Change Management as a key factor to get effectiveness in complex projects

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SUMMARY

The analysis of complexity in projects has been studied since the 90s by many authors such as Michael Cavanagh, Masood Ameen, Kathleen B. Hass, Mini Jacob, Davidson Frame, Remington & Pollack, Santana, Stephen & Maylor, Brett Nan Tie, Jeroen Bolluijt, Franck Marlet, Jean Claude Bocquet, et al. There are also several modeling essays for application, made by organizations like Helmsman International Institute, International Center for Complex Project Management (ICCPM), International Project Management Association (IPMA), Global Alliance for Project Performance Standards (GAPPS) among others. This is an area of knowledge that is still evolving, with no one study line prevailing over others. What one has of consensus is that projects can become complex systems and, therefore, require that managers have knowledge and additional tools for the treatment of non-linear behavior in projects. It is important here to distinguish complicated projects from those that are complex.

Complicated projects are driven by a building process of multiple components in sequence and may have several technical competencies involved. The process is based on manuals, models, where structured methods of planning, monitoring and control work and the measurement of value added tends to be linear during the project life cycle. If you follow the instructions and have the necessary technical competence the project will add 100% of the expected value. A bridge, a road, a new car, a tunnel, an aircraft are tricky projects.

Complex projects do not have a linear behavior during their cycle. The project does not respond to structured planning, monitoring and control methods. Value-added measurement becomes a challenge due to uncertainties in the construction process, and therefore the results may be the most unexpected. According to Cavanagh (Cavanagh, 2013), the project is "*surrounded by unforeseen events and tigers appear and jump at you coming from behind the trees*".

According to Jackson (2003) and also referenced by Cavanagh, complex systems present nine levels of complexities ranging from level one, the simplest, such as structures and models that have static behavior over time, going through level eigth that involves social and cultural systems typified by the existence of intelligence, personal behaviors, formed groups, their values, roles, communication way, economy factors, going up to level 9 which is the transcendent level of God, spirits, religion, in which no scientific knowledge are applies directly.

The world is knowledge-driven and under digital transformation, where creativity emerges in socio-cultural and economic systems. This world is always evolving, close to chaos rather than to equilibrium. In such context projects are the common motto, and changes should be increasingly anticipated and managed. Therefore, change management can be a critical success factor in managing the main factors that generate complexity. By planning, monitoring and controlling the uncertainties generated by such factors, change management is also essential in risk management. Managing changes in the organization and the environment generated by the project is the focus of HCMBOK (Vicente, Gonçalves, & Campos, 2016). *According to Gonçalves, there are no projects without people and it is the engagement of people in what was produced by the project that will determine the outcome of the project.*

PROJECTS AS COMPLEX SYSTEMS

Complex systems have as main characteristics many dynamically interacting components that are self-organized in multiple layers, with common behaviors and evolve through new behaviors, which do not derive solely from the behavior of each component (Hass, 2009).

Behavior in complex systems is always probabilistic and not deterministic. Social organizations are examples of complex systems, following the above characteristics.

In the case of projects, each project is a system that has characteristics inherent to the nature of the project, which we could conceptualize as technical characteristics.

According to Cavanagh (Cavanagh, 2013), these inherent characteristics (technical characteristics) of the project can interact with contextual characteristics. These characteristics arise from the context in which the project is inserted. This context involves social organization (for which the project is "sold" and deployed) and the environment itself generated by the project. The inherent characteristics of the project can generate a complex system, in the case of new knowledge generation scope, such as research and development (R&D) or software development. However, in this type of project, iterative and collaborative methods are applied, with flexibility in scope, time and costs. Complexity is identified a priori and based on the nature of the project (its inherent characteristics).

What can, in fact, move the project from a complicated level to a complex one is the interaction among inherent characteristics with the contextual characteristics (social organization and environment). From this interaction new and not predicted characteristics of behavior emerge. For example, according to Gonçalves (Vicente, Gonçalves, & Campos, 2016) *a project may end up with scope, schedule, cost and quality achieved, but not achieve the result expected under the organization point of view.*

So, the characteristics inherent to the project (such as scope, time and cost) can be well controlled according to PMBOK ™ best practices. However, they may not add the expected value to the organization due to a lack of integrated management of what is inherent to the project with what is contextual.

INHERENT CHARACTERISTICS

Adapting Hass's more structured view of complexity dimensions (Hass, 2009) and also considering Nan Tie and Bolluijt's approach (Nan Tie & Bolluitj, 2014), the inherent features of the project are:

Clarity of Problem, Opportunity, and Solution - Scope - Measures how defined scope is in order to achieve the project goal. The approach of Nan Tie and Bolluijt in this topic is:
- *Output* – Work Breakdown Structure of the project referenced by the list of subprojects, deliveries, work packages and activities necessary and enough to get the project objective.
- *Systems* - The number of systems being modified or added by the solution in the organization.

Volatility of requirements - Measures the level of stability of the scope (functional and nonfunctional requirements) over time. The approach of Nan Tie and Bolluijt in this topic is:
- *Variation* - The number of solution alternatives that the project may require to achieve the goal.
- *Predictability* - How much the effects of scope changes are predictable in the project during its cycle.

Project team size - Measures the number of people directly allocated to the project, necessary and enough to implement the project. The approach of Nan Tie and Bolluijt in this topic is:
- *Effort* - The level of effort required to deploy the solution.

Team competency and performance level - Measures the level of technical competence of the team to implement the expected solution, level of external dependency (for instance, third parties), competence and leadership of project management and if people worked together before generating reliable estimates as technical specialists. The approach of Nan Tie and Bolluijt in this topic is:

- *Activity* - The number of lines of work of different technical competencies to be managed in the analytical structure, subprojects or different teams.
- *Outsourcing* - The level of dependency on third parties to deliver.
- *Abstraction* - The type of thinking required to analyze problems and generate solutions, depending on the nature of the solution implementation (process oriented or knowledge oriented, for instance *design thinking*).

Time and Cost - Measures the total length and costs of the project. The approach of Nan Tie and Bolluijt in this topic is:

- *Duration* - Total duration of the project.
- *Cost* – Total cost of the project.

Technology - Measures the knowledge and experience level over the technology employed (pioneer in the use of technology or innovation level related to the market use). The approach of Nan Tie and Bolluijt in this topic can be related to:

- *Abstraction* - The type of thinking required to analyze problems and generate solutions, depending on the nature of the solution implementation (process oriented or knowledge oriented, for instance *design thinking*).

CONTEXTUAL CHARACTERISTICS

The project context arises from:

- **Project Marketing**: The expectation generated in how the project was "sold" during the Initiation Process; According to Gonçalves (Vicente, Gonçalves, & Campos, 2016), defining the purpose of the project is *to define the purpose of the change, that is, a deep vision of why the project is carried out and not only what.*
- **Social Organization**: The characteristics of the "buyer", the social organization where the project will be "implemented";
- **Project Environment**: The characteristics of the specific environment generated by the project within the organization;

The value added by the project (or its effectiveness) is dependent on the project context and therefore resulting from how marketing (the "sale"), social organization, project-generated environment, and inherent project characteristics are managed during and after deployment.

Adapting the complex dimensions structure (Hass, 2009) and considering also Nan Tie and Bolluijt (Nan Tie & Bolluitj, 2014), contextual characteristics are:

Strategic Importance - Measures the level of sponsorship the project has in the organization, the level of understanding of the goal and whether there are policy implications or agenda in the initiative. The approach of Nan Tie and Bolluijt in this topic is:

- *Priority* - The level of strategic priority the project has for the organization.
- *Direction* - The level of clarity, precision, and consistency that the project objectives and purpose have for the organization.

Organizational Change Level - Measures the level of impact of the change to the organization, considering its culture, structure, organization, processes, people, functional groups, interaction of groups and people and influence level of the environment. The approach of Nan Tie and Bolluijt in this topic is:

- *Inputs* - At what level the critical inputs to the project are restricted to or dependent on the organization.
- *Integration* - At what level the solution modifies directly or through integration the organization legacy (people, groups of people, form of interaction, processes, systems, infrastructure).
- *Paradigm shift* – At what level people or groups are willing to change their way of acting and thinking. Or, at what level the scope is disruptive
- *Experience* – At what level the organization already has previous experience with this type of solution and project, allowing reliable forecasts and how much the organization (people) is accustomed to changes.

Multiple Stakeholders - Measures how many people or relational and / or functional groups (in and out of the organization) are involved with the project and at what level their expectations are conflicting.

According to Cova (Bernard Cova, 2002):

- People or groups that have relational position have relationship influence on the project. People or groups that have functional position have a specific function during the project development cycle. These actors form a social organization that evolves during the project with new behaviors that emerge as the context created by the project evolves.

The project environment is shaped by the evolution of people and / or groups during the project cycle. This evolution generates new behaviors in the social organization and can influence positively or negatively the evolution of the project.

The approach of Nan Tie and Bolluijt in this topic is:

- *Stakeholders* - The number, behavioral characteristics (resistant, indifferent, change agent) influence and decision power level of the stakeholders involved in the project.
- *Population* - The total number of people who will be directly affected by the change impact of the solution.

Urgency and Flexibility of Cost, Time, and Scope - Measures how flexible the organization is in terms of the scope, time, and cost required to implement the project. In this case, Hass's approach is focused on contracts.

The approach of Nan Tie and Bolluijt in this topic is:

- *Flexibility* - How flexible the buying organization is for variations in scope, time, and cost.

Another view of the contextual characteristics can be seen in the results presented by the Bakhshi, Ireland and Gorod research (Bakhshi, Ireland, & Gorod, 2016). This is one of the most complete works on project complexity. According to this research, the main factors of complexity are:

1. Culture Configuration
2. Local laws and regulations
3. Cultural Variety
4. Variety of Interests
5. Variety of Interdependencies
6. Networking
7. Goal Alignment
8. Interconnectivity of Activities

9. Team cooperation
10. Number of stakeholders
11. Number of units and departments
12. Number of methods
13. Technology
14. Project Duration
15. Scope uncertainties

From 1. Culture Configuration to 11. Number of Units and Departments item can be inferred that are contextual characteristics of the project. From 12. Number of Methods to 15. Scope Uncertainties it can be inferred that are inherent characteristics of the project. Eleven out of fifteen factors are contextual. According to the Nan Tie and Bolluijt approach, the complexity level of the context can attenuate or amplify the inherent complexity during the project cycle and at a point of time generates the current complexity of the project. So, the management of contextual characteristics is essential throughout the project cycle. It is interesting to note that, according to Vicente (Vicente, Gonçalves, & Campos, 2016), stakeholder management should also consider *"ego" and "personal agendas"*, or context analysis should also cover individual characteristics, especially if the actors have functional and / or relational influence during the project cycle.

THE ORGANIZATIONAL CHANGE MANAMGENT OR THE CONTEXT MANAGEMENT

As seen above the context is generated from the project, its specific goal, its expected results and the changes expected considering the specific result. According to Gonçalves (Vicente, Gonçalves, & Campos, 2016) projects, social organizations and the environment are essentially made up of people and / or groups of people. According to Gonçalves, *the goal of the Change Management discipline is to plan, implement, measure and monitor human factor management actions in a change project to increase the chances of the expected results to be achieved or overcome.*
Change Management is methodological and has a set of processes and activities that can perform the evolution management of the main contextual characteristics during the project cycle, from the initiation and planning process to the measurement of the expected results (production process). Based on the HCMBOK ™ (Vicente, Gonçalves, & Campos, 2016) methodology, the following text shows the relationship of adherence between the main contextual characteristics and the Change Management processes:

CONTEXTUAL CHARACTERISTIC – STRATEGIC IMPORTANCE LEVEL

The HCMBOK processes and activities that deal directly with this characteristic are:
Initiation and Planning /
- Define and Prepare Sponsor
- Hold the alignment and mobilization workshop
- Define the purpose and identity of the project
- Plan kickoff
- Develop the Strategic Change Management Plan

Execution /

- Carry out the Kickoff event of the project.
- Define indicators for assessing readiness for change.

Deployment /
- Conduct the implementation decision meeting.
- Communicate the outcome of the deployment decision.

Production /
- Ensure and sustain the change

According to HCMBOK, the process of Planning and Managing Communication is used throughout the project cycle to ensure the effectiveness of communications and make the necessary adjustments, according to target groups. The formal and informal communication techniques are reinforced with project management methodology use.

According to Mattelart (Mattelart, 2000) *the standardization of communication means for the constituted power to reach people's minds more easily for having a standard behavior of these people. Standard behavior makes the domain of the masses subtly possible*. In this case the constituted power, can be the sponsor, executives and project management.

As evidenced above, the adherence of HCMBOK is STRONG in the treatment of this contextual variable.

CONTEXTUAL CHARACTERISTIC – ORGANIZATIONAL CHANGE MANAGEMENT LEVEL

The HCMBOK processes and activities that deal directly with this characteristic are:

Initiation and Planning /
- Evaluate the characteristics of the organizational culture and reflexes in the
- Assess the predisposition of the climate to changes and their impacts.
- Establish the Change Management Action Plan.
- Develop the Strategic Change Management Plan.

Execution /
- Assess organizational impacts.
- Plan and execute learning management

Deployment /
- Assess user readiness and confidence for deployment.
- Ensure leadership commitment to implementation.

Closing /
- Ensure the preparation of users to train new employees.
- Ensure preparation of maintenance and support staff in the post-project phase.
- Celebrate achievements and goals achieved.

Production /
- Ensure and sustain the change

The Processes of:
- Planning and Managing Communication;
- Build team spirit and reinforce dynamics;
- Stimulate participatory processes;
- Managing conflicts, motivation, stress and behaviors;

- Stimulating creativity and innovation;

They are used throughout the project cycle and are essential to ensure the effectiveness of the transformation.

As evidenced above, HCMBOK adherence is STRONG in the treatment of this contextual variable. Additionally, Organizational Change Management is also the center of gravity of the methodology.

CONTEXTUAL CHARACTERISTIC – MULTIPLE STAKEHOLDERS

The HCMBOK processes and activities that deal directly with this characteristic are:
- Initiation and Planning /
- Map and classify stakeholders.
- Define roles and responsibilities of the project team.
- Plan the project kickoff

Acquisition /
- Plan the human aspects of the procurement process.
- Assess risks of cultural shocks between suppliers and staff.
- Define additional team training needs.
- Map supplier leadership styles.
- Validate roles and responsibilities with suppliers.
- Plan integration of suppliers to the culture of the organization.

Execution /
- Confirm the future of stakeholders in the post-project.
- Define roles and responsibilities for the production stage.

The Processes of:
- Manage Stakeholders
- Planning and Managing Communication;
- Build team spirit and reinforce dynamics;
- Stimulate participatory processes;
- Managing conflicts, motivation, stress and behaviors;
- Stimulating creativity and innovation;

They are used throughout the project cycle and are essential to ensure the effectiveness of the transformation.

As evidenced above, HCMBOK adherence is STRONG in the treatment of this contextual variable. There is even a recurring specific process - *Managing stakeholders* - that aims to reduce antagonism and promote engagement in change, during the project life cycle.

CONTEXTUAL CHARACTERISTIC – URGENCE AND FLEXIBILITY OF SCOPE, TIME AND COST

The HCMBOK processes and activities that deal directly with this characteristic are:
Initiation and Planning /
- Conduct the alignment and mobilization workshop for leaders

The workshop serves to adjust leaders' expectations and clearly define metrics.
The metrics are related to the goals (scope, deadlines and costs). If the project team does not believe in the goals, especially those of schedule, the project will hardly be successful.
- Develop the Strategic Change Management Plan

- Goals and metrics definition
- Action plan
- Risk Identification

Execution /
- Carry out the project kick-off event

The Processes of:
- Manage Stakeholders
- Planning and Managing Communication;
- Stimulating creativity and innovation;

They are used throughout the project cycle and are essential to ensure the effectiveness of the transformation.

As evidenced above, the adherence of HCMBOK is STRONG in the treatment of this contextual variable. According to Hass (Hass, 2009) this is characteristic of contract with the "client" and, according to Nan Tie and Bolluijt, represents the flexibility that the organization will present in accepting changes of scope, time and cost. The more restrictive this characteristic is, the stronger the project management should be.

Using the work of Bakhshi, Ireland, and Gorod as the basis, the HCMBOK ™ adherence level is also STRONG for:

1. Culture Configuration
2. Cultural Variety
3. Variety of Interests
4. Variety of Interdependencies
5. Network of Relationships (Network)
6. Goal Alignment
7. Interconnectivity of Activities
8. Team cooperation
9. Number of stakeholders
10. Number of units and departments

Regarding local laws and regulations, HCMBOK ™ does not treat them directly. Stakeholder, for the methodology, is any person, group of persons or entity that will be affected directly or indirectly by the project. Local laws and regulations can affect a project. According to Cova (Bernard Cova, 2002), *people or groups of people who participate in entities that define and / or enforce laws or regulations are actors that must be mapped, considering their functional influence on the project.* The focus of the HCMBOK ™ stakeholder management process of Initiation and Planning process is to map anyone that influences the project and it includes entities that are in charge of laws and regulation enforcement control.

CONCLUSION

Projects in private or public organizations are carried out to generate economic and / or social results by adding value to these organizations. These projects can generate changes that affect the social organization during the deployment cycle, generating a new context and environment resulting from the deployment. This new context and environment can generate new behaviors in social organization. These new behaviors may favor or restrict the implementation of the project and its effectiveness. The emergence of new behaviors is characteristic of complex systems. Managing the characteristics of the context and environment generated by the project is essential for the effectiveness of complex projects. This management should be simple but performed in a structured way. This structure is found in the method recommended by HCMBOK ™ that manages all the characteristics of the context, as seen in the previous chapter. Therefore, the greater the level of complexity of the project, the greater the importance of Change Management in achieving the expected results of the project or its effectiveness.

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