

ORIGINAL CONTRIBUTION

Basic Elements of Project Management in the Example of Lean Manufacturing Student Research Group Activities

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Abstract— The aim of this paper is to present the author's approach to project management. It was developed in view of the growing popularity of this methodology in the world of business and manufacturing. The current approach has been developed on the basis of methodologies such as Prince2, PMI Book, Demimnga Cycle and Product Life Cycle. Individual elements necessary to launch the project were selected and presented in the form of project documentation. It's part of project charter, organisational structure, division of labour structure, project schedule, project budget, project status report. For all documents, a customised layout of content, developed in accordance with the above mentioned methodologies, has been developed. The developed methodology was implemented into the project of building a training production line under the name "AGH Lean Line", carried out by the student research group "Management" operating at the AGH University of Science and Technology in Krakow.

Index Terms— Management, Project, Lean Manufacturing, Line, Production.

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Introduction

In recent years, there has been a tendency to refer to the actions taken as a project. The project can be both the organization of conferences, the creation and conduct of workshops, as well as the construction of a new production hall. It is worth remembering that a project is a complex and multifaceted project. The project consists of a number of sub-activities, between which there must appear appropriate relations (Allen, 2008; Kolm, n.d.; Schwaber, 2004). From the point of view of the entity, this also applies to persons directly involved in the implementation of the project. The success of the whole project will depend on their mutual relations, the way they cooperate, provide information and the degree of commitment. That is why proper project management is so important in the implementation of the project. Project managers can choose from a variety of tools, techniques and methodologies that enable them to be effective and efficient in the project management process (Bencsik et al., 2019; Schechowiz & Sumilo, 2019; Styk & Bogacz, 2017).

The aim of this work is to trace and present basic project documents and to present simplified project management on the example of a student project. The paper presents the definition of a project and the growing popularity of project management. Next, the author of the Lean Manufacturing-student research group called "Management" operating at the

AGH University of Science and Technology in Cracow was presented. Going to the description of a student project AGH Lean Line, which consists in building a model of a production line to simulate and practice Lean Manufacturing tools and promotional activities of the so-called LeanLine project. Project management is based on basic project documents, which have been collected and characterized according to the methodology developed in the scientific community. At the end, individual documents and solutions created for the AGH University of Science and Technology project were presented. This project management system may be implemented in other student research group management activities.

Literature Review

Project - Definition and meaning

There are many definitions of project, depending on sources and interpretation needs. Table 1 presents three selected studies on this issue. On their basis, it can be concluded that a project is an activity with a clearly defined time-frame, a plan that is constantly being specified, aimed at achieving the assumed objectives - a unique result or a solution to a specific problem.

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Table 1
Selected project word definitions

Lp.	Source	Definition
1.	Project definition as defined in ISO 10006 (Kolm, n.d.)	A single process, consisting of a set of coordinated activities and with precisely defined start and end dates; it is an undertaking aimed at achieving an objective with defined time, cost and resource constraints.
2.	Definition according to Prince2 methodology (Projects in Controlled Environments 2) (Kolm, n.d.)	An organisation established for a certain period of time in order to produce, within a given period of time and using predefined resources, unique and predefined results or outcomes.
3.	Project Management Institute (Jones, 2008)	(...) a temporary undertaking aimed at creating a unique product or service.

The main attributes of a project are (Kolm, n.d.): definition in time, uniqueness, complexity and purposefulness. This means that each project must be defined in time - time frames are defined not only for the whole project, but also for individual tasks. Each project should be characterized by complexity, i.e., individual tasks or activities cannot be considered as a project. Similarly, the situation is unique and purposeful - each project is unique, one-off and must always pursue the objectives set at the beginning of the work.

Apart from the attributes, each project has certain limitations, which are ideally characterized by the so-called design triangle, as shown in Fig. 1. The presented model indicates as a central element, quality, and is supported by time, costs and scope. It is extremely important to maintain the rigidity of the connections between all extremes. Otherwise, the middle parameter will not be met. For example, when changing the scope of a project, changes in cost and duration should be taken into account, otherwise the quality will decrease significantly.

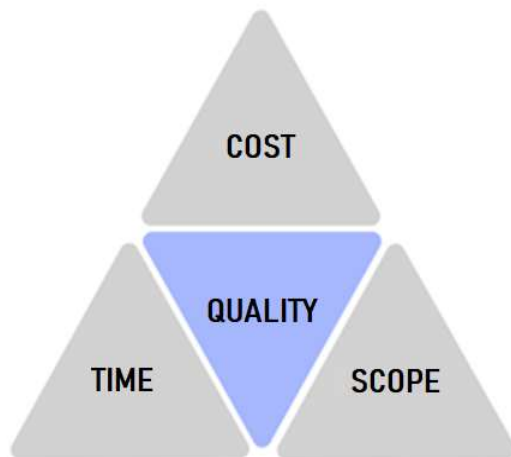


Fig. 1. Design constraints triangle. Source: Kolm (n.d.)

A few words about project management

The success of a project is strongly linked to the appropriate coordination of the undertaken activities, and for this it is essential to manage the projects properly. The Project Management Institute defines this issue as a field of management dealing mainly with the application of available knowledge, skills, tools and techniques in order to meet the needs and expectations of project principals (Styk & Bogacz, 2017; Kopczewski, 2013; Walczak, 2014). This definition can be broken down into the following six elements (Office of Government Commerce, 2009):

1. Problem - presentation of the problem to be solved during the project duration,
2. Purpose - to define the objectives to be achieved,
3. Benefits - definition of the benefits to be achieved after the completion of the project,
4. Measures - indication of measures which will allow to achieve the set objective,

5. Evaluation - indication of criteria which will allow to assess the level of implementation of the original project plan,
6. Effectiveness - planning the use of indicators allowing to determine the level of effectiveness of the implemented project.

The project, like most of the activities or even a product, has its life cycle. Project life cycle models may be similar or significantly different depending on the characteristics of the project or the specificity of the industry in which implementation is undertaken. However, all models are based on certain basic principles and concepts. One of them is the Deming Life Cycle (or Plan-Do-Check-Act (PDCA) cycle). This is a concept originally related to quality management, but when you look at it more closely, it is extremely versatile. Characteristic, arranged in a cycle of four steps - Plan, Do, Check, Act - allow for the so-called continuous improvement of actions taken. The Deming cycle is shown in Fig. 2.

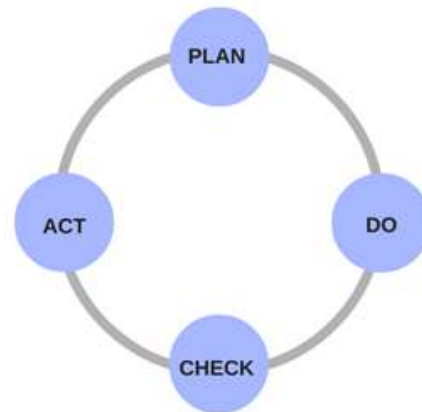


Fig. 2. Deming cycle. Source: Kapusta (2013)

In adapting this basic and universal project Management tool, the following stages of the above cycle should be distinguished (Jones, 2008):

1. Initiation, the first stage, which occurs in the project before its commencement. During this stage, an idea is developed, reasons for implementation are sought and the essence of the problem and solution to be solved, as well as the chances of its success are justified.
2. Planning, during this stage, the first full project plan is executed, taking into account all the tasks necessary for execution. During the planning stage, a project team is appointed, a work schedule and a plan of specific activities are established, as well as a budget. Workload and material consumption of the whole project are also planned here.
3. Implementation, this stage consists in the implementation of previously planned activities.
4. Control and monitoring, the third stage consists in monitoring the verification of compliance of undertaken activities with the previously established plan. The most important elements are the efficient identification and solution of problems, appropriate communication of team members about the progress of work and the

binding deadlines for the implementation of subsequent tasks and potential threats.

5. Completion, as the name suggests, at this stage the project is summarized and closed. A summary of the beneficiaries, the benefits gained from the implementation of the plan and financial sum-

maries shall be drawn up here. The experiences, critical points and good practices gathered during the project are also defined here.

All described project management stages do not have to follow in a specific order. In practice they overlap and mutually penetrate each other, sometimes they even exist in parallel. The manner of their penetration is presented in Fig. 3 below.



Fig. 3. Project management stages. Source: Kapusta (2013)

The different phases of project management have their own specific questions and documentation requirements. Each methodology, let us mention that there are many, sets out different criteria, but there is some way of simplifying the work that will be undertaken in subsequent stages.

The initiation phase (in some cases called the definition phase) is the definition of the vision, scope, purpose, planned sources of financing, recipients and likely sources of risk. It is mainly a conceptual activity that does not involve significant costs and involves only stakeholders such as managers, specialists or principals. The basic document, which should be created after the initiation stage is the Project Card, containing all the element mentioned above.

The design phase, as the name suggests, aims to create a complete and comprehensive project plan, which will also function as a separate document. According to Pawlak (2006), the project plan should include:

- Needs, objectives and requirements,
- Tasks, their structure and scope,
- Existing restrictions and additional requirements (including technical ones),
- The timetable.
- The organizational structure of the project with an indication of roles and responsibilities,
- Budget,
- Risk analysis

This stage, which is strictly organizational and planning in nature, involves the project team, the management of the units involved and as the body supervising the Management and/or the principal. Costs are at an average level, showing an upward trend.

The implementation phase, as already mentioned above, consists in the implementation of previously planned tasks. Actions taken are executive and coordinating in nature and the costs are constantly increasing up to the maximum level. This stage is also characterised by certain documents. These include statuses of summary tasks, basic tasks or cyclical tasks, as well as agendas and reports for working meetings. The form of both statuses and meeting documentation is arbitrary. However, it is extremely important that it is coherent, understandable and appropriately adapted to the stage of advancement of the project. An example of a status card is shown in Fig. 4. It contains the name of the project, date, responsible person, RAG status (The RAG system is a method of rating for issues or status reports, based on Red, Amber (yellow), and Green colors used in a traffic light rating system), progress in the previous unit of time, to be done in the current unit of time, new problems and threats, update of problems and threats from the previous unit of time. A multimedia presentation, a list of tasks or a detailed plan (main topics and sub-themes) is an easy way to prepare an agenda. Reports can also take simple forms - an e-mail with an appropriate structure, supplemented by information, a presentation with an agenda or a simple text document.

PROJECT STATUS REPORT			
NAME OF THE PROJECT	Przewód AdBlue		
	06.01.2019	Developed by	Mieszko Daraż
RAG STATUS	Time	Quality	Budget
Progress last week	Creation of a prototype of an upgraded AdBlue cable		
To be done this week	Tests for tightness, resistance and resistance to low temperature		
New threats, problems	Negative test results, problem with renting a thermal chamber, ambiguous test result		
Update of threats, problems from last week	A positive result of visual and quality test of the created prototype was obtained, creation of the prototype within the set deadline, creation of the prototype did not exceed the assumed budget.		

Fig. 4. Example of project status report. Source: Materials from subject Project Management on AGH University of Science and Technology

The completion stage, as the name suggests, takes place after the completion of the project implementation works. Its task is to summarise the work, the accounts, the final communication and, importantly, to carry out an analysis of the correctness and effectiveness of the work undertaken so that conclusions can be drawn - what was good, what was bad, what should be improved. This will allow the working team - Project Leader and all individual members to gain experience in project work as well as information about their personal efficiency and effectiveness, thanks to which they will be able to improve their results in the next implemented project. The basic documentation should be a document that is closing the project, containing the above mentioned elements, such as, the level of achievement of objectives, achieved results, effectiveness of the project and working group, conclusions. This documentation is at the same time a documentation of the control and monitoring stage. It needs to be extended and adapted to the other stages - where communication, monitoring progress, reporting and division of labour are equally important.

Project AGH Lean Line in AGH University of Science and Technology in Cracow (Poland)

Students associated in the student research group management operating at the Faculty of Mining and Geo-engineering of the AGH University of Science and Technology in Krakow have been focusing their interests on the subject of Lean Management methodology for many years now. "Effect in a minute" was the first of the projects implemented within this subject matter consisted in developing and working through a series of theoretical and practical workshops addressed to students of primary schools, junior high schools and high schools. These classes, accessible to every age group, showed how to apply techniques, methods and tools such as 5S, Just in Time or visual Management in everyday life in a simple way. Thanks to such use of Lean methodology elements it is possible to improve everyday activities, teamwork skills and better organize and use their resources such as time, energy or space. As shown by the 4 editions of "Effect in a minute" in which several hundred students participated, the participants willingly took part in this type of activities and, what is most important, continued to use the knowledge gained during work in the group.

After conducting dozens of workshops as part of "Effect in a minute", students of student research group "Management" decided to expand this project and try to organize an extended version of the simulation, previously conducted as part of the practical part of the workshops. This is how the competition called "Oleanpiada"; arose, in which teams selected through elimination compete in several competitions testing their theoretical and practical knowledge. The whole competition, of course is still referred to the subject of LeannManagement, but this time the amount of substantive material was expanded. At the end of this event, participants faced an extensive simulation of the production cycle, checking their knowledge of Lean tools and techniques and current analysis of the achieved results. Thanks to the application of further improvements in their activities, and creative unconventional ideas, they managed to reduce the time needed for the production of product, at the same time improving its quality.

The third project, which is the next stage of work on interactive simulations of the production process, is the so-called AGH LeanLine. This a project assumes the creation of extensive workshops involving even more participants through the use of new, never used methods and tools of Lean "Management". In addition to specially developed products made of Lego brake pads, in the simulated production process there will also be robots from programmable Lego Mindstorms brake pads reflecting real machines in production companies.

Methodology

student research group "Management" also takes up project management topics in order to deepen its knowledge of responsible and effective conduct of its activities. Therefore, it was decided to implement project management elements in the AGH LeanLine project. It was not decided on a complete methodology in this respect due to the insufficient experience of the members of the scientific community and conclusions drawn from past projects, where the amount of documentation and the complexity of the methodology absorbed significant resources of the conducted project, which was disproportionate to the results obtained. However, an innovative, own project management system has been created, which is shown in the following sections of this article.

Project Management in AGH Lean Line Project

The student research group "Management" has relatively little experience in the implementation of project "Management", but as students of the faculty "Management" and Production Engineering they decided to undertake this difficult task and structure their work. Analyzing the specificity of the project described in the previous chapter and the available methodologies, they decided to create their own project "Management" system, taking into account the individual stages described in this article. The scope of this project is presented in detail below.

Initiation phase

The project initiation definition phase started in March 2018. It was then that the idea of building a new position to extend the didactic offer of the Laboratory of Production and Quality Engineering (LeanLab) was born. The budgets of scientific circles are not large and as we all know, the implementation of projects, especially construction projects, involves the need to spend money. The next step was therefore to look for sources of financing for a new project. Ideal solutions for student research group "Management" appeared in April 2018. Then the Ministry of Science and Higher Education of the Republic of Poland announced a call for the Best of the Best 3. 0 programme, which from 2015 supported young and outstanding designers, inventors, innovators and programmers, giving them the opportunity to participate in international competitions and professions aimed at popularization of science and technology. It was also decided that the second pillar allowing to obtain funds would be the competition for the "Grant of the Rector of AGH 2019", awarded by the university authorities for student teams (mainly scientific circles) implementing projects of a scientific-research, conference or construction nature. From among the members of student research group "Management", a Project Leader emerged, who took responsibility for the implementation of the entire project. Initially, a small group of three people was formed, whose task was to build applications and obtain financing, which would open up the possibility of undertaking the project. The main objectives of the project, the initial scope and schedule as well as the planned total cost of the project became defined by then. A group of recipients, beneficiaries and stakeholders was identified. Students of AGH University of Science and Technology (AGH) in the field of Management and Production Engineering were identified as the main recipients, in particular members of the "Management" Board and students of the faculty of "Management" and Production Engineering at the Faculty of Economics and Management in Industry, Faculty of Mining and Geo-engineering, AGH. Among the beneficiaries of the project are also primary and secondary school students who will participate in extensive workshops conducted by members of student research group "Management" within the framework of other Lean Management projects (described in the previous section). Among the

stakeholders, we should not forget about the employees of the home department and the faculty, who can take part in training courses and about the possibility of conducting training for industry. The existence and types of risks were indicated, as well as the assumptions used in the plans. All these elements have been gathered in the form of a project Management document, i.e., Project Charter, approved by the Supervisor of the Scientific Circle and Lean Management Expert (Employee of the Faculty of Mining and Geological Engineering). This card is shown in Fig. 5.

Project Charter	
Prepared by: Katarzyna Styk / Jakub Liszcz	Date: 15.04.2018
Project Name: AGH Lean Line	
Sponsor: Best of the Best 3. 0 project / AGH University of Science and Technology Grant Competition 2019	
Project Summary: The SKNZ project is about: (1) design and construction of an automated production line, using LEGO Mindstorms EV3 and modern technologies actually used in companies, and (2) promotion of Lean Management projects carried out by the research club at international conferences, competitions and professions	
Project Manager: Jakub Liszcz	Beneficiary: AGH University of Science and Technology students working in the field of „Production Management and Engineering”
Other stakeholders: AGH University of Science and Technology research and teaching staff, secondary school students, employees of companies and enterprises (participates in trainings)	
PM Responsibilities: creates a project plan and schedule, plans resources needed for implementation, builds a team, assigns tasks and delegates responsibility, sets priorities for tasks, assesses team performance, defines tasks to be performed within the project, ensures quality, reports and presents project progress, prepares and delivers reports, monitoring and control of problems, scales problems and proposes solutions, monitors budget and expenditures, launches and closes the project.	
Objectives: - presentation of the Polish Lean Manufacturing concept and its results at world-class conferences and competitions, - use by students of knowledge gained during field classes, study trips, implementation of projects and participation in university classes, - using the acquired knowledge and acquiring new skills in order to design and build a miniature production line, - learning to build aesthetic and effective multimedia presentations in order to present achievements in competitions and conferences, - the experience gained from the development of scientific articles resulting from the lasting effects of the conferences, - the possibility of confronting projects and ideas in the international arena during conferences and thematic competitions.	
Scope: - participation in conferences and professions (prepared presentations, papers and scientific articles), - model of an interactive production line with a warehouse of finished products, which allows to modify the production process, to conduct optimization projects, - computer program allowing to control the workflow of the production line and warehouse organization in order to work on their effectiveness and to learn methods and tools of the methodology „Lean Manufacturing” (in English for lean production).	
Milestone schedule: - obtaining financial resources (October 2018), - construction of the project plan (October 2018), - production line project (March 2019), - trips to conferences and competitions (June 2019), - construction of a production line (September 2019), - organisation of training courses and workshops (November 2019).	
Budget: 250 000 zł	
Risks: NEGATIVE - lack of co-financing, lack of knowledge in the field of automation, lack of possibility to obtain materials, problems of time availability and availability of the working group, communication and composition of the working group.	
Assumptions: - prices of materials for airline construction, - prices of airline tickets, - prices of conference fees, - composition of the working group and experience.	

Fig. 5. AGH Lean Line project charter

Planning phase

In August 2018, the student research group “Management” received information from the Ministry of Science and Higher Education of the Republic of Poland on the recommendation of the application for financing- the awarded amount of the entire project was PLN 220,000. Therefore, the stage of project planning has begun. At this point it should be noted that the plan was built on the assumption of obtaining funds from the aforementioned competition for the Grant of the Rector of AGH 2019. According to the schedule, however, the call for applications takes place in November,

the results are announced in December, and the disbursement is possible only from February of the following year. For the purposes of the plans, it was assumed at that time that the competition would allow for obtaining PLN 5,000 for construction elements. Analyzing the structure of the project plan presented in the previous chapter, it was decided to create a document containing the following elements:

- objectives,
- division of roles and responsibilities in the project,
- division of labour structure,
- the timetable,
- budget.

Work on the next stage, resulting in the project plan, started effectively in mid-September 2018. The objectives demonstrated at the initiation stage have been maintained:

- presentation of the Polish Lean Manufacturing concept at world-class conferences and competitions, together with its results,
- the use of knowledge gained during field classes, study trips, project implementation and participation in university classes,
- using the acquired knowledge and acquiring new skills in order to design and build a miniature production line,
- learning how to build aesthetic and effective multimedia presentations in order to present achievements in competitions and conferences,
- the experience gained from the development of scientific articles resulting from the lasting effects of the conferences,
- the possibility of confronting projects and ideas on the international arena during conferences and thematic competitions.

Another element is the division of roles and responsibilities, i.e., the establishment of a project group. The AGH Lean Line group consist of students of different years of studies in different fields of study at AGH University of Science and Technology, with different knowledge, experience and interests, who are members of student research group “Management”. In a word, an interdisciplinary team was formed, in which the following roles and responsibilities were separated:

1. Project leader - project management (detailed description in the project charter).
2. Financial Coordinator - construction and supervision of estimates, creation of travel cost estimates, financial management.
3. Travel coordinator:
 - Conference team-developing materials (articles, abstracts, posters)
 - Departure team-organising and planning transport, accommodation and meals.
4. Manager of the raw materials warehouse: coordination of the process of designing and creating the raw materials warehouse.
5. Production hall manager-coordination of the process of designing and creating further production stands and the layout of the ‘production hall’.
6. Manager of the finished products warehouse-coordination of the process of designing and creating the finished products warehouse.
7. Intra-company transport manager-coordination of the process of designing and creating the internal transport system.
8. Manager of the IT department-coordination of the process of designing and creating an IT system for collecting and analysing data from the production process.

This structure is presented graphically in Fig. 6.

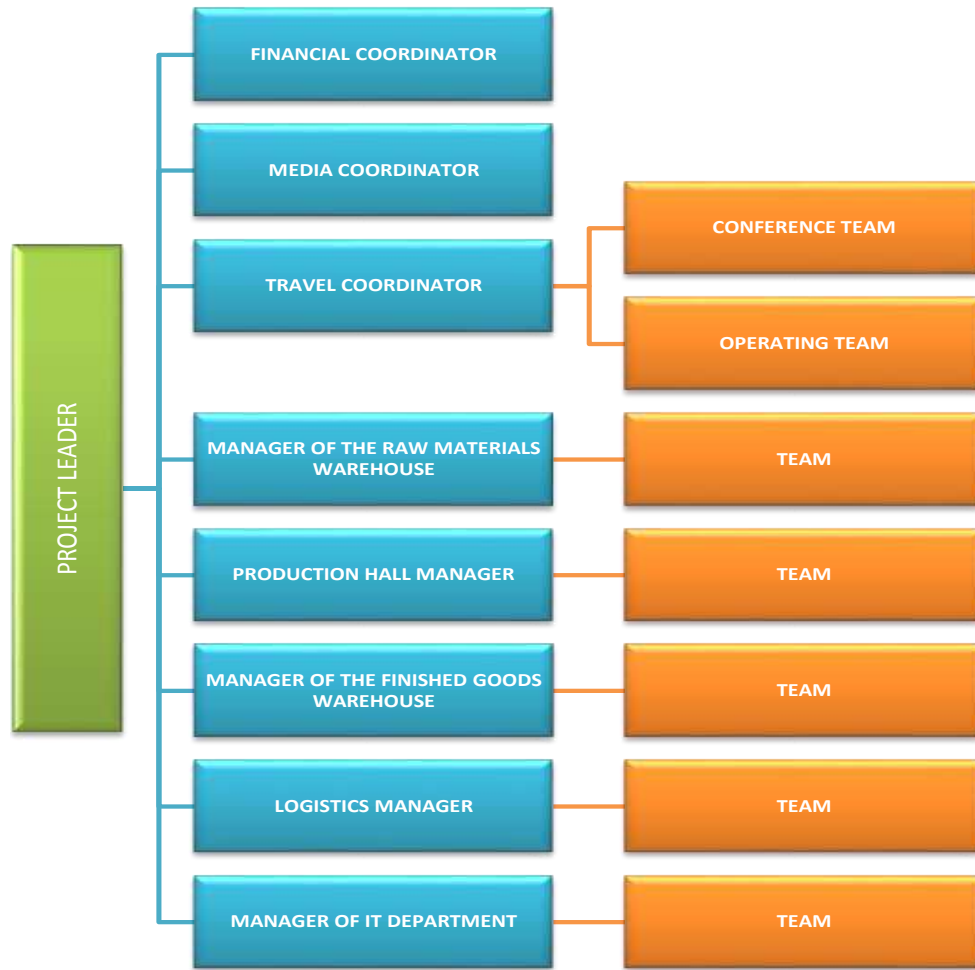


Fig. 6. Organisational structure of the project team AGH Lean Line

After defining the roles and responsibilities of the project group, it was decided to build a structure of work division based on the assumptions of awarding grants both within the Best of the Best of the Best programme and in the Rector's Grant competition. The Work Breakdown Structure (WBS) diagram is shown in Fig. 4. It was decided to include the main tasks as follows:

Production line

This group includes all construction and supply tasks related to the construction of a production line, taking into account their division into individual production departments. The tasks of this stage include, among others, development of the production line design, selection of appropriate materials, production parameters, construction works, tests.

Departures

This summary task includes organizational work on trips (calculations, searching for conferences, organization of accommodation and transport), as well as scientific and research work, consisting in the creation of studies, which are then developed into scientific articles. These, in turn, will be presented as presentations or posters when applied for the relevant contests and conferences.

Promotion

It includes promotional and communication tasks. The tasks undertaken by the project group should be properly communicated within the Scientific Circle, Faculty, University and other recipients. Tasks consist in developing the visual identity of the project, preparing graphics and promotional materials, developing posts/information/articles on the achievements and progress of work in the project (depending on the needs).

Finance

This summary task includes tasks related to the acquisition of funds (creation of applications), as well as the control of their spending (construction of budgets, estimates and their current control) and the final settlement (both substantive and financial aspects). Disbursement of public funds is connected with many legal regulations, hence the tasks of this group should include obtaining and communicating relevant information obtained from the organizers of both competitions (Best of the Best 3.0, Rector's Grant 2019), Public Procurement Department of AGH University of Science and Technology (mainly tenders), Student Affairs Department of AGH University of Science and Technology (method of settling funds), Foreign Cooperation Department of AGH University of Science and Technology (formalities related to trips abroad) and other units.

The structure of division of work for the analyzed project, allowing to divide the main objective of the project into key tasks, sub-tasks and activities, is presented in Fig. 7

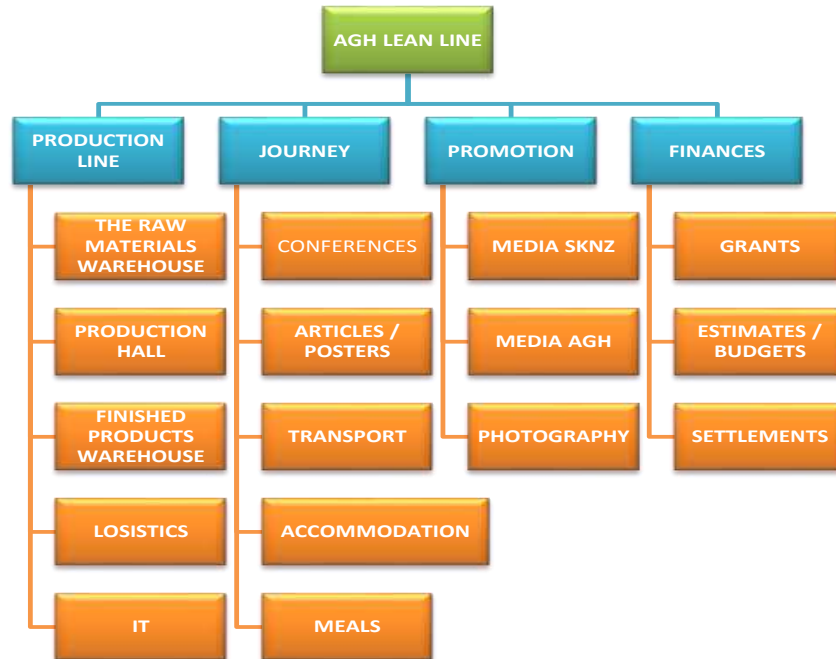


Fig. 7. Structure of the division of works of the AGH Lean Line project

The next step is to prepare a schedule of project work, which consists in dividing the general structure of work and adding a time frame for both summary tasks and individual activities. The AGH Lean Line project schedule is shown in Fig. 8. It contains nine main tasks, including three summary tasks and one cyclical task. This document prepared with the use of MS Excel Application has been enriched with additional columns, informing about the person responsible for particular main tasks (actual perfor-

mance of activities can be transferred to the members of the project group), the percentage of task performance and comments on the tasks performed. Such a structure of the document is “forward-looking”. It can be successfully used at the implementation and monitoring stage as a collective status of the project. Important information from this document is the total time of project implementation-from March 2018 to November 2019.

AGH Lean Line

Task	Termin wykonania	Osoba odpowiedzialna	% wykonania	Postęp	Uwagi
Marketing	0		0%		a cyclical task
pofundraising	31.10.2108	K. ds. finansów	100%	✓	application Best of the Best Grant Rector competition
creating Project's Plan	31.12.2018	Lider projektu	80%		team, tasks, schedule, budget
Projecting production line	22.03.2019	Lider projektu	10%		cooperation with coordinators
→ building production line	30.09.2019	Lider projektu	0%		expand to see detailed deadlines
→ workshops and trainings	30.09.2019	k. ds. mediów	0%		4 meetings - expand to see details
→ conferences and competitions	31.06.2019	k. ds. wyjazdów	17%		6 conferences - expand to see details
summary Best of the Best project	31.06.2019	Lider projektu	0%		AGH UST, Ministry of Education
summary Rector's Grant project	20.10.2019	Lider projektu	0%		AGH UST, Attorney to the Rector AGH UST, conference

Fig. 8. The schedule of the "Lean Line" project as at 31/12/2018

Time limits for individual tasks are indicated, taking into account the time buffer. Thus, these are the so-called deadline, exceeding them may result in negative consequences for the whole project, which at the same time constitute milestones of the project (an important partial task, influencing the final effect of the project (Malinowski, n.d.; Bossidy & Charan, 2004). A huge responsibility therefore lies with those responsible for the task - to adequately control the level of performance and to take into account random factors occurring in the environment during planning.

The next step is to implement the budget for the whole project - this task is supervised by the Finance Coordinator. Fig. 9 shows graphs summarising AGH Lean Line's budget and the breakdown of costs by basic types and objectives. As you can see, three main types were distinguished: conferences, production line and general. Then, within these types, objectives and smaller specific elements have been identified, e.g., the path for the conference type is as follow “CONFERENCE-CONFERENCE PRAGA- participation/publication/accommodation/transport/diets/other”.

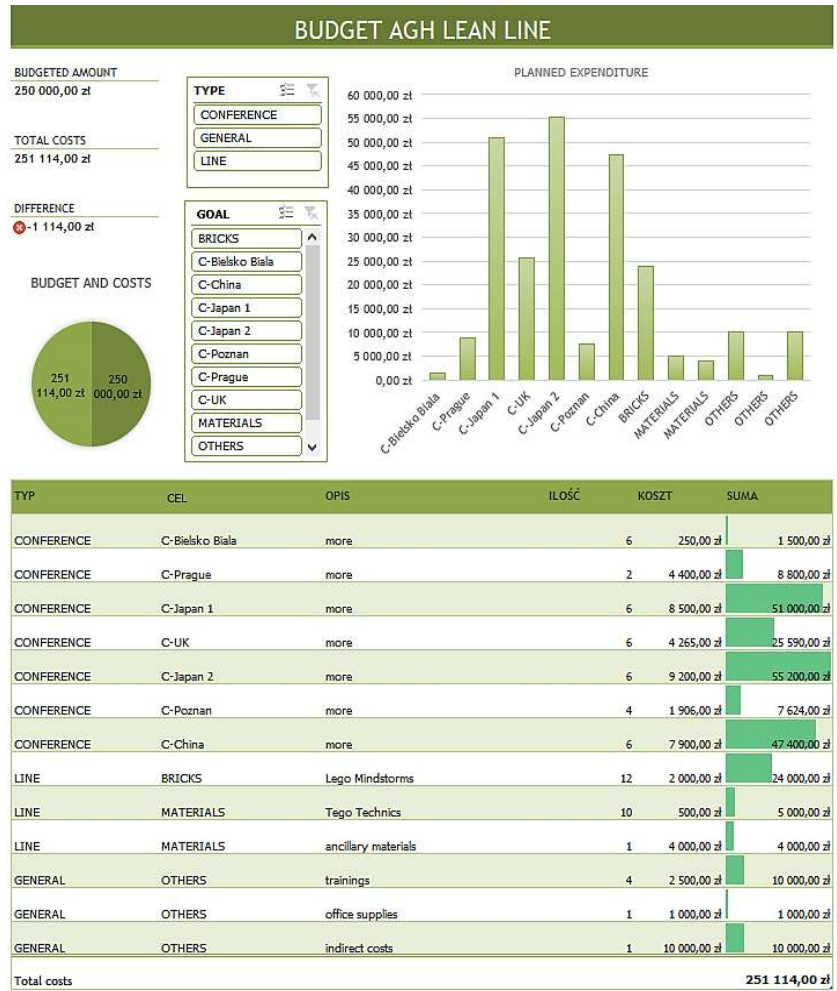


Fig. 9. The budget plan for the AGH Lean Line project

The paths for other types look the same. This way of presenting the budget allows for easy calculation and shows which objectives consume the greatest resources. One can notice a slight inconsistency in the cost estimate (the difference is about 1400 PLN). This is due to the need to estimate many costs, such as those resulting from differences in exchange rates or dates of purchase of air tickets. It also gives a direct sign to the organizers that it is necessary to stick to the established boundaries.

All the elements described above have been put together in the form of one document approved by the Supervisor of the Scientific Circle and Lean Management Expert (Mining and Geotechnical Department Employee) mentioned in the previous stage.

Implementation and control phase

The implementation phase started for good in November 2018, when scientific and research work began on individual conference articles and conference organizational issues. The first conference of the Best of the Best 3.0 project was also planned for December. For the implementation and control phase, as mentioned earlier, it is extremely important to organize working meetings and reporting. Project Leader in agreement with the whole working group set the date of meetings (Tuesday, once a week), duration (about 2.5 hour), division of meetings (about 1 hour general meeting, 15 minutes break, 1.25 hour construction meeting). Each meeting must be properly prepared-the Project Leader prepared the agenda of the

meeting, which the day before the meeting he sent to the members of the working group. At the meeting, one person from the working group is up to build a report in the form of an e-mail built in accordance with the initial template, which allows finding and assimilating the information easily. In this way the communication system in the project was built. An additional element aimed at facilitating the transfer of information and allowing for the possible transfer of know-how, was the creation of a common folder on the student research group "Management" server together with the construction of the structure of designations and the creation of a discussion group for the entire working group. Such measures were aimed at guaranteeing the members of working groups, the student research group "Management" Supervisor "Management" and Lean "Management" Expert, quick finding of information and easy access to particular documents. It was also supposed to be as quick and easy as possible to introduce new people to the project.

Completion phase

The completion stage is planned for the end of October 2019. As part of the summaries, the working group will summarize the results of scientific, research, organizational and construction work. The calculations, assumptions and objectives set at the beginning of the project implementation will be compared with the final effects. On this basis, the effectiveness of the project will be calculated. An important element of the completion

stage will also be the assessment of the project "Management" method, developed and adjusted to the project by the members of student research group "Management". If errors occur, they will be recorded on an ongoing basis throughout the project, so that they can be analysed at the end and the system can be improved before the start of further projects.

Limitations and Future Research Directions

The project management elements in AGH Lean Line project has been introduced yet due to lack of experience and due resources the implementation is not completely function. This project management system may be implemented in other student research group management activities. It is important to properly plan the project, reliably complete the documentation and properly manage the implementation of the created plan. This AGH Lean Line project still faces a number of challenges in the implementation and completion of this scope of the project as well as in the further development of the production line.

Conclusion

Managing a project, even in a simplified version, is an extremely complicated task. The team working on the AGH Lean Line project, despite their experience in managing small projects, this time did not meet this task in 100%. The implementation phase started before the approval of the project plan. Individual documents included in the plan were under construction due to organizational changes. However, on the basis of the project card and the general knowledge of the project team members, it was possible - despite everything - to undertake implementation activities. So far (31.01.2019) the project team has obtained funding from two sources (confirmed), had the opportunity to present two posters at one conference, send applications and articles at six conferences, design a preliminary concept of the production line and select products created in the production cycle. The whole team working on the AGH Lean Line project consists of 21 students of different years of study belonging to SKNZ. Two academics from the AGH University of Science and Technology (AGH) are responsible for the correctness of the content and spending of finances.

This article is an extension of a scientific article prepared for the 8th International Conference on Industrial Technology and "Management" (ICITM 2019), where the basic project "Management" documentation necessary to launch the project was described.

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