Managing Virtual Mega-Projects
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Abstract

The paper will review the best practices of the virtual project management office, complexity theory, and reverse logistics management in the business life-cycle of a program (project). The review of the virtual project management office best practices will explain how to support a mega-project through the improvement of scope management. The review of complexity theory will offer tools and techniques that allow the application of complexity theory to a mega project in order to improve schedule management. Reverse logistics management will review the three essential elements of reverse logistics: returns, recycling and reclaimed goods and how these best practices can be applied to a mega-project in order to improve budget management and to make the project more profitable.

Introduction

Mega-project success is often based upon the fulfillment of project requirements of a customer in a certain period of time while remaining under a certain budget. The theory of constraints explains that scope, schedule, and budget are three of the most important aspects of any project and if one of these elements changes then it will likely have an impact upon another aspect (PMBOK, 2008, p. 6-7). What the theory of constraints does not explain is how much is the project impacted and what can be done to mitigate the change to the project. Many project managers believe that the impact is proportional to the change; however, understanding best practices may be the solution to reducing these impacts. In some cases, there are fundamental ideas that need to change in a project in order to achieve these best practices while in other cases these best practices can be superimposed upon a project in order to achieve greater success. This decision is left to the project manager to address as it is understood that each project and project culture is different and so the application and degree of these best practices must be applied at the discretion of the project manager. However, a resourceful project manager should try to apply as many different best practices as possible in order to achieve greater mega-project success. The objective of this paper is to offer project managers different best practices that can be applied to mitigate issues pertaining to scope, schedule and budget through the application of best practices of the virtual project management office (VPMO), complexity theory (CT) and reverse logistics management (RLM).

Virtual project management office best practices: Scope management

Introduction

For those unfamiliar with the definition of a VPMO, it is a management team that is not co-located that is responsible for a project or project team (Gordon & Curlee, 2011, p.3-4). In a mega-project, the VPMO is tasked with having to manage a large and complex project with multiple sub projects and likely to have multiple important stakeholders. The complex nature of a mega-project increases the responsibility project managers who will find that they must address all of the needs of stakeholders while having less time for internal people issues. Project Managers of mega-projects need to be masters of time management and they must learn to effectively manage and maintain trust and positive communication in a VPMO. Since a virtual project manager does not have first person daily contact with team members or stakeholders, it is important that other methods are used to maintain positive communication and to continually build trust. Research has shown that the virtual environment is the hardest environment to build trust (Gordon & Curlee, 2011; Duarte & Snyder, 2006; Tavcar, Zavbi, Verlinden & Duhoavnik, 2005), and a mega-project increases this challenge considerably. Furthermore, communication by phone and other online communication are not as robust as face to face communication (Duarte & Snyder, 2006) and often leads to a personal disconnect to the project. Additionally, the increased use of email does not always result in positive communications and trust (Curlee & Gordon, 2010). Without trust reinforcing contact between the VPMO and project members and stakeholders, and robust communication, individuals can lose touch and people will often feel
isolated from the mega-project. Thus, two VPMO best practices are building and maintaining trust and positive effective organizational communication.

VPMO building and maintaining trust best practice

Although it is not easy, it is important that a VPMO invest in creating and maintain trust in a mega-project. Research has consistently supported that trust is an integral part of a successful virtual team (Anderson et al., 1998; Duarte and Snyder, 2006; Lipnack and Stamps, 1999; Tavcar, Zavbi, Verlinden & Duhovnik, 2005, Curlee & Gordon, 2010). As trust is so important in a virtual organization, one important best practice that has emerged with regards to mega-projects is the establishment of a federation in order to unify all those involved with the mega-project. The federation concept is creating a participatory relationship for the project team and stakeholders. If everyone is directly invested in the project then people are more apt to do their best for the success of the project. This would mean making people socially, fiscally and culturally invested in the project. This participation should include all mega-project stakeholders because if everyone is seen to have valued input towards major decisions the more invested that people will become. This does not mean that every employee has a voice because that would become unwieldy in a mega-project, however, one should consider more of the U.S. federal governmental method where representatives are identified as the individuals to represent the needs of any particular constituency. This type of representative decision making process can help manage scope in a manner that allows everyone into to the process. It will not guarantee that the agreed upon scope will make everyone happy but it can help everyone understand what will be done and why.

It is common in mega-projects to create a federation brand. A brand might include slogans such as ‘5989 on time!’ or mega-project logo-wear such as shirts, hats or pins to better define and improve the cohesiveness of the federation or the simple creation of a project goal card. Creative slogans are low cost options because anyone can repeat a slogan and included it as a tagline for emails, the logo-ware option might represent large investments that might not allow for logo-wear to be possible for all project. If the budget allows and if the project is appropriately funded, then a logo-wear option does help create the feeling of a federation. However, a low cost alternative to logo-wear would be to create a project goal card that can be distributed to everyone involved. The simple creation of a business card that includes an image of the final mega-project deliverable with the project name and the top goals and/or values of the project that is distributed to everyone involved can create the feeling of inclusion (Gordon & Curlee, 2011). What is important with this route is that the more personalized the card, the more likely it is to create the feeling of inclusion.

Boudreau, Loch, Robey, and Straud (1998) found that virtual organizations that leverage the notion of a federation are more successful than those that do not (¶ 13). The federation concept as defined by Boudreau et al. (1998) is virtual partnerships, joint ventures, consortia, and other alliances that are managed by a group that are designed to change with a project. A federation may include alliances with other outside organizations or stakeholders involved with the success of a project (Boudreau et al., 1998). The federation concept has been applied successfully to the B-1 Bomber project, which had over 2,000 corporations working together, most of these whose primary interaction was virtual. Other successful corporations that utilize a federation concept include Sun Microsystems, Nike, and Reebok (Boudreau et al., 1998). A federation can help build a community that is focused upon towards the success of a mega-project. A federation that works together will be able to work out scope details better than an organization that lacks a process that involves everyone involved with the scope of the mega-project.

VPMO positive effective organizational communication best practice

Since trust and communication is a major part of a successful virtual team (Handy, 1995; Dani, Burns, Backhouse, & Kochhar, 2006), the leaders of a VPMO must establish, maintain and evolve consistent values and boundaries in the organization and to continually communicate these values to all stakeholders. One manner to communicate these values and boundaries is to advertise the successes and failures of the project. Honest success leads to more trust and communication as stakeholders have something positive to celebrate. A successful project will grow new fans when the milestone success of the project is seen by others. For fans of ‘The Deadliest Catch’, nothing brings the crew together like catching full pots of crab. Once the crew is successful, suddenly, all crew disputes disappear as the group works together to haul up crabs and a big payday. The VPMO must recognize that if project success is the panacea for trust, then project setbacks are its nemesis.
Project setbacks, if not properly managed, can undermine trust and communication faster than any other factor. When a project is faltering, people will try to distance themselves from the project (or organization) in order to avoid being associated with the failure. This becomes a challenge for the VPMO and the best way to meet this challenge is to communicate the failure but to also explain the implemented solution. If the project is behind, the VPMO must communicate to everyone how they will get back on track. The VPMO must explain what scope will be changed or modified in order to meet the schedule and budget. The VPMO must also explain how it will accelerate or decelerate resources in order to meet the new challenges of the mega-project. This must all be done through multiple communication means because the attitude of ‘failure is not an option’ must permeate the mega-project in order to find solutions rather than be stopped by obstacles (Gordon & Curlee, 2011).

Conclusion

Virtual project managers involved in mega-projects are often too busy to focus on the fundamentals, however, Abraham Lincoln said it best when he stated, “A house divided against itself cannot stand.” It is the fundamentals that make any project successful and this is even more important for a mega-project. When project managers forget the basic building blocks of success, then success becomes more elusive. Social skills are just as important as scope, schedule and budget. If people do not feel included and that they are being managing correctly, there will be strife, confusion or worse, conscious or unconscious sabotage. Achieving and maintaining trust and effective communication is the only way to achieve success. When people are involved and invested in a project then they are willing to work together to find solutions rather than to accept an impasse that slows or halts the project until it is resolved. Having a rapid resolution process because people want the project to success will make people more flexible with regards to scope.

In closing, if there is time to make status calls and write update reports there is time to maintain a positive and trusting relationship with stakeholders of the project. People agree that trust is earned so the VPMO must work towards earning the trust of others (Tavcar, Zavbi, Verlinden & Duhojnik, 2005; MacPhail, 2007) so that when scope challenges arise that people strive to find solutions. Communication and building trust must be part of the daily agenda rather than something that is addressed when there is a problem because if it is addressed daily, it will never become a problem. Consider this new paradigm for a successful project, instead of using the yardsticks of scope, schedule, budget, use the yardstick of did you feel glad or sad when the project came to an end? Gladness implies that one could not wait to get out of that project team, while sadness implies that one trusted the group and enjoyed the project (Gordon & Curlee, 2011). If people are sad when the project is coming to an end, then people have worked hard together towards success and acceptable compromises with scope have been made along the way while still preserving the essence of the project. Thus, trust and communication are imperative to the overall successful perception of the final deliverables of a project.

Complexity theory best practices: Schedule management

Introduction

Complexity theory has its roots from Edward Lorenz, a meteorologist, who explained the concept of the butterfly effect theory (Wheatly, 1999). A simplified explanation of the butterfly effect is when a bird flaps its wings in Florida; this creates a minute disturbance in the atmosphere. Since weather cannot be precisely understood, because one would have to mathematically take into account every possible atmospheric disturbance. Since some atmospheric disturbances are very small, such as the example of the bird, it would then be impossible to predict the exact path of a hurricane. Even modern techniques of weather prediction can only approximate the movement of significant weather. Since this could not be calculated, this was originally believed to be randomness, and many have attempted to discount these smaller forces as irrelevant due to their relative small impact, but Lorenz found that the atmosphere never reached a state of equilibrium; it is always in a state of chaos.

Chaos theory has moved past the realms of math and science and has moved into social sciences and business. The butterfly effect can be applied and can be used effectively for large scale virtual projects (Samoilenko, 2008). From a project management perspective, when a project is moving forward, it is best to put all the forces together to work in the same direction. Just as the flapping wings of a butterfly in Japan can be a contributing force to the creation of
a hurricane in Florida, understanding that even a small impact can have a great effect when magnified over time and distance.

From these ideas about chaos, complexity theory has emerged as the management belief that total order does not allow for enough flexibility to address every possible human situation. People are inherently skeptical of less order because it is believed that in leads to less control. A recent example of where complexity theory worked at a level never before tested was with the investigation of air traffic controllers after the 9-11 tragedy. Once it was known that an unknown terrorist group was hijacking planes to attack buildings in the United States, it became a national priority to have every plane in the airspace of the United States to land at the closest airport. Since this kind of crisis had never existed, there was no procedure or process in place to allow this to happen. Researchers wanted to determine the best process or procedures to address this type of wide-spread domestic crisis were it to happen again. The researchers examined how each set of air traffic controllers managed the situation. In the end, the study concluded that the best way to handle such a crisis would be to allow each region to dynamically manage the situation. In other words, the creation of a single set of processes or procedures to handle such a situation would be a detriment in achieving the goal of landing all the planes. Accepting that there was no one set of processes that could handle such a crisis showed that a linear solution is not always the best solution to what would be considered a linear problem. This was an awakening for project managers as it brought to the forefront the underlying assumption of there is always one right solution or procedure to a problem inherently flawed.

According to complexity theory, humans exist together in an open system. What makes complexity theory different than a traditional open system is that the complexity accepts that there are parts of the system that cannot be explained but accepts a certain degree of randomness (Byrne, 1998). Traditional human thought is to break down the system into its smallest part to explain the whole. This is seen in atomic theory that attempts to explain all matter in the universe as based upon the smallest elements. Western thought seems content to understand the universe as a discreet systems rather than a holistic interconnected system. This is clearly not always the case because we cannot learn the inner workings of a colony of ants by studying a single worker ant.

**CT leadership best practice**

Projects are always about people although the key deliverables might be some final product or item that did not exist previously. Because people behave in a complex non-linear fashion, complexity theory is ideally suited to apply to project management. Although the Guide to the Project Management Book of Knowledge (PMBOK, 2008) prefers a linear approach to directing a project, a leader of a mega-project must understand that his/her leadership style will have an impact on the project. The project manager needs to have the self-confidence to understand what areas of the complexity or chaos need focus and which areas need to be allowed to be resolved by those on the team. The team needs clear direction, but not always detailed instructions as micromanagement is not a successful best practice.

Seasoned project managers realize that all parts of the projects cannot be controlled, so a successful leader will need to be able to delegate in an effective and creative manner. Project managers realize that creativity occurs on the fringes of complexity or chaos, because sometimes it means giving more authority to individuals that might lack direct organizational authority. Linear thinkers can only consider evolutionary improvements where one process connects to another sequentially with the potential of incremental improvement, while complexity based thinkers can create revolutions and introduce new systems with the potential of enormous improvements.

A single leader can motivate each individual in a project through direct and indirect actions. As explained in complexity theory, small actions and deeds can lead to large changes in a distant system, so a leader should take time for small changes to assist in creating a controlled hurricane that can achieve complex tasks. Too often people do not realize that even small contributions, such as compliments or recognition of a job well done, can build to create something greater for the mega-project. A leader that can motivate and offer small praises that matter can help move a project forward faster. The more that a project manager, particularly one that operates virtually, can harness this kind of organization, the more effective the project will become.

**CT showing results best practice**
It is a common problem for a project to fail. Projects, whether they are virtual or traditional, large or small, become troubled for various reasons. The Standish’s Chaos Report (2009) found that approximately 75% of IT projects fail. The report also found the top three reasons that projects succeed are as follows:

1. User Involvement
2. Executive Support
3. Clear Statement of Requirements

While the Standish Chaos Report focused on IT project failures, this information may be extrapolated to other types of projects as well. Results in a project are what stakeholders crave; however, results do not always translate to milestones. So, the mega-project must sometimes change focus from schedule milestones to showing results.

One example of how complexity can be applied to a troubled project is when the project manager finds himself or herself in a situation where he or she must show results before the project has attained necessary milestones. An impatient client might form a negative impression due to the lack of results. An experienced project manager will agree that stakeholder impatience and haste can often create the necessity for non-sequential activities. A linear project manager might find themselves paralyzed by this need and may result in the project manager pushing back upon the customer. The project manager may offer excuses or explanations, which do not help the project, but may represent reality. This may cause the customer to express concern about the project, even when there is no real cause for alarm.

At this time, complexity can assist by offering the project manager a more value driven perspective than a milestone driven (linear) perspective. Project managers can be pushed to resolve and handle issues out of the typical sequence in order to achieve certain milestones which are important at a higher level (Weaver, 2007). This kind of pressure can be exerted upon a project manager in order to achieve certain milestones faster in order to achieve quicker results. This means that the project team must explain how the completion of later tasks can mean time saved in the future. It could also mean that a new process or system that is being implemented that will accelerate the speed of completion in the future. Innovative ideas can keep a project on track and those kinds of innovations might not appear on a static Gant chart.

Complexity theory is about harnessing chaos in a manner that allows the project manager to increase the team’s effectiveness by allowing creative solutions to form to move a project forward (Haas, 2009). Often times allowing the random walk of the determined individual allows a certain level of creativity to become successful. An effective team can be more effective than individual, allowing an individual to plow forward can often drive the team further and faster. Complexity is the manifestation of empowering and delegating tasks to allow individuality to support the hive. A project manager must know that delegating groups of task can lead to synergistic creativity rather than emphasizing linear progress. This kind of thinking permeates human culture and even television ads of insurance companies focus on bundling or combining different types of insurances for reduced rates while statistical risk analysis indicates that there is no correlation between different kinds of risks.

**Conclusion**

Complexity is applicable in all areas of project management; however, applying these best practices in areas that are ambiguous can give a project manager a new tool to address these kinds of situations. Given that change is not always totally clear, the project manager would be better served to provide high level goals and visions to better drive the leaders charged with organizational tasks. Rather than the project manager be personally being involved with every change, the project manager should allow the organizational change team leaders to coalesce and come up with creative solutions to any given schedule challenge.

In closing, these best practices work best with the concept of a **federation**. As discussed before, a **federation** can assist with allowing everyone a voice in the project while still allowing for people to come up with creative solutions. The project manager should ensure the schedule allows enough time and consequently enough flexibility for this important aspect of a project. Too many in leadership do not pay enough heed to the changing schedule of a project. So, a project manager must take care to monitor the changing schedule but the project manager should learn to keep a distance to avoid become embroiled in the minutia of change.
Reverse logistics management best practices: Budget management

Introduction

Reverse logistics management is about the handling of materials after they have been sold. How this impacts a mega-project is that within any project there will be materials that are purchased, modified and used to finally build and complete the project. Given that so much material will be acquired during a mega-project that it is important that attention be paid to the forward logistics as well as the reverse logistics. An analysis of the waste stream and recycling should be completed to not only address any environmental concerns but to address economic savings.

The three essential areas of reverse logistics are returns, reclaimed goods and recycling (RL3) and a properly engineered reverse logistics department will allow all of these areas to work together while everyone having visibility of these processes throughout the organization. Visibility is all about allowing everyone in the organization to be able to retrieve, review and analyze the information about reverse logistics. Complete visibility is important because then there can be a true economic analysis regarding returns, reclaimed goods (waste management) and recycling. Information is the first step to achieving better outcomes, because since many of these elements are typically ignored, if one can design an organization that can leverage these areas it can lead to savings throughout the project.

A mega-project, such as the launching of Disney Cruise line that included the construction of two large modern cruise ships, the construction of a dedicated terminal in Port Canaveral, a fleet of busses and the acquisition and development of a private island was a billion dollar investment (Hemmingway, 1998). So if one were to take a conservative estimate and consider that 1% of a billion dollar project consists of waste and recyclables, then a billion dollar project has a 10 million dollar opportunity, if managed properly.

If one were to start in the planning phase of a project to consider this opportunity and to develop systems and management that would maximize these kinds of opportunities it could certainly offer considerable project savings. Given the current economic situation, no business can overlook this kind of potential and so it must plan for addressing these economic and environmental realities.

RLM returns best practice

The reported value of U.S. returns is estimated at 100 billion per year and consists of approximately 4% of the U.S. GDP (Blanchard, 2012, Stock & Mulki, 2009, Li & Olorunniwo, 2008). This statistic alone shows the importance of the management of returns. Further studies have shown that the rate of returns can vary between 5-50% (Rogers & Tibben-Lembke, 1998) and so even at a modest 5% rate, this level of returns is significant. Given this level of potential, any mega-project should start with a manageable process to address returns. What often happens is that returns have many more processes or steps and so are less effective than traditional forward logistics which leads to more money lost though inefficiency.

The returns process is the most commonly identified aspect of reverse logistics. This is not surprising because all retail organizations will need to have some manner of returns process. What was found in much of the reverse logistics research was the organizations that did not have a solid defined process for their returns were ones that had the most room for improvement (Blanchard, 2012). If the returns process is not done properly, an organization can lose the value of these returns. A best practice in returns in a project is to use a tracking number, such as a purchase order is used for supply chain and forward logistics, an internal return number allows the return to be better tracked (Gordon, 2011). The consistent use of this kind of tracking number was found to help improve the returns process as it moved through the organization. Keep in mind that if a product is not returned that the loss is 100%. Incorrect, damaged or otherwise unusable product can be a drain upon a project if not managed properly.

Another best practice is to appoint a person to oversee the reverse logistics process within a mega-project. Depending upon the size of the project, it might not mandate a full time position, but making someone responsible and having someone skilled in negotiations will certainly assist with savings in the area of returns. Organizations have long understood that having a highly trained and professional supply chain group will yield organizational benefits beyond the cost of these professionals, and organizations are only beginning to realize that applying the
same level of training and professionalism to reverse logistics can yield the same level (if not greater) of benefits. Furthermore, another best practice in returns is the policy and customer service. Given that no process will be 100%, a manager in a mega-project must understand that there will be incorrect, broken or otherwise unusable materials that will end up on the loading dock. Since the mega-project will have to manage hundreds or thousands of suppliers, it becomes important to have a reasonable returns and customer service process. Without having this requirement to start, the project might find itself overspending just to acquire the necessary materials to complete the project.

**RLM recycling and reclaimed goods best practice**

To clarify since there are many competing ideas in this area, recycling in this context is any program that reuses material by returning to locations that reuse material in a similar fashion. Examples are cardboard recycling, aluminum recycling, and plastic recycling. These materials are recycled and reused in a manner that was similar to the original item. Also, some of these materials might also include a bounty for returning the items for recycling (such as CA redemption value) which is a cost taken at the time of the sale and is returned it the product is returned to an approved recycling center. Reclaimed goods are materials that are either re-sold in a used state to gain back some value, such as selling old computers or materials that are sold for scrap, such as the sale of old cell phones where if the model is too old that the item is reduced to usable pieces or even to the point of extracting certain rare trace elements used in such technology. Both of these areas are important in a project but each could be handled differently, depending upon the project or the volume of the particular areas.

The management of the waste stream has become more important as the public has become more aware of organizations that do and do not take steps towards preserving the environment. Although there are economic issues that should be pushing project managers of mega-projects to make sure that all of their stakeholders are environmentally conscious but also fiscally conscious of waste. The United States is by far are the most wasteful nation in the world and although we have taken steps to reduce waste and to recycle more, the U.S. is still far behind other nations.

Despite political and social pressures, some companies still actively resist moving towards programs and solutions that preserve the environment. Although there is no clear solution for every project, there are certainly three important steps that any organization should take to make sure that they are addressing and potentially saving money through recycling and reclaiming goods. There are three best practices that stand out with regards to recycling or reclaiming material.

The first best practice is to appoint a responsible person who has a passion for this work. If a project manager does nothing else in this area, appointing someone accountable will at least help move the organization in the right direction. It is not necessary for a top level manager to be appointed the environmental manager, but what is important is that the person believes that it is important and they are passionate to make sure that it gets done. Too often organizations are satisfied with putting colored bins out and leaving the responsibility to the employees to properly sort. Without any kind of accountability these kinds of programs never amount to much and probably end up costing the company more money than they save. Making a passionate person responsible will often lead to remarkable results.

The second best practice is to require that all areas have a recycling and reclaim goods program in place that is sound and sustainable. When a program is required it forces people to think about the best way to do it, and if the group is forced to bear the economic impact they will try to make the program as cost effective as possible. Too often the program is set up at too high a level and it does not take into the correct information. A mega-program will have resources on a global level and a recycling program in New York City might not be the same approach to take as a recycling program in Tokyo. One also needs to take into account the scope of the recycling or reclaimed goods; if the volume is high then one should consider utilizing a liquidation company that would be able to assist with locating buyers for the recycled or reclaimed goods (Rogers & Tibbens-Lembke, 1998)

The third best practice is to examine the carbon footprint of the mega-project. This might seem a lofty goal because there is no requirement for such a review, but if a mega-project can incorporate such awareness then it will help encourage more awareness of the environment and the mega-project. Depending upon the project, there could be
opportunities with energy efficient buildings, energy efficient technology and the use of alternative energy sources to attain a carbon zero footprint (Gordon, 2011).

**Conclusion**

Reverse logistics management is important to a mega-project because it can better utilize the acquired resources for a project. Since a mega-project will typically span years, a longer time horizon must be considered. The more time that the project will take the more resources that will be used and the more resources that will be obsolete by the end of the program. By considering these long term issues such as returns, recycling and reclaimed goods the more efficient that the mega-project will be. In one building in London that was built in 1870, through effective management of resources, leveraging alternative energy sources such as solar and harvesting rainwater the building was able to achieve through renovations a 60% reduction in energy and water requirements (Gordon, 2011). Such optimization shows that it does not require the construction of a new building or the development of new technology for an organization to achieve remarkable savings.

**Conclusion**

In closing, mega-projects have mega-opportunities in so many areas. As discussed already, there are multiple best practices that can achieve significant savings in scope, time and budget. Any project manager tasked with being involved with a mega-project can apply many of these best practices in order to improve their area or perhaps even the entire mega-project. There are opportunities in not only process, people but in programs. Process improvements exist by applying the best practices of the VPMO, people improvement can be seen in scope management techniques found in CT, while program savings can be found through efficient recycling or reclaiming goods that otherwise would have been wasted. Mega-projects span longer periods of time than typical projects and so understanding and managing time can mean the difference between success and failure of a mega-project.
References


