Project management templates used to plan and manage product and service provision. Case study

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Abstract: *This article presents a compilation of methods and techniques that help manage projects successfully and which are developed by IAQG - International Aerospace Quality Group. Project management is a structured process that helps teams to achieve specific project goals. It can be used for all types of projects and project sizes. The templates were created to provide organizations a single location of common templates that can be used as an actual project workbook. The project management templates were customized using the project Technologies for obtaining new composite materials with advanced properties.*

Key Words: *project management, deliverables, Gantt Chart, EN 9100:2018/ AS 9100D, IAQG*

1. INTRODUCTION

As appropriate to the organization, customer requirements, and products and services, the organization shall plan and manage product and service provision in a structured and controlled manner including scheduled events performed in a planned sequence to meet requirements at acceptable risk, within resource and schedule constraints. This activity is generally referred to as project planning, project management, or program management [1].

Project management is a structured process and also, a good method to drive successful outcomes, which helps teams achieve their specific project goals: quality, cost, delivery [3].

2. PHASES OF PROJECT MANAGEMENT

The five phases of project management described in the IAQG guidance include:

- Initiating - Define the project charter (which includes the preliminary project structure) and the stakeholders.

- Planning - Do the Kick-Off Meeting. Validate the key deliverables of the project's objectives. Create a project plan. Perform a risk analysis.
- Executing - Perform the work described in the plan. Check for effectiveness during Gate Reviews.
- Monitoring and controlling - Status & Track Deliverables on a project tracker or Gantt chart. Develop a communication plan for the entire project. Continue to capture lessons learned.
- Closing - Provide final status. Prepare and manage the project closure [3].

The figures below contain a set of Project Management Templates in MS Excel format, customized for the project Technologies for obtaining new composite materials with advanced properties [2].

Project Charter

Project: Technologies for obtaining new composite materials with advanced properties

1. Project Description

The proposed theme is integrated in the current global guidelines for the development of components / systems for the transportation industry from new, lightweight and performing materials, aiming to increase aerospace and / or military safety and security, cost reduction and greening in air and land transport.

2. Project Scope

Inclusions

The scope of the project is aligned with the current demands and trends, which refer to new matrix solutions with superior properties of epoxy resins, to increase the performance of composites in order to achieve the technical and economic purposes of the aeronautical industry.

3. Project Purpose and Justification

The purpose of this project is...

Getting new composite materials with high performance properties using additions of nanofillers

4. Project Deliverables

The project will be measured by...

Phase 1 - Execution and testing of composite materials with epoxy matrix, nano-doped with carbon nanotubes, coated with Ni, to increase electrical and magnetic characteristics
Phase 2 - Execution and testing of hybrid composite materials based on BMI thermoreactive polymeric matrix with nanopowder additions such as carbon nanotubes, graphenes and nanoargiles of montmorillonite type
Phase 3 - Execution and testing of hybrid composite materials based on thermoplastic polymer matrix with nanopowder additions and fiber reinforcement, with tribological and mechanical performant properties
Phase 4 - Evaluation of the tribological behavior of hybrid composite materials based on thermoplastic polymer matrix with nanopowder additives and fiber reinforcement performed in the previous stages

Key milestones & dates to accomplish include:

1	Phase 1 - 25 May	4	Phase 4 - 27 Nov.	7		10
2	Phase 2 - 14 Oct.	5		8		11
3	Phase 3 - 20 June	6		9		12

5. Project Risks

The project may have the following initial risks...

Low compatibility (low interaction) of the matrix-fiber which leads to ineffective mechanical transfers between the layers of the laminate (peeling phenomenon) leading to premature mechanical failure.

6. Summary Budget

The project will have the following associated costs:

Expected Overall	*Projected Savings*
2.800.000 lei	

7. Signature of Agreement:

Titles	*Name (print/type)*	*Signature*	*Date*
Project Manager	Stefan A.		
Sponsor	ANCSI		
Other Approvers:			
Program Director			

Figure 1. – Project Charter

Stakeholder Analysis			
Project: Technologies for obtaining new composite materials with advanced properties			
Identify Key Stakeholders			
Stakeholder Title	**RACI Role**	**Level of Influence**	**Involvement (Comments)**
Comp. Materials	**Responsible**	**Critical**	The collective which develops the project.
Ministry of Research and Innovation	**Inform**	**Critical**	The beneficiary of the project.

Working Team				
Name	*Title*	*Name*	*Title*	
1	Stefan A.	*Project manager*	4 Ionescu N.	Engineer
2	Popescu V.	Chimist engineer	5 Gavrilescu L.	Engineer
3	Vasilescu C.	Chimist engineer	6 Georgescu E.	Technician

Figure 2. – Stakeholder Analysis

Statement of Work Page 1 of 1			
Project: Technologies for obtaining new composite materials with advanced properties			
1. Project Description			
The project involves...			
The proposed theme is integrated in the current global guidelines for the development of components / systems for the transportation industry from new, lightweight and performing materials, aiming to increase aerospace and / or military safety and security, cost reduction and greening in air and land transport.			
2. Background			
What happened before the project?			
INCAS has designed and developed the technology to obtain performant carbon fiber in the country, has initiate and develop research regarding carbon fiber composites and polymer composites.			
3. Project Objectives			
The goals of this project are...			
1. Improving the properties of existing epoxy composites with the help of the addition of various compounds, especially nanofillers. 2. The replacement of matrix epoxy with matrices of the same class of thermoreactives, namely basic Bismaleimide matrixes (BMIs) which exhibit superior thermal properties than epoxy. 3. Replacement of thermosets matrices with additivated thermoplastic matrices, with ductile character and recyclable.			
4. Success Criteria			
What are the measurable parameters that will be used to determine success?			
Sending the deliverables to the beneficiary within the specified deadlines.			
5. Work Approach			
Project Assumptions...			
The working team has experience and there are no communication barriers.			
Methodology			
Using the existing equipment and acquiring the necessary, the experience gained in the previous projects			
Major Activities			
Experimental study, mechanical tests, elaboration of scientific reports			
Statement of Work			
6. Project Deliverables			
The project will be measured by...			
Key Deliverable	*Responsibility*	*Acceptance Criteria*	*Approval Required*
1 Phase 1 Report	INCAS/Project manager	Acceptance by the beneficiary	Yes
2 Phase 2 Report			Yes
3 Phase 3 Report			Yes
4 Phase 4 Report			Yes
7. Training Plan			
What training may be needed to finalize or implement deliverables?			
N/A			

Figure 3. – Statement of work

Kick-off Meeting "Project Launch"					
Meeting Agenda					
1	Project proposal				
2	Estimated results				
3	Collaborations in the field of materials				
Working Team Agreement					
Roles & Responsibilities					
RACI Role (RACI = R - Responsible, A - Accountable, C - Consult, I - Inform)					
Name		*RACI Role*	*Name*		*RACI Role*
1	Stefan A.	Responsible	4	Ionescu N.	Consult
2	Popescu V.	Consult	5	Gavrilescu L.	Consult
3	Vasilescu C.	Consult	6	Georgescu E.	Consult
General Team Code of Conduct:					
Regulation of organization and functioning					
Decision Making Process					
Decisions will be made by management (additional act).					
Conflict Management Plan					
The project manager will handle the possible conflicts.					

Figure 4. – Kick-off Meeting "Project Launch"

Deliverable Metrics				
Project: Technologies for obtaining new composite materials with advanced properties				
1. Project Description				
The project involves...				
The proposed theme is integrated in the current global guidelines for the development of components / systems for the transportation industry from new, lightweight and performing materials, aiming to increase aerospace and / or military safety and security, cost reduction and greening in air and land transport.				
3. Project Objectives				
The goals of this project are...				
1. Improving the properties of existing epoxy composites with the help of the addition of various compounds, especially nanofillers. 2. The replacement of matrix epoxy with matrices of the same class of thermoreactives, namely basic Bismaleimide matrixes (BMIs) which exhibit superior thermal properties than epoxy. 3. Replacement of thermosets matrices with additivated thermoplastic matrices, with ductile character and recyclable.				
4. Success Criteria				
What are the measurable parameters that will be used to determine success?				
Sending the deliverables to the beneficiary within the specified deadlines.				
5. Metrics				
Key Project Deliverables	*Deliverable #1* *Phase 1 Report*	*Deliverable #2* *Phase 2 Report*	*Deliverable #3* *Phase 3 Report*	*Deliverable #4* *Phase 4 Report*
Importance Rating *(1 to 10, 10 = Most Important)*	10	10	10	10
How will it be measured?	Content of the report	Content of the report	Content of the report	Content of the report
What is the measurable unit?	Date of transmission of the report	Date of transmission of the report	Date of transmission of the report	Date of transmission of the report
What is the Target ?	25 May	14 Oct.	20 June	27 Nov.
What is the Tolerance or Acceptance Criteria?	Meet contractual requirements	Meet contractual requirements	Meet contractual requirements	Meet contractual requirements
Evidence of Validation	Approval report	Approval report	Approval report	Approval report
Comments				

Figure 5. – Deliverable Metrics

Work Breakdown Structure (WBS)

Fill in the boxes for the appropriate levels of the Work Breakdown Structure (WBS).

Project Name	Key Processes (Level 1)	Deliverables (Level 2)	Work Packages
Project: Technologies for obtaining new composite materials with advanced properties	Elaboration of scientific reports	Phase 1 Report	Elaborate study
			Elaborate research
			Results presentation
		Phase 2 Report	Materials selection
			Realization and testing of hybrid composite materials
		Phase 3 Report	Performing tests
			Tribological evaluation of some hybrid composite materials
		Phase 4 Report	Surface analysis

Figure 6. – Work Breakdown Structure (WBS)

Project Cost Plan

Project: Technologies for obtaining new composite materials with advanced properties

Key Project Deliverables	Cost Type	Planned Cost	Actual Cost	Planned Schedule			Comments
				Start	End	Duration	
Phase 1 Report	Labor & Materiall	242.200,00		17-Feb-16	25-May-16	71	
	Other	457.800,00		17-Feb-16	25-May-16	71	
Phase 2 Report	Labor & Materiall	242.200,00		25-May-16	14-Oct-16	103	
	Other	457.800,00		25-May-16	14-Oct-16	103	
Phase 3 Report	Labor & Materiall	242.200,00		14-Oct-16	20-Jun-17	178	
	Other	457.800,00		14-Oct-16	20-Jun-17	178	
Phase 4 Report	Labor & Materiall	242.200,00		20-Jun-17	27-Nov-17	115	
	Other	457.800,00		20-Jun-17	27-Nov-17	115	
Project Final Cost		2.800.000,00	-				

Figure 7. – Project Cost Plan

Project Phase	*Key Process Deliverables*	Responsible Person	Need Date	Planned Start	Actual Start	Actual End	Duration
Phase 1 Initiating	*Project Charter*	*Project Manager/Team*			*17.02.16*	*01.03.16*	*13*
	Stakeholder Analysis	Project Manager/Team			02.03.16	22.03.16	20
	Statement of Work	Project Manager/Team			23.03.16	22.04.16	30
Phase 2 Planning	*Kick-off Meeting "Project Launch"*	Project Manager/Team			23.04.16	26.04.16	3
	Deliverable Metrics	Project Manager/Team			27.04.16	17.05.16	20
	Work Breakdown Structure (WBS)	Project Manager/Team			18.05.16	27.05.16	9
	Project Master Plan	Project Manager/Team			28.05.16	27.06.16	30
	Project Cost Plan	Project Manager/Team			17.06.16	17.07.16	30
	Project Tracker with Gantt Chart (Detailed Plan)	Project Manager/Team			07.07.16	27.07.16	20
	Communication Plan	Project Manager/Team			28.07.16	07.08.16	10
	Project Risk Analysis	Project Manager/Team			08.08.16	28.08.16	20
	Gate Review Checklist	Project Manager/Team			29.08.16	07.09.16	9
Phase 3 Executing	*Rolling Action Items List (RAIL)*	Project Manager/Team			08.09.16	26.03.17	199
Phase 4 Monitoring & Controlling	*Gate 1 Review*	Project Manager/Team			17.02.16	25.05.16	98
	Gate 2 Review	Project Manager/Team			26.05.16	14.10.16	141
	Gate 3 Review	Project Manager/Team			15.10.16	20.06.17	248
	Gate 4 Review	Project Manager/Team			21.06.17	27.11.17	159
Phase 5 Closing	*Project Lessons Learned Log*	Project Manager/Team			20.11.17	27.11.17	7

Figure 8. - Project Tracker with Gantt Chart

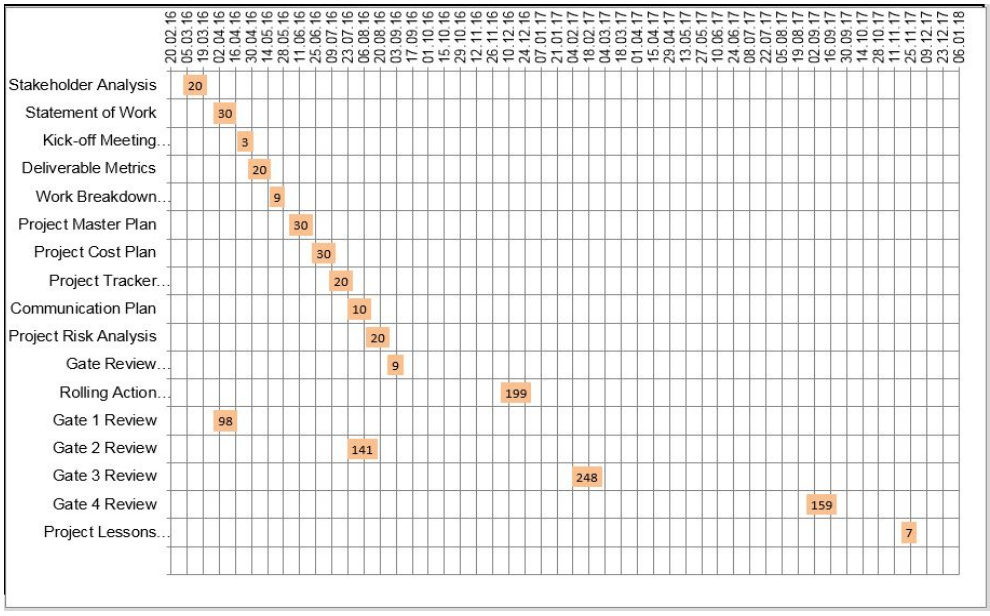


Figure 9. - Project Tracker with Gantt Chart (continuation)

Communication Plan

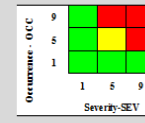
	List of project tasks or activities requiring communication	Purpose	Frequency	Recipients	Method	Other
1	Developing the necessary research for each phase of the project	Progress	Weekly	Working team	Face to face / e-mail	-
2	Realization and testing of hybrid composite materials	Progress	Weekly	Working team	Face to face / e-mail	-
3	Validation of the scientific report	Approval	As specified in the realization scheme	ANCSI	One copy is sent to the ANCSI Archive	-

Figure 10. – Communication Plan

Project Risk Analysis

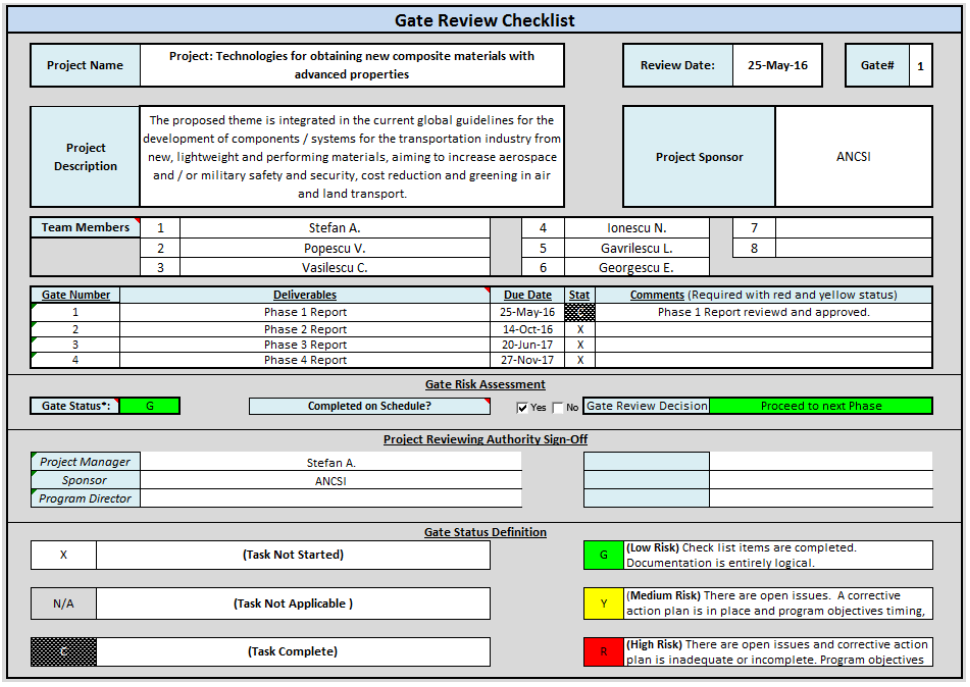
Project Name	Project: Technologies for obtaining new composite materials with advanced properties
Current Project Phase	Phase 3 Executing
Project Manager:	**Stefan A.**

Analysis Created:	
Last Updated Date:	



Risk Analysis					Risk Mitigation Plan				
Potential Risk	**Description of Risk**	**SEV Rating**	**OCC Rating**	**R.P.N.**	**Risk Mitigation Actions**	**Responsible Owner**	**SEV Rating**	**OCC Rating**	**Improved R.P.N.**
High acquisition price of BMI resin	Project delay	1	9	9	No mitigation actions needed	Project manager/team			0
Delivery times up to 4 months for BMI resin	Project delay	5	5	25	Starting the acquisition process early	Project manager/team	1	5	5
Existence of minimum purchases exceeding 25 kg of BMI resin	Project delay	1	9	9	No mitigation actions needed	Project manager/team			0
Low availability of suppliers (low number of manufacturers / suppliers) for MBI resin	Project delay	5	5	25	Search for as many suppliers as possible	Project manager/team	1	5	5

Figure 11. – Project Risk Analysis



Gate Review Checklist

Project Name	Project: Technologies for obtaining new composite materials with advanced properties		Review Date:	25-May-16	Gate# 1
Project Description	The proposed theme is integrated in the current global guidelines for the development of components / systems for the transportation industry from new, lightweight and performing materials, aiming to increase aerospace and / or military safety and security, cost reduction and greening in air and land transport.		Project Sponsor	ANCSI	

Team Members							
	1	Stefan A.	4	Ionescu N.	7		
	2	Popescu V.	5	Gavrilescu L.	8		
	3	Vasilescu C.	6	Georgescu E.			

Gate Number	Deliverables	Due Date	Stat	Comments (Required with red and yellow status)
1	Phase 1 Report	25-May-16		Phase 1 Report reviewd and approved.
2	Phase 2 Report	14-Oct-16	X	
3	Phase 3 Report	20-Jun-17	X	
4	Phase 4 Report	27-Nov-17	X	

Gate Risk Assessment

Gate Status*:	G	Completed on Schedule?	☑ Yes ☐ No	Gate Review Decision	Proceed to next Phase

Project Reviewing Authority Sign-Off

Project Manager	Stefan A.		
Sponsor	ANCSI		
Program Director			

Gate Status Definition

X	(Task Not Started)	G	**(Low Risk)** Check list items are completed. Documentation is entirely logical.
N/A	(Task Not Applicable)	Y	**(Medium Risk)** There are open issues. A corrective action plan is in place and program objectives timing,
C	(Task Complete)	R	**(High Risk)** There are open issues and corrective action plan is inadequate or incomplete. Program objectives

Figure 12. – Gate Review Checklist

Rolling Action Items List (RAIL)

Project: Technologies for obtaining new composite materials with advanced properties 30-Apr-17

ID #	Action Item	Action Description	Start D	Due Date	Count Dov	Owner	Status
1	Elaborate study	Study on the current state of research in the field of electrical and magnetic behavior of composites	17-Feb-16	25-May-16	Completed	Project manager	Completed
2	Elaborate research	Researches regarding the realization and characterization of composites with epoxy matrix with additions of Ni-coated carbon nanotubes (mechanical, thermal and electrical testing of the obtained nanocomposites)	17-Feb-16	25-May-16	Completed	Project manager	Completed
3	Results presentation	Presentation of the results of a preliminary study on the characterization and testing of new composite materials based on BMI matrix without additions in order to evaluate the mechanical strength and the way of breaking them	25-May-16	14-Oct-16	Completed	Project manager	Completed
4	Materials selection	Selection of compatible filler materials which have as effect an improvement of the mechanical characteristics of tear resistance (bending and tensile testing)	25-May-16	14-Oct-16	Completed	Project manager	Completed
5	Realization and testing of hybrid composite materials	Realization and testing of hybrid composite materials based on thermoplastic polymeric matrix with nanopowders additions and fiber reinforcement, with performant tribological and mechanical properties	14-Oct-16	20-Jun-17	37	Project manager	In Work
6	Performing tests	Mechanical test for traction and bending in 3 points and tribological to determine the coefficient of friction in dry environment, respectively in the oil environment.	14-Oct-16	20-Jun-17	37	Project manager	In Work
7	Tribological evaluation of some hybrid composite materials	Tribological evaluation of some hybrid composite materials based on thermoplastic polymeric matrix with nanoargil additions and fiber reinforcement made in the past stages	20-Jun-17	27-Nov-17	151	Project manager	Not Started
8	Surface analysis	Surface analysis subjected to tribological testing	20-Jun-17	27-Nov-17	151	Project manager	Not Started

Figure 13. – Rolling Action Items List (RAIL)

Deliverable Scorecard

Project: *Technologies for obtaining new composite materials with advanced properties*

Metrics

	Deliverable Metric	*Metric Type*	*Description*	*Units*	*Target*	*Final*
1	Phase 1 report	Delivery	Scientific report	days	25.05.2016	25.05.2016
2	Phase 2 report	Delivery	Scientific report	days	14.10.2016	14.10.2016
3	Phase 3 report	Delivery	Scientific report	days	20.06.2017	20.06.2017
4	Phase 4 report	Delivery	Scientific report	days	27.11.2017	27.11.2017

Comments

Figure 14. – Deliverable Scorecard

Project Lessons Learned Log

ID#	Key Process	Lesson Type	When was it identified	Success/Problem Description	Recommendations & Comments
1	Performing tests	Success	10-May-16	Nanocomposites based on epoxy matrix and additions of Ni-coated multilayer carbon nanotubes were mechanically tested, thermo-mechanical and dielectric	These materials can be considered for antiradar applications
2	Acquisitions	Problem	2-Mar-16	High acquisition price of BMI resin	Search for as many suppliers as possible
3	Acquisitions	Problem	2-Mar-16	Delivery times up to 4 months	Starting the acquisition process early
4	Acquisitions	Problem	2-Mar-16	Existence of minimum purchases exceeding 25 kg	Search for as many suppliers as possible
5	Acquisitions	Problem	7-Mar-16	Low availability of suppliers (low number of manufacturers / suppliers) for MBI resin	Search for as many suppliers as possible
6	Performing tests	Success	25-May-17	The presence of O-MMT and CNT-NH2 nanopowders has a beneficial effect	-
7	Performing tests	Success	20-Oct-17	The possibility of using montmorillonite nanoargiles organophilized in the thermoplastic matrix of some carbon fiber-reinforced composites in the form of fabrics	-

Figure 15. – Project Lessons Learned Log

3. CONCLUSIONS

The context in which the projects are being developed and coordinated nowadays is constantly changing. Project managers should analyze in the logical order of the activities all the main aspects necessary for the successful completion of the project.

This paper has presented a concept for project management as a systematic and cohesive management tool. The Project Management Templates, customized for the project [2] demonstrates the applicability of the concept and indicates improved project performance through the systematic and permanent control of the project activities.

To conclude it can be asserted that using the project management templates presented in this paper contributed to the achievement of the project [2] objectives.

From the point of view of using the project management templates from IAQG materials, to plan and manage product and service provision, it is important to summarise the following several advantages:

- a very good control of the use of resources, being extremely useful in situations where the resources available in the activity of an organization are restricted;
- an improved customer relations;
- an increased efficiency of the activity as a whole, by focusing on results and improving interdepartmental coordination.

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