profit sector. It is a good tool through which *project managers can highlight the bottlenecks* and understand the *challenges* the

teams are facing, especially when further discussions are made among the team members internally.

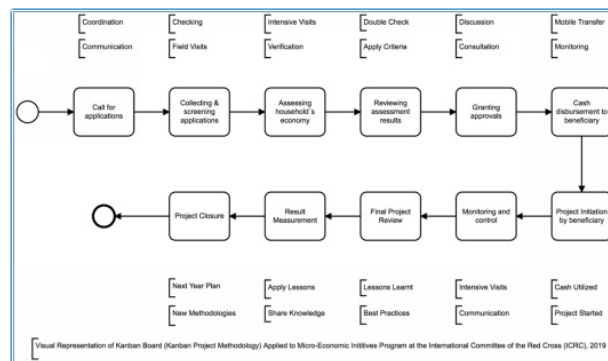
When Kanban methodology is appropriately applied, it maximizes the use of the resources by allowing the remaining tasks clear to everyone, and the amount of efforts anticipated by the managers clear as well. Subsequently, valuable time can be saved when the project managers are able to manage expectations appropriately.

Case: International Committee of the Red Cross

At the International Committee of the Red Cross, there are several humanitarian programs. Among these programs, Micro-economic Initiatives (MEI) which aims at improving the economic situation of low-income families whose income sources have been affected by the recent conflicts across the whole country. It is an income generating project under which the entitled household will receive up to 1,600 CHF as donation to initiate the business that they have skills and expertise for.

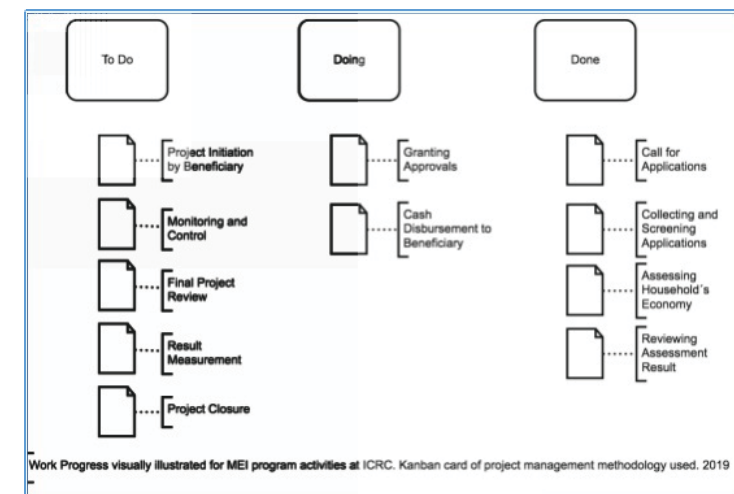
This project has multiple phases and each single phase has several sub-steps and smaller activities that the project manager has to pay attention to at certain times during the project, from the initiation to the closure.

Since visualization is a key component of Kanban model of project management methodology, through the below diagram, the MEI project life cycle has visually been illustrated with two key activities that will take place at each given milestone. This diagram will be a positive addition to further clarify the project activities for the managing teams. Therefore, Kanban board contribute to faster achievement of the organizational strategy for 2019 in Iraq.



For the above project, it takes a year from the beginning to the end for the outcomes to be delivered. Although the Kanban board is a good visual tool to illustrate the project steps, but it does not categorize which activity has been achieved and which one has not.

The work progress has to also be visualized due to its importance to the managing teams. Luckily, there is another way to do it. Kanban cards is a good way to identify what has been achieved and what has not yet. Kanban cards used for the above project as below:



The Kanban cards helps by decreasing or at least know-

ing the “work-in-progress” areas, or unfinished activities that requires daily attention and progress by having them all visually presented in one board. It is normal to be on a project with pending activities that takes longer to be achieved than some of the other activities, thus Kanban cards help by knowing where exactly the project manager is in her/his project.

Kanban cards also help the file holder to have a better workflow management as in the case of MEI projects, there are dozens of sub-activities that sometimes they overlap with each other. For the sake of this assignment, the simple model of MEI project life cycle has been presented which normally has less sub-activities compared to more sophisticated model of MEI projects, such as Collective MEI and MEI Plus models.

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The Project Management Institute “PMI”/PMBOK

The Project Management Institute, with its infamous 13 standards of project management outlined in their PMBOK, is a popular and widely applied in project management.



It is not a separate and independent methods; it is a set of standards put together by the Project Management Institute, and constantly revised and published in their PMBOK. Many organizations use this method to manage projects. The phases of PMI's PMBOK start with initiating, planning, executing, controlling, and it ends with closing of the project.

The PMI knowledge areas of project management are;

- Project Integration Management.
- Project Scope Management.
- Project Time Management.
- Project Cost Management.
- Project Quality Management.
- Project Resources Management.
- Project Communications Management.
- Project Risk Management.
- Project Procurement Management.
- Project Stakeholder Management.

The PMI knowledge areas are commonly applied across projects and gaining more popularity as the PMI continue to revise these areas. The PMI certify project managers who passes an exam by any of the PMI chapters.

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Critical Success Factors in Project Management

A comparative study between the GCC and the U.K.

By

Firend Al. Rasch & Alkathiri, O

This study examines the critical success factors in project management of Oman's construction industry, by comparing such factors to the U.K. construction industry. Construction industry involves number of activities that contribute to the economic growth, such as improvement in infrastructure, creation of expert centers, human development, and significant contribution to gross domestic production (GDP) (Slaughter 1998). As such, examination of contributing factors that critically affect the construction industry and critical component of project management that contributes to the successful development of this sector of the economy is of particular importance to the Omani government, which is the sponsor of this thesis. As Ngai *et al.* (2002) further as-

serts this hypothesis, by stating that construction sector when planned and implemented well, can improve the national economy growth and ultimately the GDP.

However, there are number of factors that affect successful growth of the construction industry in a developing country, and number of variables that influence the outcome of the implementation, including; economic uncertainties, technological factors, budgetary constraints, stakeholder's changing requirements, environmental, regulatory and implementation processes (Duy Nguyen et. Al. 2004; Chan 2004; Sanvido 1992).

Several studies have been conducted to determine the critical success factors (CSF) in varying construction industries around the world, where lessons can be drawn for future development of the construction industry in Oman.

However, Chan et. Al. (2004), Chan et. Al. (2001) and Duy Nguyen (2004) asserts that there is no mutual agreement on homogeneous and standerised critical success factors across-the-board, or one solution that fits all. Furthermore, Pinto and Prescott (1988), Parfitt and Sanvido (1993), and Yu et. Al. (2006) further asserts that critical

success factors are interrelated, intertwined and difficult to set boundaries to determine homogenous factors. However, research over the years, has shown that the importance of defining critical success factors, has undoubtedly positive impact on the successful of construction projects, by avoiding delays, additional costs and expenses related to the construction phases of the project (Chan and Kumaraswamy, 1996; Cooke-Davies, 2002; Nicolini, 2002; Erling et al., 2006; Toor and Ogunlana, 2009). The Sultanate of Oman "Oman" is now one of the most successful investment stations in the Middle East. The real estate sector has grown rapidly over the last ten years, which has contributed to attracting investment from around the world, while the services and architectural facilities provided by Oman are described to investors as both attractive and lucrative (Shachmurove 2009) and there are still expectations of more real estate investment in Oman. Such projects contribute to the development of the real estate sector and in particular, the integration of infrastructure in this young and growing country.

Oman continues to plan and launch projects, despite

the consequences of the global economic crisis of 1998, which has clearly affected the level of its real estate growth, a clear indication of emphasizes on uniqueness in the construction industry. Proportionate and balanced development contributes to the strengthening of the commercial status of Oman and provides an element of work and tourism to regional and foreign investors. There is no doubt that the influx of real estate investment into Oman confirms the growth trends in the construction sector as real income in Oman and the region increases. Therefore, all parties involved in the construction industry recognise that delays in delivery of projects, and in accordance with defined schedules agreed on by investors, would cause loss of time, material and money.

Loss of funds for both investors and contractors' lead to loss in reputation for the government agencies that promotes these projects. The delay in project completion places contractors under constant pressure that may lead to problems in implementation affecting the levels of quality. Although reason for project delays may range from poor management and engineering planning by

initiating companies, yet the inability of these companies to effectively define their objectives, and accurately develop strategies and actions to effectively implement construction projects in time frames that meets stakeholder's objectives is still a looming threat across construction projects in the Middle-East (Alnuaimi et. Al. 2009).

The administrative and engineering planning process of construction projects follows a set of rules, controls and indicators to follow, which prepares planners for project undertaking in according to environmental circumstances. The construction project management field therefore, has undergone numerous changes during the past two decades due to technological factors driven by economic growth (Froese 2010). Economic growth feeds directly into economic growth and the construction industry, and ultimately shapes the nature of project management in particular environment or a country. This has also shown to be highly influenced by cultural values and norms, which add to the complexity of the nature of project management in the construction industry (Fisk and Reynolds 2011). This is particularly

true in the case of Oman (Assaf and Al-Hejji 2006; Chan and Tse 2003; Ochieng and Price 2010). Loosemore and Muslmani (1999) have written on the role of U.K. based construction companies taking part in the construction boom of the Arabian Gulf and Oman.

The importance of planning

Clearly, today's construction project requirements need more planning than ever before. Companies face significant shifts in various areas, challenges and pressures in a globally competitive environment. Rapid change in all areas of the construction sphere is increasing the degree of environmental uncertainty regarding future conditions that affects the future outlook of management of construction projects. Kerzner (2013) suggest that the extent to which construction companies contracted the concept of project planning is measured by variables that consist of important factors as following:

- Planning contributes to saving time and non-dependence on chance.
- Work in construction project engineering without a clear plan is an undertaking that becomes a waste of time.
- In the absence of effective planning in construction projects, chaos and improvisation

becomes the norm and original goal become elusive.

- Planning aims at ensuring that there is no contradiction between means and objectives, which facilitates clarity of goals and objectives in the shortest way that saves time and money.

The importance of planning then, in essence, is the anticipation for future mishaps and possible surprises that cause inevitable fluctuation in projects goals. The objectives to be achieved are future objectives, ie, their achievement is realized during a specific time, which may be prolonged or shortened. Planning also helps greater enterprises to provide control through project management capacity for adaptation, through pre-delineation of best practices in the light of what is likely to occur.

Sapolsky (1971) points out that planning saves and prevents costs waste of resources, because it sets the goals and mechanisms of implementation in advance, and in a scientific and rational way, which contributes to the increased net efficiency and effectiveness.

Construction Planning

Kerzner (2013) further suggest that planning in construction industry involves number of criteria that a contracting company must understand to effectively manage construction projects. This can be summarized as following; coordination of the efforts of the project staff: Planning enables coordination of the efforts of each of the team members, the technical staff of the project on the one hand, and the different departments in the contracting company on the one hand. Thus, determine the objectives of the project plan and the means to achieve them provide the necessary guidance for various project staff, and the company to carry out its tasks as per assigned roles, which helps to achieve set objectives of the master plan without constant changes.

Forecasting change however is not an easy task (Sapolsky 1971). Proper planning of the project prepares the project staff and the management of a construction company to anticipate and plan for possible change, and the consequent effects of such change. Therefore, effective planning is anticipating when and where things would go wrong in the project, to prepare stakeholders to deal with changes without being totally surprised by it by

incorporating such changes into the time and cost elements. Planning provides performance measures and criteria. The construction project plan shows what it has to be achieved of anticipated results and objectives at the level of front-line workers and staff involved in the project, by assigning tasks in accordance to their competence (Sanvido et. Al. 1992). Objectives and results form the basis for criteria that can be used to measure actual performance.

Statement of the Problem

The quest for critical success factors in project management in the construction industry is the aim of construction companies and project managers around the world (Nitithamyong and Skibniewski 2006). This is primarily because of the cost attached to such large-scale projects, especially those financed by governmental entities, municipalities and provinces. Large-scale construction projects have a critical impact on governmental budgets, economic growth, and ecology. As such, determining what critical success factors that directly contribute to cost reduction, timely delivery, improvements in quality of construction and positive impact

on the environment can being mutually beneficial to all participants and stakeholders. The state of Oman has a particular interest in determining such CSF in the post financial crises, where numerous landmark projects has been frozen due to financial constraints (Alnuaimi 2006). Therefore, avoiding pitfalls in project management related factors could significantly impact the future role of British construction companies in Oman, the Gulf and other parts of the world in post-Brexit U.K. The pressure on British companies is equally higher today than ever before to maximise the effectiveness in implementation of construction related projects internationally, to compete with other European and Chinese construction firms (Lu et. Al. 2009; Norwood and Mansfield 1999). Innovation and cultural forces are found to play a significant role in cross-cultural project success (Assaf and Al-Hejji 2006; Blayse and Manley; Ochieng and Price 2010). Such forces can be viewed in relation to critical success factors will ultimately affect all participants and beneficiaries, namely, stakeholders and the environment. Therefore, the attempt to explore varying CSF is more important to Oman as government, and private

sectors involved in future construction projects, as much as it is important to U.K. based firms attempting to compete and expand their market base in such critical part of the world and uncertain outlooks for the U.K. economy.

Objectives of the study

The main objectives of this study is to determine the critical success factors influencing construction project management in Oman as a sample country of the GCC overall, and how they compare to that of the U.K.

Objectives of the study are:

- a) To provide a comprehensive overview of the CSF involved in the Omani construction industry.
- b) To assess the level of influence each CSF has on construction project management.
- c) To evaluate CSF factors in terms of differences to the construction industry in United Kingdom
- d) To highlight how such CSF should be applied, to maximise implementation effectiveness of future construction project management.

Ultimately, the objective of this study is to evaluate the level of impact CSF has on a final construction projects from the Omani prospective, and how such factors com-

pares to CSF construction project carried out by U.K. based companies. The main focus of this study will remain in highlighting the importance of such factors in the future implementation of such projects in Oman, which may also be applied to other countries in the Arabian Gulf. Beneficiaries will be U.K. based companies, Omani government and private sector companies amongst others.

Research Question

The research problem has been derived from examination of various literature review, which has shaped the objectives of this study, and therefore, the initial research questions are stated as following;

- 1) What critical success factors contributes to successful construction projects in Oman?
- 2) How such factors compare to U.K. based constructions projects?
- 3) How can such factors benefit U.K. based companies and the Omani government in future projects?

Research significance

The post-Brexit era will witness more involvement of the British companies in construction projects and the former

Commonwealth, the Arabian Gulf, and Oman in particular. This research will be mutually beneficial to both, British and Omani construction companies, to better understand significant operational differences and critical success factors that contributes to the success of future projects. Such significance lies in highlighting essential requirements, critical success factors, and cultural differences that shapes interactions and outcomes of such expense projects. This is particularly important when financial resources are becoming more scarce today than ever before, and emphasizes on determining what critical success factors to focus on to achieve the optimal results. As such, the value of findings of this research project will be significant to both, U.K. and Omani constructions companies. The Omani government as stakeholder is also the beneficiary of this work, since results will be shared with other construction companies in Oman and project managers in charge of governmental construction projects.

Theoretical Framework

Theoretical framework influencing this work is structured around Chan et. Al. (2004). Chan et. Al. proposed a model consisting of number elements, which are comprehensive in relation to the construction industry project management and examination of critical success

factors in the construction industry (Chen and Chen 2007; McGeorge and Zou 2012; Meng 2012). Chan (2004) argue that project effectiveness is an intrinsic factor and not a complementary to construction based projects. Therefore, any analysis of CSF should go beyond cost and efficiency factors, to include factors such as problem determination, communication, trust, and relationship management. Chan's model emphasizes the importance of reduction in dispute and other cultural elements, in developing economies, which is ideal to this research and the case of Oman.

Assumptions

This study assumes that CSF highlighted in literature review in relation to construction projects conducted by U.K. based companies are current and relevant. We also assumption that Omani participants in this study and sample size is sufficient to determine CSF in Oman's construction industry and can constitute a representative sample that yield effective results for this study to infer. To maximize the effectiveness of findings, a diligence is conducted to prepare of efficient sample size to participate in this study to increase its effectiveness.

Scope

The scope of this study is to engage Omani construction companies by gauging experts' opinion regarding perceived CSF in their industry. It is within the scope of this research as well to examine existing CSF literature review related to U.K. based construction projects and companies. Because of time and budgetary constraints, it is not within the scope of this study to go beyond the boundaries of the U.K. to examine CSF in European construction projects. The aim, resources and time allocated however is sufficient as far as the scope of this research project.

Limitation

Research conducted in this study is limited to examining CSF literature review related to U.K. construction companies, which is abundant regarding U.K. construction company's practices in project management. This is primarily because of the efficiency of the project management field in the U.K. (Morris and Hough 1987), efficiency in publication of relevant literature, and the long history of U.K. construction companies in managing pro-

jects in the U.K. and overseas. While project management related publications related to the Omani construction industry is minimal, if none existing. Most reports or studies are conducted by departments involved in construction projects and such information is not published. Therefore, I will have to gather such information myself as primary data for this research.

Factor	Previous studies	Current study
Environment of the study	Studies done in varying countries around the world	This study is done in the U.K. and Oman
Topics and objectives of the study	Studies concerned with numerous construction project management in various countries	This study specifically examines CSF in Oman and compares it to those factors of U.K. based companies.
	Delay issues	
	Cost issues	
	Quality	
	Varying project management issues	

Table 1: Comparison between current and previous studies

Summary

This study examines the Critical Success Factors “CSF” in project management of Oman’s construction industry, by comparing such factors to CSF in the U.K. construc-

tion industry. The chosen topic is important because of its relevance in contribute to the economic growth in the GCC and the U.K. as the decide to manage their economy separately from the rest of the E.U. Therefore, examination of contributing CSF factors that affect the construction industry and critical component of project management, contributes to the successful development of this sector of the economy and is of a particular importance to the governments of the GCC, researchers, and project management professionals. This chapter will be followed by examination of relevant literature review, which critically examines available literature on that topic and attempt to highlight gaps in available literature and derive relevant variables critical to the examination of topics discussed in this study.

Literature Review

Although significant amount of studies has been done examining CSF in U.K. based construction companies, yet little or none has been done examining such factors in the GCC and Oman.

In this section, a review of relevant literature will be pre-

sented, focusing on the Critical Success Factors “CSF” in construction project management field. The objective of this chapter is to define main concepts relevant to this study, highlight main variables, detect gaps in literature, and examine factors that provides better understanding on how such factors plays a key role in the successful implementation of construction project management, while pin pointing gaps causing failures of constructions projects.

The importance of planning in construction projects to U.K. based companies

Plenty of literature discusses the essential elements of construction project management. Synthesis below includes the work of Chan et al (2004) and Duy Nguyen et al (2004) which asserts that construction planning projects (Engineering Projects) in the U.K. takes a purely engineering terms, and viewed as the use of modern planning tools and methods, especially tools such as critical pathway and other tools, which are found to be of benefits to project managers as following:

- Get a schematic representation of the project. Through which one can find out where the problems are in a given plan.

- Forecast the time required to complete the project and the possibility of controlling the time.
- Distinguish between critical and non-critical tasks in the project, and, thus determine the margin of maneuverability. It is possible for each task where some resources can be transferred from non-critical tasks to others to focus on critical tasks, which contributes to reducing the project time and cost.
- Predetermination of total final cost of the project adjusted to inflation.
- Planning provides a benchmark to judge the success of a company (comparing actual goals with planned goals).
- Effective project planning is the basis for management’s decisions: the plans, objectives and specific activities and tasks, which guides managers and frontline teams to work in a homogenous and harmonious manor.

Elements of effective construction project management

Erling et al (2006) suggests that there is no one optimal way to plan, but the success of the planning process requires the availability of some basic elements. The extent to which construction companies contracted the concept of project planning is measured by number of variables according to Hardcastle et al (2005), these are

as following:

Inclusiveness: Planning should cover the various areas and activities of the organization, and not only one aspect, therefore, project managers and engineer should allocate sufficient time for this stage as (contracting company) for each activity in the project, and allow room for changes in circumstances.

Clarity: The implementation of construction project plan requires clarity and simplicity allowing for easy understanding when shared with technical staff that will implement such plans. Therefore, recognizing each individual and group functions and their role and what is expected of them is a crucial and fundamental principle in this process.

Realistic: Construction project plans must be consistent with the actual external and internal conditions of the project environment. This is particularly true in international settings (Jaselskis and Ashley 1991). Therefore, taking into account company's resources and available capabilities provides a clearer picture to all participants on the anticipated project framework in a realistic

manor.

Flexibility: The construction project manager must incorporate possible and expected changes in circumstances. This requires a foresight by project managers involved, learning from previous experiences (Kothari 2004). Kothari argue that adequate assessment of internal and external human factors surrounding the project must push to develop flexible plans since requirements are frequently changing. Therefore, building-in elements allowing for changing circumstances must include alternative plans (Scenario-A, Scenario-B...etc) to meet any emerging situations.

Selection: The more specific the planning, the more goals and activities are planned the more opportunities for successful implementation of the plan.

Integration and harmonization of plans and objectives: Successful planning requires consistency in integration of various tasks and sub-tasks of the master plans and objectives (Kerzner 2013). This process takes into consideration the balancing act of evaluating strategies, op-

erational, and tactical plans. Long-term vs. medium and short term plans.

Li et al (2005) argue that engineering project integrity and homogeneity is achieved by reconciling all elements of construction project, and balance between project implementation duration, project cost and quality of deliverables.

Timing: Construction project plans must consist of objectives activities with realistic times of completion, and incorporating delays to avoid penalties (Lu et al 2009). Therefore, it is fundamental that a project manager schedule the implementation in a timely manner that is agreeable to all parties involved, which determines the starting date of activities and date of completion, highlighting penalties and cost associated with such time variation in project completion (Lu et al 2009).

Cost: The construction project management and planning process must assess all foreseeable and non-foreseeable resources and cost associated with such undertak-

ing (McGeorge and Zou 2012). Such planning process should ensure that these costs are not higher than the agree total project cost (to avoid loss of profits). Therefore, the business of estimating projects cost is extremely important the construction companies. However, the difficulty arises when working in International environment, where cost estimation can significantly vary on daily bases at some instances. This is because of fluctuation in International currency, regulatory forces such as taxation and governmental restrictions on imports of raw material, and varying cost of labor (Meng 2012). However, since the currencies of the GCC countries including the State of Oman is rigged against the U.S. dollar, cost calculation allows for effective calculation of cost and profit (Loosemore and Muslmani 1999; Ngai et al 2002).

Planning Effectiveness

Norwood and Mansfield (1999) states that among the things that helps to increase the effectiveness of the planning process are the following elements:

- Detailed planning: Implementing a clear and

explicit outlines for planning that is comprehensive in nature to all areas and levels of the project.

- Senior management buying into the proposed plans, supporting and encouraging people at all levels to support the agreed plans (Parfitt and Sanvido 1993). This may be done by providing the appropriate organizational structure for the planning process and providing the adequate technical expertise, resources and various necessary support.
- Allowing employees to participate in the planning process throughout the process.
- Decimation of plans and objectives to all people involved and explain how each role may or may not fit, while highlighting responsibilities and resources allocation (Parfitt and Sanvido 1993).
- Establish an effective incentive system that rewards participation in planning process and flagging pitfalls (Parfitt and Sanvido 1993).
- Provide constant statistical information on plans pertaining previous projects, to learn and benefit from problems, mishaps and delays, while

developing future plans (Norwood and Mansfield 1999).

Previous studies conducted in the GCC countries

The work of (Alnuaimi et al 2009; Al-Jumbaz 2010; Ankras et al 2009; Assaf and Al-Hejji 2006; Loosemore and Muslmani 1999) in the GCC countries is comprehensive in nature. The collective literature included work done with project consultants related and construction companies. Their work concluded the following findings:

1. There is a statistically significant impact of leadership competency (in its dimensions of: leadership ability, skills, selection of human elements, awareness of complementary elements of performance, and time skill) on the time to complete construction projects.
2. The existence of a statistically significant impact on administrative efficiency (in its dimensions of: team building, understanding of the environment, internal contractors, dealing with external parties, human relations between management and workers) on the time to complete construction projects.
3. The existence of a statistically significant impact of scientific and cognitive competences (in its dimensions of: legal/contractual skills, scientific abilities, awareness of the surrounding technical environment, awareness

of the surrounding social environment, and human resources knowledge management) on the time to complete a construction projects.

The collective work above, presented a number of recommendations, the most important of which are:

1. The owners of the contracting construction companies should supervise and monitor the selection process of the human elements assigned to them contractors and sub-contractors. Adding, that the human element must provide the needed advantages, leadership, science edge and knowledge, as these elements are not mutually exclusive, and cannot exist with each other without one another.
2. The wages paid by the contracting companies should not be an obstacle to the selection of leadership, administrative, experience, scientific capabilities and talent.
3. Formation of union of contractors and sub-contractors, through which allows to present problems and grievances before all parties involved and discuss the latest developments and ways to facilitate the work process.
4. Foreign companies may choose to go directly into a foreign market alone, or enter through strategic alliance with local construction companies for the implementation of major projects. This would enable the exchange of experience, facilitating the availability of labour, governmental permits and licenses, and

competitive acquisition of resources.

5. Facilitate the establishment of professional training to attract the right workers in the construction sector and ensure compliance in standards and procedures. Additionally, the work of (Dissanayaka and Kumaraswamy 1999; Duy Nguyen et al 2004; Erling et al 2006; Loosemore and Muslmani 1999) and others, shed light on common issues arise when working in the international construction industry. Their work found several results, the most important of which are:

- Most of the factors affecting the delay of construction projects internationally lie in the planning phase. This reflects the importance of planning in construction projects when working on global bases.
- The main factors contributing to delay in international construction project management are: bad project planning, scheduling, lack of respect for time, financial difficulties faced by the contractor, poor cost estimation, poor management and reporting of the work site, inefficient project team members, insufficient equipment allocated to the project, insufficient allocation of resources such as labour and construction materials, difficulties in meeting monthly financial obligations, frequent change in work requirements, slow

response and communications between stakeholders and team members, and lack of efficiency by assigned consultant to the project.

The work of (Nitithamyong and Skibniewski 2006; Lu et al 2009; Sanvido 1992; Shachmurove 2009; Toor and Ogunlana 2009) provided an invaluable knowledge base regarding CSF, work environments and critical issues surrounding construction project management. Findings suggest number of prioritization and implementation strategies that can act as effective CSF in construction project management. Some CSF criteria being suggested includes careful mapping of environmental, cost benefit analysis, profit margin calculations, reputation, scalability, time and other CSF commonly agreed upon by the largest players in the construction industry.

Types of the Critical Success Factors in Construction Project Management

First of all, it is important to define the term critical success factor in order to understand how such factors can affect construction project management. John F. Rockart (1982) introduced the CSF concept in project management and helped point out its importance in this field. Before CSF were introduced and expanded in importance, Daniel (1961) introduced success factors as the key features a given manager should mainly focus on, instead of spending time discussing irrelevant and inadequate

information management on the objectives, project goals and planning. Rockart (1982) stated that with regards to CSF only “few key areas of activity, in which analysed the results are absolutely necessary for a particular manager to reach his or her goals”. These factors are therefore vital to be considered, prior to construction management project is commenced, in order to ensure fewer losses, delays and other hindrances. There is a link between the CSF, the degree of effectiveness, success in construction projects and achieving set targets (Lim and Mohamed, 1999). A number of factors related to the most effective and successful project management project were identified by Pinto and Slevin (1988), there are; schedules and plans, client acceptance, monitoring and feedback, communication, trouble-shooting, and characteristics of the project team leader. Nevertheless, this list of factors is not sufficient and fell short of mentioning factors related to organization's existing and ongoing operations and long-term successes (Alias, Zawawi, Yusof, Aris, 2014). Whereas Rockart (1982) asserts that CSF are very limited set of aspects, that helps target projects and focus on ensuring successful construction project outcomes. In this study, my main concern is the project management success, which includes the factors such as time, cost, quality, and other factors that may arise from findings (Yee and Mustaffa, 2012). These variables are called ‘hard’ concepts of the project success criteria (Alias, Zawawi, Yusof, Aris, 2014). Such factors, project

managers need to control since they are key factors leading to the successful completion of a construction project. Moreover, according to Bourne and Walker (2004) there are also 'soft' aspects that considerably contribute to the final result of a construction project and they require alertness and more sensitivity from project managers side, in order to predict and determine changes in various areas. Soft aspects that determine changes in areas such as; technology, market, social and economic changes. Amongst soft factors, we could namely include; satisfaction, effective communication, relationship between project participants as well as identifying potential conflicts and how they could be avoided. (Erling and Svein Arne, 2000; Chan, 2004; Erling et al., 2006). However, it is essential that we differentiate between project goals and the factors leading to the successful achieving of goals. To start with, a basic classification of the CSF introduced by Rockart (1982) the four main types of the CSF are as follows:

1. Industry related CSFs that specify the characteristics typical for a particular area. It is important to bear in mind that each work area, industry, and environment differs and therefore generalisation is not recommended when setting goals and CSF for a particular project as each project will require unique factors.
2. Strategy CSFs determine the competitive

strategy chosen by a company in order to succeed among other competitors. The main focus should be on how to attract a customer and how to point the qualities of products.

3. Environmental CSFs are the result of economic, technological, political, demographical and other changes and project managers need to be alert to such factors. It requires advanced skills in order to predict and assess the market changes and the market demand.
4. Temporal CSF are factors within a company or an organisation setting which direction the company is heading and what specific challenges and restrictions will have to be overcome in order to present a successful product.

In a study conducted by Alias *et al.* (2014) and Chan *et al.* (2004) five areas of variables were defined:

Project Management Actions

Project Management Actions are one of the most influential and deciding factors in achieving successful delivery of a product. Such factors include smart planning requiring project managers to have experience and skills in particular areas. As Jaselskis and Ashley (1991) described, if project managers use management tools to plan their projects they will increase the chances for their projects to succeed. However, not only planning is the critical success factor; it also depends on the communications skills and abilities, giving feedback and interact with

employees. Organisation structure also plays an important role as well as control mechanism and control of subcontractors' works. A project manager should oversee all the aspects and factors of the project in order to be able to make changes to ensure the success.

Project-related factors

These factors specify the type, size, complexity and exact demands of a project from a client, and therefore it allows us to determine the procedures that need to be chosen and applied to deliver a quality project in a short period of time. Dissanayaka and Kumaraswamy (1999) therefore introduced two features to evaluate this factor.

Project Procedures

As mentioned in the previous section, there are two features helping to evaluate project-related factors, these are procurement method and tendering method. The former is a method of selecting a suitable contractor for a construction project as well as obtaining goods needed for the project. The latter refers to the procedures applied in the process of selecting the suitable contractor.

Human-related Factors

These factors are the broadest area of all the factors involved in construction project management. Human-related factors include all the project participants ranging

from project manager, client, contractor, consultants, subcontractor, supplier, and manufacturers. This factor is so broad mainly due to number of participants and their characteristics. This section can be divided into smaller sub-sections defining particular groups of participants.

The client-related Factors

These factors include client characteristics, client type and experience, knowledge of construction project organization, project financing, client confidence in the construction team, owner's construction sophistication, well-defined scope, owner's risk aversion, client project management (Chan and Kumaraswamy 1997; Songer and Molenaar 1997; Dissanayaka and Kumaraswamy 1999).

Design Team-related Factors

Chan and Kumaraswamy (1997) considered this factor as the one causing potential delays and hindrances in designing and making preparations for a construction project as designers are crucial throughout the whole process of the construction project. They are present at the beginning of the project and are designing its way until the very end.

Contractor-related Factors

Constructors' work start once the project is designed and

ready for the construction stage. Contractor experience, site management, supervision and involvement of sub-contracting, contractor's cash flow, effectiveness of cost control system, and speed of information flow are considered to be the main contractor-related factors (Chan and Kumaraswamy 1997; Dissanayaka and Kumaraswamy 1999).

Project manager plays the crucial role in the Human-related factors as well but his main responsibilities and factors are listed in section 2.2.1. As this section is very sensitive to and based on communication, careful planning, feedback, and cooperation, it is very important to keep the team spirit and make sure the interpersonal relationships are maintained as they may affect the smooth running of a project. If any disputes or the unwillingness to cooperate occurs, it could have a negative impact on efficient or even successful project finalization.

External Environment

When speaking about external factors, such attributes are usually those we have very little control over, and that can still affect our construction project and its success. Such factors usually involve changes of various aspects, such as political, economic, changes in technology and market, demographical changes and others. These features are very difficult to predict but with strong

managerial skills and experience, there is a possibility to be able to face such changes and yet succeed (Hardcastle 2005).

Culture-related Factors

The role of culture in project management in general and construction projects in particular has been regarded as an extremely powerful force in the success and failure of projects (Rowlinson, S.M. and Root, D., 1996). Yazici (2009) adequately argues that the role of culture shapes what is perceived to be performed. While Shore (2008) suggests that culture and interpersonal communications is the predominant factor in project failures. This is strongly reconfirmed by Loosemore, M. and Muslmani (1999) who emphasize that the culture of the Persian/Arabian Gulf plays a particular role in shaping construction projects outcome success rate in terms of cost, timely delivery and quality of delivery. Pheng, L.S. and Leong (2000) further confirm Ochieng, E.G. and Price (2010) findings, that international construction projects are heavily impacted by interpersonal communications and cultural barriers that hinders varying aspects of project deliverables.

The issue of culture as a decisive factor in construction project management reoccurs in related literature endlessly. For instance, Assaf & Hajji (2006), Haslam et. Al. (2005), Pheng & Leong (2000), Chan & Tse (2011), Chan

et. Al. (2004) and Ankrah et. Al. (2009) all of which, agree on the role of culture as a primary force in causing cross-cultural collaborative projects. There is no literature found examining the role of culture however in the case of Oman. Available literature however examines various other aspects of construction projects, yet most literature seems to focus on projects conducted in Saudi Arabia and the United Arab Emirates. Shedding light on the characteristics of construction projects success factors in the Sultanate of Oman would provide an insight into the reality what differences might occur, in the oldest nation in the Arabian/Persian Gulf.

Summary

Review of relevant literature focusing on Critical Success Factors "CSF" in construction project management has examined varying concepts relevant to this study, highlighting main variables and detect gaps. Factors examined the role in successful implementation of construction project management, while underpinning gaps causing failures of constructions projects. Such factors examined included human, environmental, cost related, procedural, external and cultural factors. Project manager plays a crucial and sensitive role in the human-related factors. Such CSF includes but not limited to communication, careful planning, feedback, selection, decimation of knowledge, cost estimation, and implementation.

It is concluded that there are human-related factors and project-related factors that influence construction project management across the globe. Additionally, the external environment surrounding the project tends to be an intricate component of the CSF's. When speaking about external factors, such attributes are usually those we have very little control over, and that can still affect construction project and its success. Such factors usually involve changes of various aspects, such as political, economic, changes in technology and market, demographical changes and others. These features are very difficult to predict but can be dealt with through managerial skills and experience (Hardcastle 2005).

The issue of culture as a decisive factor in construction project management reoccurs in related literature endlessly. For instance, Assaf & Hajji (2006), Haslam et. Al. (2005), Pheng and Leong (2000), Chan and Tse (2011), Chan et. Al. (2004) and Ankrah et. Al. (2009) all of which agree on the role of culture as a primary force in causing cross-cultural collaborative projects and cause of failures. There is no literature found however, examining the role of culture in the case of Oman. Available literature however examines various other aspects of construction projects, yet most literature seems to focus on projects conducted in Saudi Arabia and the United Arab Emirates. Shedding light on the characteristics of construction projects success factors in the Sultanate of

Oman would provide an insight into the reality what differences might occur, in the oldest nation in the Arabian/Persian Gulf.

Research Methodology

In this chapter, the methodology applied in the research study is presented, outlining how the research was conducted. While the main aim of this study is to provide relevant, impartial and objective data and analysis regarding the research problem highlighted in background chapter, was formulated in the research questions. Therefore, as far as highlighting the CSF pertaining U.K. companies, this was derived and classified from available literature presented in the proceeding chapter and available secondary data.

Research Philosophy

Saunders and Lewis (2012) suggests that positivism is in essence examines a given phenomenon in terms of its properties and inner workings. Hence, this research followed a positivist approach. This is because of the deductive and objective nature of investigation this philosophy allows (Saunders and Lewis 2012). The positivist approach allowed to think of the idea from my working environment, and derive the variables from investigation of available related research literature. The next stage according to the positivist approach is to test the

idea and report findings in an objective manner (Saunders and Lewis 2012). This further suggested a deductive approach to this study as following; Collecting data, determine patterns, derive hypothesis, then making inference regarding the findings (Saunders and Lewis 2012). Creswell (2007) and Kerlinger and Lee (1999) further support such research philosophy and advise researchers of similar undertaking to this research to follow such approach to reduce bias, improve research efficiency and optimize findings Kerlinger and Lee (1999).

Research Methods

The next step in accordance to Saunders and Lewis (2012) is to determine the research methodology. Therefore, based on this research orientation, objectives and philosophy, a quantitative research approach was followed. The research strategy conducted was both the development of survey to collect primary data for analysis and the review of literature to derive primary data to be used as essential component for analysis and findings. Both Saunders and Lewis (2012) and Kerlinger and Lee (1999) supported such strategy for a research with similar approach to this undertaking. Creswell (2007) further support such strategy to increase objectivity and improve findings. Given the short timeframe allocated to this research. A rapid approach had to be followed to maximise outcome. Such approach recommended by Creswell (2007) allows for achieving the set research ob-

jectives with limited timeframe. As such, I had to utilise all contacts such as friends and colleagues at the local municipalities in Oman and asked them to pass on the survey link to others to snowball participation. Such strategy proved to be effective. The utilisation of close networks of professionals in the field of project management allowed for rapid participation in the study. Given the amount of participants (63) out of which 62 survey were utilised, helped achieve the set objectives for this study and facilitated data collection and analysis. While waiting for data to be collected, time was wisely utilised in reviewing available literature regarding project management practices amongst U.K. companies. This approach allowed the time needed to clearly understand and classify the gathered practices, and to compare them for later analysis stage.

The research methodology then consisted of two stages, analysis of literature and classification of U.K. based companies, and the second is data collection through survey. Google Survey was instrumental in the acceleration of data collection because of its stability and ability to provide real time information to the researcher regarding the number of participants. Google Survey also provided basic data analysis, which was instrumental in the analysis stage because of its visual presentation of the data collection.

Instrument

Furthermore, a questionnaire was chosen for the data collection regarding CSF in Oman's construction project management. Questionnaire is one of the most widely used methods for recording data and may vary with respect to the questionnaire types (Kothari 2004; Kumar 2005). For this study questionnaire method will be applied as it enables me to control answers through creating a set of questions relevant to this study and therefore ensure the consistency and accuracy of the answers obtained from correspondents.

The questionnaire was created on Google Forms. All questions were aimed at practitioners and professionals working and involved in managerial positions in Oman construction companies including governmental departments. This facilitated the gathering of answers from relevant people based on their hands-on experience. Experts and practitioner's answers were relevant and suitable for this research purposes.

Measurement

Creswell (2007) suggested that a Likert scale would be appropriate to gauge and measure respondents' views to particular question. This approach is widely used as a tool to measure opinions across similar studies (Kumar 2005). The questionnaire is designed to ask specific questions regarding critical success factors identified from literature review, which commonly applied to construction projects. Such questions will be rated in importance

on a scale of 1 to 5. The answer that represents number 1 on the scale is the least important, while number 5 is the most important and significant. Therefore, the Likert scale will be effective as a tool in measuring response to determine CSF related to the Omani construction professionals. Additionally, an open-ended question will be added to the questionnaire to allow respondents to add additional thoughts and to provide extra information they may feel is important to the Survey. Open-ended answers will be classified according to themes using open-coding system. Corbin and Strauss (2008) suggest that open coding method is effective approach to analyzing textual responses and classifying them into meaningful categories to derive patterns.

Target Population

The target population of correspondents have a particular experience with construction project management, construction project planning, and implementation. Such characteristics are considering to be crucial factors for construction project managers. Construction project managers in Oman consists of Omani national is and non-Omani nationals. All of which however, enjoy similar characteristics since most of them are Arab nationals, and therefore, they understand local customs and traditions. The way they operate is generic to the Omani ways and practices that dominate construction activities in Oman. Access to such professionals and

practitioners was available to us since the co-author is a member of the construction community.

The help of peers and colloquies further facilitated accessibility, distribution of questionnaire and participation rate. The synergy and cooperation in such effort is an Omani characteristic and viewed with special importance since it is part of our professional requirements and has a noble purpose. It is important to mention however that given the size of the Sultanate of Oman, population and number of projects, the target population is relatively small in comparison to neighboring Saudi Arabia or other countries. Therefore, any participation will be reflective and representative since the target population includes the most active project managers in the construction industry in Oman.

Data Analysis

Having chosen the questionnaire method, a component included qualitative responses, with open-coding method to classify responses into themes, using the open-coded system. While quantitative analysis will provide statistical information, such as descriptive analysis of answers, and graphs and charts to describe main findings and responses. Additionally, a literature review of standard CSF practices in the U.K. construction industry was reviewed through available literature and secondary sources. Such examination of CSF in the U.K was classified according to importance, relevance and

citation. The data collected from Oman was compared to those of the U.K. Results of the survey conducted in Oman and analysed accordingly. Differences were highlighted and additional findings from the survey is listed and explained in the analysis and findings chapter. Such results will play a key role in better understanding the characteristics of CSF in Oman, and how they match and compare to U.K. based operations. The survey commenced on May 29th 2017 and ended on July 4th 2017. More than 300 emails were sent directly to known project managers through the Municipality of Salalah, Oman, and affiliated registered contractors. In addition, the researcher is connected to a number of construction firms, which expressed their willingness to send the link to the survey to their project managers. Number of project managers were called by phone as the culture dictates in Oman, and were asked to send the link to the survey to known project managers. A total of 62 respondents participated in the survey, all of which, are valid for analysis since none of the surveys were missing any answer.

Ethical Issues

While conducting the research for this study, the process for considering various ethical principles was maintained. Anonymity and confidentiality will be respected and will not attempt to get any irrelevant information from the correspondents that are not related to this

study. The questions in the questionnaire will not discriminate towards any race, gender, religious group, nation or any minority. Moreover, the data collected from the questionnaire was used for the purposes of the study and future research.

Activities / Month	April	May	June	July
Prepare proposal				
Comprehensive reading of all relevant available material (literature, relevant data and information)				
Prepare the literature review and methodology				
Data collection				
Conduct data analysis				
Final analysis				

A quantitative methodology was applied to this study. Available literature played a vital role in determining gaps regarding CSF of construction projects in Oman. A questionnaire was chosen for the data collection regarding CSF in Oman. The questionnaire designed in order to compare the CSF applied in construction project management in Oman, and was compared to available CSF literature in the U.K. construction domain. The ques-

tionnaire is designed to ask specific questions regarding critical success factors identified from literature review, which commonly applied to construction projects. The target population of correspondents have a particular experience with construction project management, construction project planning, and implementation. Such characteristics are considering to be crucial factors for construction project managers. Construction project managers in Oman consists of Omani national is and non-Omani nationals.

The data collected from Oman was compared to those of the U.K. Results of the survey conducted in Oman and analysed accordingly. Differences were highlighted and additional findings from the survey is listed and explained in the analysis and findings chapter. Such results will play a key role in better understanding the characteristics of CSF in Oman, and how they match and compare to U.K. based operations. The survey commenced on May 29th 2017 and ended on July 4th 2017. More than 300 emails were sent directly to known project managers through the Municipality of Salalah, Oman. A total of 62 respondents participated in the survey, all of which, were valid for analysis since none of the surveys were missing any answer. Descriptive analysis was conducted on the data, to highlight differences between how the two countries view CSF were highlighted, and findings will be discussed accordingly in the following chapters.

Analysis

Mapping perceived Critical Success Factors in the U.K. have indicated that U.K. based construction companies follows a methodical approach to managing projects. The following findings are the results of conducted analysis:

The stage of preparing the construction project plan

Understanding the nature of the engineering project: In the U.K. an engineering project is viewed as a particular kind of technological system, generally embedded in the context of systems, technological engineering projects in many countries, specifically defined by legislation order, which requires that these projects must be implemented by registered engineers and/or registered engineering companies. At this stage, a very detailed level of analysis is conducted to determine all requirements and needed permits.

Defining project objectives

To U.K. based companies, the three measures of the efficiency of a project are time, cost and quality. Often the overall goal objective of the project is the implementation of project in the shortest time, the lowest cost and the highest quality. Realistically, that such goals might

conflict with each other, where in most cases it requires termination of the project. To shorten project time, one risk higher project cost, as well as lowering the quality of implementation (Chan Scott and Chan 2004). Woolven (1995) suggest that there are three objectives a project manager is to be concerned with at all times. There are time, cost and quality. The Project Management Institute, U.K. chapter and Yee et. Al. (2012) suggest that the following criteria are essentials in projects undertakings:

1. Project description, areas and distribution of project blocks.
2. A list of procurement, procurement and processing required for the project.
3. Project management and technology.
4. Examining strengths and weaknesses of the company.
5. Availability of resources from equipment, labor, subcontractors, market prices and practical productivity.
6. Identify available resources and appropriate alternatives for both materials and plans.
7. Technical implementation plans for project elements.
8. Identify the computer logs that help to schedule and plan construction projects for use in the project.

Project Timetable:

Included in this stage:

- Division of the project into activities.
- Determine the relationship between activities.
- Representing activities and relationships and estimating the times for each activity.

The decision stage and approval of the plan

It was also determined from available literature that after the completion of the previous phase, the project work plan in the U.K. becomes ready for actual implementation, but this is done only after being notified by the corresponding authorities. To finalize such a plan; is to address the weaknesses and the imbalance of the plan before putting it into effect. The Planning Departments in the U.K. of the contracting company then submits this plan to the senior management, which gives permission to work under this plan, and to provide all necessary facilities for its success. The existence of an integrated technical apparatus capable of taking decisions related to the planning process.

Implementation phase

Analysis of available literature further shows that all previous events will not achieve any benefit or feasibility unless the plan is successfully implemented, that means:

- Delegation of authority to the competent workforce and the distribution of work and the use of resources to translate the plan.
- The planning managers and engineers in the

contracting company play an important and vital role in the successful implementation, by clarifying the plan and explaining it to the employees and convincing them to accept, motivate and reward them, and give guidance and advice to ensure good implementation of the set objectives.

Summary

Understanding the nature of the engineering project: In the U.K. an engineering project is viewed as a particular kind of technological system, generally embedded in the context of systems, technological engineering projects in many countries, specifically defined by legislation order, which requires that these projects must be implemented by registered engineers and/or registered engineering companies. It is the findings of this study as presented in Appendix-I, which shows that construction project management in Oman is a male dominated industry. 98.4% of respondents were male. 53.2% of respondents were between the ages of 26-35 years old. Construction project management in Oman tends to suffer from the following general characteristics: constant approval of requests by others and not knowing how to say "no"; fear as factor in enforcing performance requirements; lack of adequate organization, such as book and record keeping, and filing systemization;

lack of real time management practices and lack of importance to time in general; lack of effective personal involved in projects to support tasks and duties to be performed; constant interruption by others and cell phone calls that seriously distract personal from achieving project requirements; lack of prioritization for the tasks to be accomplished and completed; corruption and payoffs as means of achieving fast results; less emphases on efficiency, and more on cost cutting; less emphases on effectiveness because of cultural and capacity issues; saving face is more important than set objectives; quality has little importance in Omani projects, cutting cost at any expense is more important; personal relationships and friendship supersedes work priorities; communication is difficult in a multi-ethnic and multi-language based construction projects, this is caused by lack of available local expertise and high level of expatriates and workers working in construction projects.

Results Compared with Literature Review

Construction Projects CSF in the U.K.

Based literature review analysis, a number of CSF has been factors identified by available literature; including the work of Yee (2012) that emphasize the importance of personal management in U.K. based companies' project management practices in general. The focus on managing people includes:

- Encouraging self-confidence and strong recovery, through which failure is overcome.
- Optimism, and positive consideration, of frustrating situations.
- Constant training to set new goals.
- Not mixing goals with objectives.
- Emphases on efficiency.
- Emphases on effectiveness.
- Emphases on meeting deadline and concern with time.
- Creating a good communication base with others.
- Focusing fully on the final project outcomes to be achieved.
- To deal with problems and difficulties as an opportunity to learn from.
- Thinking about success, and help others succeed.
- Emphases on rewards when achieving the objectives.
- Take full responsibility for the results of work.
- Personal frictions and differences are put on the side; managers are objective in their assessments of situations and others. For instance, when things do not go well, managers not blame others, but look for solutions instead, and tend to focus on future objectives to achieve.
- Project Manager (PM) take responsibility for failures and setbacks.
- Constantly searching for best practices, by analyzing workflow, and engaging subordinates

ates in the search of optimal solutions to problems, to achieve ideal and creative solutions to set objectives.

CSF in U.K. Construction Projects
The stage of preparing the plan is divided into phases: At this stage, a very detailed level of analysis is conducted to determine all requirements and needed permits.
Defining project objectives: To U.K. based companies, the three measures of the efficiency of a project are time, cost and quality,
The decision stage and approval of the plan To finalize such a plan; is to address the weaknesses and the imbalance of the plan before putting it into effect. The Planning Departments in the U.K. of the contracting company then submits this plan to the senior management of the company, which gives permission to work under this plan.
Implementation phase All previous events will not achieve any benefit or feasibility unless the plan is successfully implemented, that means; <ul style="list-style-type: none"> - Delegation of authority to the competent workforce. - The planning managers and engineers in the contracting company play an important and vital role in the successful implementation by clarifying the plan and explaining it to the employees.
Post-implementation phase Is just as important to the pre-implementation phase because it provides a comprehensive look at

what was done right and what was done wrong, by which providing valuable lessons to learn from.

Table 1: Findings of literature review analysis of CSF amongst British construction firms' practices

Construction project management in Oman

It is the findings of this study (See Appendix-I) shows that construction project management in Oman as a male dominated industry. 98.4% of respondents were male. 53.2% of respondents were between the ages of 26-35 years old. All respondents were actively involved in construction project management with role such as; project manager (PM) site manager, project supervisor, project consultant, technical director and head of engineering department. Additional analysis and findings are presented below;

Construction project management in Oman tends to suffer from the following general characteristics:

1. Constant approval of requests by others and not knowing how to say "no"
2. Fear as factor in enforcing performance requirements.
3. Lack of adequate organization, such as book and record keeping, and filing systemization.
4. Lack of real time management practices and lack of importance to time in general.
5. Lack of effective personal involved in projects to support tasks and duties to be performed.
6. Constant interruption by others and cell phone calls that seriously distract personal from achieving project requirements.

7. Lack of prioritisation for the tasks to be accomplished and completed.
8. Corruption and payoffs as means of achieving fast results
9. Less emphasis on efficiency, and more on cost cutting.
10. Less emphases on effectiveness because of cultural and capacity issues
11. Saving face is more important than set objectives
12. Quality has little importance, cutting cost at any expense is more important
13. Personal relationships and friendship supersedes work priorities
14. Communication is difficult in a multi-ethnic and multi-language based construction projects, this is caused by lack of available local expertise and high level of expatriates and workers working in construction projects.

Additional analysis also shows that there is lack of quality control, time planning to effectively manage projects, and adequate communications to effectively management projects. Culture was determined to be a critical success factor in Omani construction project management, which is required at all aspects of projects and tends to ensure that as a factor, it affects planned tasks. Lack of quality is a reoccurring theme generated by the survey (See Appendix-I), which indicates the level of dissatisfaction with current state of project management in Oman. Respondents

also indicated that overlapping responsibilities between various roles and tasks causing constant delays in project is a factor of concern to most project managers. Additional concern was the constant interference by stakeholders and changing requirements, which are contributing factors to delays and projects going over budget.

Construction CSF in the U.K.	Construction CSF in Oman
Encouraging self-confidence and strong recovery, through which failure is overcome.	Constant approval of requests by others and not knowing how to say "no"
Optimism, and positive consideration, of frustrating situations.	Fear as factor in enforcing performance requirements.
Constant training to set new goals	Lack of adequate organization, such as book and record keeping, and filing systemization.
Not mixing goals with objectives	Lack of real time management practices and lack of importance to time in general.
Emphases on efficiency	Lack of effective personal involved in projects to support tasks and duties to be performed.
Emphases on effectiveness	Constant interruption by others and cell phone calls that seriously distract personal from achieving project requirements.
Emphases on meeting deadline and concern with time	Lack of prioritization of tasks to be accomplished and completed.
Creating a good communication base with others	Corruption and payoffs as means of achieving fast results
Focusing fully on the final project outcomes to be achieved.	Less emphasis on efficiency, and more on cost cutting.
To deal with problems and difficulties as an opportunity to learn from.	Less emphases on effectiveness because of cultural and capacity issues
Thinking about success, and help others succeed.	Saving face is more important than set objectives
Emphases on rewards when achieving the objectives.	Quality has little importance, cutting cost at any expense is more important
Take full responsibility for the results of work.	Personal relationships and friendship supersedes work priorities
Personal frictions and differences are put on the side; managers are objective in their assessments of situations and others.	Communication is difficult in a multi-ethnic and multi-language based construction projects
PM take responsibility for failures and setbacks	Overlapping responsibilities between various roles and tasks causing constant delays
Constantly searching for best practices, by analyzing work flow, and engaging subordinates in the search of optimal solutions to problems	Constant interference by stakeholders and changing requirements.

Table 2: Comparative differences of CSF between

U.K. and Omani based construction projects.

Respondents when asked the following question raised the following issues:

What factors influence relationship with other contractors or companies working on project with you? Please specify (Appendix-I)

- Maintaining friendship is very important in working relationship with others.
- Culture is an extremely important factor to project managers in Oman.
- Lack of capacity do effectively implement projects it is evident.
- The issue of quality is predominantly evident in Omani construction projects.
- Overlapping authorities tends to hinder that ability to deliver project effectively.
- Project managers where almost predominantly men 98.4%.
- 53.2% of project managers and people involved on construction project supervision are below the age of 35. This might indicate lack of experience or shortage of expertise.
- Projects cost tends to frequently over budget.
- Upper management and stakeholders are frequently interfering and project flow, and causing delays.
- Changing requirements is common in construction project management in Oman, and as such, delays are a frequent and common.

Results generated from the survey includes the follow-

ing findings; The results reached the conclusion that the delay of the construction projects in Omani based companies is because of the fact that these companies are not involved in the concept of project planning as it is practiced by U.K. companies. The results reached the conclusion that delays of construction projects in Oman is because of the lack of involvement of Omani companies in the understanding of the importance of project planning, and that delay in construction projects is because of the failure of the contracting companies to adopt the elements of effective planning as the basis for project success.

Results further show that there are number of issues related to the practice in construction projects in Oman. This may be attributed to number of reasons such as cultural, historic, size, experience among others. More specifically, there is a clear lack of understanding by contracting construction companies including public and governmental institutions involved in construction projects of the concepts of quality and the concept of planning. This is represented by constant delays in construction projects, which reflects also elements of lack of understanding of the process of planning and the nature of engineering project. It seems evident that defining set objectives is not shared or taken seriously by parties involved. This may be attributed to the way people view and value the concept of time.

Results also indicate that there is lack of administrative coordination between project managers and various contractors involved in construction projects. It seems that there is no processes that lead to the success of the construction plan by reducing the duration of implementation of the project. It can be suggested here that when U.K. based companies working in Oman or with Omani partners, that they take such issues into consideration and attempt to incorporate such realities as part of their plans. Possible steps that construction companies must take to achieve successful results if and when working in Oman is to harmonies teams involved in construction projects by increasing understanding of the working environment Oman, partnering company, the parties involved in construction projects and to build their own management team and employees.

Most of factors impacting delay of construction projects lie in the planning stage as results show. Therefore, the use of planning tools according to the elements outlined by the Project Management Institute for instance, tends to ensure the success of set objectives and delivery. It is important to remember here that the human factor is the primary factor that prevents companies from achieving completion of deadlines. This corresponds with Alnuaimi (2009) findings, which concludes that the most influential factors in project delays are poor pro-

ject planning, malpractices caused by people, scheduling overlap, errors in financial reporting of this project, and inefficiency of the working group project resources and mismanagement.

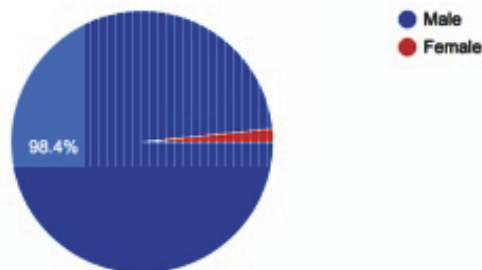
APENDIX-I

Construction PM in Oman

62 responses

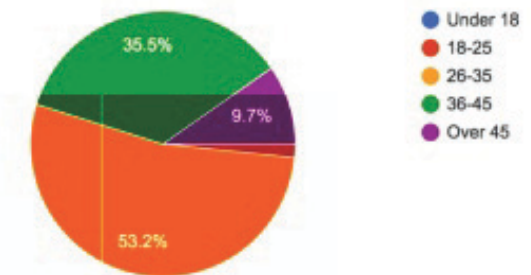
Gender

62 responses



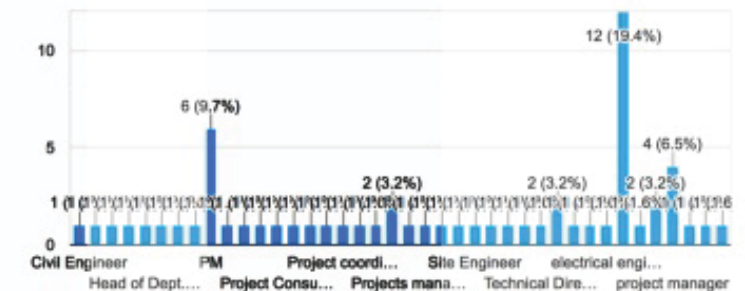
Age

62 responses



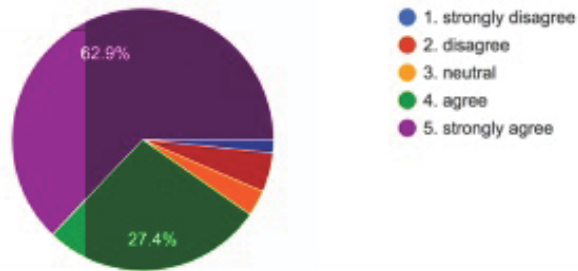
Please indicate the nature of your role and involvement in construction projects

62 responses



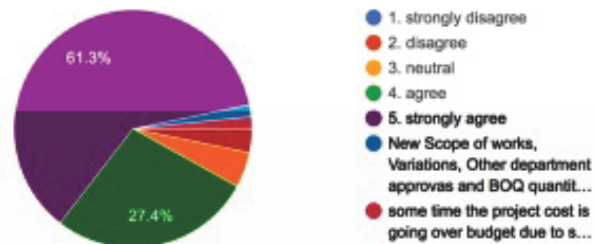
To what extent do you think the following factors influence construction projects in your workplace? Delays in project delivery

62 responses



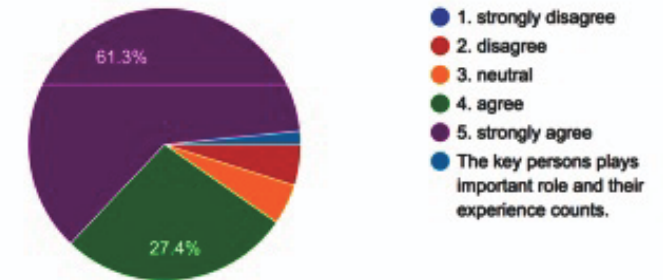
Project cost going over budget

62 responses



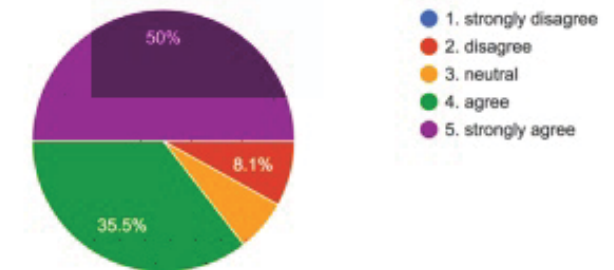
Experience of people working on the project

62 responses



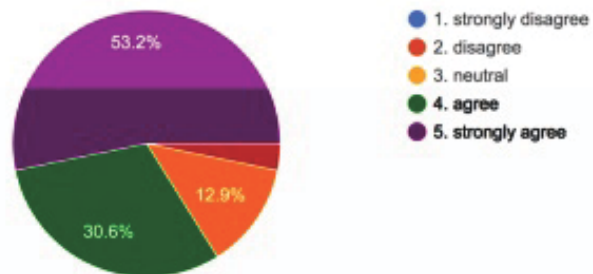
Communications between people involved in the project

62 responses



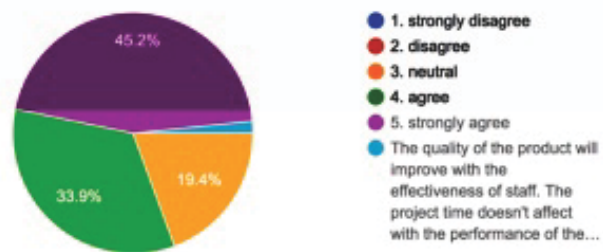
Efficiency of people involved in the project

62 responses



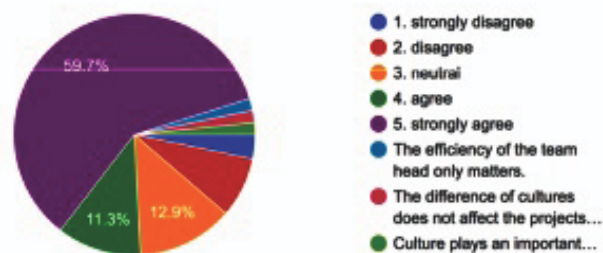
Effectiveness of people involved in the project

62 responses



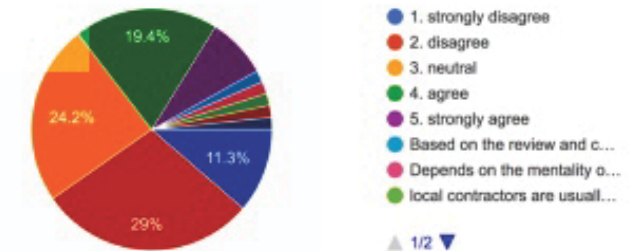
To what extent do you think cultural differences plays a role in project success?

62 responses



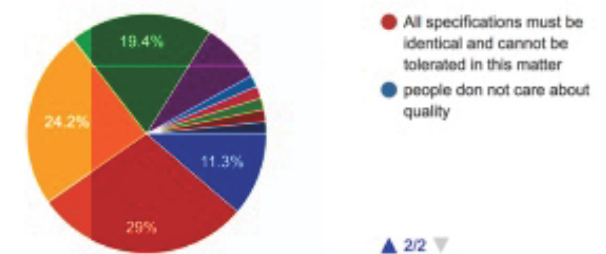
To what extent do you think people care about quality issues when working on projects?

62 responses



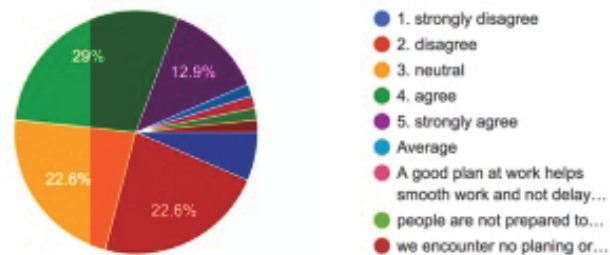
To what extent do you think people care about quality issues when working on projects?

62 responses



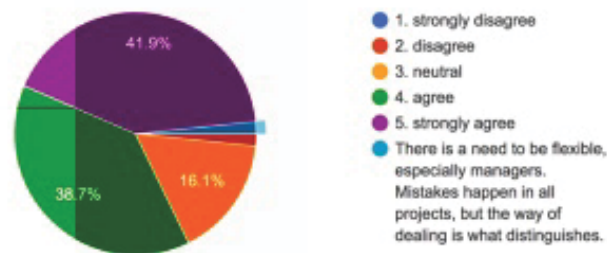
To what extent do you think people involved in projects are prepared to do their job because of good planning?

62 responses



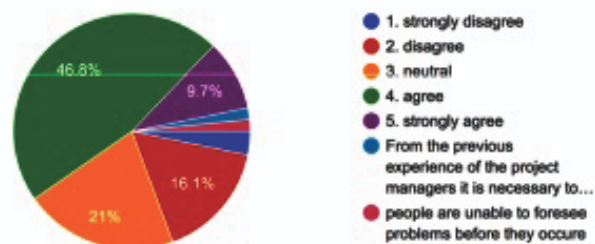
How important is flexibility to the people involved in project?

62 responses



To what degree you think project managers are able to foresee problems before they occur?

62 responses



Do you think that project tasks are clearly defined when working on construction projects?

62 responses



1	What factors influence relationship with other contractors or companies working on project with you? Please specify
2	friendship (4)
3	connection (2)
4	previous working relationship (2)
5	reputation (2)
6	delays (2)
7	Connections, pay offs
8	1. The trust level is most important factor between the peoples involved. 2. The ideas should be reviewed based on project successful completion rather than who is promoting it. 3. The transparency in discussions required. 4. The financial implications and technical
9	their system, the need of regular meetings, mistakes and following the contract.
10	Neutral
11	The relationship between the contractors or the companies operating in the project must be within the scope of the work only. The
12	most important thing that affects the relationship is the commitment of each contractor or each company to the tasks required of them
13	Contractors Integrity, their attitude towards work, HSSE awareness, their knowledge of work, their communication skills, stakeholders
14	Knowledge of work, Poor planning and management of resources, Communication, work ethics, integrity, stake holders management
15	I think the main factors are trust, delivering to commitment,
16	1- good coordination 2- specifying roles for each party
17	performance, preparedness, and honesty
18	Bad coordination
19	Experience of people working on the project
20	Responsibility, Sincerity, obedience, punctuality.
21	To be uncooperative
22	money and deadline. along the duration of the project either they or i will ask for money for some part of the project to be finished with
23	good communications, flexibility

23	Late payments in proportion to the progress of work, the lack of quality in construction, errors and delays in the production drawings and for approval of sample materials were considered the most interface problems and geological problems.
24	Quality
25	Coordinate
26	Contracting relation
27	Culture, Friendships
28	Lack of communication Lack of experience
29	Delays in project finish and no Communications
30	time is an important factor because if you are on time some problems can be ignored
31	Credibility & Determination
32	friendship, connection
33	language, culture
34	culture
35	friendship
36	knowing them well
37	knowing the other party well
38	friends and people I know
39	well known partner
40	no communication between partners
41	strong relationships
42	Delayed payments cause delays for projects. Also there are no professional engineers in contracting companies that have the ability to
43	Failure to comply with the schedule and quality required affects the relationship with the project executing company
44	connection, friendship
45	connection and friendship
46	seniority
47	overlapping authority
48	no coordination between parties/contractors
49	superseeding authority
50	no communication
51	communication issues
52	1- commitment 2- experience 3-efficiency
53	communications
54	good working relationship
55	good bonding through long working relationship
56	experience
1	What other issues, factors or concerns you face when working on construction projects that you would like to share? Please specify
2	culture (2)
3	constant delays (2)
4	Culture and personal connections
5	1. The coordination with other departments to get clearance is a big concern. 2. Design review or alternative proposal needs a strong design team. 3. Delay in procurement of Materials by the Contractors. 4. Cash flow
6	Interface between contractors and the mentality of claim-oriented contractor
7	Level of Labors must be better, all project needs foremen, no actual planning between planning program & actual execution, period of
8	One of the most important factors or issues that affect the work of the project is the prior coordination with all government departments or concerned authorities related to the project and know their future plans of and its impact on the project
9	Contractors poor cost estimation skills leading to cost over runs and variations, having direct impact on project completion.
10	Improper risk identification at various levels, Main contractor Sub-contracting a major portion of job, work force improper planning, not
11	they are several items that the scope is not defined well and there are items to be added to the project which is not included in the
12	1- poor planning 2- lack of experience among the staff
13	clarity of scope of work, market conditions
14	Design change
15	Communications between people
16	Lack of sufficient Labors, delay in payment, inexperienced supervisory staffs.
17	Fear of lying of workers
18	lack of some materials that is according to the specifications within the country
19	skills of people involved in the projects, no contracting engineer in site
20	n government projects we face problems in providing high quality materials. Where the government intervenes to oblige companies to
21	Human relations

22	Achieving quality with low cost
23	- Monthly Payment - Efficacy of Equipment
24	Cost, Connections
25	Quality Time
26	quality of materia and quality of work
27	the lack of experience from the contractors side that make the consultant work with twist the effort to get a good result
28	contractor's financial situation & qualified manpower
29	laguage between different nationalities
30	quality
31	language, culture
32	constant delays, changes in requirements, interference by stakeholders
33	interference by customers
34	constant delays, changes in requirements
35	changes in requirements
36	constant delays
37	delays
38	constant changing requirements
39	changing requirements
40	requirements issues
41	changes in projects
42	last minute things must happen
43	people involved in projects have no experience
44	Government laws oblige contracting companies to employ citizens, most of whom are engineers and do not have sufficient experience in
45	main problem facing me in construction project: not enough skilled workers, Unreliable Subcontractors and Changing Minds of
46	interference by many parties
47	competition
48	interference from different people and levels in project
49	authority
50	overlapping tasks
51	no power given to the PM
52	contractors don't care about quality of deliverables
53	bribery
54	constant delay
55	1-Variation
56	labor issues and delays
57	communication problems
58	no clearly defined responsibilities
59	labor issues
60	delays
61	communications

1	What issues or difficulties you encounter regularly that impacts projects? Please specify
2	delays (3)
3	delays, quality (2)
4	changes in requirements (2)
5	constant delays (2)
6	changing requirements (2)
7	Delays, people don't care about time or quality
8	1. Breakdown of Machineries 2. Materials supply 3. Quality compliaw
9	Having higher mangement decision without reffering back to us
10	classification contractor degree (excellent) not identical as actual
11	One of the most important problems we face regularly in the implementation of projects is the additional tasks which we have to add to the project, which requires to obtain the approvals of the concerned authorities and to provide the required funds for that
12	Contractors poor planning , lack of communication, limited project management, limited engagement with stakeholders, contractors limited ability to secure approvals and permits on site, Main contractor subcontracting more than 50% of their job, limited expertise in risk assessment.
13	Communication gap, no abiding to Health, safety ,security and environmental plans leading to stoppage of works, Variations
14	No Objection from Government Authorities; disputes on scope
15	shortage in financial resources
16	understanding importance of deadlines, not providing adequate resources
17	Site issues
18	Experience of people
19	unskilled labours, irresponsibility of Management etc
20	nothing
21	there is no fixed plan for the project
22	no engineer in the site all work managed by foremen
23	Additions after the final adoption of the project, in addition to delays in projects and extra costs
24	Third party's
25	Time of the project
26	Distance from city center
27	Quality, Delays
28	Site issues Safety
29	changes and Delays on work
30	lack of financial liquidity in contractors causing delays in business
31	Project location spec. those @ remote locations or in the desert
32	level of knowledge
33	knowledge, time
34	constant delays,
35	many delays
36	delay, inteference by others in the project
37	delays, lack of knowledge
38	nobody knows what is to be done next
39	The nature of the land here is difficult and lack of good planning causes frequent problems and changes on the plan constantly
40	Systems are constantly changing I expect that the most frequently repeated thing is changing and updating the regulations of the city constantly and updating them. How are you supposed to stay on top of everything?
41	Everything is done last minute, no pre-planing
42	delays, changing requirements
43	new requirements

44	labor issues
45	weather factors: heat
46	no coordination between contractors
47	inteference from company forcing different course of actions
48	curruption and pay offs
49	no attention given to quality
50	communication with workers
51	1-Delays on submission 2- lack of experience
52	cost going over budget
53	inteference in project activities
54	communications
55	constant changing project requirements
56	time and cost
57	culture

Analysis of various literature revealed a number of CSF factors, which has been identified; including the work of Yee (2012) that emphasize the importance of personal management in U.K. based companies' project management practices in general. This chapter classified difference and findings of CSF in project management between both U.K. and Omani companies and presented them in Table 2. Analysis in this chapter of the study further reveals that there are number of issues related to the practice in construction projects in Oman. This may be attributed to number of reasons such as cultural, historic, size, and experience among others. More specifically, there is a clear lack of understanding in State of Oman and across the GCC, by contractors and construction companies including public and governmental institutions involved in construction projects, of the concepts of quality and the concept of planning. This is represented by constant delays in construction projects, which also reflects elements of lack of understanding of the process of planning and the nature of engineering

project.

Conclusion

This chapter presents the reached conclusions of this study. Such conclusions indicate that Omani contracting companies should delegate more authority to the competent foreign partner and allocate resources for such works to improve project efficiency. Thus allowing the planning function of the project to experienced team to participate in the development of plans. This chapter further concludes that British contractors operating in Oman should be keen on conducting more frequent meetings/interactions between planners and implementers throughout the life-cycle of the project, through which to explain plans and objectives to employees of Omani or GCC partners and contractors. This will facilitate and elaborate on the needed amendment to various tasks, sub-tasks and phases of the projects to ensure compliance and successful implementations of unified and homogenous project objectives. Furthermore, British contracting companies should emphasize the engagement of workforce that is certified by professional bodies such as "Project Management Institute" and others, to ensure that personal involved are qualified, and to secure readiness of planning and implementation tasks. In final conclusion, it is extremely important to be aware

of the fact that cultural characteristics tends to be the predominant factors in the make up of relationships that take place in countries like the GCC. Such findings may be inferred across projects conducted in developing countries.

In Conclusion

Recommendations regarding the results of this study. U.K. companies should consider such factors when operating in Arabian/Persian Gulf and in developing countries, these are:

1. The necessity of construction companies to allocate a special attention to thoroughly examine project plans proposed by counterparts, and all documents pertaining general specifications, more specifically, contractual agreements, since they significantly vary from those in the U.K. In the GCC, they tend to be non-thorough and non-comprehensive in nature. This largely because of cultural reasons. As such, U.K. or Western (including Japanese) companies might find themselves missing essential components. Additionally, when working with counterparts in developing economies, it is advisable that long and frequent meetings should take place to understand the nature of the engineering project and conduct thorough analysis, whereby both parties ensure that all participating parties involved are in tune with one another.
2. It is essential to ensure that when working

with contractors, it is advisable to appoint highly trained staff and professional to minimize cultural frictions and misunderstandings of the host country.

3. It is common to find low waged labor. Such workers will be doing the actual work, which lack basic communication skills, language barriers and attention to detail. The utilization of such workforce although highly contributes to profit margins, yet, they significantly affect planning, implementation and specifications of deliverables.
4. Administrative and technical decisions should be left to qualified partner, while actual construction should be left to be managed by local partners.
5. It is important to pay attention to local values and norms that can significantly affect project outcomes such as; obtaining permits, regulatory issues, labor management... etc. Building a rapport, forming friendships, and understanding of local customs will ease tension and improve projects outcome.
6. It is common to find young and predominantly male workforce under the age of 35 managing projects. This is part of the governmental policy in developing economies to provide jobs to the local population and grow local talent. The side effect of this, is that such young workforce lacks the capacity to effectively manage projects.
7. It is highly advisable to engage counterpart's workforce in short courses and training ses-

sions to improve capacity and to set expectations regarding project deliverables from a Western point of view, and set standards early in the pre-project initiation stage.

8. The contracting companies in developing economies should delegate the authority to competent foreign partner and allocate resources as such. Thus delegating the planning function of the project to experienced team to improve the development of plans.
9. Western contractors operating in developing economies should be keen on conducting regular meetings between planners and implementers, through which to explain plans and objectives to employees of Omani partners and contractors, and elaborate regularly on the needed amendment to projects to ensure compliance and implementations of unified project objectives.

Finally, it is extremely important to recognize that cultural characteristics tends to be the predominant factors in making up of relationships that take place in a developing economies like Oman and the GCC in general. Data collected in this study shows that such approach to project management can make or break a project. Therefore, it is highly advisable that whenever a Western or non-Western contractor operating in a developing country, should develop an understanding, and invest in the development of friendship building and acceptance of cultural norms to facilitate future working relation-

ship once a project is commenced. Such generalization may also be applied in the case of working relationships and projects across the Middle East & Africa, Asia, Latin American, and other developing economies. The similarities in cultural characteristics and business practices across “High-Context Societies” according to Edward T. Hall. This is attributed to the fact that such High-Context societies tends to enjoy similar socio-economic and historical development characteristics. As such, most companies operating in such regions tends to have similar experiences when dealing with local contractors and parties (Ankrah et. Al. 2009). Although the involvement of Western companies in the GCC region has a history that expands over more than nine decades, yet, new generation of engineers, managers, and project practitioners might not have the needed international work experience that equip them to deal with an entirely new project experience, which may seriously hinder the success of project undertaken. This may be attributed almost entirely to cultural differences. Therefore, developing cultural understanding by both parties, U.K. and Omani project managers, would significantly help not only the implementation, but the earlier preparatory stages required in the planning process of undertaken projects.

Research Contribution

With increasing British involvement in projects in the former commonwealth, as a resurging objective of the British busi-

ness community to regain economic involvements and market share, this research is mutually beneficial to both, British and companies of the developing world, by providing current and relevant framework of significant operational differences and critical success factors that contributes to the success of projects. Such significance lies in highlighting essential requirements, CSF, and cultural differences that shapes interactions and outcomes of such expense projects. Contribution of this study is particularly important in a time of scarce financial resources and increasing Chinese competition in global projects. Therefore, emphases on determining what critical success factors to focus on to achieve optimal results is crucial for Western companies. Stakeholders in developing countries are potential beneficiaries of this work as well.

Limitation of the Study

This study is limited to examining CSF literature review related to U.K. construction companies, and Oman, which are derived from current and relevant literature review that discusses U.K. construction company's practices regarding project management practices. This is primarily because of the efficiency of the project management field in the U.K. (Morris and Hough 1987), efficiency in publication of relevant literature, and the long history of U.K. construction companies in managing projects in the U.K., Europe and across the globe. While project management related publications regarding Omani and GCC countries construction industry is very limited or available only in Arabic language. Available research

reports and studies in Oman and the GCC are conducted by governmental departments involved in construction projects, or companies involved in such projects, which makes such vital information unavailable to the general public to benefit from. Therefore, such data had to be gathered through a survey for the purposes of this study. This study is limited to engaging Omani construction companies by gauging project managers' opinions and views regarding perceived CSF in their industry. It is within the scope of this study as well to examine existing CSF literature review related to U.K. based construction projects and companies as a representative sample of Western construction companies. Because of time and budgetary constraints, it is not within the scope of this study to go beyond the boundaries of the U.K. to examine CSF in European construction projects. The aim, resources and time allocated however is sufficient as far as the scope of this research project is concerned.

Suggestions for future research

The researcher recommends that after the completion of this study, future studies should address the extent and impact of financial crisis and economic down turn on the implementation delays of construction projects in the GCC, Middle East and Asia. The Experience of the UAE and Dubai particularly would be very interesting grounds for such studies; this is particularly true in the age of low oil prices, which significantly impacts oil

dependent treasuries of the region. Another dimension to examine in future studies, is operating under highly volatile political tensions between GCC countries (such as current tension between Saudi Arabia and the UAE in one hand vs. Qatar on the other) and what opportunities might there be for Western based companies. Another suggestion for future research is the role of British companies in post-Brexit era, and how Western expertise can help the GCC region in developing local economies of the developing world.

Summary

This chapter concludes that there is a clear lack of understanding by contracting construction companies including public and governmental institutions involved in construction projects of the concepts of quality and the concept of planning. This is represented by constant delays in construction projects, which shows a clear lack of understanding and appreciation of the process of planning and the nature of engineering project. It seems evident that objectives are not shared or taken seriously by parties involved. This may be attributed to the way people view and value the concept of time and quality (Firend, Al. R. 2016). Recommendations regarding the results of this study suggests that Western and U.K. based companies should take such factors into consideration, when operating in the GCC and developing economies. Such factors include the necessity of companies

involved in project management to allocate a special effort to thoroughly examine project plans proposed by host country counterparts, and all documents of general specifications, specifically contractual agreements and specifications, since they significantly vary from those in the West. Finally, this study highlights the importance of recognizing the cultural norms and characteristics that tends to be the predominant factors in forming a workable relationship that take place in countries of highly complex or underdeveloped regulatory frameworks.

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