Politechnika Wrocławska

SOFTWARE PROJECT IN MANAGEMENT

2019/2020

dr Sebastian Tomczak

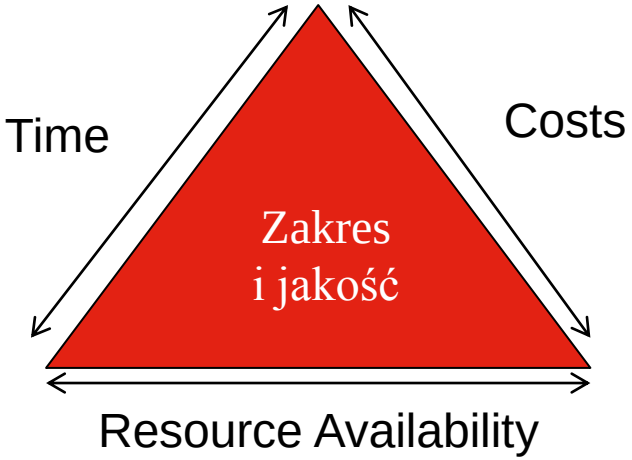
Defining the project plan: scope, resources, cost and quality

PROJECT


Problem
The existing unfavorable situation
Goal
An image of the desired situation in the future
Project
The way to achieve the goal

DEFINING THE PROJECT PLAN

- Project requirements are defined by five parameters:
  - scope (tasks necessary to accomplish the goal),
  - quality (compliance of results with expectations),
  - cost (expenditure related to the implementation of the required actions),
  - time (the period needed to complete the required actions)
  - resources (materials, employees, information, equipment and knowledge needed to perform the required tasks).



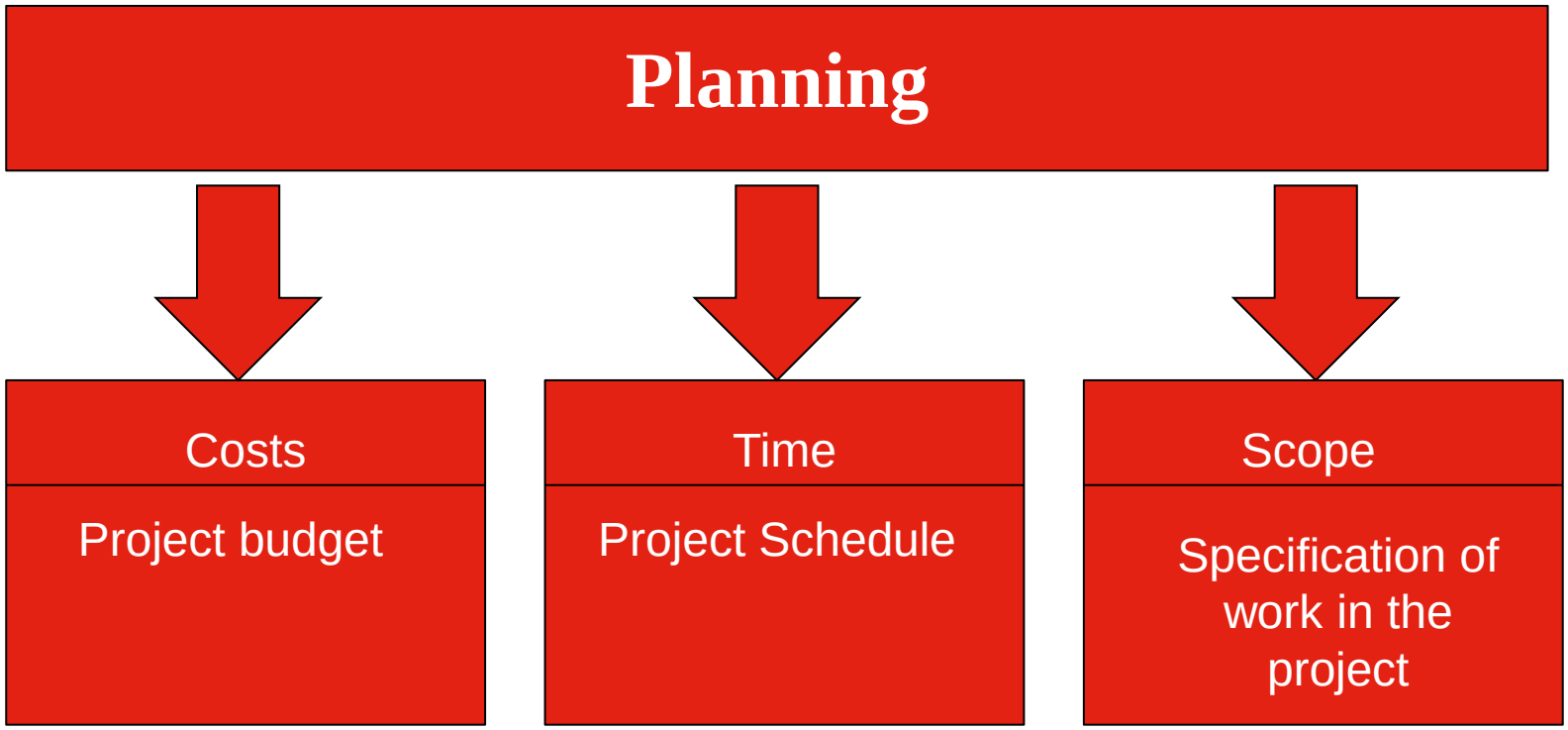
DEFINING THE PROJECT PLAN

- Planning is a continuous process because the conditions change constantly during the project implementation (e.g. resignation from the work of team members).

- Plans despite its low stability, and are necessary because they are map of conduct and a tool in the decision-making process.

- Planning reduces uncertainty, helps you understand the project, and increases efficiency.

DEFINING THE PROJECT PLAN



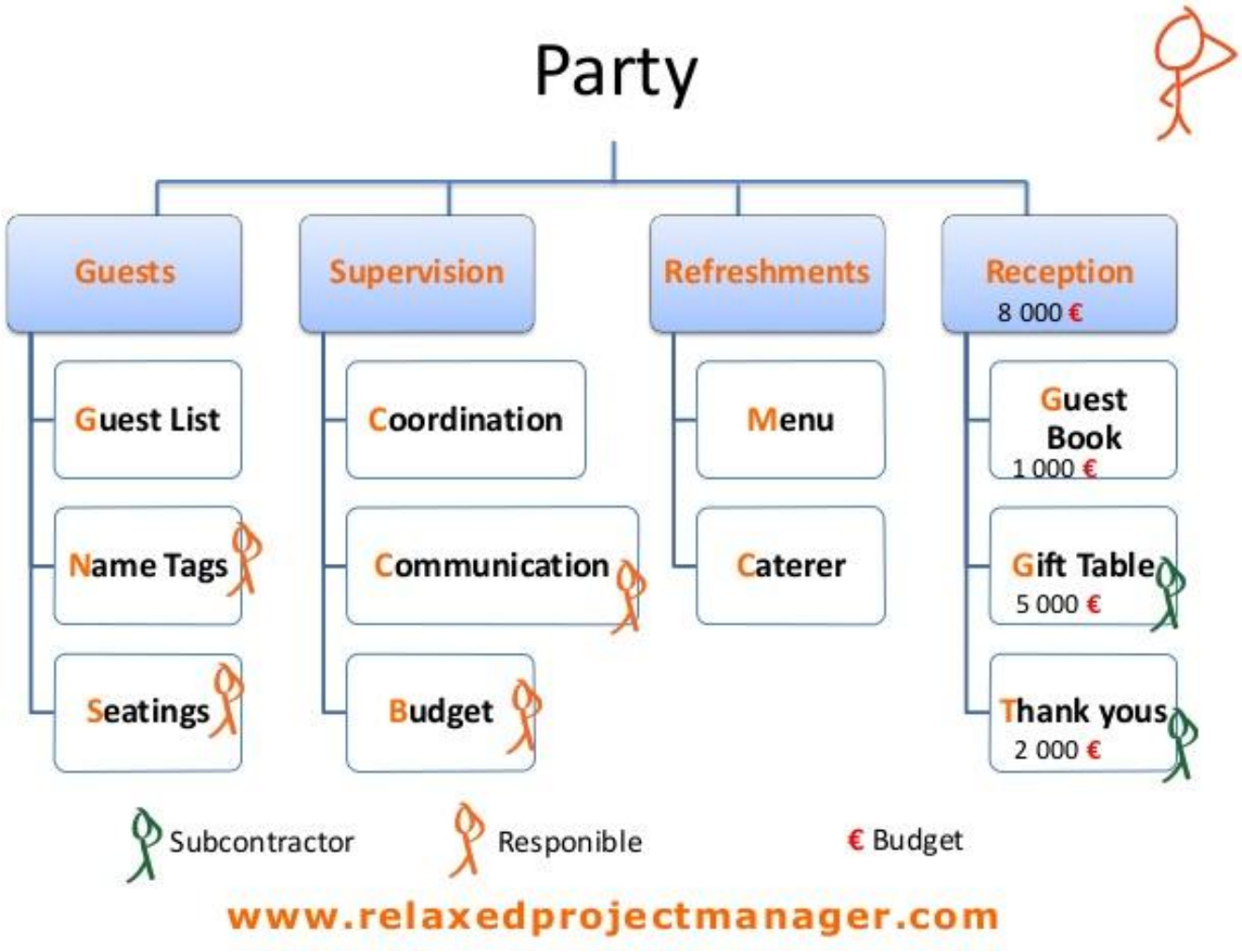
SCOPE PLANNING

- The scope of the project is expressed by the main and intermediate goals of the project, as well as being closely related to the expected results and effects of a given project.

- A change in the scope of the project is any change in the project made after its implementation has started.

- The basic tool for planning the scope of the project is the Work Breakdown Structure (WBS). The WBS structure uses a general approach to detail, breaking the main project results into smaller, and thus easier to manage components.

WORK BREAKDOWN STRUCTURE (WBS)



WORK BREAKDOWN STRUCTURE (WBS)

GANTT CHART

	Task Mode	Task Name	Duration	Start	Finish	Pre
0		**Software Development**	**95,75 days**	**Mon 25.02.19**	**Mon 08.07.19**	
1		**Scope**	**3,5 days**	**Mon 25.02.19**	**Thu 28.02.19**	
7		**Analysis/Software Requirements**	**14 days**	**Thu 28.02.19**	**Wed 20.03.19**	
17		**Design**	**14,5 days**	**Wed 20.03.19**	**Tue 09.04.19**	
25		**Development**	**21,75 days**	**Wed 10.04.19**	**Thu 09.05.19**	
32		**Testing**	**48,75 days**	**Wed 10.04.19**	**Mon 17.06.19**	
48		**Training**	**45,75 days**	**Wed 10.04.19**	**Wed 12.06.19**	
57		**Documentation**	**30,5 days**	**Wed 10.04.19**	**Wed 22.05.19**	
67		**Pilot**	**70,25 days**	**Wed 20.03.19**	**Wed 26.06.19**	
74		**Deployment**	**5 days**	**Wed 26.06.19**	**Wed 03.07.19**	
81		**Post Implementation Review**	**3 days**	**Wed 03.07.19**	**Mon 08.07.19**	
86		Software development template complete	0 days	Mon 08.07.19	Mon 08.07.19	85

WORK BREAKDOWN STRUCTURE

- For each activity in the WBS structure, work dimensions should be identified, i.e. the following should be determined:
  - time (the number of time units that will need to be allocated to the activity),
  - cost (amount of money spent on work and materials),
  - scope (work to be carried out and method and result of its performance),
  - resources (labor, materials and equipment needed),
  - quality (required level of work performance and parameters enabling its measurement),
  - risk (uncertainty and threats related to the implementation of the action),
  - relations to other activities (activities that must be carried out before this specific one can start).

PROJECT SCHEDULE

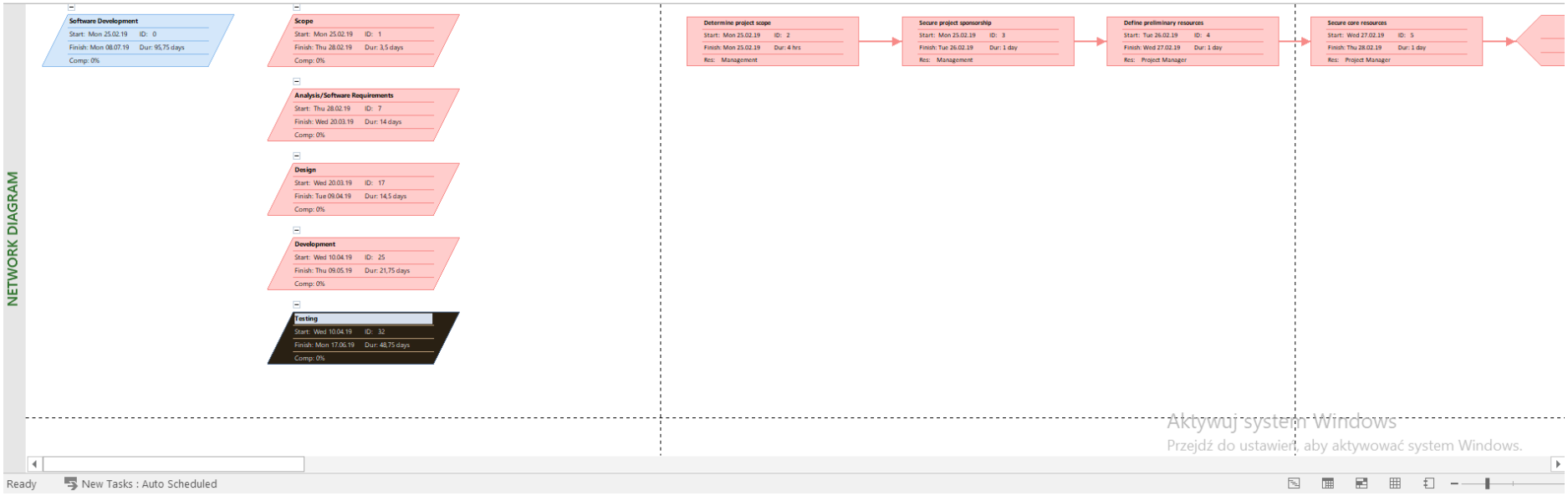
- Completion of the project within a given time is one of the basic conditions for successful completion of the project.
- To achieve this, first, it is necessary to create a project implementation schedule, and to monitor constantly the compliance of the project implementation with the schedule.
- The schedule creation process consists of the following stages:
  - identifying tasks to be carried out during the implementation of the project,
  - identifying dependencies between tasks,
  - estimation of task duration,
  - making a network diagram,
  - creating a preliminary implementation schedule,
  - adjusting the initial schedule based on the availability of resources and project constraints,
  - comparison of the expected end date with the date required.

PROJECT SCHEDULE

- The following methods can be used to make estimations:
  - method of adjusting standards
  - the weighted average method
  - expert judgment
  - Delphi technique

NETWORK DIAGRAM

Identified and described actions should be arranged in a logical order of their execution, i.e. create a network (logical) diagram.



PROJECT BUDGET

- The budget, which defines the maximum amount of financial resources that can be used for the implemented project, is perceived as the financial dimension of the project limitation.

- The budget applies to both the allocation of material resources, the human capital expenditure involved in the implementation of the project as well as the reserves intended to remove the effects of the project's risks.

PROJECT BUDGET

- There are four basic methods of the cost of the project estimation:
  - Bottom-up estimation - involves estimation costs at the level of detailed elements of the WBS structure.
  - Top-down estimation - involves estimation based on the actual costs of previous projects.
  - Estimation based on parametric modeling - the sought costs of the project (tasks) are expressed by an analytical formula to which it is enough to substitute the appropriate values (parameters).
  - Estimation based on expert judgment - cost are estimated based on expert opinion.

PROJECT BUDGET

- The project budget can be created from the bottom-up (i.e. by the project manager and the project team, the budget is created then negotiated with the management board and approved for implementation after adjustments) or top-down (i.e. starts with the senior management creating a budget for the entire organization and allocating budgets to the departments).

- Regardless of the method of creation, the finally approved project budget should be accepted by both the project team and superiors - this is a condition for effective budget implementation.

PROJECT QUALITY

- There are many definitions of software quality: "compliance with requirements", "usability".
- The primary task of the project manager and other people responsible for the project is to agree on a common vision of quality.
- The leader of the implementation process must take care not only of the software has all the functions that are expected, but mainly of the functions that will be available are reliable, efficient, secure, etc.

QUALITY CRITERIA

Program operation	
Convenient	Refers to the program's usage efficiency and convenient interface
Security	Refers to the program's security of use in terms of controlling the rights to use it and resistance to the effects of incorrect operation
Efficiency	Refers to the system performance assessment and resource management methods
Correctness	Refers to the degree of implementation of the requirements, completeness and logic of implementation, compliance of the program operation with the specification
Reliability	Refers to the degree of program resistance to errors, its formal correctness and ways of reacting to erroneous situations
Adaptation to modification	
Maintainability	Evaluates the degree of adaptation of the program to activities aimed at its correction, modification, extension, adaptation, etc., according to new requirements or error reports
Flexibility	Evaluates the possibilities of expanding the program with new functions and the universality of implemented solutions
Testability	Assesses the adaptation of the software to the testing process, i.e. its structure, documentation, module specifications, etc., as well as the mechanisms envisaged to support this process
Software mobility	
Portability	Evaluates the software for its ability to be easily run on machines or programming systems other than the design environment
Versatility	Refers to the possibility of using existing software or portions thereof for the construction of other computer programs or systems
Openness	Evaluates the degree of adaptation of the program to cooperation or exchange of information with other computer systems

Tabela 1. A set of quality criteria describing the software.
Source: Frączkowski, 2003, p. 54

QUALITY PLANNING

- The plan should include the following categories of activities:
  - contract reviews,
  - control of requirements analysis, design, implementation,
  - supply and control of subcontractors,
  - software control and testing during production,
  - service of design products that do not meet the requirements,
  - installations, implementations,
  - service,
  - staff training,
  - organizational support of the project,
  - internal audits and quality system reviews initiated by project management,
  - other activities.

QUALITY PLANNING

- The quality plan should include:
  - description of how to implement the company's quality policy,
  - description of the quality assurance system - its structure, distribution, responsibilities, procedures and resources needed,
  - a set of accepted quality criteria and metrics to monitor and evaluate them,
  - adopted standards and norms,
  - plan of verification and validation activities during the project,
  - audit plan,
  - setting quality criteria for all products,
  - emergency plan and procedure,
  - a description of the terms of cooperation with the client, cooperating parties, guaranteeing high quality.

QUALITY MANAGEMENT

Quality monitoring

- Positive or negative results of quality control are the source of design decisions that aim at:
  - documenting activities,
  - take corrective actions,
  - tracking their implementation,
  - verification of their effectiveness.

QUALITY MANAGEMENT

Improving quality

- The basic tools for quality improvement include:
  - requirements engineering,
  - design method,
  - verification and validation,
  - software technical reviews,
  - software testing,
  - proof of correctness
  - simulations and prototyping,
  - requirements tracking
  - other tools.

PROJECT RISK ANALYSIS

- Risk is a possibility, chance of danger, non-deterministic situation in which the probabilities of occurrence of cases, both positive and negative, are determined.

- Uncertainty is the lack of information, knowledge or understanding regarding the outcome of an action, decision or event.

- There are no projects where there is no risk or uncertainty.

PROJECT RISK ANALYSIS

Table 2. Typical areas of high uncertainty.

Area	Description
Scope	Estimated range of work, ability to clearly define work, errors and omissions in design, change of scope due to the client
Time	Expected project duration, estimated duration of activities, time to market, launch date, time needed for management to review and approve the schedule
Cost	Estimated project cost, production side effects, maintenance, inflation, exchange rates, budget constraints
Technology	Customer expectations, probability of success, ability to reproduce on a larger scale, ease of product manufacture, design success
Human resources	Quantity, quality, availability, matching skills to tasks, ability to define roles and responsibilities
Organizational issues	Customer priorities and knowledge, coordination between activities
Chances of market success	User expectations, sales volume, price, market share, demography, quality, geography, economics
External factors	Competitive actions or reactions, regulations

Source: Heerkens, 2003, p. 135.

PROJECT RISK ANALYSIS

- When identifying risk, it is necessary to convene the entire project team and gather all project documentation prepared (including project definitions, critical success factors, business justification, information on the basis of which time and cost estimates were made), including the plans created (the most important is WBS structure, implementation schedule and RAM matrix).

- When identifying risk, it is beneficial to use checklists.

PROJECT RISK ANALYSIS

Scope
- The client extends the scope
- Work cannot be defined
- Project goals are changing

Project Schedule
- The project duration has not been estimated
- The end date is not realistic
- The approval of the project was delayed
- A board check delays the project

Marketing
- Surreal customer expectations
- Market requirements are changing
- The price ceiling is changing
- Efficient sales value

Materials
- Unavailability of materials
- Poor integration with already used materials
- Supplier unreliability
- Material failure
- Quality below standards
- High price

Buildings and equipment
- Lack of access
- Unreliability
- Incompatibility with the equipment used
- Competitive applications or competitive users
- Low flexibility / adaptability
- Restrictions related to the ownership of buildings or equipment
- Bad location
- Space (no or wrong type)

Resources
- Team members are changing
- Financing, modifying or freezing
- Uncertain costs / expenses
- Inaccessibility
- Badly set priorities

Organizational
- Unclear roles and responsibilities
- Poor task delegation
- Poor relations between organizational units
- Lack of proper coordination
- Potential conflicts between individuals
- Restrictions on company politicians
- Poor communication
- Reorganization issues
- Problems on the line: regular employees and function employees

Personal
- Holidays and sickness
- Personal trouble
- Deconcentration of external reasons
- Ethical and moral issues

Interpersonal Relationships
- Workmanship and productivity
- Interpersonal conflicts
- Development and strengthening
- Weak motivation and negative attitude
- Poor skill match
- Health and safety issues
- The problem of diversity

External influences
- Weather, natural disasters
- Government regulations
- Health, safety, OHS
- Patents, copyrights
- Cultural barriers
- Political tensions
- Bad company image
- Adverse legal situation

Table 3. *Common problems encountered during the implementation of the project - a checklist of risk. Source: Heerkens, 2003, p. 136.*

PROJECT RISK ANALYSIS

- Risk management strategies:
  - avoidance (change of direction to eliminate exposure to threat),
  - transfer (insurance by transferring responsibility for risk to third parties),
  - acceptance (taking no action and willingness to bear the consequences of risk),
  - prevention (taking actions to reduce the likelihood of risk),
  - mitigating the impact of problems (reducing the negative effects of risk),
  - creating reserve plans (planning actions to take in the event of a risk).

PROJECT TEAM MANAGEMENT

- Success in project management depends mainly on people and their teamwork skills.
- Team management begins when it is built: you need to identify the skills of employees needed, involve the right people.
- In the selection process of team members, appropriate recruitment strategies should be used and appropriate diligent people should be attracted to the team.

PROJECT TEAM MANAGEMENT

- Each new employee should be presented and explained why he was employed in the project. Therefore, roles and responsibilities should be assigned to them.

- People employed for the needs of the project must also quickly learn to cooperate with each other, so various integration activities should be undertaken (e.g. joint trips, bowling or going to the pub).

PROJECT TEAM MANAGEMENT

RACI MATRIX

Table 4. Dog care.

Phase \ Person	Mom	Dad	Jan	Sylwia	Marek	Kids*
Feeding	A	C	R			
Playing	I	I	A			R
Grafting	R	A/R				C
Morning walk	C		A/R	R		
Evening walk	C		A/R		R	
Washing	C		A/R			
Cleaning	C	A	R			

R- **Responsible** , A- **Accountable** , C – **Consult** , I – **Informed**

PROJECT TEAM MANAGEMENT

RAM MATRIX

Table 5. RAM matrix.

Element of WBS	Project team members					Other stakeholders		
	Adam	Ewa	Mariusz	Sylwia	Mateusz	Sponsor	Management	Expert
1.1.1 task	N				R			
1.1.2 task		R	C					
…								
1.2.1 task	R		S			A		G
…								
1.3.1 task			R		S			A
1.3.2 task			R			N		
1.3.3 task				R				
…								
1.4.1 task	R			S		A	A	
1.4.2 task		R			C	N		

Legend: R - responsible , S - support required, C - need for consultation, N - need for notification, A - need for acceptance, G - input data controller

Source Małyszek, 2011, p. 98.

PROJECT TEAM MANAGEMENT

- Features of an effective team :
  - common goal
  - occurrence of various social roles,
  - mutual understanding and acceptance,
  - developing "game rules",
  - direct exchange of information,
  - planning control,
  - direct agreement,
  - personal responsibility
  - tasks that require effort,
  - access to necessary funds,
  - access to the latest information,
  - peer rating,
  - limited micro-management.

PROJECT TEAM MANAGEMENT

- Team development phases:
  - shaping phase - the team shapes and learns behaviors that are acceptable, becoming acquainted and acclimatizes,
  - turbulent phase - team members oppose the emergence of a group structure, conflicts, rebellions, mutual accusations, disputes arise,
  - the norm creation phase - conflicts are resolved, resistances are overcome, unity, common goals, norms and rules of functioning appear,
  - efficiency phase - the team functions as one whole, and its structure becomes a useful tool, not a matter of dispute,
  - phase of termination of activity - project teams are appointed only for the duration of the project, after its completion they are dissolved.

PROJECT TEAM MANAGEMENT

No.	Technique	Nature
1	Strength of transmission	Influencing others by creating a behavioral model
2	Understanding the values important to the company	Actions showing loyalty, dedication and exceeding the requirements of a given position
3	Appreciation of company policy	Compliance with applicable regulations and clear presentation of their content, even if they are not fully approved by the manager
4	An enthusiastic approach to work	Commitment and fair use of working time
5	Professionalism of action	Behavior with dignity and seriousness, emotional maturity and so that people trust the judgment of the manager
6	Health and personal culture	Encouraging employees to lead an active lifestyle, compliance with health and safety rules, gentlemen's appearance and behavior
7	Inspirational approach	mpact by referring to successes, visions, sensory impressions and such important matters as patriotism, family values or reluctance to fight
8	Showing emotions	In moderation, selectively, with explanation of the reasons and without undue pretense
9	Consultation	Without unnecessary comments and without showing that the decision may already be made
10	Championship in its industry	Championship may be in different areas, not necessarily directly related to the exercise of their functions

Table 6. Techniques supporting the leader's tactics.
Source Małyszek, 2011, p. 100.

PROJECT TEAM MANAGEMENT

No.	Need	Nature of need	The ability to meet the needs
1	Achievements	People have a strong need to do something and find satisfaction in the task they are doing	Creating something from beginning to end, carrying out a large task
2	Authority	People with a strong need for power seek control	Supervising an important task
3	Membership	People with such a need seek close contacts with others and are loyal friends or employees	Participation in a stable working group
4	Recognition	People with a strong need for recognition want gratitude for the work input and results	Jobs that require competition
5	Reign	People with a need for reign want to influence others to impose their way of thinking, often using coercion	Allocation of particularly important tasks
6	Order	People with a developed need for order strive to organize various matters, understanding, balance and precision	Organization of databases, reorganization of the warehouse
7	Experience seeking	Some people like risk and emergency situations	Introduction of new products, recovery of receivables
8	Security	Most people have a need to work in safe conditions, free from physical and emotional threats, and a need for job security	Employment contract, respect

Table 7. Techniques supporting the leader in triggering group motivation.
Source Małyszek, 2011, p. 100.

PROJECT TEAM MANAGEMENT

No.	Technique	Nature
1	Creating a mission	Providing a detailed message that distinguishes an organizational unit and includes a specific purpose, reason and password
2	Encouraging discussion	Preventing a situation in which at least one member of the team remains passive
3	Closeness and camaraderie atmosphere	Providing access to a room intended for shared use
4	Exchange of views	Sharing ideas, sending copies of important articles and studies
5	A reward for helping a group	The achievement of the goal favorable to the group should be as rewarded as the achieved individual goals
6	Promoting your team	Creating a system of team and individual awards
7	Providing conditions	Assistance in the implementation of difficult tasks, but do not perform them for others
8	Environmental jargon	Expressing support for jargon within the group
9	Humor and laughter	A good leader has a sense of humor (but shows maturity), situational humor is particularly nice

Table 8. Techniques supporting the leader in creating a sense of team community
Source Małyszek, 2011, p. 101.