SOFT-SKILLS INTEGRATION INTO PRODUCTION PROCESSES

SCIENTIFIC MONOGRAPH

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For the professional content of the text correspond authors.
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CONTENT

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

We are witnessing a natural need for and pressure from social practice, businesses, institutions and organizations to more rigorously select higher education graduates in their recruitment, based on the credibility of the university, its level and its reputation in the higher education market. Naturally, the increasing demands on graduates vary depending on prospective employment and the social sector in which the graduate is looking for a career, whether it is a specialized job or a more generally defined job, whether it is a domestic or a foreign company.

Until recently, human resources professionals have dominated, almost exclusively, candidates' expertise. Today, they are increasingly interested in the individual personality of each candidate. This means properties that cannot be included in the professional qualification. Not only in the Anglo-Saxon world, are they referred to as "soft-skills". Although we encounter attempts to use the Slovak equivalent of "soft skills", this term is usually not translated. Soft-skills are called personal properties which range from empathy or knowledge of people, through communicativeness or self-criticism, to the ability to assert themselves, lead a team or the ability to inspire others for a common goal. Their importance varies according to the specific requirements of the company. The common denominator is the ability to communicate.

What might seem self-evident in theory is, for many graduates, the greatest and most difficult test on your way to professional success. There are several reasons why individuals may try to develop soft skills during their studies. Educational institutions annually produce hundreds to thousands of graduates with the same or similar education. They have competed with graduates from previous years with acquired experience. The individual will only assert himself through the complex of superstructure competencies and the ability of their practical and effective application for the benefit of the employer.

The basic objective of the scientific monograph is to systematize knowledge of the perspectives of applicability of soft-skills in production processes. In formulating the monograph's objective, we started from the theoretical and practical knowledge of management gained mainly from available scientific literature, as well as from our own research and experience. The scientific aim of the publication is to define the theoretical basis of the knowledge competencies of employees in the field of soft skills and ICT skills in the context of the content of teaching social science subjects for study programs focused on production process management. The aim also predetermined methodical work, structure, and methods of research.

The monograph is divided into five basic parts so as to provide space for interconnection of general theoretical approaches and their application in practice and in teaching. Research methods used – analytical – synthetic, inductive – deductive and scientific abstraction correspond to the aim of the research. The publication provides a comprehensive and systematic analysis of soft-skills in the context of the analysis of skills required by employers from graduates of technical universities. It is the result of long-term research of the authors.

Theoretically and methodologically, the work follows the objectives of KEGA project No. 011TU Z-4/2017 "Integration of progressive information technologies and soft skills into study programs focused on production process management". We believe that the scientific monograph "Integrating Soft Skills into Manufacturing Processes" will provide interested readers with inspiration at work and personal life in improving the quality of soft skills; it will motivate students to enhance their own personal qualities with a perspective to better employability and higher education. Last but not least, for teachers, it also features suggestions for improving teaching in accordance with the requirements of practice for the competences of graduates.

1 CURRENT UNDERSTANDING OF THE SUBJECT OF MANAGEMENT

1.1 The nature and importance of management

Management is one of the most important human activities. As people in the past started to associate and form groups to achieve goals that they were unable to achieve as individuals, management became a necessary condition to ensure the coordination and focus of efforts of individuals in the right direction. Over time, the society developed and a general tendency prevailed to rely on group efforts, specialization of individual activities and division of labour. The very natural consequence of this process was the growing importance of people, later directly specialists, aimed at coordinating the effort of individuals or smaller groups – the managers. At present we can state that we meet a number of definitions of management that are focused on individual company building blocks, whichever the given author prefers.

The term management can be understood by Majtan et al. (2005) as an open set of knowledge about the specific activities (functions) of managers that are necessary to achieve the goals of an organization. Management can be understood from different points of view and interpreted in four ways:

- **as a process** expressing the fact that management is a practical activity of a manger that represents a set of activities to achieve a goal. It is a dynamic process from the definition of objectives, their implementation up to the control. These activities constantly repeat.
- **as a profession** that is associated with the recruitment of professionals in managerial positions in economic organizations. Effective management like any other profession requires specific content, structure, and level of knowledge, skills, abilities and practical experience. In order to meet these requirements, it is also necessary to provide adequate conditions for the preparation and training of managers.
- **as a scientific discipline** that has an interdisciplinary character in that it integrates the knowledge of social disciplines into one whole, such as psychology, sociology, economics and others, but also natural and technical disciplines. The main task of management as a discipline is to create a management methodology whose application would increase the effectiveness of the functioning of organizations.
- **as an art**, it is associated with Japanese management, which seeks to address the whole person through its pragmatic, social, moral, aesthetic and emotional aspects. Management as art means to look for and place the right people in the right places, communicate with them, motivate them and stimulate them both individually and as team members, create a team and anticipate development, risk reasonably and so on. Managers can work more efficiently by using systematic management knowledge as a science.

Management characterizes the process of leadership and management of all parts of the organization, especially business, through manipulation of human, financial, material, knowledge and other intangible resources. In the early 20th century, Mary Parker Follet characterized management as the art of doing things through people (Veber et al., 2011).

According to Druker (1992), management is, therefore, free in what has traditionally been called free art because it deals with the basic categories of knowledge, self-knowledge, wisdom and leadership skills; art, because it is a practical and application field. Managers draw on all the knowledge and facts of social sciences such as psychology and philosophy, economics and history, ethics, as well as natural sciences. However, they must focus this knowledge on the

effectiveness and results of healing a patient, teaching a student, building a bridge, developing and selling computer software that would be optimal for their user.

Hittmár (2006) states that management is a process in which managers, using scientific knowledge, but especially practical recommendations, are able to carry out basic management functions in evaluating available resources in order to identify and achieve the business objectives of an organization.

Borovský and Vargic (2005) indicate that management distinguishes four basic managerial functions, which are:

- **planning** – answers the questions: What are the long term goals of the organization? What resources does the organization use to meet its goals? What strategy is most important to meet the goals set in a company?
- **organizing** – answers the questions: How should the activities be organized to achieve the business goals? When and how should be the organizational structure of the organization be upgraded?
- **directing** – answers the questions: How necessary it is to motivate and stimulate people in the workplace? How it is possible to solve conflicts in the workplace? What managerial style is the most suitable under given circumstances?
- **controlling** – answers the questions: What organizational activities require controlling and how this control should be carried out? Which organizational deviations are most relevant to employees and how to use the knowledge about the deviations?

Synek et. al. (2010) states that according to Fayol there are five basic functions of management:

- **planning:** set future goals and its achievement
- **organizing**: provide human and tangible sources
- **commanding:** assign tasks to subordinates
- **coordinating**: harmonize activities of the employees
- **controlling:** check compliance between the plan and reality, make conclusions.

Majtán et al. (2007) present the functions of management as follows:
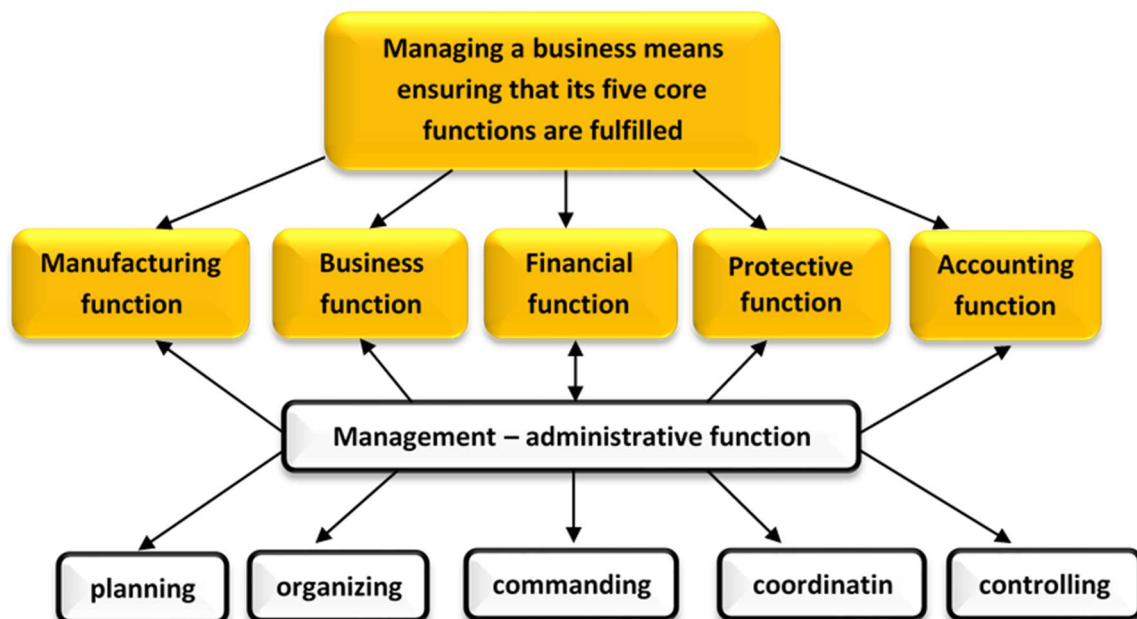
Fig. 1.1 Functions of management

Source: Majtán et al. (2007)

Current literature lists a variety of management functions that intersect and support each other, some are highlighted while other are suppressed, but ultimately as a unit, they form one management cycle. On this basis, we can consider planning, organizing, managing people, controlling and decisions making as a cross-cutting managerial function as the most frequently reported management functions.

1.2 Tasks of a manager

Past definitions characterized a manager as a member of an organization, a company or an institution who gave orders to subordinate employees what and how to do. The other employees just filled their orders and had no subordinates. These characteristics do not currently apply. Present time erases the sharp boundaries between managers and other employees in organizations. Many of the traditional positions where management activities were not needed in the past are now inevitably required, especially in case of activities performed in teams. So how to define the current position of a manager and his duties? The manager is the one who works with people and coordinates their activities and decides in a way to achieve the goals of the organization. This means that he/she coordinates the work of individuals or groups within one unit or more departments, as well as the work of in-house units with external institutions such as suppliers, outsourcers, government agencies, and so on. Of course, it is necessary to realize that the manager is also responsible for coordination and integration activities, as well as for introducing new trends and systems into managerial work. No one is born as a manager, it is necessary to become one. Like everybody, the manager is also influenced by physiological and psychological preconditions and by the fact that each of us is unique. One of the most problematic aspects of leading people is the manager's personality. Who wants to be a good manager must get along with people, shall be interested in them, try to understand their feelings and be able to communicate with them. The manager must be intelligent and have the necessary skills to improve the capabilities necessary to perform the assigned function.

1.2.1 Definitions of a manger profession

A manager in an organization is the person who is responsible for the entrusted organizational unit or otherwise defined area. The role of the manager is to manage, i. e. plan, lead, organize, make decisions and control people, processes and other resources in the responsibility of the organization. There are many definitions for the manager.

Donnelly et. al. (1992) characterize managers as people responsible for achieving results through specialized efforts of others, individually, in groups, or in organizations.

Hitka and Lorincová (2016) state that managers have a dominant position in the new hierarchy of relationships between owners, managers, and employees. The success of an organization depends on its managerial competence.

Majtán (2007) perceives a manager mainly as a profession. The person who carries out this profession directs the activities of the organizational unit through managerial functions to achieve set the goals.

Hangoni and Imrichová (2010) characterize a manager as a leader who works with own ideas and looks ahead. They shall know not only the goal but also the way and thus the strategy on how to realize their vision.

Vetráková (2002) describes a manager as a person who is responsible for employee activities, organizational resources, and for own decisions. Before taking a decision, managers must

balance objectives and options, set priorities and re-calculate everything. A manager is a person who works with people. They work with everyone whose information they need to complete their tasks. They are a communication channel inside and outside the organization. They negotiate with employees, customers, business partners, representatives of various associations, institutions, mass media, etc.

Based on the study of various sources dealing with manager definitions, we can conclude that many authors agree in their manager definitions that the managers use managerial functions in their activities and thus ensure the goals of the organization.

A manager is a person who possesses certain knowledge, experience and usual authority in his area of responsibility. The position of the manager is very attractive and thus attracts the attention and interest of the increased number of people. Managers cannot be judged on the basis of their visual aspect, but on their abilities and knowledge, and especially on the basis of how the manager possesses the abovementioned knowledge and abilities (Sojka, 2006).

Mládková and Jedinák (2009) characterized managers as people who manage other employees of the organization and in their book, they divided managers into three organizational levels of management:

- **top management** that creates strategic plans for organizational development and coordinates it overall. Strategic planning is significant particularly for marketing, human resource development, investment decision-making, and research and development. Top management consists of representatives of owners and top managers of the organization, the so-called C-level. They communicate with clients and with the company as a whole, plan, decide, and lead in the long-term period for 2 to 5 years. The top manager is also called the director. These include in particular:

Director of the company, the term General Director is used especially for big companies, generally, all other managers on the level of directors are subordinated, the abbreviation CEO is often used (Chief Executive Officer),

- Financial Director, the abbreviation CFO is used (Chief Financial Officer),

- Operational Director, the abbreviation COO is used (Chief Operations Officer),

- ICT Director, the abbreviation CIO is used (Chief Information Officer),

- HR Director, the abbreviation CHRO is used (Chief Human Resources Officer),

- Sales Director, the abbreviation CSO is used (Chief Sales Officer),

- Depending on the complexity and structure of the organization, there may be other top managers at the level of directors, such as CTO (Technical Director, Production Director), Plant Director or Branch Director, Region Director, etc.

- **middle management** is a level between top managers and first line managers. It is also referred to as the tactical level. Tactical objectives serve to fulfill strategic objectives. Throughout the year, concrete measures are taken to achieve the strategic objective. Typical middle line managers are a quality manager or finance manager. They plan, decide and lead in the medium term t. j. for several months up to 2 years. They transform strategic roles created by top managers into the roles of subordinate lines and oversee their fulfilment. Typically, middle management is created in larger organizations:

  - Head of Unit, Head of Area, Head of Department – for line organization structure,

- Quality Manager,

- Risk Manager,

- Safety Manager,

- R&D Manager,

- and others.

- **lower management** is made up of supervisors, project managers and managers with a narrow range of responsibilities. Their role is to perform managerial functions in the short term period from a week to 1 year. This level is also referred to as operative management. Operational objectives are always specific and linked to the responsible person. Their job is to lead the performing employees. They are experts in what their subordinates do. Examples of first line management are:

- Product Manager ,

- Logistic Manager,

- Marketing Manager,

- Service Manager,

- Facility Manager,

- Civil Engineering Manager,

- Head of Accounting,

- Head of Warehouse and others.

The manager is responsible for performing tasks that require to lead other members of the organization. But there are great differences in the complexity of these tasks and also in the position of managers within the organization. Differences in levels determine the requirements and skills that are needed to meet successfully the organizational goals at a given level, while at the same time these differences motivate managers to develop personally and track their career paths (Bělohlávek, 2006).

1.2.2 Personality and leadership of the manager

In general, the term personality is linked to the effort to identify the uniqueness of each person, to compare and understand the characteristics that distinguish each person. The term personality describes the mental characteristics that affect the distinctive behaviour of each individual, are relatively stable over time and unique to each person. Personality represents those personal characteristics that lead to a logical predictable behaviour and it is a critical element of management. In everyday language, we use the word personality in the evaluation meaning. We consider a person as a personality when he/she is the author of his/her actions when he/she does not imitate when he/she is responsible for his/her actions, is aware of the consequences of his/her decisions. For these reasons, it is very difficult to interpret a person as an individual – a personality. This difficulty is caused due to the complex nature of the human being as well as the environment and the related communities in which he/she lives.

For several thousand years, people have been trying to define certain types of personalities so that one can easily recognize and describe each person's character. One of the first and still one

of the most famous theories is the categorization of personality according to Hippocrates. The classification of Hippocrates divides people into four basic groups:

- **Sanguine** – optimistic, active, sociable,

- **Phlegmatic** – apathetic, lazy,

- **Melancholic** – sad, depressive, frightened

- **Choleric** – aggressive, emotional.

The above related classification is used also at present, however, it is not sufficient because there are several types of personalities, not only four. Therefore, in the course of time, new definitions of typology were created. The German-British psychologist Hans Eysenck (1916-1997) examined nervous system. He confirmed Hippocrates in a certain way when he used four types of permanent so that he related them to the emotional stability or lability as a type of nervous system and introversion/extroversion as a type of soul, which is shown in figure 1.2.
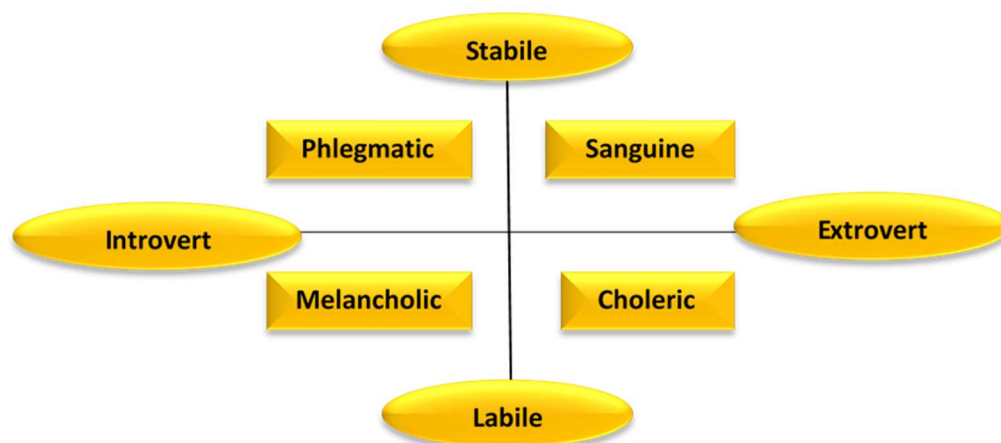
Fig. 1.2 Personality of a manager
Source: Own elaboration according to www.studium-psychologie.cz

The personality of a manager is exposed to situations that require not only a high level of emotional intelligence such as self-control, motivation, empathy, self-management, and others but also the ability to manage people who work in his/her team. In recent decades, experts have increasingly emphasized the importance of the quotient of emotional intelligence (EQ). At its level, both verbal and non-verbal communication between a person and his/her surroundings is extremely important for the personal and professional image of man. Unlike intellectual intelligence - IQ, EQ is not innate. It is necessary to acquire and develop it throughout the whole life! The literature states that only 20% of IQ contributes to success factors in life, suggesting that people's lives are much more driven by emotions than logic (Vymětal, 2008).

The level of manager's social skills as the ability to accurately identify a problem, the ability to communicate effectively, to manage criticism, to solve problems constructively, to look for solutions and so on shall help him/her to cope with these situations. The manager's personality plays an irreplaceable role in shaping interpersonal relationships and social atmosphere. Through their actions, attitudes and behaviour towards their subordinates affect their job satisfaction, attitudes and, last but not least, their performance. In doing so, knowledge of "typology" can help him/her very much. A newer typology is the typology of Carl Gustav Jung, whose personality approach is focused on the psychological preferences of introversion and

extroversion, as well as the tendency to feel or think. The personality matrix according to Jung is illustrated in figure 3 and depicts four basic types of the manager´s personality (Dědina and Odcházel, 2007):
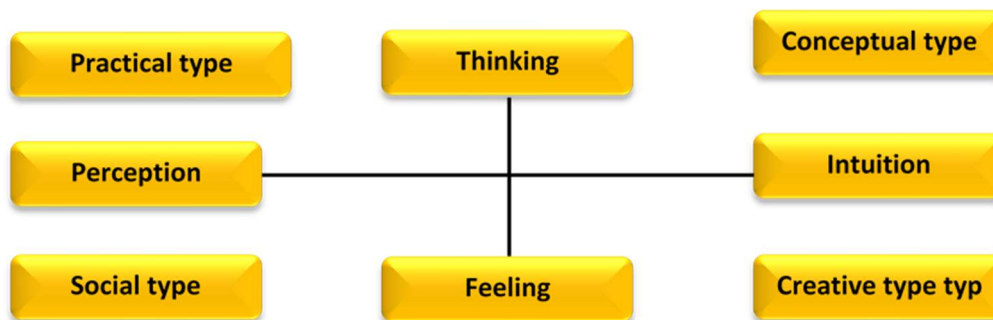
Fig. 1.3 Personality types of manager according to Jung

Source: Own elaboration according to Dědina and Odcházel (2007)

Personality types of manager:

- **Practical type** (combination of thinking and perception) A man who lands on his feet, impersonal and fact-oriented. He uses direct sentences and commands in communication. His distinctive feature is precision, does not like ambiguous statements. He is highly performance-oriented and prefers clear structures with well-defined authorities in the organization.

- **Conceptual type** (combination of thinking and intuition) A creative individual with a sense of conceptual work. On the basis of analyses, he is able to find the impacts of individual alternatives of his decision-making in the future. He likes to use mathematical models. He generates new ideas, gives impulses for changes. He can arouse enthusiasm in other people.

- **Social type** (combination of perception and feeling) A social and sociable individual who is interested in other people, their motives and needs. He does not like ambiguous statements. He likes to set the rules of conduct, but he suffers from a lack of time to assess the situation and lack of feedback.

- **Creative type** (combination of thinking and intuition) A sincere, enthusiastic man with great imagination. He sets high goals, does not like to obey rules, hierarchy, and procedures. He prefers flexibility and open communication. He manifests himself with persistence and devotion towards the organization. He is often perceived as an idealistic dreamer (Dědina and Odcházel, 2007).

The manager carries out countless diverse and challenging activities that place high demands on the manager's personality. Each manager is equipped with certain features, practical experience and has some prerequisites for managing activities that are connected with his/her leadership in the organization. The manager is expected to use effectively his/her knowledge, abilities and management tools to meet the organization's goals.

The main benefit of knowing the manager's personality is to combine the character of his/her personality with managerial work because depending on the personality characteristics, the manager can apply a specific approach to work duties or employees.

For a detailed description of the manager's personality from the point of view of executing the managerial activity, we must first of all pay attention to the general characteristics of the

personality. It is very difficult to define precisely the term personality since the opinions of individual authors differ. Only after having understood the personality as such, we can look for coherence not only associated with the formation of a manager's personality, but also with the requirements and assumptions that every successful manager should meet. Personality is a unique combination of psychic features that characterize an individual. He/she determines how to acts in different situations. He/she manifests the results of work and relationships with other people, says Schwarz (2012), adding that knowledge of personality allows predicting the behaviour of other individuals, seek ways to motivate them, and estimate professional success in different functions.

Based on the above mentioned definitions, the features of personalities have been defines, as follows:

- **uniqueness** – personality is something that psychologically differs a man from the others,

- **complexity and unity** – personality is a complex of psychological elements that form a unity,

- **relative stability** – psychical side in a man, what is relatively stable and what enables to predict the behaviour of a man in certain situations,

- **adaptation and development** – personality is a continual process and a way how to cope with changes in the conditions in our inside and environment (Bedrnová et al., 2012).

Many authors dealing with management issues and specifically defining managerial personality characteristics (Sedlák, 2012, Folvarczná, 2010, Armstrong, 2006, Veber, 2014, Porvazník, 2007) list various categories of abilities, skills and qualities that a successful manager should possess, most often the personal characteristics of managers, which can be divided into four areas. Based on their combination, it is possible to create a specific **profile of the manager´s personality**:

- *expertise on management object -* represent the ability of managers to use specific knowledge, techniques, methods, and procedures to deliver executive activities and processes, especially at the first level of management such as:
  - technical knowledge,

  - knowledge of the technology used,

  - knowledge of processed materials,

  - knowledge of the organization of the facility,

  - abilities and skills in using different information technology.

- *interpersonal skills* - most of the tasks that managers do have to be implemented through their employees. Therefore, interpersonal skills are essential to them. In order to lead his or her employees, it is essential that he/she is able to communicate effectively with them and motivate them.
  As an example:

  - talent to lead collaborators,

  - ability to assert - persuade others,

  - ability to navigate difficult situations,

  - interest to cooperate,

  - contact with world,

- ability to communicate,

- ability to make decisions,

- ability of an international (intercultural) orientation.

- *conceptual skills and experience* - managers' ability to see a company as a system that needs to be guided to achieve strategic goals. Managers with conceptual skills and experience are aware of all the company's core activities, their interconnection, continuity, and relationships, and can effectively coordinate individual activities. Some examples are:

- thinking in a broader context,

- ability to plan,

- ability to organize,

- diagnostic ability,

- analytical overall imagination,

- creativity,

- ability to take logical decisions,

- awareness of profitability and its application in practice.

- *performance assumptions (high performance capability)* - in many desirable abilities, knowledge, and skills, those that enable managers to operate efficiently in dynamically changing conditions are at the forefront. These include, in particular, the manager's personal qualities that make it possible to achieve good results in his/her managerial position, for example:

- endurance,

- the ability to overcome obstacles, tracking and meeting the goals set,

- loyalty to the company,

- a positive relationship to company development,

- willingness to work hard,

- interest in your own career and development,

- ability to act independently.

A view has been recently taken that the personal abilities of the interpersonal skills group play a very significant role in the manager profile because these skills have the greatest impact on the exploitation potential of the human resources. Among the interpersonal skills, in particular, those that focus on manager interaction with subordinates, are highlighted.

In connection with a manager's personality, the manager is often referred to as a leader. Leadership is a specific relationship between the leader and his/her followers with an impact on the consequences of the behaviour of people in the company. The authors Veteška and Tureckiová (2007), Armstrong and Stephens, (2008), and Maxwell (2008) characterize **leadership** or creative leading as a process in which the leader applies the influence on his/her followers, while the right to lead is voluntarily accepted by the followers. Leadership flexibly adapts to specific situations, includes effective communication, motivation, and inspiration of people to deploy their best abilities so that they can effectively achieve group goals. The leader is

perceived as the best employee and at the same time as one of them. The style he/she leads depends on the situation. The communication with the followers is very open and effective. While the proper leader tries to persuade the followers to participate in achieving goals, he/she is flexible and has many visions that push the company forward. Leaders and managers need different skills. Although they overlap in some ways, they are specific. Above all, leaders need the ability to see things from a wider perspective and decide on important roles and goals. Conversely, managers should be excellent at performing tasks and goals. Communication skills are essential for both leaders and managers - speaking, writing, presenting, listening, selling and persuading.

The leader shall further develop:

- vision and ability to engage the team in common goals,

- courage and conviction to fulfil his/her intentions and difficult decision making,

- pure intentions and confidence,

- humour and humility,

- empathy and deep understanding of priorities,

- the ability to inspire others to enthusiasm and confidence,

- self-confidence - not arrogance,

- credibility and moral strength,

- the "servant leader" approach, which serves others, not himself//herself.

Managers shall further develop:

- self-management and ability to prioritize on a broader perspective,

- the ability to collaborate within the team,

- planning and performing tasks,

- decision-making ability,

- balance and confidence in all circumstances,

- the ability to resolve conflicts,

- personal discipline and ability to fulfil own commitments,

- personal development and dedication to improving their knowledge and skills,

- flexibility and ability to adapt quickly to changing conditions,

- delegation and trust in others and their abilities (www.jobs.cz).

1.2.3 Tasks of a manager

During their work, managers deal with various activities and create variable relationships with employees in their area. These relationships relate to their superiors, subordinates, co-workers, clients, or the public. Manager behaviour in different relationships is governed by certain rules. Tasks of a manager complement each other and overlap in all management functions (Šuleř, 2008).

Sedlák (2012) deals with managerial tasks in the book Basics of Management. According to him,

managers do not pay the same attention to each task. Every single manager is an individual personality and is characterized by his/her own work style. The tasks of managers depend on the organizational level, the type of organization and the function he/she performs. They also depend on changing situations.

Solving of the managers' tasks also depends on the style of management that we can divide into:

− **autocratic style** – is characterized by the use of the will of the leader, regardless of the views of the subordinates, and he/she applies the appropriate means of power. The manager himself/herself decides gives orders to subordinates and expects them to be fulfilled. It is basically one-way top-down communication. For motivation, the manager uses his/her position, decides on the differentiated remuneration, as well as penalties for the employees.

− **democratic style** – is characterized by two-way communication between the leader and the subordinate. He/she agrees with them on the proposed tasks and decisions as well as proceedings on how to solve them. He/she not only consults but carefully considers their opinions. He/she coordinates the fulfilment of the work, help to reach duties and discusses the results or corrections with the subordinates. The participation of the subordinates is also used at evaluation and rewards.

− **liberal style** – the manager seldom uses his/her power and leaves his co-workers a lot of freedom to act, so they are largely independent. He/she relies on the subordinates to set or develop their objectives to a great extent and the means how to achieve them and they also choose how to implement them. The manager helps subordinates to obtain the necessary information and ensures contact with the outside environment. He/she acts as a representative of a subordinate team.

Tasks of the manager according to the management area are illustrated in Table 1.1.

Tab. 1.1 Tasks of the manager according to the management areas

Strategic goals of the company and their transfer to the areas	*Clear and concrete ideas, stimulus of active action, what to do and what to achieve in the period of 5 years, creating a feeling of joy, sense, and enthusiasm from activities, ensuring the existence of a company (workplace).*
Systematic approach to the prioritization	*In a variety of everyday tasks, what we have to do, what is important, what can happen when it fails to meet, time estimation to perform tasks and relaxation, development of priorities into the tasks of a workplace.*
Time management of processes and other work	*Lack of time as a big problem, employee well-being, load uniformity, reduced work quality - unfinished tasks, inconsistent work; disruption of planned tasks (e.g. sales), failure to fulfil and postpone tasks, neglect of personal development, family, friends; loss of work appetite.*
Influence of subordinate leading employees on the successful work performance	*Leadership - professional level, methodological knowledge, character traits, workforce, language skills, results of their work and support for all other employees, selection of new employees.*
Work teams and achieved results	*Team problem solving, informal approach, team achievements, non-advocacy, new ideas, individual willingness, teamwork management, awareness and facts, consensus search, motivation, project enforcement.*
Negative behaviour of the employees	*Incoherence, lack of interest in others, irony, mockery, defamation, power struggle and the promotion of personal interests, personal contradictions, stressful situations, conflicts, creating obstacles.*
Knowledge of individual employees and their potential	*Strengths and weaknesses of individuals, use of intellectual or character traits, systemic thinking, self-confidence, finding the causes of mistakes, passing and delegating challenging tasks, creating situations for knowing others, tolerance of initial failures.*
Motivation of employees	*Financial and non-financial incentives (especially respect, confidence) to achieve better job results, teamwork, employee stability, increase of qualification and change of work style, as well as penalties in case of non-compliance; personal example and the natural authority of executives.*

Assign tasks to employees	*The clarity and completeness of the formulation, the reality of the requirements, acceptance, and fulfilment by the employees, records of the assigned tasks, the wall board with the task overview.*
Evaluation of the employees´ work	*Preparing for an assessment interview, calm course, communication - questions about positive work and its results, taking a negative fact, completing specific tasks, recording an interview.*
Personal development of the employees	*Setting goals, keeping own activity, namely evaluating process and progress, explaining the consequences of non-compliance, encouraging, releasing from urgent tasks.*
Commendation of employees	*Directness, concreteness, publishing, finding opportunities for praise, thanking team members, symbolic gifts.*
Criticism and punishment of employees	*Detecting the real reasons for failure, reproaching negligence and irresponsibility, addressing, specificity of the matter, dignity, social tact, matter of only the subordinate and the leader, records.*
Financial rewards and remuneration system	*Motivation by fixed and variable salary amount, simplicity of remuneration system for work, timeliness of remuneration, amount of remuneration (adequate to merit), explanation of remuneration, secrecy of wage records*
Creation and change of culture of the workplace	*Expressing basic values - customs, practices, way of communication and speech, opinions on what is good and what is bad, rituals, appearance of workplaces, image in public, logo, and way of dressing. Clarification of cultural norms (egg code of conducts), their brevity and impressiveness, presentation in written form, leaders - as bearers of cultural change.*
Organization and conducting of meetings – management and communication tool.	*The goal of the meeting, preparation of the meeting, timeliness of the beginning, presentation of goals and program, checking of previous tasks, facts, argumentation, taking decisions, participation of individuals in the discussion, checking the course of the discussion, minutes of the meeting.*
Solving conflicts and aggressive pressure	*Conflict prevention, exclusion of emotions, search for a mutually acceptable alternative, personal inventions, promoting your opinion, inappropriate questions, compromise proposal, admitting own mistakes.*
Presentation of own opinions and proposals on the workplace	*Interest in new ideas and ideas, thought and preparation of presentations, recruitment, logical sequence of the topic, summary of important facts and influences, visual presentation.*
Solving of problems of a workplace	*Problem formulation, analysis of problem causes, solution variants, selection of optimal variant, implementation, and evaluation of decisions or optimal solutions. Finding new approaches to management, teaching, research, budgeting, and other workplace activities.*
Overall summary	***Areas: work planning and organization, leadership, motivation, communication, behaviour, and acceptance with each other and to customers, problem solving, working environment equipment and management support.***

Source: Own elaboration according to the authors Veber (2005), Heller (2005), and Sedlák (2020)

1.2.4 Roles and functions of a manager

Current literature provides two views or approaches to managerial work. One group of authors talks about managerial roles and the other about managerial functions. Both opinions are complementary, we cannot say that they are excluded, but we can state that they are different views of the managerial job. Canadian expert on management, Henry Mintzberg (1989), has defined ten types of managerial roles in the field of interpersonal relationships, information sharing, and decision making. In his classification, he focused on what the manager does and not how he does it. He distinguishes informational roles, where he includes monitor, disseminator, and spokesman. The second group of roles contains decisional roles, and here are included entrepreneur, disturbance handler, resource allocator and negotiator. Interpersonal roles involve figurehead, leader, and liaison. A whole range of authors has developed the theory of Mintzberga who have elaborated individual roles as follows:

- **Interpersonal roles** – are key roles, lead to the area of human relationships. A manager builds a network of interpersonal contacts, they often combine with each other. They conclude:

- **Role of a figurehead** – this role is played by the manager in situations when he represents the organizational unit that he leads. His duties here are symbolic.
- **Role of a leader** – the most important role includes managing and coordinating employee activities, staffing activities (employee selection, training), as well as employee motivation activity.
- **Role of a mediator** – is closely related to the role of leader and is important in conflict resolution in the workplace, as an unresolved conflict can lead to a loss of employee motivation and a reduction in unit performance. An important role of the current manager is to recognize and resolve conflicts in time, and the third person – the mediator – helps to clarify the root causes of the problem.
- **Role of a liaison**– the manager ensures interpersonal relationships outside his/her field of activity. It is about maintaining relationships with managers within the enterprise and other employees. Through informal relationships, he/she ensures communication between business units of the enterprise (Čambál et al., 2013).

- **Information roles** characterize manager as a nerve centre, in which the information is received, processed, evaluated and sent away (Sedlák, 2007), or require to provide sending and receiving important information, which is supported by interpersonal roles:
  - **monitor** – the manager monitors the environment and surroundings, collects necessary information about problems, threats, and opportunities against his/her organizational unit. It is important for the monitor not only to listen and observe but also to understand the monitored issues in the context and to draw conclusions (Čambál et al., 2013).
  - **disseminator (informator)** – this task is an integral part of management work involving the exchange of information between the manager and subordinates, superiors and other managers at the same level of management. The manager communicates to the employees important information that they are not able to obtain otherwise, or they do not have quick and simple contact with each other. In order to avoid misrepresentation, the information should be given to a clearly specified person, within the required scope and at the right time. Distortion of information can lead to employee demotivation.
  - **spokesman** – this role may have internal and external character. For example, in the case of a presentation for potential customers, the role of the speaker has an external character. The role of the manager as the official representative is to provide the organization's information and opinions for mass media, superior authorities, customers, and so on. In case of the internal character of the role, the manager acts as a spokesman when negotiating e.g. a salary increase for his/her employees (Majtán et al., 2008).

- **Decisional roles** are based on the previous two functions, they are basic inputs for further activity of the manager, and which is the decision making. This activity is usually considered as the most important part of managerial roles. The roles are:
  - **Manager as an entrepreneur**– manager shall use all the changes of the environment to improve the activity of the unit under his/her control, thus making the necessary changes. At the same time, he/she must respond in advance to the future needs of customers.
  - **Manager as a disturbance handler** – this role takes precedence over the previous ones as the removal of mistakes must be done immediately. When a failure occurs, the manager must change his work and activities to find at least a short-term appropriate solution (Sedlák, 2007).
  - **Manager as a resource allocator** – it is a position when the manager has to allocate the sources in the most effective way.

- **Manager as a negotiator** – to achieve the most convenient conditions for his/her organizational unit, the manager has to negotiate with various organizational units to e.g. negotiate the character of the work, performance, and factors that influence the functioning of the unit (Čambál et al., 2013).
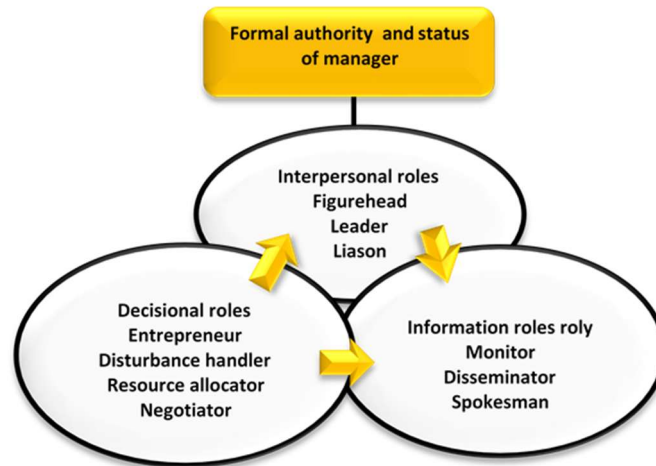
Fig. 1.4 Managerial roles and their mutual interconnection

Source: Sedlák (2012)

The concept of managerial functions represents activities that the manager should meaningfully and effectively perform to ensure the success of his/her managerial work. The purpose of his/her activities is to bring unity into social work, to transform it into work and to work with the common interest of the interest group he/she leads. He/she brings unity, order and a system to the work of the group that formulates its competence.

The activity of the manager of the work performed is conditional on managing activities such as setting goals, organizing work, motivating and ensuring communication, measuring and evaluating the results of work and, on the basis of them, fair evaluation and remuneration of employees, ensuring the qualification development focused on training, development, and integrity of the employees.

Managers perform their work, it is their job and profession. In order to carry out their work successfully, they must have power, influence, and authority.

For them, power means the ability to influence the subordinates and the environment. It is a means by which a manager can force a group or individuals to do or create something.

The classification of managerial functions by Veber (2007) as well as Vodáček and Vodáčková (2012) corresponds to one of the most widespread classifications of managerial functions on which the American authors Harold Koontz and Heinz Weihrich based their management textbook. We can classify managerial functions by these authors as follows:

- **Sequence management function** (they follow gradually, in a logical sequence):
  - *planning* – information process of setting goals and anticipated procedures for their achievement (identification of the initial situation, estimation of options, setting goals, their arrangement and mutual relations, elaboration of proposals and analyses for achieving the considered goals, selection of plan scenario, determination of the steps of implementation of the selected plan and possible adaptation to changing conditions.
  - *organizing* – this function includes defining and temporally organizing the tasks to be performed, assigning them to individual employees, including the allocated resources, competences, and responsibilities. It is about creating a structure of relationships – organizational structure and coordination of activities of individual employees. The main

objective of organizing is to determine what needs to be done, how to do it, and who should do it.

- *selection and placement of employees (staffing)* – emphasis is placed on the professional and qualification prerequisites of available employees, their skills, knowledge, abilities, habits. They are selected, deployed and distributed, including the recruitment of new employees or the use of retraining (Vodáček, Vodáčková, 2013).

- *leading* – the ability to lead people (often referred to as leadership), draws attention to direct and indirect influence on the activities of subordinate employees and their motivation to perform efficiently the necessary tasks (Beránek et al., 2013). Leadership is one of the basic managerial functions, but it is often confused with management. For a more detailed explanation, I will point out the difference between management and leadership. Managers must be leaders and leaders are usually, but not always managers. However, there is a fundamental difference in their procedures. While management is interested in achieving goals by utilizing, deploying, acquiring and controlling all the necessary resources such as money, people and information, the leadership focuses on the most important resource, the people. It is a process of developing ideas into the future and motivating them. This difference is rather fundamental. Management is predominantly about using and controlling resources, but where people are involved (and that is almost everywhere), it is impossible to achieve results without effective leadership. This implies that it is not enough to be a good manager, but also to be a good leader (Armstrong, 2006).

- *controlling* – it is involved in the information processes for evaluation, measurement of quantity and quality of interim and final results in managerial activity. The aim is to compare objectives, plans, standards and norms with the results achieved. Control is important feedback.

- **Parallel management functions (continuous)**
  - *analysis of the solved problems* – it is a partial information process that is needed to understand and express properly the purpose of planning, to form an opinion on criteria for its effective implementation, thus creating the necessary information for other functions, such as decision-making and implementation. On the part of the managers, it is necessary to pay attention to this function because if underestimated, they may create incorrect assignments of further solution procedures or they have insufficient and inappropriate data if less attention is paid to the analysis of conditions.
  - *decision making* – it is a choice between at least two possible options. This means checking whether the objectives can be realized under the conditions that were entered or detected. The result of this process is not a real solution to the problem, but a decision, i.e. a choice between the options for decision and the subsequent procedure for their implementation.
  - *implementation* – the stage of transposing the decision into reality. It is difficult enforcement of the goals and procedures of a demanding decision process involving various employees and workplaces. In more complicated cases, fulfilling the ongoing managerial function of implementation and coordination of partial works and their executors comes to the forefront. It is then a timely, spatial and factual harmonization of individual activities and their source provision, which as a whole leads to the fulfilment of the specified task, respectively a decision on the progress made. It is often a demanding coordination activity, which is the reason for emphasizing the role of coordination in the implementation (Vodáček and Vodáčková, 2013).

2 THE THEORETICAL BASIS FOR COMPETENCE AND SKILL DEFINING

Briefly and in general, we can state that managerial competencies are given by the four basic functions of management: planning, organizing, leading and controlling. The fifth cross-sectional function is decision making. Some authors put an "equals" sign between the concepts of management and decision-making, that is, management is leading, especially a choice, decision-making between variations in planning, organizing, staffing, and control. Veber (2003) states: "Managers constitute an independent profession where an individual, by appointment, nomination, election, authorization or mandate, carries out active management activities for which he or she is equipped with the appropriate competencies. A manager is, therefore, any leader appointed, nominated, elected, mandated or empowered." The most important part of the definition is that the manager is primarily a profession. Its holder is responsible for achieving the goals in the organization, based on the use of a team of collaborators and provided resources. The manager does not have to be a dominant boss with an army of subordinates but a man who must be able to use the knowledge and skills of his co-workers.

2.1 Competences and functions

Porvaznik et al. (2007) define education as an emotional, cognitive, and voluntary information-communication process aimed at acquiring and developing characteristics and skills of a person that influence his activities, actions, behaviours and experience in work and personal life. The aim of preparing people for managerial competence is a certain model, the ideal of possible and desired human qualities that can be achieved by education. The competence of management subjects in organizations can be achieved by acquiring and using professional knowledge and practical skills. In today's globalized market environment, the issue of human social maturity, the human approach, is at the forefront. The trend towards humanization has been worldwide increasingly promoted, Porvazník et al. (2007) state.

Table 2.1 lists the different levels of organization management by competencies and functions that require different qualification, skills and knowledge requirements.

Tab. 2.1 Competencies and functions of managers on different managerial levels

Management level	Functions and competences			
	Managerial function	Competence	Type of knowledge	Extent of managerial tasks
TOP management	Strategic management	Strategic competences	General (wide)	General management
Middle management	Operative management	Social competences	General and specialized	Functional and sectoral management
Executive management	Professional realization of the tasks	Professional competences	Specialized (knowledge depth)	Professional management

Source: Own elaboration according to Mužík (2000)

The term competence comes from the Latin word competentia, which means professionality, authority, ability, skills, etc. The terminology indicating competence has been formed in the English language from the term basic skills up to competences. In professional didactic publications, competences are defined as "behaviour (activity or complex of activities) that characterizes an excellent performance in a certain area of activity, where competences are characterized by elements of activity that occur much more often and consistently in achieving superior performance than poor performance in a certain area" (Blaško, 2014)

To have a competence means that a person possesses a set of interrelated knowledge, skills, abilities, and attitudes, which enables him to successfully handle various life (personal, work, social) situations. Furthermore, having a certain competence means that in a certain natural situation we can adequately orientate, respond adequately and subsequently activate appropriate action, take a beneficial attitude. Competence can be understood as the penetration of acquired knowledge, acquired skills, abilities, forming attitudes, value orientation, motives to action. The mutual relationships of these aspects are closely interrelated and are significantly influenced:

- Ability as a mental trait of personality is a prerequisite for the successful performance of a complex activity (ability to think logically) and its degree depends on congenital conditions and acquired assumptions (e.g. by learning). Abilities form the performance side of a personality.

- Skill presents a specialized ability to perform a specific activity (e.g. make notes during reading).

- Competence is a behaviour (activity, a complex of activities), that is characterized by excellent performance in some area of the activity.

Characteristics of competences:

- It is characterized by an activity - it is formed on the basis of personal practical experience and activity, at the same time prepared to be carried out in the praxis.
- It is a complex unit - it contains knowledge, skills, attitudes and other components that have been perceived more independently so far.
- It has a procedural character - it does not express a permanent state, but changes its quality throughout its life. It has the ability to develop continuously (therefore it can be the basis of lifelong learning and personal flexibility).
- It is dynamic and developed at various levels - it is an ideal competence as a planned target state that meets a certain standard. It exists in a latent form during and at the end of the learning process and can only be assumed when applied in a learning or life situation. It will become a real competence and can be developed to varying degrees.
- It is a prerequisite for the performance in a particular area of activity
- It is the result of formal and non-formal education. Key competencies are a portable and multifunctional set of knowledge, skills, and attitudes that each individual needs for their personal fulfilment and development, for their participation in society and for successful application.

The acquisition of key competences is not only a matter of the individual's personal efforts and ambitions but also requires favourable conditions of the social ecological environment. From an economic point of view, key competences contribute to:

- increase of productivity and effectivity of work,

- increase in competitiveness,

- development of the qualified workforce,

- development of the flexibility and adaptation of the workforce,

- creation of innovative and creative environment.

However, key competences help in the broader context to:

- improve the political awareness of individuals,

- improve involvement in democratic processes,

- strengthen social cohesion and justice,

- strengthen human rights and autonomy, thus eliminate inequalities of chances and marginalizing individuals or groups.

It is evident from the above that there is a connection between quality work and competences with opportunities of wide implementation not only in the educational process. The concept of competences has a very broad meaning, but it is generally described by the characteristic: "The structure of competencies is based on the commonly accepted ideas of society about the competences of an individual contributing to his/her happy and successful life. Competences become key if they are not only beneficial for the individual but also for the whole society, we talk here about competences for quality and full life" (Blaško, 2014).

To improve the efficiency of management in a company, increase its efficiency and performance, it is necessary to develop management and organizational skills of executives at all levels of management. Managers must be able to practically manage, organize, control, decide, delegate and motivate their subordinates. Continuous improvement of managerial skills of managers achieves higher efficiency, success in the management of the working team and strengthens the manager's competence. According to authors Prokopenko and Kubr et. al. (1996) it can be characterized as the ability to perform a certain function or set of functions while achieving a certain level of performance.

Competences can be divided into four main groups:

- **Professional knowledge,** which means all memorized information (relations, phenomena, concepts) related to the environment and organization where the manager operates and factors influencing knowledge (social, psychological, economic, cultural, technological, political, etc.) Professional knowledge, manager's knowledge is gained mainly through education. Managers receive education through traditional school structures through secondary and higher education. The manager is not able to handle all professions but should at least try to review the activities performed by his subordinates. This will ensure better coordination and cooperation with his subordinates. Globalization trends and changes in the current management world have required managers to innovate their education through various complementary forms of education. One of these forms is to attend courses.

- **Practical skills,** i.e. abilities to use personal prerequisites, apply knowledge and attitudes in the work environment at performing the activities. The manager's practical skills can be continuously improved as well as new skills can be acquired through training and practice. In the case of managers, it is to cope with correct managerial practices and skills. Robert L. Katz (Robbins, 2004) defined three basic skills that managers require:

- **Conceptual skills** present the ability to think comprehensively, to anticipate future development, to set goals and priorities within the organization as well as within the self-management of the manager. Conceptual competences are very important when making decisions, especially at the top level of management

- **Experience**, knowledge from the practical experience acquired from the executed activities.

Authors like Cejthamr and Dědina (2010), Armstrong (2006), Prokopenko and Kubr et. al. (1996), Veteška and Tureckiová (2008), Folwarczná (2010), although they have a slightly different view

of manager competencies, they agree that the above four competences can be narrowed into two areas, namely:

- **technical competences or hard skills**, that involve knowledge, skills, talent and attitudes,

- **competences related to the dealing with people or soft skills** that present the work with people, communication and human relationships. They are also known as interpersonal skills.

The term soft skills is sometimes replaced by the term personal skills. These skills involve skills in the area of behaviour and are also known as interpersonal skills. They present competences of people to communicate, work together, act, solve conflicts, organize, decide, etc. They are related to emotional intelligence (EQ). They complement hard skills. Every person has innate and developed certain soft skills, abilities and personality traits that predestine him to perform a certain profession better or worse. Even if one does not have innate soft skills (no natural talent), one can acquire them (with some limitations) throughout life. Training of soft skills is essential for success in some professions. A person with more developed soft skills has better relationships with people both inside and outside of the workplace.

2.2 Hard skills

The success of enterprises and organizations depends on their flexibility and their readiness for a change. Flexibility is created by employees who understand the need for change and are ready to change. Preparedness and the ability to respond flexibly to changes place high demands on the education, training, and qualifications of employees, including the requirements for personality traits and employee behaviour.

Koubek (2007) states that traditional forms of education such as courses, training, or retraining are no longer sufficient and organizations increasingly use development activities aimed at forming wide range of skills and knowledge required by the job as well as the personality, value orientation and adaptation to the culture of the organization.

Technical and professional skills are required and more important in the professional and manual professions. Soft skills are more required in managerial and business professions. They are an integral part of the company's requirements for the job, i.e. the requirements for professional competence to perform a certain profession. Every person has innate and developed some soft skills, abilities and personality traits that predestine him to pursue the profession at a certain level. Even if one does not have innate soft skills and natural talent, one can learn them throughout life. Training of soft skills is very important in some professions, especially for the development of soft skills that largely ensure better relationships with people both inside and outside the workplace. Soft skills include communication and verbal and non-verbal skills, team leadership, organizational skills, negotiation and conflict resolution, conceptual, strategic and creative thinking, networking and anticipation skills, predictive skills, self-reflection and empathy, stress resistance, assertiveness and independence, teamwork ability.

According to Sedlák (2012), certain general characteristics are required to hold managerial positions, but also specific characteristics depending on the category of managers. In order to carry out the managerial function, especially the top level, it is necessary to have specific theoretical training and long-term experience, which enable to acquire the necessary knowledge and skills. Certain character features are also important. Education is seen as an important means of shaping the skills needed to perform managerial functions, especially senior managers. Organizations often turn to universities and look for suitable graduates who are the source of

future senior managers. They do not underestimate the theoretical knowledge gained during university studies but do not overestimate their importance for managerial work. The sober view of school education is motivated mainly by the fact that the management process in companies is still mostly an art. This means that the necessary skills to perform managerial functions can only be acquired by combining studies with experience based on many years of praxis. Nowadays, companies put emphasis not only on the qualification of candidates for managerial positions. Personality traits, such as work and personal competence, also play an important role in advancing to higher levels of management, i.e. the ability of people to assert themselves in specific conditions of their job, social competence or ability to assert themselves in social relations, both among their loved ones and in relation to changing conditions of their placement at work. Positive thinking and proactive behaviour, work willingness and performance motivation, higher levels of inspiration and free effort, self-control, development of ethical and aesthetic feeling, creativity, understanding and tolerance, a sense of humour and willingness to work on each other are valued qualities in the selection of candidates to managerial positions and are considered positive personality traits. There are also negative factors in real life that reduce the chances of advancement and hinder career growth. These are particularly extreme aggressiveness, a narrow interpretation of the rules, shifting blame to others and so on.

The success of a manager depends on his innate ability to learn and apply practical experience in future situations. A good manager should use the practical skills in the technical field to be able to orientate in methods, procedures and processes of performance of activities, correctly apply the knowledge acquired through education and practice. In a practical area, a manager should know how to work with people, be able to form specialized groups, work in a team, create a pleasant working environment in which people feel free and have the opportunity to realize their opinions. In the conceptual area, the success of a manager depends on the assumption of seeing, identifying and understanding situations and knowing the relationships. The manager must be able to solve problems with regard to the circumstances, plan and fulfil the goals and visions of the organization (Katz, 1974).

A good manager, based on his/her experience and practice, experiences a routine over a certain time, which causes that he/she does not longer think about the performance of skills and all becomes for him/her automatic.

Jay and Templar (2006) describe managerial development programs that focus on gaining experience and development while performing work tasks. They are implemented through the following methods:

- **assisting** – managers assist their superiors,

- **job rotation** – Managers rotate on the job positions based on a time schedule,

- **couching** – superior manager teaches, instructs and leads the subordinate managers.

Lojda (2011) is of the opinion that the above-mentioned methods need to be supplemented by another educational form of a formal character, which is intended directly for managers. Development of managers occurs in the form of courses or is based on the structured self-development.

The development of employees is the development of qualitative aspects of the internal workforce, i.e. the development of the workforce involves a positive change of qualification and development of personality potential, including lifestyle and health (Dvořáková, 2004) and its

goal is to combine and optimize the knowledge, abilities, and skills of each employee with the individual position (Palán, 2002).

Personal development refers to the forming of work skill of the employees by improving their qualification, in particular through training in organizations and gaining work experience, as well as the planning and management of employees' careers. Through planning of personal development, the employer positively influences the knowledge potential of the company as well as the work motivation and employee satisfaction, because it increases the attractiveness and perspective of work in the organization, helps the development of individuals and work groups and prevents unwanted staff turnover.

Social development can be perceived as company measurements that head to the development of system of social relationships within an organization. Social development is reflected in the nature of corporate culture, for example in the communication of senior managers with other employees and creating a positive social climate (Dvořáková, 2004). The key components of the development of human resources and therefore of employees are:

- **learning** - defined by Bass and Vaughan (1967) as a relatively permanent change in behaviour that occurs as a result of experience,

- **education** - development of knowledge, values and skills required in general in all areas of life rather than knowledge and skills related to the specific areas of work,

- **development** - the growth or realization of personal abilities and potential through offering educational actions and practices,

- **professional education/training** - planned and systematic formation of behaviour through learning opportunities, educational actions, programs and instructions that enable individuals to achieve a level of knowledge, skills and abilities to perform their work effectively (Armstrong, 2005).

Education is learning something new or building new knowledge on already learned. It is a development as a process of improving the existing competences or knowledge of the current state. At present, enterprises are under strong market pressure, so they are trying to be competitive. This can be achieved not only by the innovation of their products but above all by the development of their employees. A businessman must have good communication skills to sell a new product. A developer needs to have a higher level of creativity to develop something new. It is important for employees to have teamwork skills, and their managers need team leadership skills. As we can see, soft skills are needed all around us, although we often don't realize them.

2.3 Soft skills

Since 1959, the US military has invested considerable resources in the development of various training techniques based on modern technology. In 1968, the US military officially introduced a new training doctrine known as "Systems engineering training", which was covered by the document CON Reg 350-100-1, where Dr. Whitmore introduced the definition of soft skills: work-related skills, which include activities that mainly concern people and documents, e.g. control of soldiers, supervision of office personnel, elaboration of various studies, preparation of maintenance reports, elaboration of efficiency reports and design of e.g. bridge structures.

At the Conarc Skills Conference in 1972, Dr. Whitmore introduced a concept to see how the term "soft skills" (in the areas of command, supervision, consultancy, and management) is

understood. After designing and processing the results of the questionnaire that was part of the concept, a preliminary definition was formulated: soft skills are important job-related skills that involve little or no interaction with machines and whose application in the workplace is generalized. The concept was criticized at the time. Yet, in 1972, psychologist Nicholas Humphrey declared that social intelligence defines people rather than quantitative intelligence. And the practice has shown that soft skills play an important role in many sectors. Since 1972, the term soft skills has been formally used in practice worldwide.

Part of emotional intelligence is also social competence, which includes the ability to communicate with others, to establish and maintain relationships, all in an emotionally cooperative way. As the economy of the company has changed from industry to services where customers, people, are at the centre, it is necessary to focus on communication, problem solving and empathy (Hubert, 2005).

The importance of soft skills that include emotional intelligence in finding or maintaining employment, is supported by Goleman research, which, by examining the characteristics of successful people (181 positions in 121 organizations) found that 67% of all traits needed to get a job falls into the category of emotional intelligence. This means that the ratio of emotional intelligence to IQ and the degree of experience in the professional field is 2: 1. The principle of this research was also carried out by Hay & McBer, which examined 40 different enterprises and reached similar conclusions as Goleman. (Goleman, 2000). Literature often does not agree on the definitions of emotional intelligence and soft skills from the perspective of what is part of what, even though in each definition there is a bit of truth. Based on these statements, it is possible to suggest that emotional intelligence is part of soft skills because the calculation of all soft skills is more extensive than the calculation of characteristics that we can associate with emotional intelligence.

These are interpersonal competencies for effective communication, persuasion, empathy, teamwork, negotiation, and others. Other authors characterize them as soft skills as non-technical skills, characteristics and abilities that are necessary for working in the work environment (Mühleisen and Oberhuber, 2008).

Moss and Tilly (1996) define soft skills as skills, qualities and abilities that relate to personality, attitudes, and behaviours beyond formal or technical knowledge.

According to Murti (2014), soft skills are communication, conflict resolution, interpersonal relationships, presentation, negotiation, team building and other characteristics defined in terms of expected results and not as specific methods or techniques such as statistical analysis.

We have stated only a few definitions of soft skills that can be summarized as non-technical, interpersonal and socially important behavioural competences that relate to social or emotional intelligence (EQ) and overlap with each other and have a significant impact on recruitment.

2.3.1 Importance and significance of soft skills

It will not be sufficient for a man of the future in the world increasingly saturated with technology to have good intellectual skills and knowledge to succeed in the labour market. On the contrary, the reality of the future will be a burdensome test of social and emotional skills and qualities. Soft skills should be a top priority in education systems. Machines are expected to replace many of today's physical and mental workflows in the future and many new types of jobs will be created today thanks to technology.

The importance and significance of soft skills can be found in most advertising jobs, we find there soft skills requirements such as communicative skills, proactive and presentation

approach, etc. They are important for working in a team, for fulfilling work duties, which contribute to the development of the company and others. Mastering skills at an appropriate level affects the work of executives and the social climate in organizations. They are essential for setting goals and achieving them through subordinate employees and in managing work performance.

Vymětal (2008) described a list of skills required by employers for future collaborators, namely communication skills, both verbal and non-verbal, written and oral, individual and team, presentation skills and abilities, including productive discussion, controversy and argumentation, healthy self-esteem, tolerance, recognition of moral and ethical values, creativity, flexibility and initiative, and especially teamwork and creative cooperation.

Kevin Capuder (2012) confirms the importance of soft skills. While soft skills are a prerequisite for recruitment, special training is provided elsewhere. This type of training covers from non-verbal communication, conflict resolution to teambuilding, i.e. everything necessary to acquire soft skills. The great role of teambuilding in learning or improving the soft skills gas been confirmed. The Slovak Republic is sufficiently equipped with people with technical skills (so-called hard skills), entrepreneurial spirit, and general work ethics, but these people lag behind in soft skills. And these are the skills of managers and employees that determine the success of the business and the acquisition of new customers. A company may have the most technologically advanced product, but if a manager or salesman is unable to perceive the customer's needs or speak with them empathically and understand the non-verbal aspect of communication, we will not achieve any great success. However, some authors, for example, Hrubý (2010), Mühleisen and Oberhuber (2008) attribute getting job position to our hard skills, but they attribute success in their career advancement to soft skills.

On the basis of the conclusions from the mentioned sources, it can be concluded that both components are necessary, at the beginning of the job as well as at career advancement. Without hard skills, many employers could not hire us, but without soft skills, they would not even notice us. On the other hand, we can have perfect communicative skills or strong empathetic behaviour, be a great team leader, but if we do not have sufficient knowledge in for example accounting, it would be very difficult and risky for management of the company to get on the position of a sales director.

Soft skills are divided according to Dalay (2015) as follows:
- positive attitude,
- self-confidence,
- strong working ethics,
- teamwork,
- good communication skills,
- ability to use time effectively,
- solving problems,
- flexibility and adaptability.

Robles (2012), who indicates the soft skills research from the point of view of various HR agents, presents similar soft skills and describes in his list ten most important soft skill necessary for the contemporary world of work. Originally, the list contained more than 600 skill, but gradually it was categorized and limited to 25. The list in the book "Communication and other skills" from the German authors Peters-Kühlinger (2007), who worked as HR agents and daily met with necessities of soft skills, compiled a list of soft skills and based on the experience of other HR it contains the following soft skills:

- oral communication - ability to speak, listen,
- written communication - presentation,
- courtesy - morals, etiquette, business etiquette, kindness, decent "thank you" and "please", reverence,
- flexibility - adaptability, willingness to change, lifelong learning, acceptance of new facts, learning,
- integrity - sincerity, ethics, high morality, personal values,
- interpersonal skills - be nice, personal, have a sense of humour, friendly, self-control, empathetic, patient, social, warm, have social skills,
- positive attitude - optimistic, enthusiastic, encouraging, happy, confident,
- professionalism - relation to business, to be well dressed, to be prepared,
- responsibility - reliability, well done work, ingenuity, self-discipline, conscientiousness, common sense,
- teamwork - be cooperative, be able to get along with others, be pleasant, supportive, helpful and cooperate,
- working ethics - hard working, wanting to work, loyalty, initiative, motivated, accurate, good attendance.

Examples of using soft skills at specific middle and senior management positions are analytical and complex thinking, conflict resolution, entrepreneurial thinking or self-reflection. In the area of information systems, employees will not be able to do without analytical and conceptual thinking, but also the ability of teamwork or willingness to improve their qualifications. Salesmen and marketing staff need great communication, ability to create and maintain contacts, social empathy, and effective use of organizational skills. The administrative content of the work requires communication, organizational skills, teamwork ability, as well as performance (Holečková, 2010).

Based on a survey in 2018, companies put more emphasis on the soft skills of secondary school and university graduates in comparison to the year 2013, which is also confirmed by a survey by the agency Profesia, which can be seen in Figures 2.1 and 2.2.
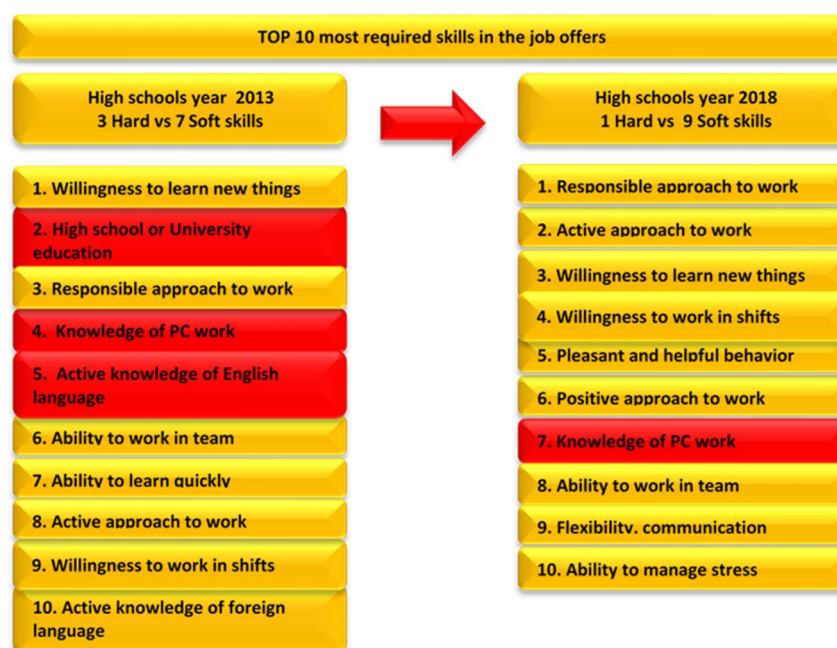
Fig. 2.1 TOP 10 most required skills in the job offers for the secondary school graduates
Source: https://www.zps.sk/assets/files/2019-03-21-konferencia-zrucnosti/tomas-janotik.pdf

Figure 2.1 shows that in 2018 only one hard skill was preferred in job offers, namely the computer skills in comparison to the year 2013 when three hard skills were preferred out of ten skills.

The survey of the required skills in job offers for the university graduates has confirmed similar tendency (Fig. 2.2) , where in comparison to the year 2013 when four hard skills were required, in the year 2018 only two hard skills were necessary.

Fig. 2.2 TOP 10 most required skills in the job offers for the university graduates
Source: https://www.zps.sk/assets/files/2019-03-21-konferencia-zrucnosti/tomas-janotik.pdf

The survey also proves that higher priorities and preferences are put on soft skills than on hard skills.

Basic categories of soft skills

The basis for defining categories of soft skills was the initial analysis of foreign literature, so we could define nine basic categories of soft skills, identified in the next section.

Nine basic categories of soft skills are emotional intelligence, communication skills, presentation skills, ability to work with others, problem and conflict resolution, time management, innovative skills, leadership and management skills and self-leadership (Fig. 2.3).

Our objective was not to present an exhaustive description of soft skills but to define basic soft skills and determine the area of soft skills for the needs of the practice.

Fig. 2.3 Basic categories of soft skills

Source: Authors´ design

2.3.2 Emotional intelligence

In practice, it is assumed that emotional intelligence influences the process of coping with stressful situations towards the use of more efficient procedures. As Owen (2008) states, a good manager must be able to solve problems and manage money, that is, to have at least an average IQ - intelligence quotient, to have an EQ - emotional quotient, which gives the manager the ability to negotiate and work with people, motivate them and adds charisma to the manager. Thanks to the presence of the PQ - political quotient, the manager is able to gain power and make changes in the organization.

In the culture of the 20th century, emotions have long been overlooked as irrelevant and attributed to women rather than to men who were supposed to be logical. However, a breakthrough in the mid-1990s was Daniel Goleman's book "Emotional Intelligence", which popularized the results of American researchers and introduced a new view that people in employment were often not characterized by extremely high IQ, but above all significant EQ (Kanitz, 2008).

However, as early as the mid-1970s, American psychologist Howard Gardener sparked a revolution in psychology with his theory of multilateral intelligence (Hubert, 2005). According to it, intelligence can not only be understood unilaterally as mathematical, technical or linguistic ability, but we must also think of motoric, musical, individual and social abilities. Among aspects of intelligence, there is also the so-called interpersonal intelligence, which includes the understanding of others, their emotional state and behavioral patterns. Another aspect was the so-called intrapsychic intelligence, which included an understanding of own feelings and personality. At the end of the 1980s, Peter Salovey, a professor at Yal University, divided these two bits of intelligence into five basic features and called it emotional intelligence (Hubert, 2005). It was then followed by the above-mentioned D. Goleman. Emotionally intelligent individuals are defined as persons who can reconcile feelings and thinking. They can act in

different situations based on the perception of others' feelings and thus direct their own emotions. They know different situations and emotional reactions to them and can adapt their decisions accordingly (Kanitz 2008)

Emotional intelligence (EI) can be defined as the ability to record own as well as other people's emotions, distinguish them, and use this information in their thinking and action (Mayer, Salovey and Caruso, 2004).

According to Neubauer and Freudenthaler (2007), there are two models of emotional intelligence study, which differ in both theoretical understanding and measurement methods. These are:

- **ability model** that understands emotional intelligence as a complex of cognitive abilities involving the processing of emotionally-relevant information, the ability to regulate own emotions and others. EI is measured by maximum performance tests that focus on what people are able to do as their best performance (Mayer, Salovey, and Caruso, 2004).

- **mixed model called also** *trait* that perceives the emotional intelligence as an interplay of mutual emotional and social competences that determine how effectively we understand and express ourselves, how we understand and how we get along with other people (Bar-On, 2000). This approach takes into account not only the abilities but also the personality traits associated with the emotion field and EI is ascertained by self-assessment questionnaires as a typical performance (the usual behavior of a person in everyday life).

In a newer model, four hierarchically arranged components or branches of emotional intelligence are distinguished:

1. Perception, interpretation, and expression of emotions as the first branch is conceived as the ability to know what we feel and what people around us feel.
2. The use of emotions to support thinking involves the ability to evoke emotions and justify them.
3. Understanding emotions is the ability to understand emotions and emotional chains, the way how emotions change.
4. Emotion regulation refers to the ability to imagine successful strategies using emotions to contribute to reaching the set goals (Neubauer and Freudenthaler, 2007, Fiori, 2009).

This model is accepted as a possible good starting point for further study of the issue (e.g. Neubauer and Freudenthaler, 2007, Fiori, 2009). However, there are still relatively few empirical studies on this subject. Research into the relationship of emotional intelligence and coping points to the need to apply a transactional model of stress and coping, in particular, to emphasize the situational approach (Zeidner et al., 2009).

One of the more important recent trends in the research of coping is the increased interest in the role of emotions (Vavricová, 2013).

Only nowadays, positive emotions are more attractive in the context of coping (Folkman and Moskowitz, 2004, Vavricová, 2013), particularly in the context of the study of emotional regulation in stressful situations. Emotional intelligence implies both the ability to correctly identify and understand emotions and their regulation in specific situations. It is more reasonable to monitor its connection with the management processes.

Emotional intelligence is associated with happiness and personal and professional success. Unlike IQ, EQ can change over the course of life and we can influence its amount because EQ is not congenital but acquired. To understand our emotions, we need to think about them and find

out why they are here and where they come from. Emotions always serve a purpose, they are a response to our life experiences and are also based on them. It is crucial that we would be able to understand and use our emotions for our benefit (Zeidner et al., 2009).

Vavricová (2013), Folkman and Moskowitz (2004) Zeidner et al. (2009) report that emotional intelligence consists of four components:

- **self-awareness** – ability to accurately perceive own momentary emotions and motives in a given situation,

- **self-control** – the ability to use our emotions to remain adaptive and to manage our behavior positively,

- **social awareness** – the ability to accurately recognize other people's emotions and understand what is really happening to them**,**

- **relationship management** – the ability to use the perception of one's and other emotions to manage interactions. This capability ensures clear communication and effective problem management.

Emotional intelligence skills are more important for work performance than any other leadership abilities. The same applies to job positions. People with the highest degree of emotional intelligence in any position reach better results than their colleagues.

2.3.3 Communication skills

Communication means the exchange of ideas in words, letters or images. It is defined by the sender-receiver relationship. Communication in today's world is indispensable and it is almost impossible not to communicate due to communication by gestures and the like. In the context of work, communication is important in meeting team goals or fulfilling the company's vision. It is impossible to work on one goal and not to share information or instructions with each other. In addition, communication creates interpersonal relationships that one usually needs for a full life (Peters-Kühlinger, 2007). "Communicativeness means the ability to understand and be comprehensible, to inform in time, to stand openly and to take into account the cultural differences of the communication participants." Because of its complexity, communicativeness is one of the most difficult soft skills. It contains techniques of reasoning and asking, negotiation, rhetorical ability or the art of conducting a conversation. It focuses on body language, presentation, gestures, and facial expressions.

Communication can be simply defined as:

- the way in which ideas, information, and opinions reach their destination,

- the process of transferring information from one person to another,

- any form (verbal, non-verbal, oral, written ...) of information transmission from the sender to the receiver,

- the process of transmitting and receiving information in contact with people (Čambál and Halenárová, 2006).

Proper communication should fulfill two basic tasks according to Porvazník (2007):

- exchange as much communication content as possible between communicators over a given time unit – **communication efficiency**,

- transmit notifications between communicators due to the existence of noise (disturbance impact) with the least possible losses – **reliability of communication.**

We see communication skills as the basis and the most important part of soft skills. In most cases, if one has the ability to communicate, he is also a good teammate or leader. He can solve problems more effectively, manage projects and himself. Communication competences appear in all the definitions of the most important soft skills. The area of communication skills is very broad. Basic communication requirements are clarity, conciseness, correctness, completeness, and courtesy. People always communicate for a purpose. The purpose may be, for example, to exchange information, influence people's behavior or influence interpersonal relationships between individuals and with oneself. Not only what we say is important, but also how we say it. For successful communication, we need to be able to approach other people and gain their trust.

McLangan and Krembs (1998) distinguish two types of communication skills – receptive and expressive:

- **Receptive skills** reflect the ability or readiness of receptors to perceive another person. They consist of the ability to "tune in" to receive information without prior evaluation, which enables direct communication, mutual respect, mutual responsibility for the course of communication, and the ability to know and understand the other person's goal. The specific receptive skills include:
  - *observation* – meaning the ability to observe the action, the ability to predict the consequences of individual activities, the ability to judge whether it is a standard or a unique phenomenon or a situation. It enables accurate information on behavior, feelings, and results,

  - *active listening (listening)* – consciously accepting the role of the recipient. The aim is for both parties to clearly perceive and understand the content and meaning of what they say, whether or not they agree, allowing them to hear what has been said and indicated, identify key points of the communication, verify the correctness and accuracy of understanding of the heard. To understand the point does not mean to agree with it, however, it allows further effective communication,

  - *empathy* is firstly and foremost the ability to empathize with the situation of the other, the ability to identify and understand the feelings and values, the causes of attitudes and behaviours, which makes it possible to appreciate and accept others' thoughts, feelings, values, and opinions; this ability requires some additional prerequisites, but even if an empathic relationship fails to be established, it must be made clear that we respect the other person and value the experience that decisively affects their behavior. That means empathy allows us to perceive communication at the level of feelings and values, complementing the findings from observation and listening.

- **Expressive skills** express mainly the ability to detect and bring new information, to orient it in a certain direction, the ability to express their content and meaning, therefore they are also dependent on the language skills of the manager, on their expression skills. Expressive skills include:
  - *asking, asking questions* is a transition between expressive and receptive skills, means asking questions and information, giving reasonably detailed answers, interviewing, showing interest in what the other party is saying and avoiding questions, which can be answered "no" or "yes". In crisis management, this skill can contribute to engaging people in risk factor analysis, in identifying causes of failures or errors, etc.,

- *describing* is an undervalued communication skill that includes the ability to identify specific examples of behaviour and its implications, ensuring that both sides speak of the same, allowing them to perceive it specifically, clarifying the focus of the discussion, adequately informing, pointing to examples of activities and behaviour with their impact on results, it is possible to present examples to the appropriate extent and at the right time, the greatest obstacles to this skill are language deficiencies, incomprehensibility as well as frequent use of negative assessments, negative generalizations, which can reduce motivation in performing demanding tasks.

- *formulation of decisions, conclusions* are based on the ability to determine the outcome, to formulate and clarify the overall position, clearly formulate a recommendation or decision, enabling mutual understanding and understanding of objectives and tasks, reaching recommendations, decisions and possible agreements acceptable to both parties; it is necessary to bear in mind that the formulation of decisions cannot be effective without applying previous skills.

Every person should master basic communication skills. It is a summary of spoken expression, emotions, self-confidence, self-knowledge and also getting to know communication partners, and listen (Janiková, 2012).

The basic objectives of business communication were described by Hospodářová (2008) as follows:

- the information interlinking between the organization and the staff, the circulation of the information needed to carry out the work of each employee,
- developing attitudes and influencing the working behavior of employees through motivation, engagement, and initiative,
- harmonizing the needs of the individual and the organization,
- mutual recognition, understanding, interconnection, support, and cooperation,
- formation and maintenance or change of corporate culture,
- a functional and flexible feedback system to indicate whether and how we go where we want to go.

When communicating, it is important that the information gets where it should and that the networking of the organization's employees is encouraged to allow mutual cooperation and understanding. In the context of communication, it is also essential to verify the clarity of the formulations, to ensure their understanding and explanation. Managers are constantly increasing requirements for communication skills and experience, socio-cultural and leadership qualifications, corporate culture, socioinformatics, emotional intelligence, etc. Surveys clearly show that the art of communication is one of the most important characteristics of a manager. Managers rarely work with things, but work with information about things, usually. It is essential to pay particular attention to communication, both in the learning process within the learning organization and in individual learning. In the case of communication between people according to Vymětal (2008), we talk about social communication, which is usually divided into three basic types:

- **oral communication** - interview, consultation, discussion, teaching, asking, explanation,

- **written communication** - memorandum, note, report, manual, minutes, etc.,

- **visual communication** - diagram, graph, table, photo, video, film, etc.

In terms of the use of means of communication Vymětal (2008) divides communication into:

- **nonverbal communication** - non-verbal communication, communication with the body, senses,

- **verbal communication** - word communication,

- **communication through actions and deeds.**

Non-verbal communication lacks conscious intention and is controlled by the subconscious. The ability to register and evaluate signals coming from non-verbal communication is part of the social intelligence (Majtán et al., 2005).

Černý (2003) compares non-verbal and verbal communication so that non-verbal communication is:

- older and richer in development,

- there are no language barriers,

- emotive,

- more influenced by side effects,

- less modified and less civilized,

- truer when there is a conflict with words,

- in the standard "face to face" situation, it accounts for the majority of information exchanges - up to 85%.

Verbal communication is, in the strict sense of the word, defined as an essential part of interpersonal communication that takes place between the communicator and the communication in a particular communication situation using the same communication code - language, speech. In the literature, it is often referred to as speech or oral communication. In a broader sense, verbal communication is defined as a process by which information and messages are transmitted and conveyed by words, even in writing through the media (Majtán et al., 2005).

2.3.4 Presentation skills

Effective presentation is a prerequisite for success in many situations. Sometimes we want to present ourselves, the company or the product in such a way as to attract and inspire confidence. At other times, it is important to convince colleagues or supervisors or business partners. And sometimes we want to transmit information in a way that listeners can understand and use, whether they are experts in the field or lay people. The audience is often given and topics as well. The only area that can be managed is our presentation. To do this, we need to set a clear goal and consider the form of presentation in the light of the outcome that we want to achieve. It is important to analyse the audience, build a clear presentation structure and choose a form of communication and technical support that transmits the intention well.

Last but not least, some self-knowledge is useful - feedback on how we interact with other people. The aim of the presentation is to persuade others to believe in the speaker's opinion and to accept their possible recommendations. To do this, the presenter needs to have a clear idea of what they are saying and show that they also believe it by themself. When presenting, it is important to say this in the most clear and concise form and in the shortest possible time. Presentations that are enjoyable to the audience are understandable, practical, entertaining, exciting, compelling, and concise. Scientific and highly professional presentations can also be

presented to the audience in an acceptable form. The basis of a successful presentation is careful, although time-consuming preparation. It is advisable to think about the audience for which the presentation is intended and then to adapt its appearance, language, aids, and form of recitation. If the speaker wants to leave a good impression and convince listeners, they need to be sound, sympathetic, reliable, and it is important to dress appropriately. At the end of most presentations, there is room for questions and questions. A bad, inappropriate response to the question posed will spoil the impression of the entire presentation, even if it were better. Therefore, it is appropriate to develop a strategy for answering questions. Presentation skills have recently become as important as knowledge of foreign languages. We have to present at work, in front of the client, at school, but also during a job interview. The way we act and style determines the outcome of our actions.

2.3.5 Teamwork ability

In the modern world, teamwork has become one of the most important factors that ensure the competitiveness of the company in the market. A complex problem structure often requires the exchange of information and more insight into the problem. The possible division of the problem into smaller parts and their simultaneous solution by several individuals presupposes saving not only time but also money. However, the success of a team depends on all its members and their teamwork capability. Real teamwork requires common preconditions such as immediate interaction, common goals, and rules of the game, common values and a sense of belonging. Furthermore, the way of communicating with colleagues, integration ability and conflict resolution are important in this respect (Holečková, 2010, Peters-Kühlinger, 2007).

Teams are usually the pillars of a well-functioning organization. Teamwork is a way of organizing work based on shared engagement, mutual cooperation and responsibility of all team members in the performance of tasks to achieve the stated goal. We can characterize it with the acronym of the word „team":

TOGHETER

EVERYBODY

ACHIEVES

MORE

We can translate it freely as: **we achieve more together** (Kolajova, 2006).

In psychology, the word „team" is understood as an informal group, which is interlinked with the effort to achieve the set goal. Katzenbach and Smith (in Kolajova, 2006) define a team as a small group of people who complement each other's capabilities, who are committed to the common purpose, work goal, and approach to the work for which they are mutually responsible. This definition not only speaks of a common role but also emphasizes the addition of skills and accountability for the goal. The working team according to Rudy et al. (2001), Kheler (2006), Arnold et al. (2007) usually refers to an internally formally unstructured small group of people who work together for a set period of time. Hermochová (2006) defines a team as having two or more members, a well-known and defined goal, where coordinated cooperation of people in the team is needed to achieve the goal. Teamwork is, as the name implies, collaboration of people of different qualities, skills, and knowledge on any project. Teamwork is promoted primarily for more complex tasks that require creativity and different perspectives on the problem. Tasks that are more routine and do not require too many innovations are better left to individuals to be

solved faster. Therefore, the team leader must always know when to work better as a team and when to work independently. If teamwork works well, it produces better results than if individuals were working on the same project. This effect occurs when people on the team have different knowledge and experience, inspire each other and approach different work, bringing a new perspective to the problem. There is also a responsibility towards collaborators that drives individuals to higher performance, and members support each other. However, there may also be a negative synergy when individuals in the team do not have common goals, individuals try to promote themselves at the expense of the team and less connected people in the team cannot or are not able to express their opinions. A negative pressure of the group can also be applied, which reduces the performance of capable individuals to an average so that they do not protrude. This is also related to the fear of diversity, group laziness and poor group relationships (Bradbery and Greavesova, 2007).
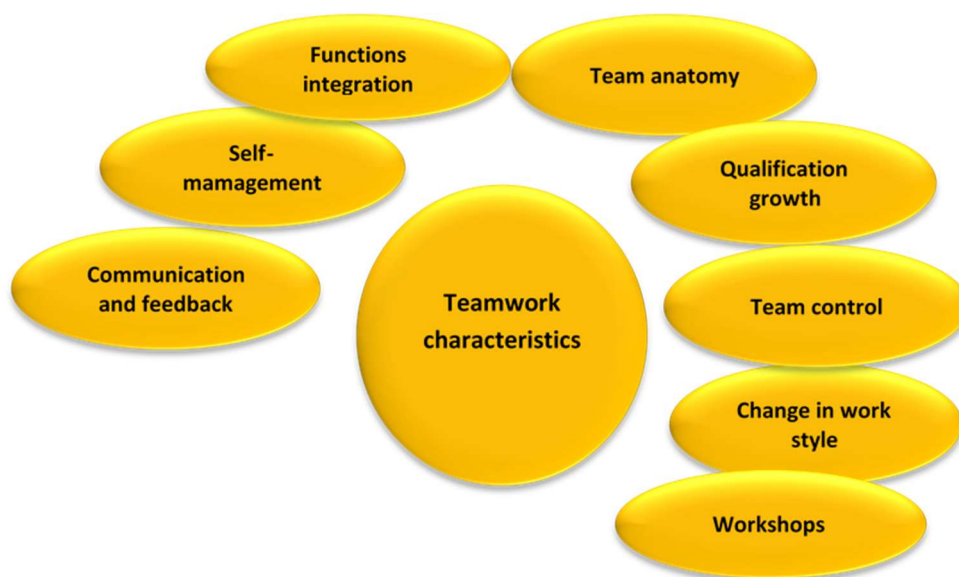
Fig. 2.4 Teamwork signs

Source: Authors´ design according to Kolajová (2006)

The reasons managers decide to introduce a team to the organization are different:

- effort to involve all people in problem-solving,

- effort to increase productivity, manufacturing flexibility, reduce costs, reduce lead times, improve quality by decentralizing and delegating some competencies directly to teams,

- efforts to increase employees´ motivation and interest in company´s results,

- effort to ensure greater flexibility for workers,

- efforts to improve communication,

- benchmarking with other successful global companies which have established teamwork.

Characteristics of the team:

- the team has a common interest and goal - it must be clear and acceptable,

- absolute priority of the set objective,

- internal positive motivation of the activity,

- individual team members have open communication and cooperation,
- team members trust each other,
- the work hierarchy is determined.

One of the team leaders' tasks is to motivate team members so that the team members are able to perform their tasks well. The art is not to motivate people to work they like, but to motivate them to enjoy doing things that are not their favourite. We tend to think that it is appropriate, even desirable, to use the knowledge of team personality analysis and to motivate each team member exactly as his personality type requires. In order to motivate each team member individually, it is necessary to know the person's personality type.

The Mayers-Briggs (2014) personality classification system divides human characters into classes based on 4 areas:

1. **Social attitude** - the individual may be extrovert or introvert. Introverts are secretive and prefer independent work. Extroverts like to work with people. The interaction with people is exhausting for the introverts. The extroverts supplement the energy and vigor. A suitable motivation for the extrovert is the opportunity to share the results of their work with others, eventually public praise and the like. Introvert enjoys more and motivated by the possibility of working independently.
2. **Information acquisition** - sensory observation or intuition. The observer prefers tangible results, is a detailist and values information based on real facts. An intuitive person sees facts as the basis for concepts and usually has more imagination. In order to motivate an intuitive person, it is advisable to give them a greater opportunity to apply their creative thinking. The observer could be motivated by the possibility of optimizing solutions, where they can observe changes after the solution has been improved.
3. **Decision making** - thinking or feeling. The thinking man likes order. He is critically thinking, making decisions based on logical judgment and objective consideration of the situation. The feeling person decides rather on the basis of personal consideration of the situation and his personal values.
4. **Perception of the environment** - judgment or perception. Judging persons enjoy organized work. They plan ahead and prefer deadlines to avoid last-minute stresses. They tend to set deadlines. Perceptive people are flexible, prefer spontaneity and leave things open in anticipation of better opportunities. They see deadlines as guidelines and are motivated by pressure.

2.3.6 The ability to solve problems and manage conflicts

The problem is a questionable, unresolved question or a difficult task. The following steps lead to problem solving: problem definition, problem analysis, production of different problem alternatives, evaluation and selection of the most suitable alternative, implementation of decisions and monitoring and evaluation. Therefore, it is necessary to see the problems in the context, identify their causes, identify solutions and verify that the solution was correct.

Collaboration within different departments of a single company tends to be full of situations where there is a conflict of views and interests, and there are often different conflicts that need to be resolved as effectively as possible for the good of the company. However, conflicts can also be seen as a dialogue where new ideas, perspectives and solutions arise. Positive conflict resolution implies the ability to concentrate on the problem, propose alternative solutions and, above all, a willingness to compromise (Holečková, 2010, Peters-Kühlinger, 2007).

Most people do not like conflicts because they arouse archaic emotions such as anger, despair, depression, etc. Persistent conflicts are resolved far worse than new ones. Therefore, it is good to approach each new conflict actively and try to clarify everything with the partner. When solving a conflict, it is good to try to empathize with the feelings of your partner, to clarify what we are trying to do, to distinguish between the impulse to conflict and its cause, to avoid pressure and forcing, to talk about yourself in the first person singular and to find solutions. If the conflict persists, it is advisable to seek the third-party assistance.

Praise is a powerful tool in resolving conflicts between people. However, some principles need to be followed. It should only be praised if one is sincere, otherwise, the "praised" person knows it and the problems may get worse. Praise should not be exaggerated, one should praise the way they feel. Praise should not be given regularly and expectedly, then it loses its effect. It can also be used to encourage it if it is expressed in front of other people and can motivate the praised person greatly.

The opposite of praise is criticism and is used if the superior is not satisfied with the work of his subordinate. Criticism should not prevail over praise. If the employee has long-term bad results, options other than criticism must be chosen. In criticizing it is necessary to avoid criticizing the personality of a person, to be tactful, to criticize when the problem occurs, not to humiliate the criticized and not to blame the collective if an individual causes the problem.

2.3.7 Time management – efficient use of time

This skill is added to the list because we find it very important and necessary based on our own observations. The more frequent name for effective use of time is the English term Time Management, which is already used in the Czech and Slovak environment, that it is no longer translated. Time management is an effective management of your time. Many times, it may seem that some people have more time than others. They manage more at school and have time for their hobbies and friends. Such people can organize and manage their time well. Learning to plan your time effectively should be one of the first soft techniques that a person begins to learn. Because when you manage to schedule your day well and use hidden and often unnecessarily wasted time reserves, you get more time to develop other skills.

The principle of time management is the organization of the time when we use various methods to prepare a plan of activities and tasks that we need to do and to do so we assign an indicative time, importance or deadline. Typically, it is recommended to write tasks to the diary every night or the morning. The most important factor appears to be the eliminating activities outside the free time, such as watching TV or series, using the internet and social networks. The concept of procrastination is closely related to time management and comes from Latin *pro crastinus* means for tomorrow. This refers to the postponement of duties for later and their replacement by activities that should fill only our free time (Mikula, 2014). There are many guidelines on how to effectively distribute tasks, how not to grow and how to increase productivity during the day. This is closely linked to discipline (Holečková, 2010).

2.3.8 Innovation abilities

Without innovative abilities, there would be no progress. Innovation is not always a completely new idea, it is often an effective improvement or even a small change that will make a big profit. Innovation comes mostly in creative ways.

Creativity

Creativity is the ability to do something differently or to come up with something new, whether with a new problem solution, a new method, a device, or a new artistic object or form. Thus, creativity is a creative approach to common or new things. Creativity does not only mean inventing new things but also putting them into practice. The first key element is the ability to perceive the world from different points of view, to find new connections, patterns, linking of seemingly unrelated things into new compositions, and bringing solutions where everything else has failed. The second key is implementation. If you only have ideas, you only have imagination, but you are not creative, yet. Creativity is becoming a key skill of the 21st century. It is needed by scientists, entrepreneurs, managers. Companies are looking for employees having this ability. In today's world, where things change quickly and solutions do not work infinitely, it is necessary to constantly create new and new things. In addition, with a creative approach, we can make work easier by being able to figure out how to make our work more efficient. Thus, creativity is one of the best ways in which one can develop and improve. The concept of creativity is derived from the Latin word "*creatio*", which means creation. In literature, some authors make a certain distinction between creativity and productivity. Creativity means the ability of a person to create new and original ideas that their originator did not know before (Boroš, 1977). It is the ability to uncover new and unconventional views, to deal with them by new unusual procedures, to look for new connections between things and phenomena that further shift knowledge (Papula, Papulová, 2010). Nowadays, knowledge, skills, and abilities are becoming a key resource for organizations to build their competitive advantage. Creativity can also be seen as a source. On the condition the creativity is represented by the idea, the idea becomes an important production input similar to capital and human labour. Creativity by Luknič (2008) and Williams (1999) is the foundation for:

- **discovery** (finding something that already exists, but the existence of what has not yet been known) is the discovery of unknown, objectively existing phenomena, properties or patterns proven by the scientific method,

- **invention** (finding something new, which makes it possible to do other things in a new or better way), e.g. devices, machines, instruments, tangible but also intangible things like patterns, ideas, concepts,

- **innovation** - thoughts are not useful if they are not used; therefore, in the broader sense, innovation can be understood as implementation of discoveries and inventions, or commercially, as a commercialization of new ideas, inventions, products for profit.

The emphasis on creativity has begun to be applied in management since the 1940s and 1950s. This was mainly due to Alex Osborn (founder of the BBDO advertising agency), who became famous mainly as the author of "brainstorming". In addition to creative techniques, he and his colleague Sidney Parnes observed that every person has the potential to be creative as long as they have the right conditions and opportunities (Osborn, 1953). Sindey Parnes' research has shown that creativity as a skill can be developed by coaching and training. Edward DeBono, who is known for his thought mapping and lateral thinking, also significantly contributed to the development of creativity (Nollke, 2006). Other research and studies in this area have only confirmed that every person has the ability to be creative, we all have a creative trait, but some can be born with more aptitude and talent. The fact that many of the creative talents remain unused during the lifetime is caused by various barriers, whether they are upbringing, working, or specializing. The present time requires specializing in a particular field, so other talents and aptitudes are suppressed and energy is concentrated only in one direction. As a result, many

hidden talents will be wasted. However, there are currently many approaches, techniques, and trainings that help people develop their creative potential.

Creativity is appreciated not only in terms of value for an individual, but also in terms of value for a company, or for the whole of society. Creativity is getting more attention together with innovations as one of the key factors for the success and competitiveness of businesses. But at the same time, creativity is perceived as an unlimited resource compared to natural mineral wealth, so concepts such as "creative economy" or "creative industry" are now at the forefront of focusing on people who use their brains, talents, and ideas in work.

2.3.9 Managerial and leadership abilities

Leadership abilities are creating visions and having commitment for the work, supporting employee´ confidence and motivation, and encouraging changes that organizations require. Leadership skills are, for example, the ability, but also the possibilities of physical, mental and spiritual growth. The one who looks confident may not always be Confident. What is important is whether a person is calm-headed. A self-confident man can usually accept others as they are. Healthy self-confidence means that we can mainly perceive ourselves and know our strengths and weaknesses and our limits. It manifests itself by an upright posture of the body, clear and distinctive speech, the ability to cope with difficult situations. Being self-confident means consciously perceiving yourself, your feelings, and emotions. It is often confused with a self-confident expression, but the difference is particularly evident in difficult situations when the extent of self-confidence is very important. Among other things, it forms the basis of successful communication and coexistence of people (Holečková, 2010).

Goals statement

Goals are important because if they don't have them, they can't make any plans for their progress. If a man does not know what they want to achieve, and therefore they cannot even enjoy any success because they do not know that this is a success. Without a goal, they also lose motivation quickly, because their endeavours can be meaningless and aimless. One should clarify the goals in several different areas of their life, namely in professional (study), mental (ability), family and social and financial area. It is good for a happier life to maintain a balance between all areas of life, not just focus on career goals.

Analytical thinking

Today's working world does not value analytically thinking people much. Compared to creative colleagues and charismatic leaders, they can appeal ordinary. They often get ridiculed and accused of spoiling fun. Yet, these seemingly boring analysts are vital to the organization. I tis commonly heard: "We need more leaders and fewer managers". In most cases, leadership is perceived to be of greater value. Leaders are characterized as emotional, intuitive and charismatic visionaries and managers, as analyst technocrats. Intuitive leaders and analyst managers are equally important and necessary. There is not one person better and the other worse. Analytical reasoning is often confused with mathematical skills, which is not entirely accurate.

Analytical thinking is a form of logical reasoning and involves considerably more than just counting or estimating numerical values quickly. We can characterize it as a process of thinking in which one judgment derives from another and the result is the right conclusion. A lot of job positions require analytical thinking. If you meet such a requirement, you are most likely to be able to recognize the problem and solve it systematically. This process ideally takes place in

three steps. First, you need to analyze a complex topic or problem. Subsequently, to examine the individual aspects of the problem, to select the essential information, thereby skip the unimportant and link what belongs to it. In the final step, you need to link each aspects to create a feasible synthesis that leads to a solution to the problem (Holečková, 2010, Peters-Kühlinger, 2007).

Analytical thinking is characterized by a thorough analysis of the situation. It is important to find as many details as possible, their evaluation and mutual interactions. People with advanced analytical thinking can capture the situation very quickly and respond adequately to it. Thus, analytical thinking is a process of thinking, where one judgment derives from the other and the end result is the right conclusion. People who have a good grasp of analytical thinking can map the situation quickly and react accordingly. To properly assess the situation, all facts must be identified, deduce from them, compare the comparable items on the equal basis, looking only at verifiable and relevant experience and information, and proving that the conclusion is logical. Analytical thinking helps significantly to solve the problem and is often required by employers. Logical thinking takes over information, chooses the most important, demonstrates and examines interrelations. (Palmer a Weaver, 2000).

People who have a good grasp of analytical thinking can capture the situation and respond to it properly in the future. The analyst can be characterized as:

- perceived by the environment as a balanced, thoughtful person, mentally stable even in stressful situations,

- seldomly reacts to emotions, which does not mean that they do not have them, they just do not focus on them,

- can be perceived as a person who keeps distance from their surrounding,

- is an excellent observer, with a natural trait to observe and judge standard situations,

- pays attention to details and but complex understanding of the individual aspects is usuallyisolated, they lack levity of the view,

- focus and thoroughness in work is natural, they address a problem systematically. However, they can deal with one problem at the time only,

- easily detects errors and inaccuracies, recognizes risks and what needs to be optimized,

- can clearly justify and interpret the results.

Four key performance dimensions can be identified for people with strong analytical thinking. They can capture complex content very quickly. They are able to go into great depth of the problem and operate simultaneously with multiple variables and details. They can put the problem in a clear chain of causes and consequences. Their analysis will result in a useful model of explanations and outputs.

2.3.10 Self-development ability

In this section, we describe those abilities that help a pesron to develop in all the abilities we have already mentioned. All soft skills are more or less connected and are interrelated. Soft skills are the knowledge of oneself and the use of the own potential and desire to work on yourself.

The ability to persuade

Appropriate persuasion means to persuade someone not by speaking and by no means forcing them to agree. It is related to self-presentation, which presupposes the art of communication, argumentation. Confidence of others is also important. It happens that one does not have to have the right arguments, however, it is sufficient that it has a more dominant behaviour, and thus the person wins the recognition faster than a person with the right arguments. It is associated with the ability of self-presentation (Holečková, 2010, Peters-Kühlinger, 2007).

Adaptability

Adaptability in the field of soft skills means a quick adaptation to the conditions which a person encounters or creates around them. It does not mean thoughtless adaptation, rather it is the ability to react and be able to fit in e.g. a new team, to orientate in new trends in the field and in related fields.

Stress management

Stress is any environmental or physical pressure that induces an organism's response. In most cases, stress encourages survival, forcing the organism to adapt to environmental conditions. However, if the stress is too great, the organism may become ill or die. Stress is a strange complex phenomenon of today, which is influenced by modern lifestyle and technology. Stress can also be defined as a state of tension.

Stress has now become a common phenomenon, especially among managers. It arises not only as a result of time pressure but also in the decision-making process in which the manager is lacking information and yet has to make a clear decision. It is important that the manager identifies the start of stress in himself and in the subordinates and seeks possibilities to eliminate its causes. If a manager is to identify the start of stress quickly, the following list of stress symptoms can help.

The symptoms of stress are, according to Rudy and Piškanin (2002) divided into three basic groups: physical and physiological symptoms, psychological symptoms and behavioural symptoms of stress.

- **Physical and physiological signs of stress are as follows:**

    - heart pounding, so-called palpitation,

    - increased heart rate; increased blood pressure,

    - muscle tension,

    - headache and grip on the breast,

    - loss of appetite and expansion of gases in the abdominal cavity,

    - cramping pain in the abdomen,

    - more urge to urinate,

    - double vision and difficulty concentrating sight on a single point, the so-called diplopia.

- *Psychological symptoms of stress are as follows:*

    - rapid and quick mood changes,

    - mental depression,

- internal dissatisfaction,

- excessive suffering from problems that are not as important as the manager believes,

- low ability, or absence of empathy,

- excessive concern for physical condition and physical health,

- extraordinary day dreaming, escape from social interaction and communication,

- excessive feelings of fatigue, inability to focus and complete problems and tasks,

- states of increased irritability, anxiety.

- ***Behavioural symptoms of stress are as follows:***

  - indecisiveness, inability to make a clear decision,

  - continuous unnecessary and unreasonable groaning, purposeful self-disregard,

  - frequent personal injury,

  - low labour productivity, efforts to avoid tasks,

  - increased consumption of alcohol and tobacco products,

  - overeating or loss of appetite,

  - biorhythm change, insomnia, day dreaming,

  - substantial loss of work done (Rudy and Piškanin, 2002).

In the opinion of experts, a certain level of stress is not harmful and belongs to normal life. However, excessive stress has a detrimental effect on both work results and worker´s health. Therefore, the most important tasks of personnel departments and managers are to take care of stress reduction and create favourable conditions for work and health of workers. An important prerequisite for stress reduction is to identify and eliminate the causes of stress. Plamínek (2013) characterizes stress as an organism's response to internal and external stimuli (stressors) that reach such values that they exceed the physiological capacity of the organism.

The types of stressors are divided by Večeřová-Procházková (2004) into:

- **positive stress** (Eustress) is associated with experiencing or expecting some positive event, for example, before meeting a loved person. It stimulates us to perform better, increases our creativity, concentrates, and helps us achieve our goal. It also stands for our satisfaction from the well done work,
- **negative stress** (Distress) experienced in various adverse situations. Such an excessive burden leads to a reduction in performance or inability to perform the activity. If its intensity is too high and persists, it can endanger and harm the physical and mental health of a person**.**

Stress is an accompanying phenomenon of a human life. Almost every person is stressed in their lives. However, stress lays unevenly on individuals. It depends on the psychic qualities of a man as well as on the situational factors. In the same situation, one worker may experience stress, and another may not. Mental stress, frustration, and stress occur mainly in management and are reflected in their complex ability to cope with a non-standard or conflicting work situation at a professional level.

Stress and frustration are most often associated with processes:

- decision making,

- implementation of decisions taken,

- the employee's aspiration level,

- communication and communication skills of the employee,

- flexible thinking and ability to perceive details,

- taking responsibility and risk-bearing capacity.

Mental load and stress are positive or negative, which results mainly from the employee's current disposition, among which we can include:

- personality type of an employee,
- psychic resistance, i. j. employee resistance to stress duration and intensity,
- the overall current mental condition and temperament of the employee,
- the life philosophy of the worker and its application in stress situations (positive thinking, etc.),
- assertive and auto-assertive skills of the employee.

Frustrating means in psychology a blockade or an obstacle to the goal. Frustration is the result of unmet needs. Internal psychic needs are enhanced by external economic requirements, a prestigious effort to take an appropriate position in society, to be recognized in the professional field, in the work group, to deliver the most valuable performance. They are related to the aspirations of a person, the level of their aspirations, the feelings of success or failure. The inability to realize and fulfil essential needs, the impossibility of applying one's own abilities can cause serious fluctuations in human development and adverse consequences in his behaviour. To frustrate the satisfaction of needs, motives in action, and behaviour by some obstacle, physical or psychological, is called frustration (lat. *frustrari* - deceive, thwart). It is a contradiction between the expectation of a person who is motivated by a strong desire (that is, their physiological, personality or social need) and between how they perceive failure to meet the need (Plamínek, 2013).

The chain of Human – Target Programmed Activity – Obstacle – Wrecking of the Activity creates a frustrating situation that stems from the insolubility of the problem, presents a challenging psychological burden and encourages individual responses. The term frustration refers not to conditions that prevent the achievement of the goal, but to the state of the organism that arises and the consequences that accompany it. Frustrating conditions may be external (e.g. violence, lack of opportunities, impossibility to meet needs) or internal (e.g. conscience and self-control). It may also be a feeling of uncertainty or time delaying satisfaction of need. Frustration is characterized by the specific mental state of the person, who is causing difficulties in achieving the goal or in solving the task, while the obstacles are real and objective (they cannot be overcome) or merely subjective and unreal. We call frustrators, the situations that cause frustration, various barriers, prohibitions, and interruptions of activity, as well as the inside of a mental barrier.

The frustration of an employee and manager usually causes 4 basic responses:

- aggression, the essence of which is to remove the obstacle,

- regression, the essence of which is the tendency to retreat from obstruction,

- repression, the essence of which is the active suppression of obstacles,

- compensation, which is based on changing goals and bypassing barriers to frustration (Szarková, 1994).

Frustration is always associated with inducing negative feelings. The most common feelings that accompany the psychological state of frustration are feelings of failure, dissatisfaction, injustice, envy, misunderstanding.

If the manager wants to perform adequately and prevent burn-out syndrome, it is essential to focus on managing the stress that affects him. There are two ways to manage stress. The first is influencing the stress, the second is influencing the resistance of a person to stress (Plamínek, 2013). As a result of prolonged exposure to excessive stress, the manager may experience a burnout syndrome. Potter (1997) in his publication *How to Prevent Work Exhaustion* describes the burnout syndrome as follows: "Work becomes a slave and a painful emptiness for a person. After a "mindless" work day, people feel exhausted and "empty" and do not want to return to work the next day. Mindless work destroys enthusiasm until it suffocates motivation. Skills and knowledge remain intact, but the appetite for performance decreases."

Motivation

Motivation is not a human trait, it is the result of a process that depends on the following factors: the power of stimulus (our inner motives and instincts), self-efficacy (inner beliefs and ability to create and survive your own judgment), time perspective (determines which the individual's goals are of greater or lesser importance at the time) and emotional intelligence. To be motivated, we need to set goals that are in line with the above key points.

2.4 Digital skills and competences

A dominant requirement for the successful integration of young people into a global society is the most effective adoption and comprehensive sets of knowledge, skills, and attitudes. An environment of increasingly saturated information, media and other technology options that target young people to enable them to respond flexibly and to meet the goals and frequent changes in their personal, social and working lives. These skills should be interconnected, pluralism, democratic, critical, thinking, self-expressing and presenting safe attitudes, but also other abolished opportunities for life in the 21st century.

One of these important lifestyles, which are of great practical significance for each individual and society as a whole, is the identified information and media competences. Information literacy according to Bellér et al. (2010) is directly related to communication and interpretation processes, i.e. knowledge and use of communication channels that enable information retrieval and evaluation, understanding, processing, and presentation.

Kostruba (2012) states that didactically founded and conceptually thought-out teaching with a computer and information and communication technologies develops at the same time:

- information literacy (the ability to seek information from multiple sources and to master information technologies),
- cognitive literacy (ability to acquire information and analyze it mentally),
- digital literacy (digital competence),
- communicative literacy (controlling the ability to speak, listen, write, read).

Digital technology and information competencies include the confident and critical use of information technologies at work, leisure and communication. According to Weiszerová (2014), these competences can be divided into digital, information and computer literacy.

Digital literacy is characterized by the ability to:

- understand information,
- use it in different formats from the various sources that are presented through information and communication technologies.

Information literacy is characterized by the ability and skills to:

- locate the various sources (computerized) containing the necessary information, look for the necessary information in those sources,
- be able to critically evaluate this information (its usefulness, contribution, truthfulness, reliability, timeliness, etc.),
- solve problems using the information obtained,
- transmit information to others in various forms - verbally, in writing, graphically, either directly or through information and communication technologies.

Computer literacy is characterized by skills and abilities such as:

- to list, organize and explain the basic concepts of information and communication technologies,
- to use a personal computer and work with data files, select and work with PC screen icons, search for the desired PC program, delete unnecessary data, make copies, print the required data, etc.,
- work with PC text editor,
- create and work with PC databases,
- create PC presentations,
- obtain information and communicate via PC - work with the Internet, create web pages, use an e-book, e-mail, and social networks.

The growing importance of media literacy is also reflected plastically in current documents and related legislation adopted at national and international level (UNESCO, Council of Europe, European Union). The European Commission, which adopted the Recommendation on media literacy in the digital environment in August 2009, is also increasingly focusing on information and media competences (COMMISSION RECOMMENDATION, 2009). The document specifies media literacy as an essential condition for inclusion in today's information society, which is becoming a key skill not only for children and young people but also for other adult groups, especially parents, teachers, youth workers, seniors, and other groups. In the European Commission document, media literacy is presented as an integral part of active citizenship and an element that can make a significant contribution to reducing the risks of social exclusion and the effective participation of citizens in democratic life. According to the European Charter on Media Literacy, a media literate person should be able to:

- use media technologies effectively to access, collect, restore and share content to meet their individual and group needs and interests,
- gain access and make informed choices from a wide range of media forms and content from different cultural and institutional sources,
- understand how and why media content is created, but also the related technical, legal, economic and political context,
- to analyse critically the techniques, language and conventions used in the media and the importance of their messages,
- use the media creatively to express and communicate ideas, information, and opinions,

- identify, prevent, or reject media content and services that may be unwanted, offensive, outrageous, and harmful,
- effectively use the media to consolidate democratic rights and civil liberties.

The use of ICT and the Internet is particularly widespread among young Europeans. According to the latest Eurostat data, only less than five percent of young people in the European Union do not use a computer at all. On the other hand, over 73% of Europeans aged 16-24 use computers and the Internet every day. The Internet is a phenomenon that has radically affected all areas of our lives. Its influence and effect are felt at every step and virtually every point of our planet. This gigantic network connecting millions of computers affects our personal and professional lives, the ways we communicate, gather information, learn, do business, or spend our free time. The changes brought about by internet communication seem incredible, especially if we realize that its mass spread has been a matter of the past ten years or so. Even in the first half of the 1990s, the Internet was a virtually unknown affair and a "minority genre" for ordinary people. In addition to scientists, it was mostly dealt with by technology enthusiasts, students of computer science and some technical fields. The Internet has become a commonplace issue for a large number of young people and makes it possible to access information to the extent and space that is unimaginable in human history. Gradually, all recorded human knowledge appears on it. At the same time, the Internet has a significant impact on communication processes between people and institutions, changing the established ways of seeking and sharing information, establishing and maintaining relationships, shopping, entertainment, social conventions, participation in public affairs, and many other areas of life. Today's young people are the first generation for whom the Internet is already commonplace, they consider it to be a natural part of their lives, and many cannot even imagine a time when there was no network connection. They are the first generation to be in daily contact with tens to hundreds of their peers through social networks. Many do not even think that a few years ago such facilities were not available at all. Internet applications, social networks, mobile phones, computer games or instant messaging are an integral part of their lives.

Over the past decade, several publications have been produced around the world and several research studies have been carried out on youth identity in a global digital technology and network environment. However, one of the most important outcomes of all these activities is repeated with greater or lesser variations. It is the finding that the new generation of adolescents is fundamentally different from the previous ones. Young leaders, youth leaders and youth workers should take all of the above into account and accept their significance and evident influence at both individual and social levels. This implies the need to intensify the development of their information and media competences so that the enormous potential and thought capacity of the global information society can be used effectively in youth policy and youth work. Internet platforms and mobile applications can also be used to educate young people about opinions, values and ideas related to coexistence. Social networks help people with the same interests and opinions to become part of a group or movement that could help in communicating between different cultures. Young leaders, youth leaders and youth workers should, therefore, learn to apply information work and digital presentation skills in an efficient and effective way. We need to be aware of their potential and learn about the most important effects of these phenomena on our society and the lives of our young people.

The above-mentioned facts imply the current need to carry out research projects that will investigate the current situation in the field of information and media competences not only of

young people themselves but also of youth leaders and people working with young people on a voluntary or professional basis.

When the transnational political authorities of the European Union in 2000 proposed and enforced the adoption of the so-called Lisbon Strategy, they especially pursued, over the next decade, the objective of ensuring such process dynamics throughout the whole its life, the most important and targeted consistency of which will be the European Union's global leadership in the competition for the most competitive and dynamically developing knowledge economy in the world. Many people found it already obvious that the reality of this project depends on the rich structure of the determinants. The fatal underestimation of one of the decisive ones - the competence of the citizens of a knowledge-based Europe to fulfil the Lisbon Strategy - was at that time, and thus too late, the formation of an expert committee to determine the key competences for lifelong learning. Despite the efforts, the conclusions of the Barcelona European Council, which, inter alia, envisaged introducing a European dimension in education and integrating it into pupils' basic skills by 2004, were not met. The results of the expert group to set a reference framework of the timeline almost met with an assessment of the state of play and progress in implementing the Lisbon Strategy in the first half of its implementation, as set out in the Wim Kok´s report. These facts, together with others, have a significant and growing potential to turn the virtual competition for a global leader between the EU and the US into a real EU battle with China or India to maintain at least its current position.

The outcome of the work of the expert group on establishing a reference framework for the key competences of the people of Europe offered to the European Commission in November 2004, was used in November 2005 by both the European Council and the European Parliament to adopt the EP Directive on key competences for lifelong learning. The central message of this directive, which is 'marked' by respecting the principle of subsidiarity in the field of education, can simply be expressed as follows: Work success, active citizenship and the joy of living the lives of Europe's people of knowledge are very closely related to the degree of correlation of their competence profiles with those required by the labour market. Therefore, it is recommended that the responsible personnel and institutional authorities of the educational sectors of the European Union countries incorporate key competences for lifelong learning into the content of education at all levels which (adopted by individuals) serves for the fulfilment and development of personality, its social inclusion and application. Key competences should be developed by the end of compulsory education or training and should form the basis for further learning as part of lifelong learning.

2.4.1 Information competences

An information-competent person has learned how to learn because he/she knows how knowledge is organized, how to find information and use it for society. Such a person is prepared for lifelong learning because he can find information necessary for solving tasks or making important decisions at any time. There are several documents and projects in the Slovak education system dealing with informatization of society. Access to electronic information resources is a basic prerequisite for the development of the knowledge society, as evidenced by the National Information System of Support for Research and Development in Slovakia NISPEZ, which includes access to electronic information resources. NISPEZ is based on a national project, primarily focusing on information support for Slovak research and development workers. In the long term of 2009-2014, it implemented coordinated purchase and access to electronic information resources for research and development in Slovakia, based on additional tools and

technologies, creation of a database of Slovak research and development e-resources, expansion of the Central Information Portal for research and development. Innovation of new functionality, respecting European Union standards, which focus primarily on linking with other research and development information systems within the European Union. Current activities include e.g. the Global Information Society project, the Action Plan of the Information Society in the Slovak Republic, the Information Society Strategy, the Competitiveness Strategy of Slovakia until 2010 and Information for All.

Information competences play an important role in the life of a modern man. This is linked to the permanent increase of new information possibilities, such as Internet libraries, electronic periodicals, blogs, and related information resources. The truth is that we often subconsciously use information competences in common activities such as when shopping, choosing a vacation or looking for a job, or finding the ideal route for a trip. Information competences are close to digital competences. These terms are often mistakenly confused. The primary content of information competence is work with information and work with digital technologies. Information and communication technologies (ICT) are based on the concept of information communication technologies. ICT are understood as a set of means, procedures and knowledge used in information processing and communication. Especially in the field of education we mean computational and communication means, procedures and information resources supporting different ways of teaching, cognitive processes and other educational activities.

S. Papert, a co-author of Logo and Logic Culture, introduced the theory of constructionism, suggesting that educators dreaming of modern school should refer to modern technologies as DT instead of information and communication technology. To differentiate between digital competences and ICT in the context of education, we can define them as a broad set of computer resources, tools, environments and practices that we use to support learning and learning, communication and collaboration, expression, creation, etc., i.e. to provide comprehensive support for all development domains for children, pupils and learners of all ages (Kalaš, 2015).

Digital education professionals are hindered in the notion of information and communication technologies by the fact that they emphasize information and computing resources too much. From a technical point of view, the activities we do on a computer are only work with information and calculations. The reason why we consider these activities significant in the educational process is different. We deliberately use means that we can perceive from two perspectives: both as an information medium and as a construction medium that helps pupils create, explore, discover, express and develop. Although both views are significant, a common understanding of the notion of information and communication technology highlights the information side of these processes. We also distinguish similar aspects, such as information and construction, in education. The area of the cognitive process is oriented towards obtaining information. However, the second area of cognition is significant in creation, discovery, and construction. By favouring digital technologies over information and communication technologies, S. Papert and other authors emphasize the design side of modern technologies for developing the construction aspect in the cognitive process.

2.4.2 Digital competence

Digital competence is understood as a structure of digital sub-competencies (hereinafter digital competencies) i.e. competences applied in the work with information and communication

technologies. Basically, we can talk about digital competence as a two-stage graduate competence:

- at primary level, attitudes, approaches, skills and knowledge that enable an individual to use digital technologies to acquire, concentrate, classify, select, evaluate, store, create, protect and exchange information and to communicate and participate in working on the Internet,

- the second stage is characterized by the independent, confident and critical use of digital technologies, including Internet services, digital content and digital media. This level is characterized by logical and critical thinking in the use of digital technologies, high-level managerial skills and a similar level developed by communication skills.

The level of acquisition of digital competencies can be measured. The standards of basic digital competencies have been elaborated with particular quality. The most well-known ant the most widespread in education and among the employers in the labour market in the European Union is the standard of digital competences determined by the ECDL syllabus (European Computer Driving License).

Life in so-called digital era a priori excludes segments of society that have not been affected by the impact of information technology and related changes. The European Commission estimates that more than 90% of professions will use digital skills to varying degrees. In the future, citizens will have to cope with the digital and information challenges of the 21st century so that Slovakia does not lag behind in the implementation of information and communication technologies compared to the population of advanced IT countries, which may have a significant advantage in advanced informatization of the country (Learning Slovakia). This requires modifying the undergraduate training of professionals in the field of enhancing digital competences. Current trends in education, in the accelerating pace of time and technology, place ever more and more new demands on the financial efficiency and availability of educational content in integrated education systems, available anytime, anywhere and from anywhere. Andragogy, in addition to its own scientific development, must also reflect new challenges, opportunities and changing conditions in society, so education also implements information and communication technologies that stem from the gradual transition of society from industrial, through information, to the current onset of the so-called digital era or digital age. The turbulence of change and globalization, which require the efficient transfer of information and know-how, together with the development of information and communication technologies, are intertwined in the field of education.

This creates a triangle whose three peaks, according to Drucker (2002), are globalization, technological development and education. Rejecting globalization or technical progress would push society's development back as well as not reflecting and not adapting the educational process to these changes. It is education that enables progress by educating individuals in the use of modern technologies. Working with information and communication tools helps individuals to absorb the knowledge of different disciplines. The educational process with appropriately selected contents, methods, forms and using appropriate didactic means facilitates the learner with certain predispositions to understand technological changes and progress that takes place in geometric series while the development of man and his personality progresses at a much slower pace. It is not possible to apply modern technologies in education without knowledge of personality psychology and adaptation of new, activating and motivating content, methods and forms to the laws of the human psyche leading to not acquiring adequate competences by individuals. Information and communication technologies (computers, tablets,

internet), with which we have experience from different spheres of work and private life, constantly increase their share in the educational process.

Kalaš (2006) states that the word technology refers to technical means, processes and skills that are used for a specific purpose and that bring practical results. By combining information and communication technologies, we refer to computing and communication tools that support teaching, learning and other educational activities in various ways. These are technologies related to the collection, recording, and exchange of information. In addition to the above-mentioned information and communication technologies, the educational system also uses various additional devices, e.g. printer, scanner, keyboard, various educational software programs. Digital technologies include power-point presentations as well as interactive whiteboards, digital cameras, smartphones, and others.

Some authors such as Kalaš (2006), Dostál (2007), Kostrub (2011) believe that it is necessary to differentiate the concepts of information and communication technologies and digital technologies. According to them, information and communication technologies are rather tied to the classical school environment and serve as didactic aids.

2.4.3 Digital literacy

According to Ľapinová (2016) and Štefková (2016), digital technologies are also transferring to other environments and therefore have a closer relationship with adult education. We acquire with them new knowledge, develop several skills, as well as different competences related to mastering digital technologies, such as digital competence. Acquired digital and information literacy is considered necessary and achieves the position of mathematical and language literacy. In the context of information and communication technologies and overall computerization, it is essential to develop digital literacy and digital competences.

Pospíšil and Špatenková (2016) define computer literacy as a set of knowledge, abilities and skills focused on computer control.

At present, the definition given above does not adequately reflect the constantly expanding spectrum of information and communication technologies, and therefore the new concept of 'information and communication literacy appears to be a set of competencies needed to decide how, when and why to use information and communication technologies and then use them effectively to address different situations in life. In the context of information literacy, the ability to recognize, identify, evaluate and use information effectively is based on "functional literacy", including literary, documentary, numerical, foreign-language literacy.

Weiszerová (2014) complements and characterizes digital literacy as an ability to understand information, use it in a variety of formats from a variety of sources, presented through information and communication technologies. While related information literacy specifies as the ability or skill to locate various sources (computer) that contain the necessary information, to look for the necessary information in these sources, be able to critically evaluate this information, solve problems using the information obtained, graphically, either directly or through technology.

Based on the digital and information literacy specifications, it can be said that it is the acquisition, processing, storage of information, knowledge, knowledge, and facts about digital technologies primarily through digital technologies. In the context of information retention, it is also the insertion of different content into these diverse digital technologies.

The basic and main output of digital literacy is the so-called digital competence, which is a necessary competence in the modern information society. It represents the skills, abilities, knowledge, and competences of all digital technologies, from operating a personal computer to working with the input and output devices of this computer, understanding the functions of the Internet with an objective view of its positives and negatives. On the one hand, it is the confident use of these digital technologies, and on the other hand, the critical use of digital technologies, that is, a digitally literate person can assess the relevance of the information obtained, i.e. they can assess what is right and wrong, appropriate and inappropriate. It critically evaluates the information obtained, distinguishes information and knowledge and selects only the knowledge and facts which is needed. Digital competence is based on mastering and developing key digital, information, and communication skills. The digital literate has the skills and knowledge to acquire, restore, collect, process, produce, present, exchange, and understand the more complex context of the virtual environment. We also include the use of services provided by the Internet such as e-mail, social networks, skype, and many others. Creativity, critical thinking development and the promotion of innovative solutions are important skills acquired through digital technologies (Recommendation of the European Parliament and Council, 2006).

DigComp 2.0 identifies the key components of digital competence in the following five areas:

1. Information and information literacy: expressing information needs, searching and searching for digital data, information and content. Assess the relevance of the resource and its content. Store, manage and organize digital data, information, and content.

2. Communication and cooperation: communicate, communicate and cooperate through digital technologies, recognizing cultural and generational diversity. Engage in society through public and private digital services and participatory citizenship. Manage your digital identity and reputation.

3. Creating Digital Content: Creating and Editing Digital Content Improve and integrate information and content into an existing body of knowledge while understanding how copyright and licensing should be applied. Know how to give clear instructions for a computer system.

4. Security: Protect devices, content, personal data, and privacy in a digital environment. Protection of physical and mental health and knowledge of digital technologies for social well-being and social inclusion. Be aware of the impact of digital technologies on the environment and their use.

5. Troubleshooting: Identify needs and problems and solve conceptual problems and problem situations in the digital environment. Use digital tools for process and product innovation. Keep up-to-date on digital developments.

2.4.4 Innovations in the education systems in the area of digital skills

Education and training is the best investment in Europe's future. They play a key role in promoting growth, innovation and job creation. European education and training systems must provide people with prospective knowledge, skills and competences in order to innovate and thrive. They also play an important role in building a European identity based on shared values and cultures. Education should enable young people to express themselves and become actively involved in shaping the future of a Europe based on democracy, solidarity, and inclusion. Digital

technologies enrich learning in many ways and offer learning opportunities that must be accessible to all. They make the horizons of information and resources accessible.

Digital transformation will accelerate with the rapid development of new technologies such as artificial intelligence, robotics, cloud computing and blockchain in Europe. Similarly to previous major technological revolutions, digitalization affects people's way of life, social interaction, study and work. Some jobs will be lost, others will be replaced, new jobs will be created; many positions and sectors will be transformed and new activities will emerge. Therefore, one has to invest in their digital skills throughout the life.

While digital transformation brings many opportunities, today's greatest risk is the company's unpreparedness for the future. If education is to underpin growth and integration in the EU, the key challenge is to prepare citizens to make the most out of the opportunities offered and to face the challenges of a dynamic, globalized and interconnected world.

Although reform efforts are progressing on an annual basis, disparities remain between and within EU Member States, particularly in terms of digital infrastructure and skills, hindering inclusive growth. This situation affects the most vulnerable groups of the population. In addition, girls' lack of interest in studying information and communication technologies (ICT) and science, technology, engineering and mathematics (STEM) is a clear ongoing problem. This leads to a loss of social and economic opportunities and a risk of widening gender disparities.

Education could benefit from specialized classrooms, practical experience, and projects, as well as new learning tools, materials, and open educational resources. Online collaboration can open up new opportunities for students. Access to and use of digital technologies can help bridge the gap between prominent students and those with weaker socio-economic backgrounds. Personalized learning can increase motivation by focusing on individual students. However, progress in integrating technology into education is still limited.

Over 80% of European youth use the Internet for social activities. Mobile internet access has improved significantly in recent years. However, the use of technology for education is lagging behind. Not all primary and secondary schools in the EU have broadband connection, and not all educators have the necessary knowledge or confidence to use digital tools in teaching. A recent study showed that in 2015, broadband connection was provided in estimated 18% of primary and secondary schools in the European Union.

Innovation in education systems understood as the introduction of new services, technologies and competences by educational institutions, can contribute to improving learning outcomes, strengthening equality and streamlining. It is most effective and sustainable when it is taken up by well-prepared teachers and integrated into clearly formulated learning objectives. More needs to be done to make the best use of digital resources to achieve educational goals. Progress in the digital sphere brings new challenges to European pupils, students, and educators. Algorithms that use social networking sites and news portals can significantly enhance bias and dissemination; at the same time, the protection of personal data is becoming increasingly common in the digital society. Youth and adults are exposed to threats of cyberbullying, harassment and predatory behaviour, but also to worrying online content. Everyday exposure to digital data, which largely controls hidden algorithms, brings its risks, so the need for critical thinking and the ability to act positively and responsibly in the digital environment is stronger than ever. The required media literacy and the wide range of digital skills and competences needed (including areas such as security and privacy) are constantly evolving, but their

dissemination to the general public and more advanced occupations and sectors remains problematic.

Cooperation within the European Union in the form of exchange of best practices, peer learning and dissemination of knowledge is a good way of supporting member states' education and training systems. Common frameworks help identify effective solutions and common tools such as eTwinning increase efficiency and extend impact. Innovative practices in education (especially digital) are emerging throughout the European Union. They come in many forms and include public, private and non-governmental actors. However, innovation in education is not an end in itself, but rather a way of enhancing the quality and inclusiveness of education systems.

The findings of the European Institute of Innovation and Technology (EIT) show that, instead of waiting for change, relevant actors are actively exploiting digital opportunities to improve education and training. An innovative and entrepreneurial spirit in the education and training sector should be fostered and supported by a clear political will and a desire for innovation to serve everyone. Innovative practices need to be disseminated, discussed, promoted and, where possible, adopted. Concepts, tools, methods, processes, systemic and design thinking must be more accessible to practitioners who usually do not have a complete overview of what is tried and tested elsewhere.

Data and evidence at EU level increase transparency meanwhile monitor progress and mutual learning between Member States. The use of technology in schools is captured by many studies and surveys. However, most of them are either partial (ie they focus only on a specific area as connectivity) or geographically limited as they target only a specific country. The main sources of global benchmarking are the European Commission surveys, including the 2013 ICT in Education survey, the annual survey on the use of ICT by households and individuals, as well as the OECD International Student Assessment Program (PISA) and the Adult Skills Survey (PIAAC). Further evidence is needed as well as a consistent approach to data collection.

Education and training stakeholders play a key role in making innovation a standard. Recent public consultations highlighted the need for more targeted EU action to promote the adoption of innovative approaches and digital technologies in education, as well as the development of digital skills, including digital media literacy, security, and well-being. In the Erasmus + public consultation, up to 68% of respondents recognized that innovation is particularly relevant to the needs of the education sector. At the same time, there is a clear need to (i) strengthen entrepreneurial competences and mentality and (ii) promote digital business that is moving in new directions and transformation of existing businesses using new and emerging digital technologies.

The Digital Learning Action Plan is based on two announcements adopted in May 2017: "A new EU program for higher education" and "School development and excellence: the key to an excellent start to life". It supports work in the digital Market as well as a new skills agenda for Europe.

At the same time, the Action Plan is the next step in meeting the challenge of the Globalization Paper to make society increasingly mobile and digital, and to provide the right combination of soft skills, as well as good digital skills. It states that education should strengthen resilience in an era of rapid technological change. The Action Plan is in line with the 2017 G20 Ministerial Declaration on the Digital Economy, which outlines the use of new digital technologies and the need to adapt all forms of education, including lifelong learning.

These documents outline a number of relevant policy objectives that apply more than ever before.

Here belongs:

- promoting quality education,

- increasing its relevance,

- developing and promoting the digital skills of Europeans,

- fostering innovation and digital competences in all educational institutions,

- opening education systems.

The Action Plan focuses on the need to implement, stimulate, support and disseminate the effective use of digital and innovative learning practices. It will draw input from a wide range of stakeholders with an interest in education and training, including businesses, research and non-governmental organizations and, where relevant, non-formal education organizations. It includes three priorities:

- making better use of digital technologies for teaching and learning,

- the development of digital competences and skills relevant to digital transformation,

- improving education through better data analysis and prediction.

For each priority, the Action Plan sets out measures to help Member States of the European Union to meet these challenges. Here belongs:

- providing tools to help educators and trainers make better use of technologies, including better internet connectivity,

- measures aimed at developing relevant digital competences,

- Strengthening existing and developing new activities to improve education by improving available data and analysis.

This Action Plan does not prejudge the Commission's forthcoming proposal for a new multiannual financial framework or future funding programs. The following priorities were presented in the Action Plan:

- making better use of digital technologies for teaching and learning,

- development of digital skills and competences relevant to digital transformation,

- educational system improvement by better analysis and data prediction.

2.4.5 Making better use of digital technologies for teaching and learning

Digital technologies are penetrating our society and economy more and more. Technology takes many forms and forms a major part of our work environment and lifestyle. However, there is a difference between the use of digital technologies in everyday life and in education. The potential of digital technology to improve education is huge and largely unexploited.

Ensuring equity and quality of access and infrastructure is a key part of digital education. So called the digital gap has many dimensions, but in tackling inequalities and exclusion, the starting point must be to improve access to technology and connectivity for all children in the education system. Differences in quality of access and infrastructure need to be addressed, as high quality means a more innovative and more valuable learning process.

Innovation in education and training is largely a matter of strengthening the role of teachers and their involvement. Erasmus + addresses this issue through peer learning. New expert-led training and hands-on seminars for policy-makers and educators, including those organized within the framework of the European VET Providers Platform, will continue to strengthen links by creating specific multilingual content and using key EU portals such as the School Education Gateway or the Teacher Academy. Mixed mobility will also be supported by new Erasmus + opportunities that will enable learning and exchanges between pupils from different countries, both online and live.

Digital readiness in education requires know-how and involves adaptation to change. Schools and training institutions in Europe are diverse and their equipment, teacher skills and approaches to the use of technology vary widely. The digital education world has innovative nests throughout Europe. However, innovative policies and practices require systematic support.

To bring innovation and technology to the classroom, educators need the appropriate environment, infrastructure, facilities, and management´ support. The contribution of digital technology to students and school staff requires an approach that combines teacher training, curricula and learning materials tailored to digital learning models. Such an organizational approach to the introduction of digital technologies in teaching is reflected in the SELFIE self-assessment tool, which has already been piloted by schools in 14 countries.

Mobility is an important part of education, and digital technologies are key to further improving it. Erasmus + projects, such as the European Student Electronic Card or Erasmus Without Papers, will be expanded and integrated with the authentication activities of projects under the Connecting Europe Facility to:

- enable students to authenticate in accordance with the "just once" principle,

- digital interconnection of information systems of higher education institutions,

- ensure secure exchange and validation of student data and academic records,

- reduce administrative procedures,

- allow access to services to which students are entitled when they arrive in the host country.

The EU Student Card Electronic Initiative aims to improve student mobility in Europe. By 2025, all Erasmus + students should be entitled to automatic recognition of their national identity and student status in all EU Member States, as well as access to higher education services (e.g. study materials, enrolment, libraries) upon arrival abroad. 20,000 pupils and 4,000 teachers will receive support for learning exchanges to complement and build on ongoing work and collaboration on digital projects

2.4.6 Development of digital skills and competences relevant to digital transformation

In order to acquire digital skills to function and prosper in a digital society, people need competences to help them overcome the challenges of digital transformation and take advantage of the opportunities it offers. Digital skills mean basic skills in addition to literary and mathematical literacy needed in all spheres of life, but many citizens have limited or outdated skills. Attention needs to be focused on the population as a whole, as all citizens must have (at different levels) an overview of all aspects of digital competence, but at the same time go deep - especially for specialized IT skills that require occupations in the ICT sector.

Digital competence is part of the revised European Reference Framework for key competences for lifelong learning that all citizens should have. Digital competence means the confident and critical use of digital technologies and includes the knowledge, skills, and attitudes that all citizens need in a dynamic digital society. The European Digital Competences Framework for Citizens describes digital competence in five areas: information and data literacy; communication and cooperation; digital content and its creation; safety and well-being; Troubleshooting. The recently published European Framework of Digital Competences for Educators guides educators in creating digital competence models. Together, both frameworks provide an in-depth and usable reference model to systematically support digital competence.

The digital revolution will continue to dramatically change the way Europeans live, work and study. While this presents unprecedented opportunities, if digital competences do not develop, there are also serious risks. Under the Skills Agenda, the Skills Raising Initiative recommends that Member States consistently ensure the improvement of digital skills (as well as literary and mathematical literacy) of many millions of adults with low skill levels or low qualifications, as this is a group in the most urgent need. In addition, it is estimated that currently, 90% of jobs require a certain level of digital skills, and if Europeans of all ages are not equipped with digital skills, there is a real risk that Europe will lose its greatest competitive advantage of a skilled and educated workforce.

Acquisition of digital skills must start at an early age and continue throughout life. It can be part of a school curriculum or post-school courses. Young Europeans are enthusiastic about surfing the web, using apps and playing games, but they must also learn the structures and basic algorithms behind these phenomena to become leaders and creators of digital content. A successful step in this direction is the Codeweek.eu initiative, which reached almost a million people worldwide in 2016. Following this experience, the initiative will be expanded to motivate all European schools to participate in the European Programming Week in cooperation with EU member state authorities, the ambassadors of the Programming Week, the eTwinning Network, the Digital Skills and Jobs Coalition and other related activities.

Greater emphasis needs to be placed on effectively addressing the challenges of digital transformation in online safety and cyber hygiene. We need to strengthen the critical thinking and media literacy of children and youth so that they can assess and overcome the ubiquitous threat of false news, cyberbullying, radicalization, cyber-security threats, and fraud. Even the youngest children are in everyday contact with digital technologies, but they do not understand their risks and parents worry about inappropriate content and other risks, but do not know how to deal with them. At the same time, cyber-attacks, data security breaches, and other illegal online activities are increasing in frequency in Europe. In its September Communication on Cyber Security, the Commission called on EU Member States to commit to including cyber security in their education and training curricula.

Europe urgently needs to close the gender gap by educating in the digital and business world if it is to take full advantage of the benefits of the digital revolution. Girls and boys have similar interest and skills in digital technology, but fewer girls develop that interest in their studies or careers. Girls and young women need positive examples, role models and support to overcome stereotypes and realize that they too can build a fulfilling and successful career in the ICT and STEM sectors. Greater representation of women in these careers will help Europe to realize its digital potential and ensure that women play an equal role in shaping the digital world. Women represent less than a fifth of the EU's ICT professionals.

The development of qualified ICT professionals is crucial for competitiveness. Advanced digital skills are important to support the next generation of analysts, researchers, and innovators. However, in-depth digital expertise is needed in many professions, not just ICT. For example, doctors analyse disease spread trends and need both medical and extensive advanced digital competences. More generally, three quarters of all researchers currently have no open access or open data management training. Citizens' research and innovation and addressing societal challenges should make better use of open data and collaborative digital technology tools and methods.

2.4.7 Educational system improvement by better analysis and data prediction

Data are crucial for education and training. The use of technology creates data that can be used. The challenge is to get a better insight and prediction from them to improve education systems and address their current problems. As technological trends such as artificial intelligence, automation, and robotics are global, cooperation at EU level can provide useful guidance to all EU member states and help initiate cooperation and exchange on a possible response to emerging cross-border digital challenges. A key input for policy making is the collection of data in the form of surveys and studies on digitization in education and training institutions as well as on digital teaching technologies. However, comparable comprehensive data on technology diffusion in education systems is often missing, incomplete or outdated. There is, therefore, a demand for more efficient and effective data collection and coordination at EU and international (OECD) level.

At the same time, while data help to identify and meet the need for evidence-based policy measures, comparable data is rarely used. Digital education initiatives are rarely compared to other initiatives and data available, so little is known about which practices generally work or could be helpful in social and educational systems. A new opportunity to capture, analyse and utilize data to improve education are big data and educational analytics. There are enough initiatives in EU member states to move from a standard teaching model to more tailor-made teaching in subjects such as mathematics, allowing content to be tailored to the individual needs of pupils. Educational analysts can also contribute to such personalized learning (for example by identifying 'at risk' students), which can also assess the impact of individual teaching strategies. However, as educational analytics in Europe is only in its infancy, we need more pilot schemes for research and experimentation in this area.

User-initiated innovation is the key to rapidly implementing innovative responses to educational challenges. Data and trends in education are mostly obtained from top levels under the guidance of international organizations and public administrations. Often, the user's perspective is not sufficiently taken into account, which may limit potential solutions to a particular need. This is doubly true in the current era of user-initiated innovation, where individuals themselves seek solutions to the problems they encounter. In this context, the Commission will explore how to promote citizen engagement and user-driven innovation in the annual pan-European education-oriented programming marathon to bring innovative solutions to key education and training challenges.

Prediction: instead of reactivity, changes need to be predicted. Education and training institutions are just trying to catch up with technological developments. The education and training forecast can reverse this situation and allow individual actors (from policy makers to practicing educators) to manage changes.

2.4.8 Digital skills in a company

In addition to soft skills, information technology skills that are required from graduates, whether secondary schools or universities are important for the company's growth. In the soft skills research, attention was also focused on the discovery of digital skills, although they are hard skills with their focus. In general, when evaluating digital skills, companies focus on information processing, communication, content creation, security and problem solving at different levels of knowledge, whether as a basic skill user, a single user or an experienced user. The availability and use of various software on the market allows companies to impose diverse requirements on the digital skills of job seekers. The basic software that every graduate should be familiar with today is office software.

Office software is an office software package designed primarily for general business and organizational activities. Its programs are designed to achieve greater productivity and efficiency in these activities. This focus does not preclude other users from using it, so it is well applicable in schools, households, and entrepreneurs.

Office software usually includes applications such as Outlook, Word, Excel, PowerPoint OneNote, Publisher, Access and others. Standard Microsoft Office programs are as follows:

Outlook – a personal diary, is a tool for managing e-mail, calendar, contacts, tasks, and events.

Word – a text editor, allows you to create documents, simple and complex spreadsheets, images, and templates that can be used on your local or Web network. This application can integrate documents from other applications into one final document.

Excel – spreadsheet calculator, can create formulas, functions, and graphs. It allows the creation of different types of graphs for a clearer and more accurate presentation of data, as well as the creation of pivot tables.

As a presentation tool, **PowerPoint** offers a range of options ranging from more automated shapes and text effects to soft shading and fills. Bezier curves, three-dimensional shapes, and connecting lines allow you to create accurate images. It allows electronic presentation of text and graphics with various types of animation.

Publisher is a text and graphics editor for creating simple publications.

Access is a program for building and managing relational databases.

Internet and **e-mail communication** are modern communication tools. Skills from professional email communication are required in most professions. Requirements for graduates from the field of Internet and email communication mainly include skills based on modern business etiquette and its rules called „netiquette".

Special software
Special software includes computer aided design (CAD) systems for designing and computer aided drawing, respectively.

CAD program is a summary term for activities where a computer is used in development and design activities. This applies, in a narrower sense, to the interactive graphical creation of the digital representation of the object and its manipulation (technical drawing, 3D model of the object, etc.). Object is e.g. component, equipment, construction, etc. The digital representation of the object is stored in a database, which is also available to other departments. In a broader sense, CAD refers to general engineering calculations using a computer with graphical output for the area of development and design activities or drawing. The theoretical basis for CAD systems

is computer graphics and modelling of technical objects, methodological basis is the formalization of the design process. CAD system is basically a graphical system designed for technical applications. According to Fořt and Kletečka (2004) and Kuchyňková (2003), the emergence of parametric modellers is considered as a separate stage in the development of CAD systems. AutoCad, TurboCad, SolidWorks, Creo Parametric, Pro Engineer and more. Their big advantage is excellent visualization, constant possibility to change any parameter (parametric modeling), and many other advantages.

Analytical software

Statistica programs with various applications and applications of the ANSYS Academic Research program package are used quite often from analytical software.

Statistica is a comprehensive system that includes data management, analysis, visualization, and user application development. It provides a wide selection of basic and advanced tools, specially developed for business, data mining, science, and engineering applications. The Statistica analytics platform will enable organizations to manage the entire analytical lifecycle from grouping and data preparation, visualization to model creation and implementation. STATISTICA not only includes general statistical and graphical procedures (including reporting and data preparation) but also offers full implementation of specialized methods such as data mining, resources for biomedical research, social sciences, business or engineering applications. All the tools in the STATISTICA software product line are part of a comprehensive application package. These tools can be controlled through the optional user interface menus that include:

- highly optimized user experience with the ability to use STATISTICA from within Microsoft Office and other applications

- a complete browser-based user experience (WebSTATISTICA) that allows you to access STATISTICA from any Internet-connected computer in the world.

A comprehensive industry standard and NET of compatible Visual Basic that offers access to over 13,000 externally available features. STATISTICA Visual Basic can be used to simplify tasks of any difficulty i.e. from simple macros to run repetitive operations to advanced development projects.

ANSYS Fluent is part of the ANSYS Academic Research CFD program package. The working environment of the program package is called ANSYS WORKBENCH (WB). In this program, it is possible to create a simulation tree and links between the individual steps of the simulation itself. It is also possible to form linkages between variants and modifications. The program provides clear simulations, allowing the user to run individual programs in this environment without having to search for files through the file manager. The philosophy is to create a project that includes all phases of pre-processing, processing and post-processing. The created project will be saved in the form "Workbench Project Files. The ANSYS Workbench user interface consists of four areas:

- a drop-down menu that contains functions for working with files (creating a project, loading a project, saving a project, updating a project ...). It is also possible to define units and customize the ANSYS Workbench user interface.

- ANSYS tools, which contain products available under ANSYS. The quantity of products depends on the user's license.

- an environment depicting the structure of the project, it is the workspace in which the user creates the necessary structure for each program to use during project creation.

- the information panel provides the user with information about the operations performed in the Workbench environment. The information panel also provides the user with error or information messages.

Simulation software

Tecnomatix applications have a large presence in the simulation software which is the most widely used in technical universities. Synchronization between product engineering, manufacturing engineering, manufacturing and service operations can be achieved with Tecnomatix software to maximize production efficiency and carry out innovation. Siemens Tecnomatix is a comprehensive portfolio of digital manufacturing solutions that enable the digitization of production and the process of transforming innovative ideas and materials into real products. The portfolio includes various applications:

SiemensTecnomatix PLM is a product line of Siemens PLM Software, which includes several software tools for various production areas that can be interconnected. The tools in the Tecnomatix range enable industrial enterprises to put into practice the concept of a digital enterprise; i.e. plan and design production, design, verify and optimize processes and production resources in a digital environment. Accurate digital modelling, simulation, and 3D spatial visualization allow professionals who collaborate to develop, visualize and analyse future production processes. Such an evaluation allows key decisions in the design of the process to be made and approved in a timely manner and with a broader understanding. This will reduce errors that would otherwise occur only at the start of production. Digitization allows processes to be prepared faster and more accurately, while simulation and optimization in the development phase ensures that a flawless product is produced for the first time, without the need for additional costly and time-consuming changes to the real factory. This software package contains several modules focused on specific areas of design such as:

Process Designer is a module designed for designing production processes. It allows project teams to simultaneously plan, analyse in a 3D graphical environment, validate and optimize production.

Process Simulate is a set of tools for simulating and verifying production processes.

Process Simulate Human is a simulation and analysis of manual manufacturing operations in terms of feasibility, ergonomics, and workload.

Process Simulate Robotics and ***Process Simulate Spot*** are static or dynamic simulations of robot reach, collision detection, robot layout optimization, etc.

Process Simulate Assembly - product assembly analysis allows you to design and verify component paths during assembly and detect potential collisions.

Plant Simulation is a module for dynamic simulation. Creation of a structured hierarchical model of production plants, lines, processes, transport, etc. Thanks to dynamic design examination we can identify bottlenecks, define workloads of individual workstations/operators, determine system throughput and so on.

Jack is a module designed for detailed design of the workplace in terms of ergonomics. In this module, it is possible to create an arrangement of the workplace and then to insert an anthropometrically and biomechanically accurate human model. The human model can be adjusted in detail according to working positions and anthropometry. The most accurate movement in space, joint range, and joint coordination were taken from NASA studies. Jack is a tool used to modify existing workplaces or to design new workplaces. The module offers a

number of the most used ergonomic analyses, generation of reach zones, collision detection, operator field of view evaluation and others. The benefits of application include reducing workplace risk, eliminating workplace reorganization, improving workplace efficiency, improving ergonomic standards and reducing costs by eliminating non-ergonomic processes (www.sova.sk).

3 MATERIALS AND METHODS

The aim of the research was to assess the requirements of practice for knowledge competencies of graduates of technical universities. Relevant areas of soft-skills assessment and information-communication technologies (one of the areas of hard-skills) were specified for the analysis of knowledge competencies of university graduates of technical studies. The method of questionnaire survey which is standardly used for so oriented research objectives, was chosen for the execution of the research. There were two target groups of the questionnaire: respondents from companies who described the expected (or required) and actual state of competences of university graduates, and current university students who evaluated their own level of knowledge in the specified areas.

3.1 Questionnaire research method

The purpose of the questionnaire research was to gain an overview of what knowledge of a student or a graduate of a technical university, is necessary for its successful employment in practice, or what competencies of the graduates need to be improved. By completing the questionnaire, the respondents provided important feedback for the research executor. The addressed sample of respondents consisted from students of technically oriented study programs from the Faculty of Technology and the Faculty of Wood Sciences and Technology, Technical University in Zvolen - technical faculties. The results of the questionnaire were used for research purposes of the KEGA project guaranteeing the anonymity of the respondents. The aim of our research was to analyse and compare the level of education provided in the relevant areas - soft skills and information - communication skills. The questionnaire method is considered the most suitable for the research on respondents' opinions in terms of evaluating and comparing the level of selected criteria. We assume that the questionnaire survey is the most used method for assessing knowledge competencies. The following sequence of steps was chosen to carry out the research:

1. Defining the soft skill areas.

2. Defining the relevant knowledge areas of information-communication technologies

3. Questionnaire design.

4. Random choice of respondents and their demographic characteristics specification.

5. Evaluation of the results of the questionnaire research

3.1.1 Specification of soft-skills areas

Soft skills are interpersonal competences for effective communication, persuasion, empathy, teamwork, organizing, negotiating and others. Some authors characterize soft skills as non-technical skills, characteristics and abilities that are necessary for working in the working environment. Based on the literature review given in Chapter 2.3., selected soft skills competencies, which we consider to be the most sought-after and relevant in the positions occupied by graduates of technical university degree. The following eight areas of soft skills were specified for the analysis:

1. Creative thinking

2. Team cooperation or team work

3. Time management

4. Communication

5. Assertiveness

6. Stress resistance

7. Organisational skills

8. Dealing with conflicts

Considering the soft skills assessment from the point of view of the practice or future employers, the competences which were assessed were those:

1. the employers expect the graduates of technical universities to have

2. the newly recruited employees – the technical university graduates actually have

3.1.2 Specification of relevant knowledge areas of information-communication technologies (ICT)

The basic requirement of employers when employing university graduates is an excellent knowledge of computer applications and work with information technologies. Today, computers, various software, and Internet applications are an integral part of students' lives, which they can make good use of in their professional lives. For these reasons, as well as on the basis of the literature review mentioned in chapter 2.4, ICT was chosen as a representative of hard skills in the research of knowledge competencies of graduates of technical faculties. In the context of a large number of different computer applications, the following areas of evaluation were chosen for the evaluation of ICT competencies:

1. Standard Office software (e.g. Word, Excel...).

2. Presentation tools (e.g. PowerPoint, ...).

3. Internet and e-mail communication

4. Special software - graphic programs (e.g. AutoCad, TurboCad, SolidWorks, CreoParametric).

5. Special software - analytic programs (e.g. Statistica, Ansys, Fluent and others).

6. Special simulation software (e.g. Arena, Siemens Tecnomatix PLM, Siemens Jack etc.).

Similarly to the assessment of soft skills, also for the ICT knowledge (hard skills) assessment, the computer competences assessed were those which

1. employers expect from the technical university graduates

2. newly recruited employees – the technical university graduates actually have

3.1.3 Enterprise questionnaire design

The questionnaire for evaluating the practice requirements for the knowledge competencies of graduates of technical universities was divided into four parts. The introductory part included addressing the respondent, explaining the research purpose of the questionnaire, emphasizing the feedback for faculties as educational institutions with an emphasis on improving services and ensuring the anonymity of the respondent

Part A of the questionnaire was to find out the basic information about a respondent and the enterprise, the respondent´s work position, the name of the enterprise, the number of employees in the enterprise.

Part B of the questionnaire was aimed at assessing the need for soft skills in graduates of technical universities. It was divided into two parts:

1. assessing the level of soft skills that enterprises expect from graduates of technical universities;

2. evaluation of the level of soft skills actually achieved by newly recruited university graduates.

Part C of the questionnaire was aimed at assessing the need for knowledge of information and communication technologies (ICT) of university graduates. It was divided into two parts:

1. assessment of what ICT knowledge enterprises expect from graduates of technical universities;

2. an assessment of what ICT knowledge is actually attained by newly recruited university graduates.

The concept of the questionnaire was based on the definition of relevant areas of soft skills assessment and ICT competencies listed in chapters 3.1.1. and 3.1.2. Respondents evaluated the individual areas through the Likert scale of evaluation, which is shown in Tab. 3.1. The respondent chose just one statement in each evaluation area, which was represented by the relevant point value in the evaluation of the questionnaire.

Tab. 3.1 Likert scale of evaluation

Statement	Excellently developed	Developed very well	Developed well	Developed sufficiently	Not developed
Point value	1	2	3	4	5

3.1.4 Students' questionnaire design

In order to compare the results and find out students' opinion on the quality and applicability of the knowledge gained by studying in the analysed areas of soft skills and ICT competences, a targeted questionnaire was created in which students assessed their own level of knowledge in the specified areas.

In the questionnaire, students were asked about their opinion of soft skills and ICT as a part of the educational process in their field of study and their own self-assessment of the achieved level of knowledge. The areas of soft skills and ICT as well as the rating scale were the same as in the enterprise questionnaires.

3.1.5 Random selection of respondents and specification of their demographic characteristics

After the questionnaire was created, it was distributed through a random selection of respondents from practice. The questionnaires were sent to the business respondents (mostly external students) in printed form or electronically by e-mail. In total, the questionnaire was sent to 200 potential respondents - employees of enterprises operating in the Slovak Republic. 155 respondents responded to the questionnaire. The return on the questionnaire represents 77.5%, which we consider to be a successful result.

After completion of the questionnaire survey, the demographic characteristics of respondents were specified. The respondents were categorized according to the size of the company according to the number of employees and the job position of the respondent.

Enterprises were divided by size or by number of employees:

• Large - over 250 employees (designation V),

• Medium - 50-249 employees (S-mark),

• Small - up to 49 employees (labelled M).

The analysis of respondents in terms of the size of the company is illustrated by the graph in Fig. 3.1. The evaluation of the replies of the enterprises revealed that 35% of the participating enterprises were large enterprises, 27% were medium-sized enterprises and 38% of the replies represented the evaluation of small enterprises with less than 50 employees.
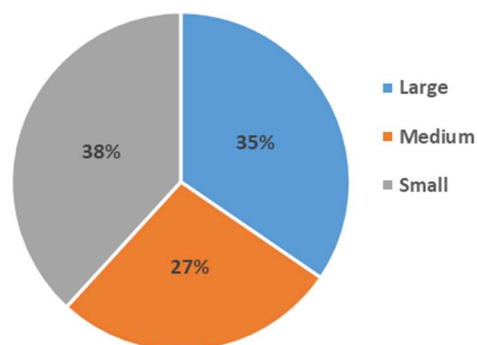
Fig. 3.1 Respondents´ analysis by the enterprise size

The results of the analysis showed that respondents from large, medium and small enterprises in the roughly balanced share participated in the research, which is a very suitable result, which at the same time corresponds to the distribution of employers of graduates of technical universities.

Another classification of respondents was classification by respondent's work position (Fig. 3.2). In terms of the scope of the research, three categories of employees were specified:

• managerial positions - managers,

• technical-economic workers - middle management,

• operators, workers.
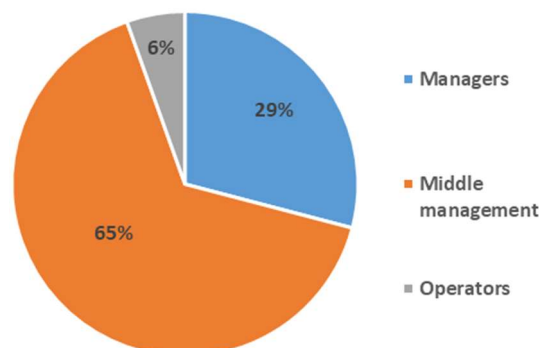
Fig. 3.2 Respondents´ analysis by the work position in the enterprise

The analysis of respondents shows that the largest share of 65% of respondents was in the position of technical-economic workers (THP), followed by managers with a share of 29%. We

believe that the above-mentioned composition of respondents is very suitable with the respect to the objectives of the research, because mainly THP workers and managers cooperate with newly recruited university graduates and we assume that they are able to best define expectations and reality in soft skills and information-communication technologies.

Respondents - students of full-time bachelor's and master's studies received questionnaires for completion by teachers directly at the lessons. A total of 132 questionnaires were distributed, of which 100% returned. Of the total number of students, the proportion of students studying at the Bachelor's degree (Bc.) was 55%, the proportion of students studying at Master´s studies (Ing.) was 45% (Fig. 3.3). Students participating in the research studied at the two faculties (Faculty of Technology (FT) and Faculty of Wood Sciences and Technology (DF), at the following study programmes:

- Production technology and management of production processes (FT, Bc.),

- Economics and management of wood-processing enterprises (DF, Bc.),

- Production technologies (FT, Ing.),

- Furniture design and construction, Wood engineering and Wood constructions (DF, Ing.).
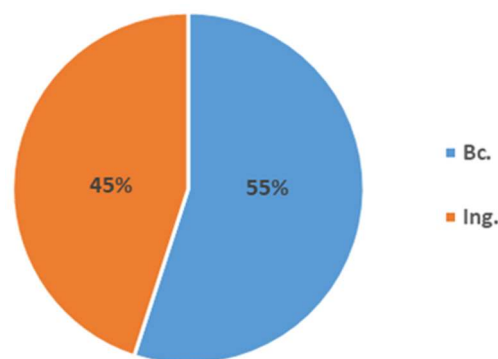
Fig. 3.3 Respondents´ analysis by the study degree at the university

It was an initial research into the evaluation of soft-skills in enterprises and among students. The research was limited in time to one academic year, resulting in smaller sample of respondents assessed. Of course, in the next phase of the research we plan to collect data for several years, the results will have a stronger explanatory power, or to examine the development of requirements for the reporting skills of students.

3.2 Statistical methods of the research

A questionnaire research method was used to analyse the knowledge competences of graduates of technical university studies in which responses were evaluated using the Likert scale. In order to select a suitable method of mathematical induction, the data obtained from the questionnaires were first tested for normal distribution. We chose the Shapiro-Wilk test of the many tests that statistical software currently provides. The assumption that our research outputs are non-parametric variables that do not exhibit a normal distribution was verified. Based on the results of the testing, subsequently nonparametric testing using statistical induction methods, namely Mann-Whitney U – test was used to investigate the significance of the difference between expected and actual state of competences. The decision was also supported by the fact that our variables are at the ordinal level of measurement.

3.2.1 Shapiro-Wilk test of normality

One of the most commonly used tests of normality is the Shapiro-Wilk (SW) test. The test is based on determining whether the points of the constructed quantile-quantile graph (Q-Q plot) differ significantly from the regression line outlined by these points. At the level of significance α selected beforehand, we test the null hypothesis H_0: $F(x) = F_0(x)$ against the alternative hypothesis H_1: $F(x) \neq F_0(x)$, where F is the empirical distribution function of the sample of the range at F_0 distribution function of normal distribution *norms* (μ, σ) with parameters μ and σ unspecified.

SW test is mainly used for samples of smaller ranges $n \leq 50$. Let us consider the ordered values $x_{(1)}, x_{(2)}, ..., x_{(n)}$ of randomly selected sample $x_1, x_2, ..., x_n$. The test statistics uses the equation as follows:

$$W = \frac{\left(\sum_{i=1}^{m} a_{i,n} \cdot \left(x_{(n-i+1)} - x_{(i)} \right) \right)^2}{\sum_{i=1}^{n} \left(x_{(i)} - \bar{x} \right)^2} \tag{3.1}$$

where:

$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$ is the sample average,

$a_{i,n}$ are the tabulated coefficients,

$m = \frac{n}{2}$, if n is even, or $m = \frac{n-1}{2}$, if n is odd (Markechová et al., 2011).

The closer the test statistic value W approaches 1, the better the match between theoretical and empirical distribution. We reject the hypothesis H_0 on the normal distribution of the population from which the random sample was made on the significance level α, if applies $\leq W_\alpha(n)$, where $W_\alpha(n)$ is tabulated critical value (Ostertagová, 2012).

3.2.2 Nonparametric Mann-Witney U-test

The Mann-Whitney test of significance is an especially appropriate test when two independent and randomly selected sets of sample observations are at least ordinal-level; that is, the data must be such that they can be ranked from low to high (or high to low). The purpose of the test is to determine whether or not the two independent samples come from the same population. U-statistics is a simple function of totals of the ranks. It can be shown that the Wilcoxon sum test for two independent samples and the Mann-Whitney U-test are equivalent. The only difference between the two tests is that the Mann-Whitney U-test has two test statistics in the form:

$$U_1 = n_1 n_2 \frac{n_1(n_1+1)}{2} - T_1 \tag{3.2}$$

$$U_2 = n_1 n_2 \frac{n_2(n_2+1)}{2} - T_2 \tag{3.3}$$

The conclusion of the test is based on an assessment of whether the first or second test statistics, or both test statistics, are too small to confirm H_0. For small samples, the smaller computed U value is used in making the decision to either reject or accept the null hypothesis; namely, that there is no difference in the distribution between the two samples.

The values of U_1 and U_2 statistics are interrelated, and according to (2), only one of them can be calculated, while the other stands for:

$$U_2 = n_1\,n_2 - U_1 \qquad\qquad (3.4)$$

The sum of $U_1 + U_2$ is equal to $n_1.n_2$ since $U_1 + U_2$ is constant for the tested samples, a small value of U_1 means a large value of U_2 and vice versa. At approximation by normal distribution with test statistics in the form,

$$Z = \frac{U_1 - \frac{n_1 \cdot n_2}{2}}{\sqrt{\frac{n_1\,n_2\,(n_1+n_2+1)}{12}}} \qquad\qquad (3.5)$$

then the mean value deducted in the numerator of the test statistics $\frac{n_1 \cdot n_2}{2}$ equals according to the relation (4) to average of both values of U_1 and U_2. The value of test statistics in the absolute value is the same in case any of the values U_1 and U_2 is used. Then, it does not matter which one is used in the test for the difference between two population medians (Pacáková et al., 2015).

4 RESULTS AND RESEARCH EVALUATION

In the questionnaire survey the respondents evaluated the level of knowledge competences of graduates of technical university degrees in terms of expectations and achieved reality in practice. Within the research, relevant areas of soft-skills evaluation (Chapter 3.1.1) and knowledge of information-communication technologies (hard-skills) were specified (Chapter 3.1.2). Respondents rated individual areas of evaluation using the Likert rating scale, in the range of points 1-5, with 1 being the best rating (most developed), 5 being the worst rating (least developed) (Chapter 3.1.3).

In the first step, the evaluation results in questionnaires were processed into two databases. The first database contained evaluations of 155 respondents from enterprises for individual evaluation areas in terms of expectations and achieved reality. The second database contained evaluations of 132 respondents - students with statements, which of the so-called soft skills and ICT skills they develop within the educational process in the relevant field of study.

Results from data databases were first processed through descriptive statistics. In Excel 2010, frequency tables for each data group were created and based on them, radar charts were processed. Radar charts are a common tool used to evaluate opinions presented by the Likert scale for one or more subjects. The radar chart shows the relative position of the data points relative to the centre. The number of data points (categories) determines the number of value axes (in our research it is 5 degrees of the Likert scale) and the point value then indicates its distance from the centre of the graph. Each category has its own centre of values. Separate radar charts were created for each area of soft-skills and ICT competencies, comparing expectations with reality.

Tab. 4.1 Variables labelling

Area	Variable	Expected state in enterprises (OS)	Actuality in enterprises (SS)	Self-evaluation of the actuality state by students (RS)
Soft skill competences	Creative thinking	KM_OS	KM_SS	KM_RS
	Team work	PvT_OS	PvT_SS	PvT_RS
	Time management	TM_OS	TM_SS	TM_RS
	Communication	K_OS	K_SS	K_RS
	Assertiveness	A_OS	A_SS	A_RS
	Stress resistance	OvS_OS	OvS_SS	OvS_RS
	Organisational abilities	OS_OS	OS_SS	OS_RS
	Dealing with conflict	RK_OS	RK_SS	RK_RS
Information-communication technology competences	Standard Office	OFF_OS	OFF_SS	OFF_RS
	Presentation skills Power Point	PP_OS	PP_SS	PP_RS
	Internet, e-mail	I-E_OS	I-E_SS	I-E_RS
	Graphic CAD programs	CAD_OS	CAD_SS	CAD_RS
	Analytical programs	AP_OS	AP_SS	AP_RS
	Simulation programs	SP_OS	SP_SS	SP_RS

The research results were evaluated in STATISTICA (VERSION 10). In the first step of mathematical statistical analysis, the Shapiro-Wilk test (chapter 3.2.1) was used to verify the normality of the variables - results from the questionnaires. Since the Shapiro-Wilk test confirmed that the distribution of our variables was not normal and the data from the

questionnaires were ordinal variables, in the second step of mathematical statistical analysis, non-parametric testing by means of the Mann-Whitney U-test was used to test the significance of the mean difference. Used table data are presented in a modified form, box plots are presented in the original format. A significance level of α = 5% was used in all tests.

Because of the large number of variables and for the sake of clarity of results, abbreviated terms characterizing the variables in mathematical calculations, tables and graphs were used. The labelling of the individual variables used in evaluating the measurement results are given in Table 4.1.

4.1 Shapiro-Wilk normality test

Having summarised the results of the questionnaires in databases and generating descriptive statistical results (found in the following chapters), the variables - results from the questionnaires were subjected to subsequent testing. The Shapiro-Wilk test was used in the research to test the normality of variables.

Tab. 4.2 Shapiro-Wilk test results for soft skills competences evaluated by enterprises.

Variable	Value of the test criterion W	P – value
KM_OS	0.82	0.000
PvT_OS	0.81	0.000
TM_OS	0.86	0.000
K_OS	0.83	0.000
A_OS	0.90	0.000
OvS_OS	0.83	0.000
OS_OS	0.88	0.000
RK_OS	0.90	0.000
KM_SS	0.88	0.000
PvT_SS	0.90	0.000
TM_SS	0.91	0.001
K_SS	0.91	0.000
A_SS	0.85	0.000
OvS_SS	0.89	0.000
OS_SS	0.91	0.001
RK_SS	0.90	0.000

The found p-values of the Shapiro-Wilk test for soft-skills competence imply that the test values are not normally distributed in either case.

The results of the Shapiro-Wilk test for ICT competences imply that hypothesis H_0 on compliance of our data distribution and normal data distribution is rejected.

Based on the results of the Shapiro-Wilk normality test, it can be stated that our assumption that the samples (soft-skills and ICT competencies rated by enterprises, soft-skills and ICT competences rated by students) do not follow the normal probability distribution was confirmed. For this reason, the tested variables are considered to be nonparametric. Consequently, to test the significance of the difference, nonparametric testing of the mean values by means of the Mann-Whitney U-test was used.

Tab. 4.3 Results of the Shapiro-Wilk test for ICT competences rated by enterprises

Variable	Test criterion value (W)	P – value
OFF_OS	0.57	0.000
PP_OS	0.70	0.000
I-E_OS	0.57	0.000
CAD_OS	0.78	0.000
AP_OS	0.77	0.000
SP_OS	0.79	0.000
OFF_SS	0.71	0.000
PP_SS	0.70	0.000
I-E_SS	0.71	0.000
CAD_SS	0.72	0.000
AP_SS	0.59	0.000
SP_SS	0.51	0.000

Tab. 4.4 The Shapiro-Wilk test results of self-evaluation of the reality on soft skills and ICT rated by students

Variable	Test criterion value (W)	P – value
KM_RS	0.874	0.000
PvT_RS	0.843	0.000
TM_RS	0.879	0.000
K_RS	0.872	0.000
A_RS	0.814	0.000
OvS_RS	0.916	0.000
OS_RS	0.885	0.000
RK_RS	0.902	0.000
OFF_RS	0.847	0.000
PP_RS	0.862	0.000
I-E_RS	0.876	0.000
CAD_RS	0.779	0.000
AP_RS	0.645	0.000
SP_RS	0.472	0.000

4.2 Research results on the area of soft skills in enterprises

The research results for the competencies of soft skills in enterprises are classified in the next chapter for each of the eight areas of evaluation. For the sake of clarity of results and comparison of individual areas for the expected and actual situation, the following chapters give an evaluation of each area of soft skills individually. Whereas, the normality testing is presented together for all areas in the previous chapter of 4.1.

Individual evaluation areas include:

1. Evaluation by descriptive statistics:
   - absolute frequency of variables (AP) for expected (OS) and actual state (SS) of the variable – the specific area of soft skills,

- relative frequency of variables (RP) for expected (OS) and actual state (SS) of the variable – the specific area of soft skills,
- a radar chart comparing the Likert scale ratings for the expected (OS) and the actual state (SS) of the variable – the specific area of soft skills.

2. Evaluation by mathematical statistics:

Mann-Whitney U - test was used to test the hypothesis whether or not the difference between expectations and actual state in a specific area of soft skills is statistically significant. If the test showed the significant difference, the test results are also shown in a box plot. The graph also shows the typical mean value of the variable - median. If the Mann-Whitney U - test did not show statistical significance, i.e. there was no evidence of a difference between expectations and actual state in a specific area of soft skills, the area is not developed any further; the difference between expectations and the actual situation in a specific area of soft skills is found to be insignificant.

4.2.1 Creative thinking competence evaluation

4.2.1.1 Descriptive statistics for the creative thinking area

Tab. 4.5 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for creative thinking area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.5 Descriptive statistics parameters for the area of creative thinking

Creative thinking	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	59	38.2	14	9.2
2	45	29.1	37	23.6
3	17	10.9	79	50.9
4	17	10.9	22	14.5
5	17	10.9	3	1.8
Total	155	100	155	100

The radar chart in Fig. 4.1 shows relative frequencies of individual ranks of the Likert scale.
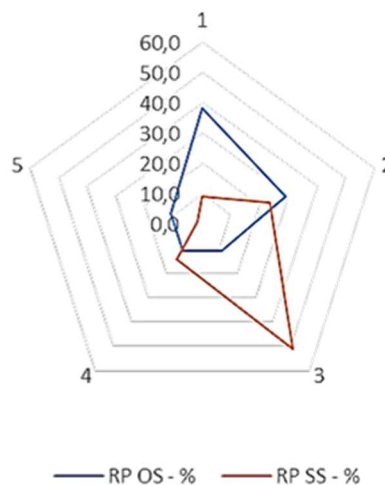
Fig. 4.1 Radar chart of relative frequencies for Likert scale ranks for the area of creative thinking by expected (OS) and actual (SS) states

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual ratings for creative thinking. It can be concluded that there are considerable differences between ratings. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates, the Mann-Whitney U – test shall be used to test the our results.

4.2.1.2 Mathematical statistics for the area of creative thinking

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the creative thinking area are shown in Tab. 4.6.

Tab. 4.6 The Mann-Whitney U – test results for the area of creative thinking

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks KM_OS	Sum of ranks KM_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid KM_OS	N valid KM_SS
Creative thinking	2595.50	3509.50	1055.50	*-2.812*	*0.005*	155	155

Based on the test results and the p-value (p = 0.005), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of soft skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.2)
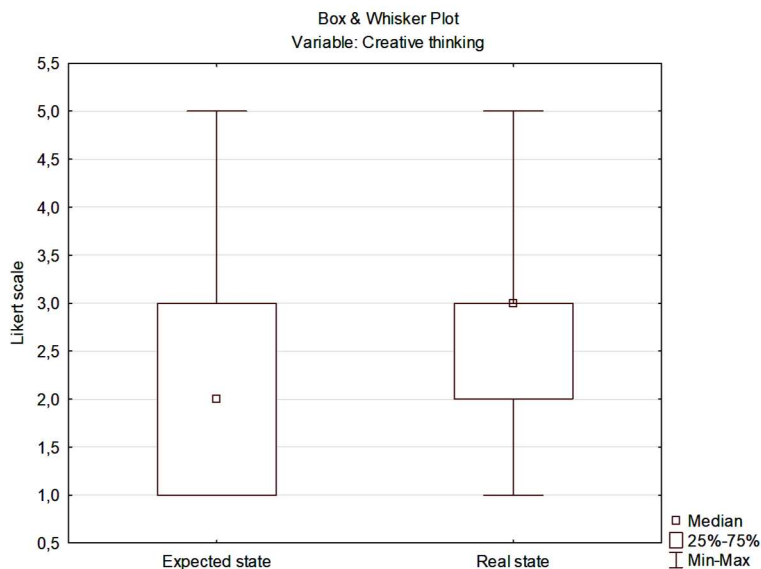
Fig. 4.2 Box plot for the variable of creative thinking

The box plot in Fig.4.2 shows:

- 25 to 75% of all respondents' assessments in the area of creative thinking for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles;

- the median i.e. the middle value, for the expected state of creative thinking is 2.0 which corresponds to a very well developed area of soft skills;

- 25 to 75% of all respondents' assessments in the area of creative thinking for the actual state are within 2-3 of Likert scale corresponding to the 2nd and 3rd quartiles;

- the median i.e. the middle value, for the actual state of creative thinking is 3.0 which is a well-developed soft skills competence.

4.2.2 Assessment of competences in the area of team work

4.2.2.1 Descriptive statistics for the area of team work

Tab. 4.7 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for team work area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.7 Descriptive statistics parameters for the area of team work

Team work	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	59	38.2	41	26.4
2	37	23.6	45	29.1
3	20	12.7	28	18.2
4	11	7.3	20	12.7
5	28	18.2	21	13.6
Total	155	100	155	100

The radar chart in Fig. 4.3 shows relative frequencies of individual ranks of the Likert scale for the area of team work.

Fig. 4.3 Radar chart of relative frequencies for Likert scale values
for the area of team work by expected (OS) and actual (SS) states

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual assessments for the area of team work, it can be concluded that there are no significant differences between the ratings. This was consequently tested by the Mann-Whitney U-test.

4.2.2.2 Mathematical statistics for the area of team work

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing by means of the Mann-Whitney U-test was chosen. The results of the test for the team work evaluation are shown in Tab. 4.8

Tab. 4.8 Results of Mann-Whitney U–test for the area of team work

Variable	Mann-Whitney U-test The tests are significant at the level of $p < 0.05$						
	Sum of ranks PvT_OS	Sum of ranks PvT_SS	Test criterion U - value	Test criterion Z – modified value	p-value	N valid PvT_OS	N valid PvT_SS
Teamwork	2842.00	3263.00	1302.00	-1.293	0.196	155	155

The results of the Mann-Whitney U-test for team collaboration did not confirm a significant statistical difference between the expected and actual states of soft skills assessment. Based on the results of testing and the corresponding *p* value (*p* = 0.196), the null hypothesis was confirmed; there is no statistically significant difference between the expected and actual states of soft team assessment; i.e. reality and expectations are the same. This result points out that graduates predominantly meet the practice requirements for the skills in that area and there is no need to improve teaching in that area. As the significant statistical difference between the expected and the actual situation was not confirmed; a box plot showing the distribution of respondent ratings is not provided. Median; i.e. the typical value, for the expected team work is 2.0 which means that practice requires highly developed teamwork skills from graduates.

4.2.3 Time management competence evaluation

4.2.3.1 Descriptive statistics for the time management

Tab. 4.9 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for time management area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.9 Descriptive statistics parameters for the area of time management

Time management	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	25	16,4	11	7,3
2	62	40,0	37	23,6
3	34	21,8	62	40,0
4	11	7,3	31	20,0
5	23	14,5	14	9,1
Total	155	100	155	100

The radar chart in Fig. 4.4 shows relative frequencies of individual ranks of the Likert scale.
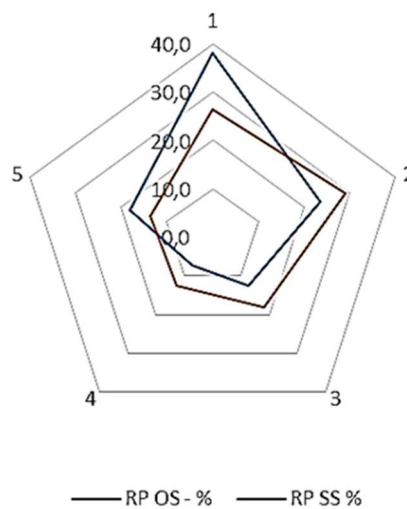
**Fig. 4.4 Radar chart of relative frequencies for Likert scale ranks
for the area of time management by expected (OS) and actual (SS) states**

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual ratings for time management, it can be concluded that there are considerable differences between ratings. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates, the Mann-Whitney U – test shall be used to test the our results.

4.2.3.2 Mathematical statistics for the area of time management

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the time management area are shown in Tab. 4.10.

Tab. 4.10 The Mann-Whitney U – test results for the area of time management

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks TM_OS	Sum of ranks TM_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid TM_OS	N valid TM_SS
Time management	2723,00	3382,00	1183,00	*-2,037*	*0,042*	155	155

Based on the test results and the p-value (p = 0.042), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of soft skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.5)

Fig. 4.5 Box plot for the variable of time management

The box plot in Fig. 4.5 shows:

- 25 to 75% of all respondents' assessments in the area of time management for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the median i.e. the middle value, for the expected state of time management is 2.0 which corresponds to a very well developed area of soft skills,

- 25 to 75% of all respondents' assessments in the area of time management for the actual state are within 2-4 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the median i.e. the middle value, for the actual state of time management is 3.0 which is a well-developed soft skills competence.

4.2.4 Communication competence evaluation

4.2.4.1 Descriptive statistics for the communication area

Tab. 4.11 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for communication area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.11 Descriptive statistics parameters for the area of communication

Communication	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	56	36,4	14	9,1
2	40	25,5	45	29,1
3	25	16,4	48	30,9
4	11	7,2	42	27,3
5	23	14,5	6	3,6
Total	155	100	155	100

The radar chart in Fig. 4.6 shows relative frequencies of individual ranks of the Likert scale.
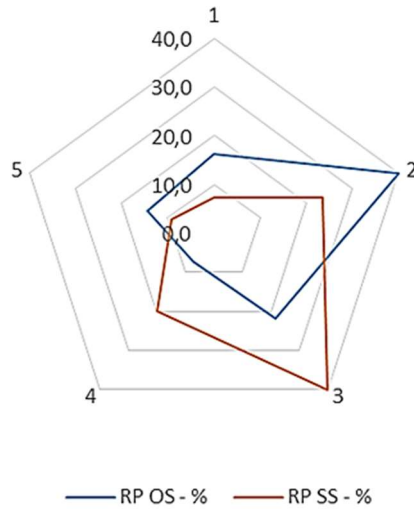
**Fig. 4.6 Radar chart of relative frequencies for Likert scale ranks
for the area of communication by expected (OS) and actual (SS) states**

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual ratings for communication, it can be concluded that there are considerable differences between ratings. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates, the Mann-Whitney U – test shall be used to test the our results.

4.2.4.2 Mathematical statistics for the area of communication

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the creative thinking area are shown in Tab. 4.12.

Tab. 4.12 The Mann-Whitney U – test results for the area of communication

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks K_OS	Sum of ranks K_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid K_OS	N valid K_SS
Communication	2651,50	3453,50	1111,50	*-2,458*	*0,014*	155	155

Based on the test results and the p-value (p = 0.014), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of soft skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.7)
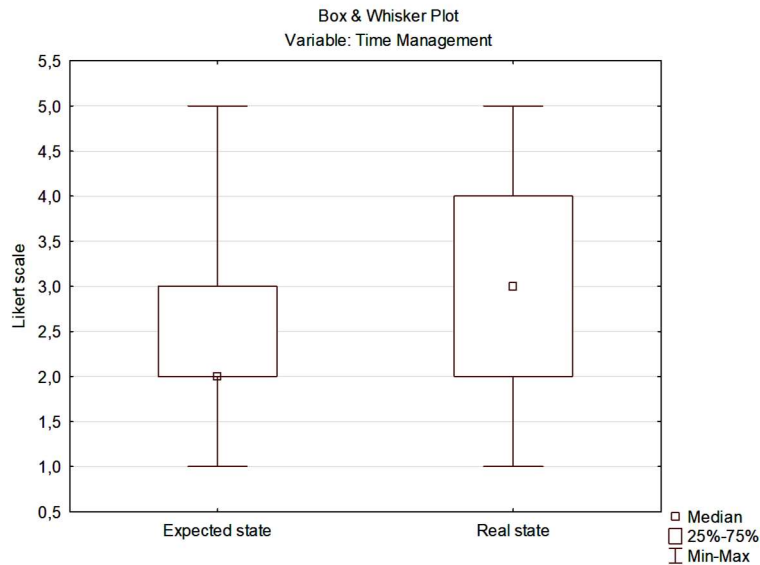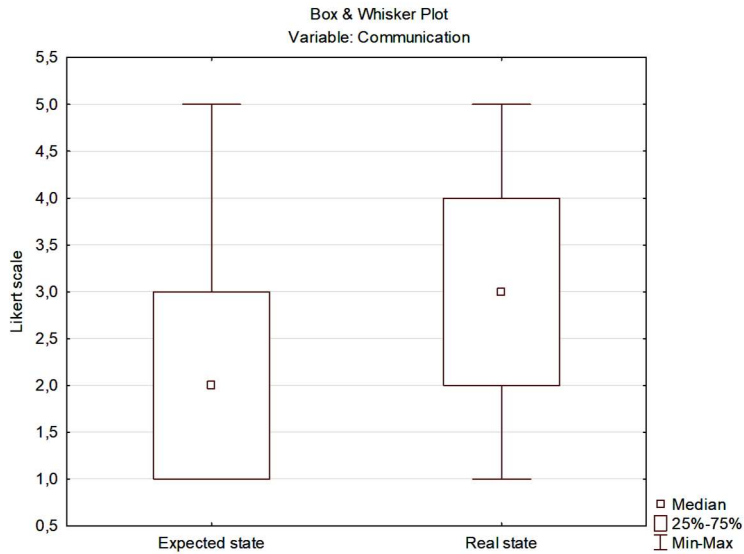
Fig. 4.7 Box plot for the variable of communication

The box plot in Fig. 4.7 shows:

- 25 to 75% of all respondents' assessments in the area of communication for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the median i.e. the middle value, for the expected state of communication is 2.0 which corresponds to a very well developed area of soft skills,

- 25 to 75% of all respondents' assessments in the area of communication for the actual state are within 2-4 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the median for the actual state of communication is 3.0 which is a well-developed soft skills competence.

4.2.5 Assessment of competences in the area of assertiveness

4.2.5.1 Descriptive statistics for the area of assertiveness

Tab. 4.13 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for the assertiveness area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.13 Descriptive statistics parameters for the area of assertiveness

Assertiveness	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	17	10,9	9	5,5
2	45	29,1	53	34,5
3	67	43,6	73	47,3
4	17	10,9	20	12,7
5	9	5,5	0	0,0
Total	155	100	155	100

The radar chart in Fig. 4.8 shows relative frequencies of individual ranks of the Likert scale for the area of assertiveness.
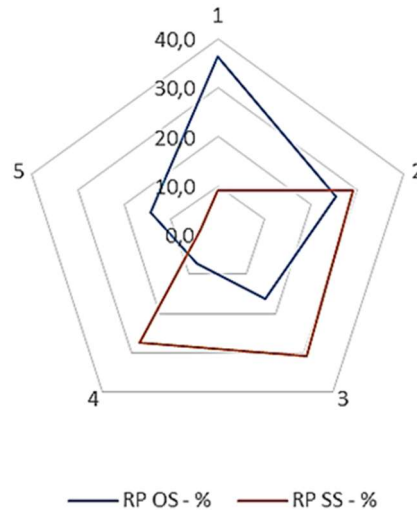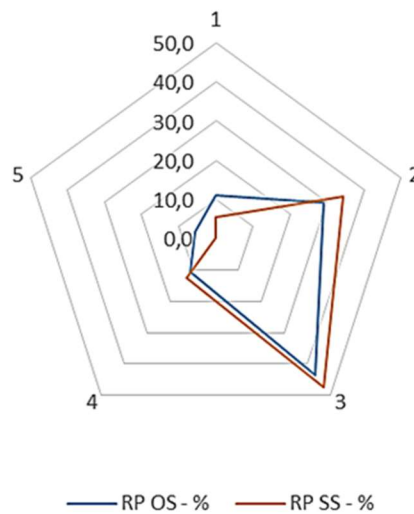

**Fig. 4.8 Radar chart of relative frequencies for Likert scale values
for the area of assertiveness by expected (OS) and actual (SS) states**

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual assessments for the area of assertiveness, it can be concluded that there are no significant differences between the ratings. This was consequently tested by the Mann-Whitney U-test.

4.2.5.2 Mathematical statistics for the area of assertiveness

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing by means of the Mann-Whitney U-test was chosen. The results of the test for the assertiveness evaluation are shown in Tab. 4.14.

Tab. 4.14 Results of Mann-Whitney U–test for the area of assertiveness

Variable	Mann-Whitney U-test The tests are significant at the level of $p < 0.05$						
	Sum of ranks A_OS	Sum of ranks A_SS	Test criterion U - value	Test criterion Z – modified value	p-value	N valid A_OS	N valid A_SS
Assertiveness	3063,00	3042,00	1502,000	0,064	0,949	155	155

The results of the Mann-Whitney U-test for team collaboration did not confirm a significant statistical difference between the expected and actual states of soft skills assessment. Based on the results of testing and the corresponding p value (p = 0.949), the null hypothesis was confirmed; there is no statistically significant difference between the expected and actual states of assertiveness; i.e. reality and expectations are the same. This result points out that graduates predominantly meet the practice requirements for the skills in that area and there is no need to improve teaching in that area. As the significant statistical difference between the expected and the actual situation was not confirmed; a box plot showing the distribution of respondent ratings

is not provided. Median; i.e. the typical value, for the expected assertiveness is 3.0 which means that practice requires well developed skills from graduates.

4.2.6 Stress resistance competence evaluation

4.2.6.1 Descriptive statistics for the stress resistance area

Tab. 4.15 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for stress resistance area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.15 Descriptive statistics parameters for the area of stress resistance

Stress resistance	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	45	29,1	8	5,5
2	51	32,7	56	36,3
3	22	14,5	54	34,5
4	8	5,5	25	16,4
5	29	18,2	12	7,3
Total	155	100	155	100

The radar chart in Fig. 4.9 shows relative frequencies of individual ranks of the Likert scale for stress resistance area.
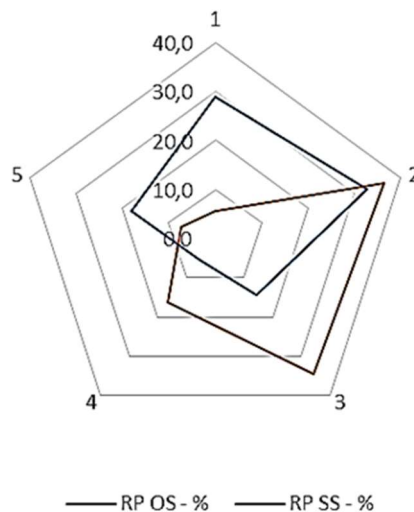
**Fig. 4.9 Radar chart of relative frequencies for Likert scale ranks
for the area of stress resistance area by expected (OS) and actual (SS) states**

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual ratings for stress resistance, it can be concluded that there are considerable differences between ratings. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates, the Mann-Whitney U – test shall be used to test the our results.

4.2.6.2 Mathematical statistics for the area of stress resistance

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the stress resistance area are shown in Tab. 4.16.

Tab. 4.16 The Mann-Whitney U – test results for the area of stress resistance

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks OvS_OS	Sum of ranks OvS_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid OvS_OS	N valid OvS_SS
Stress resistance	2727,50	3377,50	1187,50	*-2,006*	*0,045*	155	155

Based on the test results and the p-value (p = 0.045), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of soft skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.10)
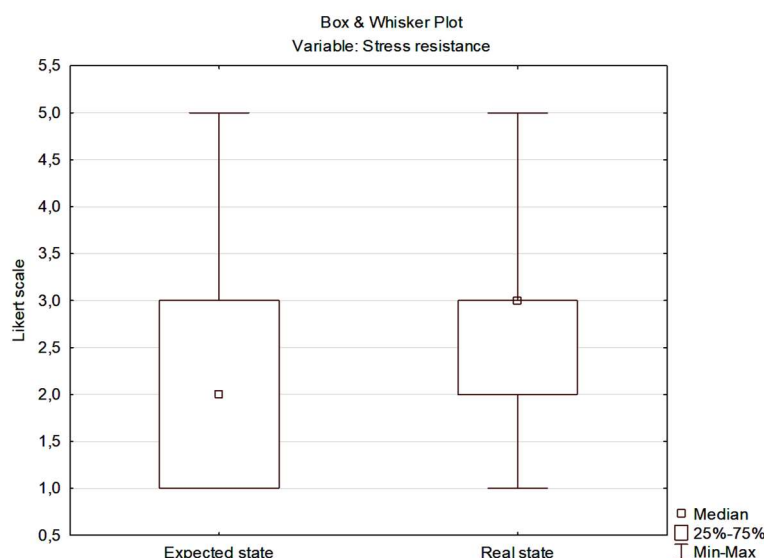
Fig. 4.10 Box plot for the variable of stress resistance

The box plot in Fig. 4.10 shows:

- 25 to 75% of all respondents' assessments in the area of stress resistance for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the median for the expected state of stress resistance is 2.0 which corresponds to a very well developed area of soft skills,

- 25 to 75% of all respondents' assessments in the area of stress resistance for the actual state are within 2-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the middle value, for the actual state of stress resistance is 3.0 which is a well-developed soft skills competence.

4.2.7 Assessment of competences in the area of organisational skills

4.2.7.1 Descriptive statistics for the area of organisational skills

Tab. 4.17 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for the organisational skills area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.17 Descriptive statistics parameters for the area of organisational skills

Organisational skills	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	40	25,5	25	15,7
2	40	25,5	45	29,1
3	36	23,1	45	29,1
4	18	12,4	32	20,6
5	21	13,5	8	5,5
Total	155	100	155	100

The radar chart in Fig. 4.11 shows relative frequencies of individual ranks of the Likert scale for the area of organisational skills.

Fig. 4.11 Radar chart of relative frequencies for Likert scale values
for the area of organisational skills by expected (OS) and actual (SS) states

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual assessments for the area of organisational skills, it can be concluded that there are no significant differences between the ratings. This was consequently tested by the Mann-Whitney U-test.

4.2.7.2 Mathematical statistics for the area of organisational skills

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing by means of the Mann-Whitney U-test was chosen. The results of the test for the organisational skills evaluation are shown in Tab. 4.18.

Tab. 4.18 Results of Mann-Whitney U–test for the area of organisational skills

Variable	Mann-Whitney U-test						
	The tests are significant at the level of $p < 0.05$						
	Sum of ranks OS_OS	Sum of ranks OS_SS	Test criterion U - value	Test criterion Z – modified value	p-value	N valid OS_OS	N valid OS_SS
Organisational skills	2903,00	3202,00	1363,00	-0,915	0,360	155	155

Based on the results of testing and the corresponding p value (p = 0.360), the null hypothesis was confirmed; there is no statistically significant difference between the expected and actual states of organisational skills assessment; i.e. reality and expectations are the same. This result points out that graduates predominantly meet the practice requirements for the skills in that area and there is no need to improve teaching in that area. As the significant statistical difference between the expected and the actual situation was not confirmed; a box plot showing the distribution of respondent ratings is not provided. Median; i.e. the typical value, for the expected organisational skills is 3.0 which means that practice requires well-developed organisational skills from graduates.

4.2.8 Assessment of competences in the area of dealing with conflicts

4.2.8.1 Descriptive statistics for the area of dealing with conflicts

Tab. 4.19 shows summarized results from questionnaires using descriptive characteristics - absolute and relative frequency for dealing with conflicts area. Individual assessments are characterised by Likert scale for expected (OS) and actual (SS) states.

Tab. 4.19 Descriptive statistics parameters for the area of dealing with conflicts

Dealing with conflicts	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	26	16,4	14	9,1
2	48	30,9	53	34,5
3	42	27,3	48	30,9
4	22	14,5	26	16,4
5	17	10,9	14	9,1
Total	155	100	155	100

The radar chart in Fig. 4.12 shows relative frequencies of individual ranks of the Likert scale for the area of dealing with conflicts.
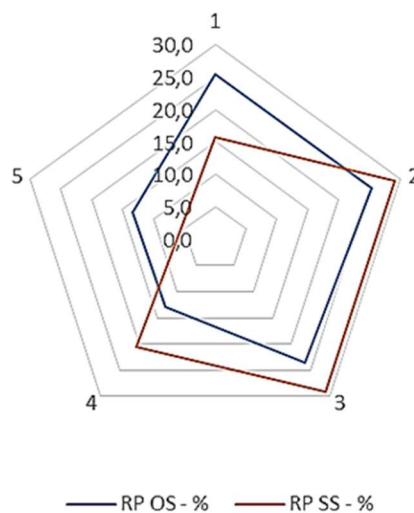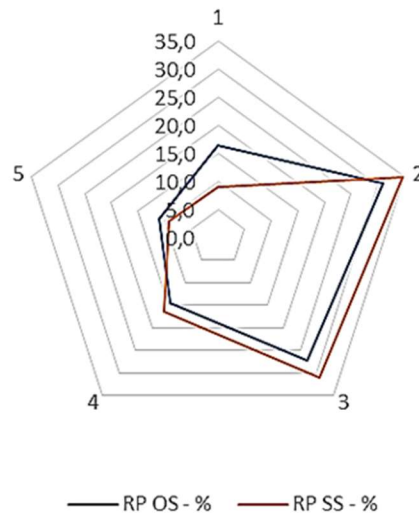
**Fig. 4.12 Radar chart of relative frequencies for Likert scale values
for the area of dealing with conflicts by expected (OS) and actual (SS) states**

By comparing the graphs for the expected (OS) and the actual states (SS) of the relative frequency of individual assessments for the area of dealing with conflicts, it can be concluded that there are no significant differences between the ratings. This was consequently tested by the Mann-Whitney U-test.

4.2.8.2 Mathematical statistics for the area of dealing with conflicts

In order to test the significance of the difference between the expected and the actual states of soft skills competencies for graduates of technical faculties, nonparametric testing by means of the Mann-Whitney U-test was chosen. The results of the test for the dealing with conflicts evaluation are shown in Tab. 4.20.

Tab. 4.20 Results of Mann-Whitney U–test for the area of dealing with conflicts

Variable	Mann-Whitney U-test The tests are significant at the level of $p < 0.05$						
	Sum of ranks RK_OS	Sum of ranks RK_SS	Test criterion U - value	Test criterion Z – modified value	p-value	N valid RK_OS	N valid RK_SS
Dealing with conflicts	2975,50	3129,50	1435,50	-0,474	0,636	155	155

Based on the results of testing and the corresponding *p* value (*p* = 0.636), the null hypothesis was confirmed; there is no statistically significant difference between the expected and actual states of dealing with conflicts assessment; i.e. reality and expectations are the same. This result points out that graduates predominantly meet the practice requirements for the skills in that area and there is no need to improve teaching in that area. As the significant statistical difference between the expected and the actual situation was not confirmed; a box plot showing the distribution of respondent ratings is not provided. Median; i.e. the typical value, for the expected dealing with conflicts is 3.0 which means that practice requires well-developed skills from graduates.

4.3 Results for the assessment of information and communication competences in enterprises

The research results for the assessment of information and communication competences in enterprises are classified in the next chapter for each of the six areas of the assessment. Considering the clarity of results and comparison of individual areas for the expected and actual situations, the following chapters give an assessment of each area of ICT skills individually. Testing of the normality of the examined variables is given in Chapter 4.1.

Individual evaluation areas include:

1. Evaluation by descriptive statistics:

- the absolute frequency (AP) for the expected (OS) and actual state (SS) of the assessed ICT area.

- Relative variable frequency (DP) for expected (OS) and actual state (SS) expressed in %.

- a radar chart comparing Likert scale ratings for expected (OS) and actual (SS) states of a variable - specific area of competence in information and communication technologies.

2. Evaluation by mathematical statistics: the hypothesis was tested by Mann-Whitney U – test, whether or not the difference between expectations and the actual situations in a specific area of ICT
is statistically significant. If the test showed the significance, the test results are also shown in a box plot. It is also possible to identify a typical mean value of a variable from the plot.

4.3.1 Assessment of competences in the area of standard Office software use

4.3.1.1 Descriptive statistics for the area of standard Office software use

Tab 4.21 shows summarised results of the questionnaire evaluation via descriptive characteristics – absolute and relative frequency for the area of standard Office software use. The individual evaluations by Likert scale on expected (OS) and actual states (SS) are specified.

Tab. 4.21 Descriptive statistics parameters for the area of standard Office software use

Standard Office software use	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	76	49.5	51	32.2
2	33	21	67	44.3
3	41	26.1	19	12.1
4	5	3.4	16	10.1
5	0	0	2	1.3
Total	155	100	155	100

Radar chart Fig. 4.13 shows the results of relative frequency of individual evaluations of Likert scale for the competences in the area of standard Office software use.

Fig. 4.13 Radar chart of relative frequencies of levels of Likert scale for the competences in the area of standard Office software use on the expected (OS) and actual state (SS)

By comparing the charts for the expected (OS) and the actual states (SS) of the relative frequencies of individual evaluations in the use of standard Office software; it can be concluded that there are significant differences between evaluations. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates in the area of standard Office software use, the results were tested by the Mann-Whitney U-test.

4.3.1.2 Mathematical statistics for the area of standard Office software use

In order to test the significance of the difference between the expected and the actual states of hard IKT skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the standard Office software use area are shown in Tab. 4.22.

Tab. 4.22 The Mann-Whitney U – test results for the area of standard Office software use

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks OFF_OS	Sum of ranks OFF_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid OFF_OS	N valid OFF_SS
Standard Office use	2541,50	3563,50	1001,50	*-3,513*	*0,001*	155	155

Based on the test results and the p-value (p = 0.001), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.14).

Fig. 4.14 Box plot for the variable of standard Office software use

The box plot in Fig. 4.14 shows:

- 25 to 75% of all respondents' assessments in the area of standard Office software use for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the middle value, for the expected state of standard Office software use is 1.0 which corresponds to a excellently developed area of hard skills,

- 25 to 75% of all respondents' assessments in the area of standard Office software use for the actual state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the median for the actual state of standard Office software use is 3.0 which is a well-developed hard skills competence.

4.3.2 Assessment of competences in the area of presentation software

4.3.2.1 Descriptive statistics for the area of presentation software

Tab 4.23 shows summarised results of the questionnaire evaluation via descriptive characteristics – absolute and relative frequency for the area of presentation software use. The individual evaluations by Likert scale on expected (OS) and actual states (SS) are specified.

Tab. 4.23 Descriptive statistics parameters for the area of presentation software use

Presentation software use	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	82	53	32	20,3
2	19	12,2	28	18,6
3	35	22,7	77	49,5
4	14	9,2	18	11,6
5	5	2,9	0	0
Total	155	100	155	100

Radar chart Fig. 4.15 shows the results of relative frequency of individual evaluations of Likert scale for the competences in the area of presentation software use.
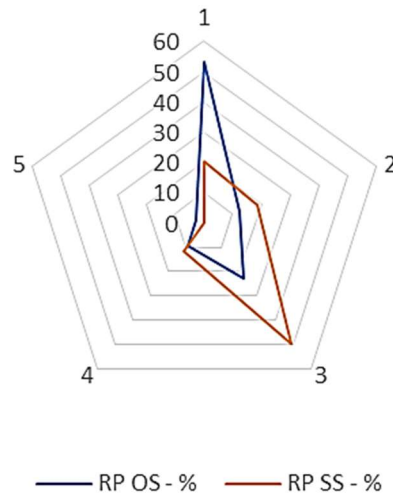
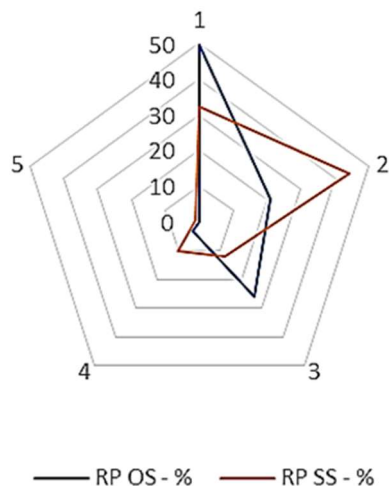**Fig. 4.15 Radar chart of relative frequencies of levels of Likert scale for the competences in the area of presentation software use on the expected (OS) and actual state (SS)**

By comparing the charts for the expected (OS) and the actual states (SS) of the relative frequencies of individual evaluations in the use of presentation software; it can be concluded that there are significant differences between evaluations. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates in the area of presentation software use, the results were tested by the Mann-Whitney U-test.

4.3.2.2 Mathematical statistics for the area of presentation software use

In order to test the significance of the difference between the expected and the actual states of hard skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the presentation software use area are shown in Tab. 4.24.

Tab. 4.24 The Mann-Whitney U – test results for the area of presentation software use

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks PP_OS	Sum of ranks PP_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid PP_OS	N valid PP_SS
Presentation software use	2517,00	3588,00	*0,001*	*-3,594*	*0,001*	155	155

Based on the test results and the p-value (p = 0.001), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.16)
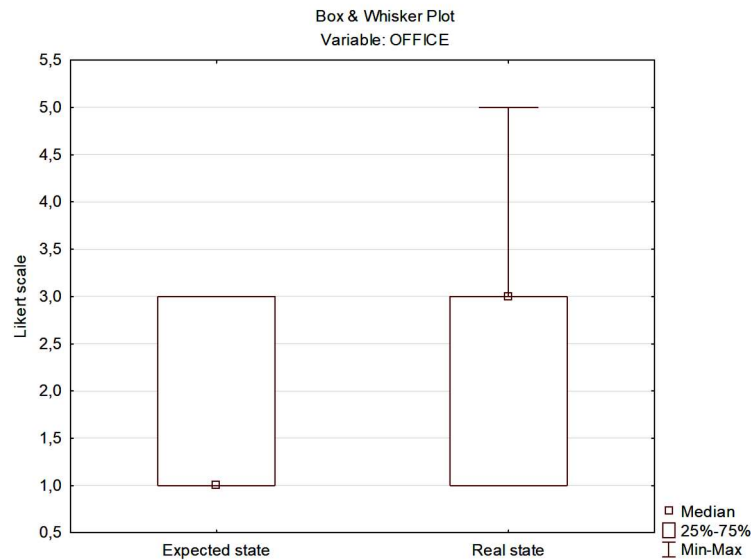
Fig. 4.16 Box plot for the variable of presentation software use

The box plot in Fig. 4.16 shows:

- 25 to 75% of all respondents' assessments in the area of presentation software use for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,

- the middle value, for the expected state of presentation software use is 1.0 which corresponds to a excellently developed area of hard skills,

- the median for the actual state of presentation software use is 3.0 which is a well-developed hard skills competence.

4.3.3 Assessment of competences in the area of internet and e-mail communication use

4.3.3.1 Descriptive statistics for the area of internet and e-mail communication use

Tab 4.25 shows summarised results of the questionnaire evaluation via descriptive characteristics – absolute and relative frequency for the area of internet and e-mail communication use. The individual evaluations by Likert scale on expected (OS) and actual states (SS) are specified.

Tab. 4.25 Descriptive statistics parameters for the area of internet and e-mail communication use

Internet and e-mail communication use	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	123	79,1	117	75,2
2	27	17,6	9	5,9
3	4	2,5	29	18,9
4	1	0,8	0	0
5	0	0	0	0
Total	155	100	155	100

Radar chart Fig. 4.17 shows the results of relative frequency of individual evaluations of Likert scale for the competences in the area of internet and e-mail communication use.

**Fig. 4.17 Radar chart of relative frequencies of levels of Likert scale for the competences
in the area of internet and e-mail communication use on the expected (OS) and actual state (SS)**

By comparing the charts for the expected (OS) and the actual states (SS) of the relative frequencies of individual evaluations in the use of internet and e-mail communication; it can be concluded that there are significant differences between evaluations. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates in the area of internet and e-mail communication use, the results were tested by the Mann-Whitney U-test.

4.3.3.2 Mathematical statistics for the area of internet and e-mail communication use

In order to test the significance of the difference between the expected and the actual states of hard IKT skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for internet and e-mail communication use area are shown in Tab. 4.26.

Tab. 4.26 The Mann-Whitney U – test results for the area of internet and e-mail communication use

Variable	Mann-Whitney U-Test Significance level p < 0.05						
	Sum of ranks I-E_OS	Sum of ranks I-E_OS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid I-E_OS	N valid I-E_OS
Internet and e-mail commun. use	2761,50	3343,50	0,082	*-2,053*	*0,041*	155	155

Based on the test results and the p-value (p = 0.041), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.18)
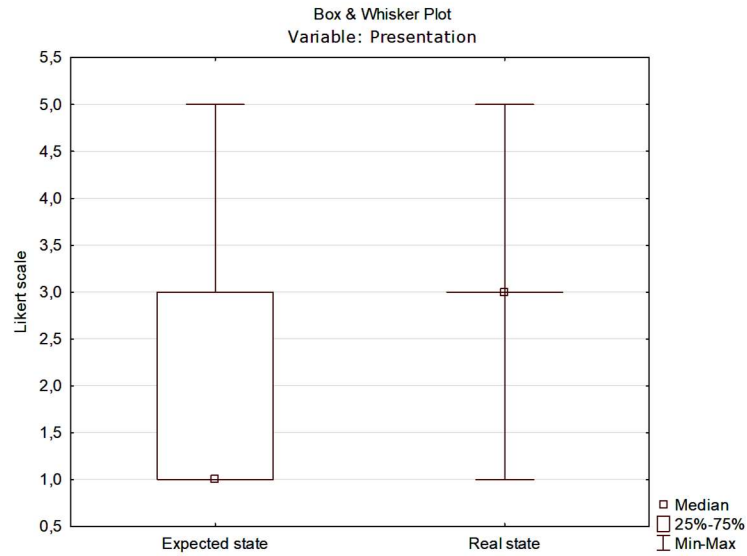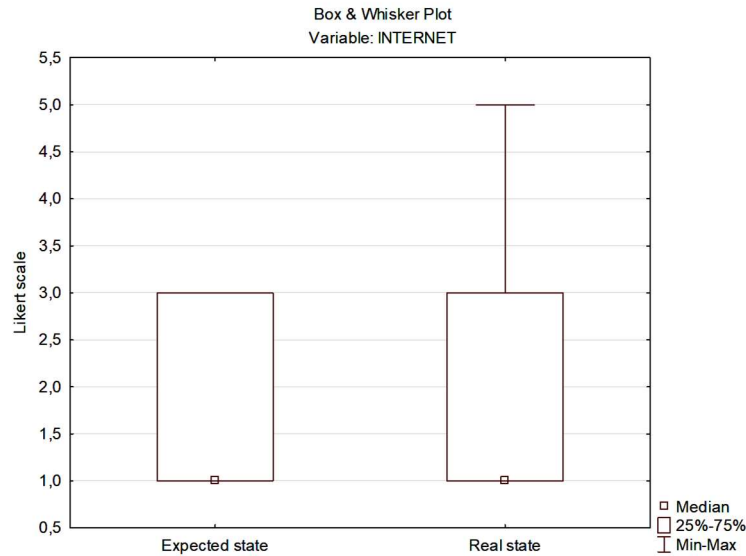
Fig. 4.18 Box plot for the variable of internet and e-mail communication use

The box plot in Fig.4.18 shows:

- 25 to 75% of all respondents' assessments in the area of internet and e-mail communication use for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,
- the middle value, for the expected state of internet and e-mail communication use is 1.0 which corresponds to a excellently developed area of hard skills,
- 25 to 75% of all respondents' assessments in the area of internet and e-mail communication usefor the actual state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles,
- the median for the actual state of internet and e-mail communication use is 1.0 which is a excellently developed hard skills competence.

4.3.4 Assessment of competences in the area of graphic programs´ use

4.3.4.1 Descriptive statistics for the area of graphic programs´ use

Tab 4.27 shows summarised results of the questionnaire evaluation via descriptive characteristics – absolute and relative frequency for the area of graphic CAD programs´ use. The individual evaluations by Likert scale on expected (OS) and actual states (SS) are specified.

Tab. 4.27 Descriptive statistics parameters for the area of graphic programs´ use

Graphic programs´ use	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	63	40,4	21	13,8
2	16	10,6	30	19,3
3	38	24,5	39	25,5
4	14	9	46	29,3
5	24	15,5	19	12,1
Total	155	100	155	100

Radar chart Fig.4.19 shows the results of relative frequency of individual evaluations of Likert scale for the competences in the area of graphic programs´ use.
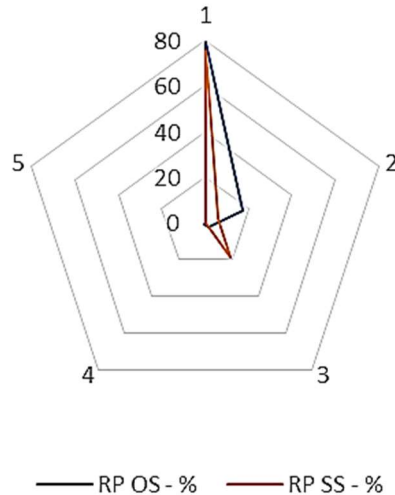

Fig. 4.19 Radar chart of relative frequencies of levels of Likert scale for the competences in the area of graphic programs´ use on the expected (OS) and actual state (SS)

By comparing the charts for the expected (OS) and the actual states (SS) of the relative frequencies of individual evaluations in the use of graphic programs; it can be concluded that there are significant differences between evaluations. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates in the area of graphic programs´ use, the results were tested by the Mann-Whitney U-test.

4.3.4.2 Mathematical statistics for the area of graphic programs´ use

In order to test the significance of the difference between the expected and the actual states of hard skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for graphic CAD programs´ use area are shown in Tab. 4.28.

Tab. 4.28 The Mann-Whitney U – test results for the area of graphic programs´ competences

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks KM_OS	Sum of ranks KM_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid KM_OS	N valid KM_SS
Graphic - CAD programs	2321,50	3783,50	*0,0001*	*-4,671*	*0,000003*	155	155

Based on the test results and the p-value (p = 0.000003), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.20)

Fig. 4.20 Box plot for the variable of graphic programs competence

The box plot in Fig. 4.20 shows:

− 25 to 75% of all respondents' assessments in the area of graphic programs´ competence for the expected state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles;

− the middle value, for the expected state of graphic programs´ use is 3.0 which corresponds to a well-developed area of soft skills;

− 25 to 75% of all respondents' assessments in the area of graphic programs´ use for the actual state are within 1-3 of Likert scale corresponding to the 2nd and 3rd quartiles;

− the median for the actual state of graphic programs´ use is 3.0 which is a well-developed hard skills competence.

4.3.5 Assessment of competences in the area of analytic programs´ use

4.3.5.1 Descriptive statistics for the area of analytic programs´ use

Tab 4.29 shows summarised results of the questionnaire evaluation via descriptive characteristics – absolute and relative frequency for the area of analytic programs´ use. The individual evaluations by Likert scale on expected (OS) and actual states (SS) are specified.

Tab. 4.29 Descriptive statistics parameters for the area of analytic programs´ use

Analytic programs´ use	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	10	6,5	3	2,1
2	5	3,2	7	4,8
3	50	32,1	19	11,9
4	25	16	15	9,7
5	65	42,2	111	71,5
Total	155	100	155	100

Radar chart Fig. 4.21 shows the results of relative frequency of individual evaluations of Likert scale for the competences in the area of analytic programs´ use.
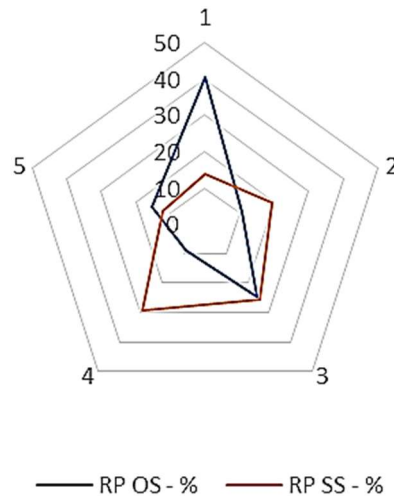

Fig. 4.21 Radar chart of relative frequencies of levels of Likert scale for the competences in the area of analytic programs´ use on the expected (OS) and actual state (SS)

By comparing the charts for the expected (OS) and the actual states (SS) of the relative frequencies of individual evaluations in the use of analytic programs; it can be concluded that there are significant differences between evaluations. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates in the area of analytic programs´ use, the results were tested by the Mann-Whitney U-test.

4.3.5.2 Mathematical statistics for the area of analytic programs´ use

In order to test the significance of the difference between the expected and the actual states of IKT hard skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for analytic programs´ use area are shown in Tab. 4.30.

Tab. 4.30 The Mann-Whitney U – test results for the area of analytic programs´ use

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks AP_OS	Sum of ranks AP_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid AP_OS	N valid AP_SS
Analytic programs	2629,50	3475,50	*0,012*	*-2,919*	*0,004*	155	155

Based on the test results and the p-value (p = 0.004), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.22)
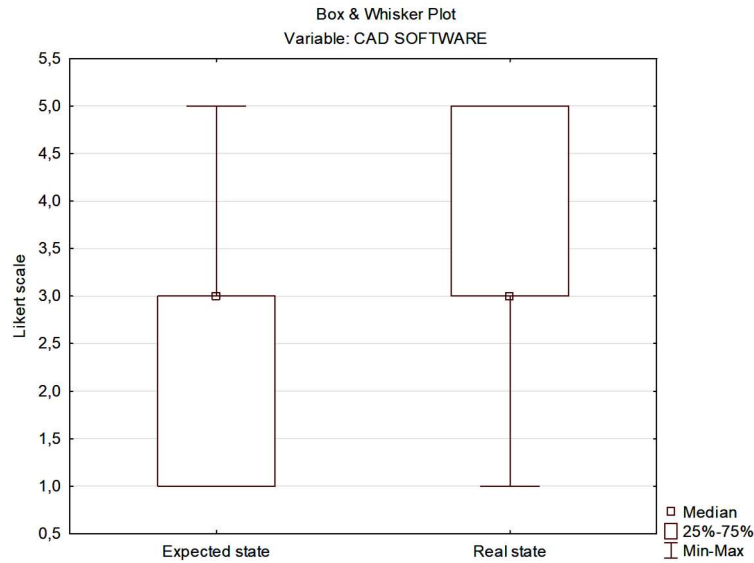
Fig. 4.22 Box plot for the variable of analytic programs´ use

The box plot in Fig. 4.22 shows:

- 25 to 75% of all respondents' assessments in the area of analytic programs´ use for the expected state are within 3-5 of Likert scale corresponding to the 2nd and 3rd quartiles;

- the middle value, for the expected state of analytic programs´ use is 3.0 which corresponds to a well-developed area of hard skills;

- 25 to 75% of all respondents' assessments in the area of analytic programs´ use for the actual state are within 3-5 of Likert scale corresponding to the 2nd and 3rd quartiles;

- the median for the actual state of analytic programs´ use is 5.0 which is a not developed hard skills competence.

4.3.6 Assessment of competences in the area of simulation software use

4.3.6.1 Descriptive statistics for the area of simulation software use

Tab 4.31 shows summarised results of the questionnaire evaluation via descriptive characteristics – absolute and relative frequency for the area of simulation software use. The individual evaluations by Likert scale on expected (OS) and actual states (SS) are specified.

Tab. 4.31 Descriptive statistics parameters for the area of simulation software use

Simulation software use	Expected state - OS		Actual state - SS	
Likert scale	Frequency	Relative frequency %	Frequency	Relative frequency %
1	13	8,2	5	2,9
2	15	9,5	6	3,4
3	61	40	15	9,9
4	34	21,9	67	44,1
5	32	20,4	62	39,7
Total	155	100	155	100

Radar chart Fig. 4.23 shows the results of relative frequency of individual evaluations of Likert scale for the competences in the area of simulation software use.
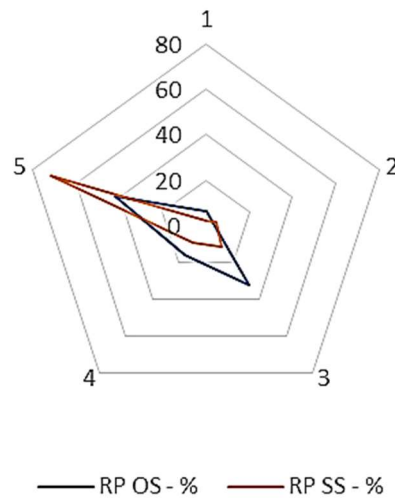
107
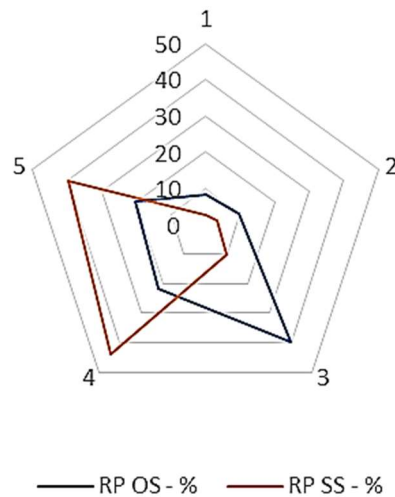
Fig. 4.23 Radar chart of relative frequencies of levels of Likert scale for the competences in the area of simulation software use on the expected (OS) and actual state (SS)

By comparing the charts for the expected (OS) and the actual states (SS) of the relative frequencies of individual evaluations in the use of simulation software; it can be concluded that there are significant differences between evaluations. To confirm the hypothesis about the significance of the difference between the expectations of practice and actual knowledge of graduates in the area of simulation software use, the results were tested by the Mann-Whitney U-test.

4.3.6.2 Mathematical statistics for the area of simulation software use

In order to test the significance of the difference between the expected and the actual states of hard skills competencies for graduates of technical faculties, nonparametric testing of the Mann-Whitney U-test was chosen. The test results for the simulation software use area are shown in Tab. 4.32.

Tab. 4.32 The Mann-Whitney U – test results for the area of simulation programs´ use

Variable	Mann-Whitney U-Test Significance level $p < 0.05$						
	Sum of ranks SP_OS	Sum of ranks SP_SS	U – value of tested criterion	Z – modified value of tested criterion	p-value	N valid SP_OS	N valid SP_SS
Simulation software use	2452,00	3653,00	*0,0003*	*-4,141*	*0,000035*	155	155

Based on the test results and the p-value (p = 0.000035), the null hypothesis is rejected and incline to the alternative hypothesis that there is a statistically significant difference between the expected and actual states of skills assessment. The box plot shows the results of respondents' evaluation (Fig. 4.24)
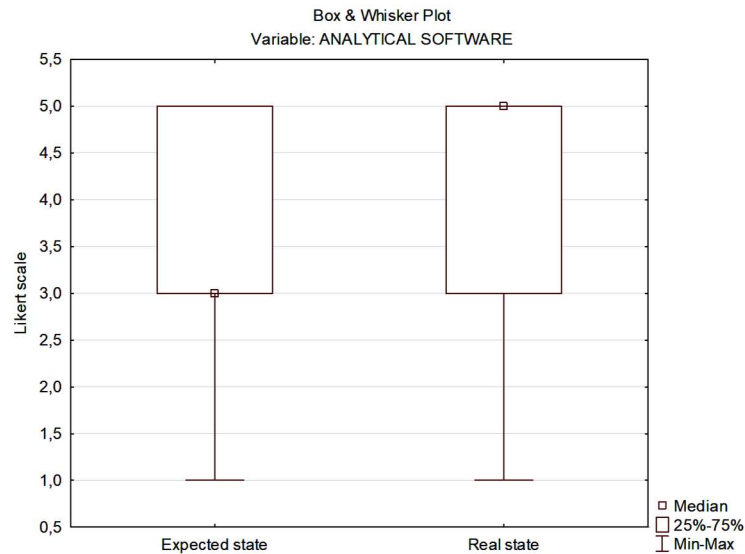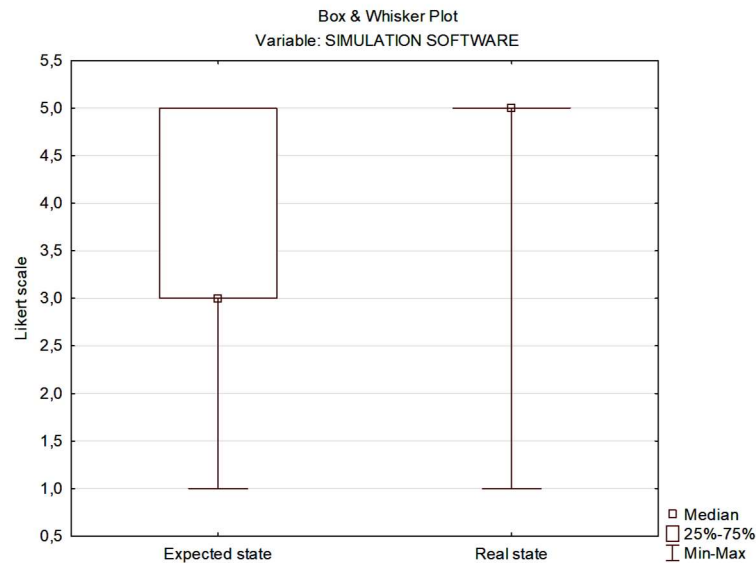
Fig. 4.24 Box plot for the variable of simulation software use

The box plot in Fig. 4.24 shows:

- 25 to 75% of all respondents' assessments in the area of simulation software use for the expected state are within 3-5 of Likert scale corresponding to the 2nd and 3rd quartiles;

- the middle value, for the expected state of simulation software use is 3.0 which corresponds to a well-developed area of hard skills;

- the median for the actual state of simulation software use is 5.0 which is a not developed hard skills competence.

4.4 Results of research of students' self – assessment of soft – skills competencies and knowledge of ICT

In the following part, the results of research for self - assessment of competences of soft - skills and knowledge of information and communication technologies by students are analysed. The results of a questionnaire survey conducted among students of technical study programmes are evaluated. The areas of assessment of soft skills and ICT as well as the scale of assessment were the same as in the questionnaires for enterprises. The concept of the questionnaire content is explained in chapter 3.1.4. In the questionnaire focusing on the self-evaluation of their knowledge, it was found out which of the soft skills and competences in ICT they develop within the educational process in their field of study and moreover their own self-evaluation of the achieved level of knowledge. The areas of soft skills and ICT, as well as the rating scale, were the same as in the questionnaires for enterprises.

The population of the research accounted for 132 students. The description of respondents is in chapter 3.1.5. Table 4.1 presents the variable definition for self-assessment of the actual state of knowledge of the students used in the following text. In chapter 4.1, Table 4.4 gives the results of the Shapiro-Wilk test of normality of students' self-assessment for soft skills and ICT competencies. Based on which, it can be concluded that given samples do not follow the normal probability distribution. Research results for students' evaluation of soft skills and hard skills (ICT) competencies were evaluated on two levels:

1. Descriptive statistics evaluated absolute (AP) and relative (RP) frequencies of variables for self-assessment of individual areas of soft skills and ICT competencies.

2. The significance of the difference between the students' self-assessment and the evaluation of the actual state of analysed competences of graduates by companies was tested by Mann-Whitney test.

4.4.1 Descriptive Statistics for Self-Assessment of Students' Competencies in the areas of Soft-Skills and Information and Communication Technologies

Table 4.33 summarizes the students' self-assessment results from questionnaires using descriptive characteristics - absolute and relative frequencies for each area of soft - skills competence. Individual specific areas are evaluated by the Likert scale for expected (OS) and actual state (SS).

Tab. 4.33 Descriptive statistics characteristics for individual areas of soft skills

Likert scale		1		2		3		4		5	
Absolute (AP)/ Relative frequency (RP - %)		AP	RP	AP	RP	AP	RP	AP	RP	AP	RP
Area of assessment	Marked										
Creative thinking	KM_RS	19	14.4	61	46.2	31	23.5	17	12.9	4	3.0
Teamwork	PvT_RS	39	29.5	57	43.2	23	17.4	9	6.8	4	3.0
Time management	TM_RS	9	6.8	33	25.0	67	50.8	18	13.6	5	3.8
Communication	K_RS	23	17.4	61	46.2	36	27.3	10	7.6	2	1.5
Assertiveness	A_RS	11	8.3	31	23.5	79	59.8	9	6.8	2	1.5
Stress resistance	OvS_RS	15	11.4	36	27.3	42	31.8	27	20.5	12	9.1
Organisational skills	OS_RS	25	18.9	50	37.9	43	32.6	10	7.6	4	3.0
Conflict resolution	RK_RS	11	8.3	31	23.5	59	44.7	24	18.2	7	5.3

Table 4.33 summarizes the students' self-assessment results from questionnaires using descriptive characteristics - absolute and relative frequencies for each area of information-communication technologies competences. Individual specific areas are evaluated by the Likert scale for expected (OS) and actual state (SS).

Tab. 4.34 Descriptive statistics characteristics for the areas of information-communication technologies

Likert scale		1		2		3		4		5	
Absolute (AP)/ Relative frequency (RP - %)		AP	RP	AP	RP	AP	RP	AP	RP	AP	RP
Area of assessment	Marked										
Standard Office	OFF_RS	34	25.8	56	42.4	38	28.8	2	1.5	2	1.5
Power Point presentations	PP_RS	34	25.8	54	40.9	37	28.0	5	3.8	2	1.5
Internet, e-mail	I-E_RS	34	25.8	49	37.1	35	26.5	10	7.6	4	3.0
Graphic CAD programs	CAD_RS	5	3.8	15	11.4	22	16.7	22	16.7	68	51.5
Analytical programs	AP_RS	0	0.0	1	0.8	11	8.3	30	22.7	90	68.2
Simulation programs	SP_RS	0	0.0	2	1.5	8	6.1	13	9.8	109	82.6

4.4.2 Mathematical statistics comparing student versus enterprise

In order to test the significance of the difference between students' self-assessment (ST_S) and the enterprises' assessment of graduates from technical universities (COM_E), non-parametric testing by Mann-Whitney U-test was chosen. The results for the areas of soft - skills assessment are shown in Tab. 4.35.

Tab. 4.35 The results of Mann-Whitney U – test for the individual areas of soft-skills.

Variable	Mann-Whitney U Test The tests are significant at level p < 0,05						
	Sum of ranks ST_S	Sum of ranks COM_E	Tested criterion U - value	Z – modified value of tested criterion	p-value	N valid ST_S	N valid COM_E
Creative thinking	11587.00	5991.00	2809.00	-2.561	*0.0104*	132	155
Teamwork	11400.50	6177.50	2622.50	-3.130	*0.0017*	132	155
Time management	11400.50	6177.50	2622.50	-3.130	*0.0017*	132	155
Communication	11253.50	6324.50	2475.50	-3.603	*0.0003*	132	155
Assertiveness	12520.50	5057.50	3517.50	0.371	0.7109	132	155
Stress resistance	12525.00	5053.00	3513.00	0.358	0.7201	132	155
Organisational skills	11617.50	5960.50	2839.50	-2.445	*0.0145*	132	155
Conflict resolution	12632.00	4946.00	3406.00	0.696	0.4866	132	155

Based on the test results and the corresponding *p*-value (p = 0.005), we reject the null hypothesis and incline towards the alternative hypothesis that there is a statistically significant difference between the assessment of soft skills by students and companies in the following areas of evaluation:

- Creative thinking,

- Teamwork,

- Time management,

- Communication,

Organizational skills.

For the other assessed areas (assertiveness, stress resistance, and conflict resolution), testing confirmed the null hypothesis that there is no statistically significant difference between the expected and actual state of soft skills assessment.

The results of the test for the areas of information and communication technologies competences are shown in Tab. 4.36.

Tab. 4.36 The results of Mann-Whitney U – test for individual areas of ICT competences

| Variable | Mann-Whitney U Test The tests are significant at level p < 0,05 | | | | | | |
	Sum of ranks ST_S	Sum of ranks COM_E	Tested criterion U - value	Z – modified value of tested criterion	p-value	N valid ST_S	N valid COM_E
Standard Office	11931.00	5647.00	3153.00	-1.493	0.1354	132	155
Power Point presentations	11156.50	6421.50	2378.50	-3.923	*0.0001*	132	155
Internet, e-mail	12873.00	4705.00	3165.00	1.442	0.1493	132	155
Graphic CAD programs	12648.00	4930.00	3390.00	0.769	0.4419	132	155
Analytical programs	12467.00	5111.00	3571.00	0.214	0.8306	132	155
Simulation programs	12574.00	5004.00	3464.00	0.731	0.4651	132	155

The results of the Mann-Whitney U - test for individual areas of information and communication technologies competences confirmed a significant statistical difference between students' and enterprises' assessment only in the area of skills in presentation software (p = 0.0001). In the case of other information and communication competences, based on the results of the testing and the relevant p-value, that the null hypothesis can be confirmed, that there is no statistically significant difference in the students' and enterprises' assessment; i.e. the reality in ICT competences assessed by students and enterprises is the same. On the basis of this result we can assume that graduates mostly meet the requirements of practice for skills in the given area and there is no need to improve teaching in the field.

Based on the results of testing the significance of the difference by Mann-Whitney U-test shown in Tab. 4.35 and 4.36 were specified areas where testing confirmed a significant statistical difference between students' versus enterprises' assessment. The following part brings the graphical illustration of the test of significance using box quartile plots for areas with a confirmed, statistically significant difference.
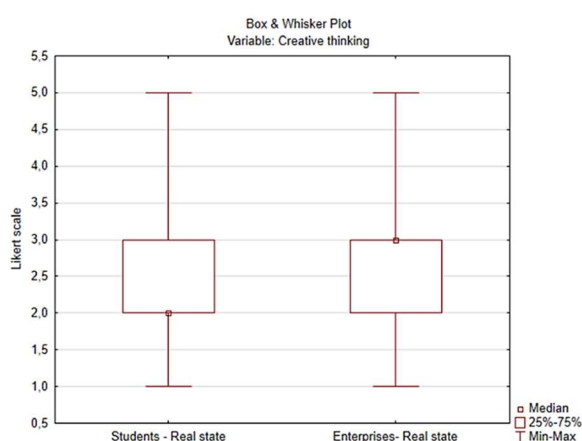

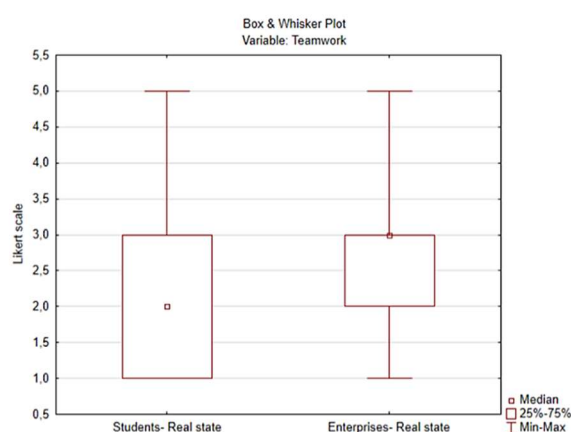**Fig. 4.25 Box plot for Creative thinking – students vs. enterprises**

Fig. 4.26 Box plot for Teamwork – students vs. enterprises
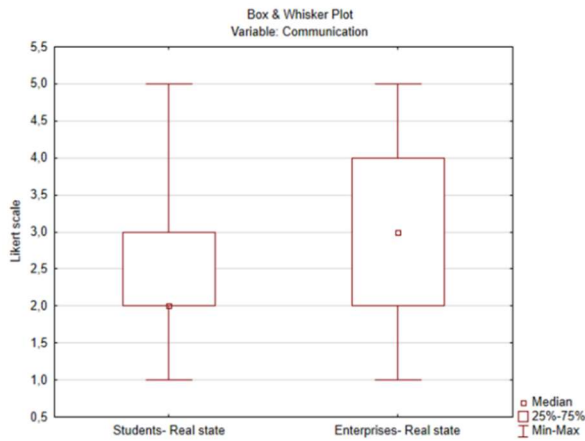
Fig. 4.27 Box plot for Communication – students vs. enterprises
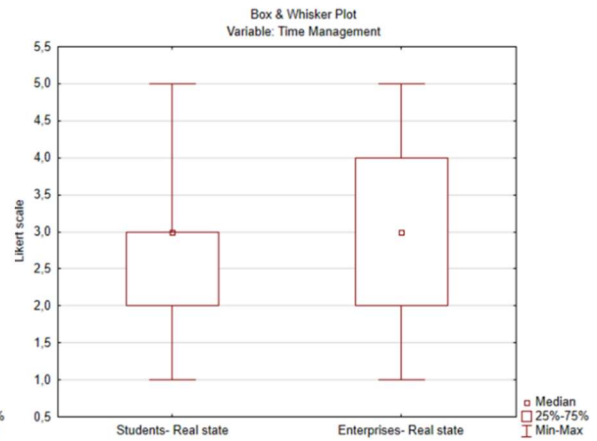
Fig. 4.28 Box plot for Time management – students vs. enterprises
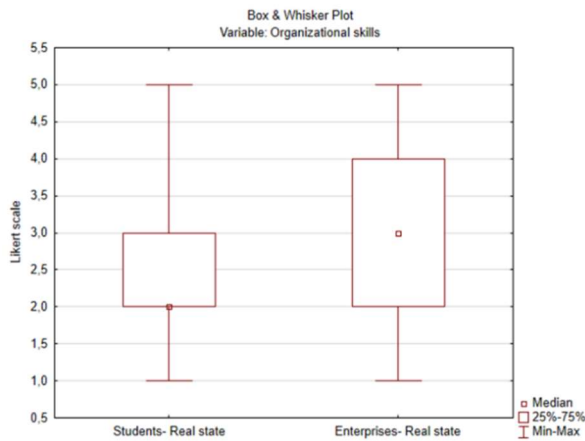
Fig. 4.29 Box plot for Organizational skills – students vs. enterprises
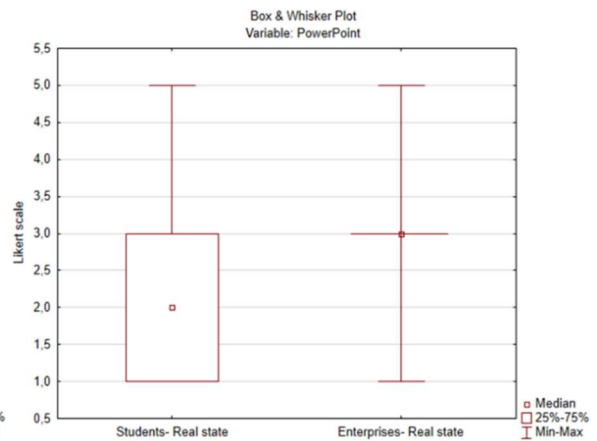
Fig. 4.30 Box plot for presentation competences – students vs. enterprises

Based on the results presented in Fig. 4.25 to 4.30, it can be generally summarised that self-assessment of competences by students is better than the assessment of graduates by enterprises. This means that students assess themselves more positively than the reality assessed by employers in enterprises when assessing the skills of newly hired graduates.

5 EVALUATION OF RESEARCH RESULTS AND COMPETENCY MODELS PROPOSAL

In general, the current labour market dynamics are causing a major change in the original orientation of higher education. In addition to what a graduate is to know in terms of the knowledge theoretically acquired, the labour market today defines quite clearly the specific requirements in terms of what a graduate should be able to do, provide for, organize, including the demands related to their competences.

To have competence means that a person possesses a set of interrelated knowledge, skills, abilities, and attitudes, which enables them to successfully handle various life (personal, work, social) situations. Competence is understood as the penetration of acquired knowledge, acquired skills, skills forming attitudes, value orientation, motives for action. Competence is a behaviour (activity, complex of activities) that characterizes excellent performance in a certain area of activity. Competence has the ability to develop continuously, so it can be the basis of lifelong learning and personal flexibility of the individual. The acquisition of key competences is not only a matter of the individual's personal efforts and efforts but also requires favourable conditions in the social and economic environment. It is clear from the above that there is a link between quality work and competences with the possibility of great impact not only on the educational process.

In the academic year 2018-2019, we conducted research at the Technical University in Zvolen, which focused on the evaluation of practice requirements for knowledge competencies of graduates of technical universities. Relevant areas of soft-skills assessment and information-communication technologies (one of the areas of hard-skills) were specified for the analysis of knowledge competencies of university graduates of technical studies. The questionnaire survey method was conducted within the research. Two groups of respondents were addressed - enterprise respondents who evaluated the expected (or required) and actual state of competencies of university graduates and current university students who assessed their own level of knowledge in the specified areas.

The aim of the questionnaire research was to summarize the knowledge of the student - graduate of a technical or technological university and find out which of them are the priority for their successful employment in practice or what competencies of the graduates need to be improved within the study. Educational institutions gained important feedback by analysing and evaluating the questionnaire. Further, the results were compared with the level of education provided in the relevant areas - soft skills and information and communication skills.

Based on the previous literary research, the soft - skills competences were chosen which are important, in our opinion, in positions occupied by graduates of technical university studies. The following eight areas of soft skills were specified for the analysis: creative thinking, teamwork, time management, communication, assertiveness, stress resistance, organizational skills and competences, conflict resolution. Subsequently, from the perspective of future employers, the knowledge competences that employers expect from graduates of the technical university as well as the knowledge that newly recruited employees - graduates of a technological university actually achieve, were evaluated.

The starting point to design technical or professional areas of graduate´s evaluation was the assumption that the basic requirement of employers in the employment of university graduates is an excellent knowledge of computer applications and work with information technologies.

Within the research of knowledge competences of graduates of technical faculties, information - communication technologies were chosen as a representative of hard - skills. In the context of a large number of different computer applications, the following areas of evaluation were selected for the evaluation of ICT competencies: standard Office software, presentation software applications for presentation creation, internet and e-mail communication, special software - graphical programs, analysis programs, and simulation software. As with the assessment of soft skills and ICT skills, the future employers assessed the competences which are expected of graduates from the technical university, and the knowledge actually achieved by newly recruited employees - graduates of the technical university.

Eight relevant areas of soft skills assessment and six areas of ICT competencies were evaluated within the scope of the questionnaire. Respondents evaluated individual areas through the Likert scale of assessment, where they expressed their agreement with a verbal statement on a numerical scale (1-5): excellently developed, very well developed, well developed, sufficiently developed, not developed (Table 3.1). The respondents chose just one rank in each evaluation area, which was represented in the evaluation of the questionnaire by the relevant point value.

In addition to assessing the requirements of practice, the research also focused on students' views on the quality of education presented through their self-assessment of the quality and applicability of the knowledge gained by studying in the analysed areas of soft skills and ICT competencies. A questionnaire was created for the area, in which students evaluated their own level of knowledge in the specified areas. We were examining which of soft skills and ICT skills the students were developing in the educational process, and their own self-assessment of the achieved level of knowledge was also carried out. The areas of soft skills and ICT, as well as the scale of evaluation, were identical to the questionnaires for enterprises.

The questionnaire for enterprises addressed 200 potential respondents - employees of enterprises operating in the Slovak Republic. A total of 155 respondents responded to the questionnaire, which corresponds to a 77.5% return on the questionnaire. An analysis of the respondents found that 35% of the participating enterprises were large enterprises, 27% were medium enterprises and 38% of the questionnaires represented small enterprises with less than 50 employees. The analysis of the respondents' job position showed that the largest share - 65% of the respondents were in the position of technical-economic workers, further it was managers accounting for 29% and 6% were operators or employees in workers' positions. We believe that the stated composition of respondents was very suitable with regard to the objectives of the realized research because especially technical-economic workers and managers are able to define the expectations and reality in soft - skills and information - communication technologies competences. A total of 132 questionnaires were distributed among students, of which return was 100%. Of the total number of students, the proportion of students studying at the bachelor's degree (Bc.) was 55% and the proportion of students studying in master´s degree (Ing.) was 45%.

The next phase of the research was the statistical processing of the results of the questionnaires. Since this was a specific set of variables at the ordinal level of measurement that represented numerical values of competency assessment of the Likert scale, it was assumed that the outcomes of our research are non-parametric variables that do not exhibit a normal distribution. In the first step, the data obtained from the questionnaires were first tested for normal distribution, for which the Shapiro-Wilk test was chosen. Our assumption that the variables are not distributed according to the normal distribution was confirmed by this test. Based on the results of the previous testing, we subsequently applied non-parametric testing using statistical

induction methods. Specifically, Mann-Whitney U-test was used to investigate the significance of the difference between expected and actual competency status. Detailed processing of findings and conclusions from the research are elaborated and evaluated in the fourth part of the scientific monograph.

The results of testing the significance of the difference between the expected and actual states of competencies assessed by enterprises (Chapters 4.2 and 4.3) bring us to the conclusion that there is a provable significant difference in the following areas:

1. Soft skills:

- Creative thinking,
- Time management,
- Communication,
- Stress resistance.

2. ICT competences:

- Standard Office software,
- Presentation software,
- Internet and email usage,
- Graphics software,
- Analytical software,
- Simulation software.

On the contrary, the null hypothesis of statistical testing, i.e. the claim that there is no significant difference between the expected and the actual state of competence was confirmed in our findings in the following areas of soft-skills evaluation by enterprises: teamwork, assertiveness, organizational skills, and conflict resolution.

Another important part of the research is the analysis of students' self-assessment, presented in chapter 4.4. By evaluating descriptive statistics on specific areas of soft-skills and ICT competence assessment through the prevailing relative frequency, we can summarize students' self-assessments. Table 5.1 shows the results of the most numerous self-assessment of students for all areas of soft-skills and ICT competences.

Tab. 5.1 The results of students' self-assessment for the area of soft-skills and ICT competences.

Area	Variable	Students' self-assessment – prime assessment parameter
Soft-skills competences	Creative thinking	2 – very well developed
	Teamwork	2 – very-well developed
	Time management	3 – well developed
	Communication	2 – very-well developed
	Assertiveness	3 – well developed
	Stress resistance	3 – well developed
	Organisational skills	2 – very well-developed
	Conflict resolution	3 – well-developed
Competences in Information - communication technologies	Standard Office	2 – very well-developed
	PowerPoint presentations	2 – very well-developed
	Internet, e-mail	2 – very well-developed
	Graphical CAD programs	5 – not developed
	Analytical programs	5 – not developed
	Simulation programs	5 – not developed

It is clear from the results shown in Tab. 5.1 that students rated their own soft skills competences as mostly very well developed or well developed, which means that they are satisfied with their own competences and do not feel the need to improve.

Interesting results were obtained by further analysis – comparison of the students' self-assessment with the evaluation of the actual state of their competencies by the enterprises presented in chapter 4.4.2. Based on testing the significance of the difference between student self-evaluation and university graduates' evaluation by enterprises through Mann-Whitney U-test, the hypothesis of the statistical significance of the difference for the following areas of soft-skills was confirmed: creative thinking, teamwork, time management, communication, organizational skills. Based on this result it can be concluded that companies evaluate the knowledge of students in soft competences differently or lower than students themselves. This implies that students' competences do not reach the level demanded by businesses, and therefore, it is necessary to improve the quality of education in this area in order to match students' real knowledge with business requirements. On the basis of the above, we can generalize that students see their competences more positively than enterprises.

5.1 Proposal of competency models

In connection with the presented research results, we propose the following measures for improving the quality of education in study programs focused on production process management:

1. Introduce soft-skills training activities, namely creative thinking, time management, stress resistance and communication, as graduates do not reach the level required by employers.

2. Strengthen teaching in all areas of ICT competence examined, as the difference between requirements and reality in business research results was statistically significant.

Based on the results of the research, competency models of soft skills and information and communication skills were designed, which were defined by the requirements and expectations of enterprises or employers on the knowledge competencies of employed graduates of technical universities. The evaluation of mathematical statistics for the analysed areas of expectations of enterprises, including their typical value, is given in Chapters 4.2.1.2 - 4.2.8.2 and 4.3.1.2 - 4.3.6.2. As a benchmark for modelling, we used the median of each evaluated soft-skills and ICT area, which represents a typical value of enterprises´ expectations for each specified area. In tab. Table 5.2 shows the medians of soft skills evaluation for business expectations.

Tab. 5.2 Table of medians for enterprises´ expectations for the individual areas of soft-skills

ASSESSMENT AREA	MARKED AS	ASSESSMENT MEDIANS
Creative thinking	KM_OS	2 – very well-developed
Teamwork	PvT_OS	2 – very well-developed
Time management	TM_OS	2 – very well-developed
Communication	K_OS	2 – very well-developed
Assertiveness	A_OS	3 – well developed
Stress resistance	OvS_OS	2 – very well-developed
Organisational skills	OS_OS	3 – well-developed
Conflict resolution	RK_OS	3 – well-developed

Based on the results shown in Tab. 5.2, a competency model of soft - skills was created, which expresses the expectations of enterprises or employers for knowledge competencies in individual areas of soft skills recruited by graduates of technical universities.
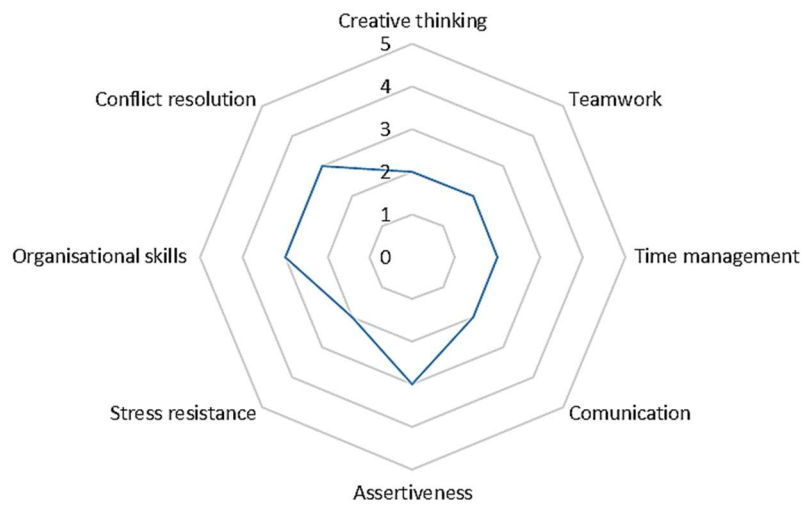

Fig. 5.1 The design of the model of soft-skills competences.

The design of the soft-skills competence model shows a graphical illustration of the ranks of individual soft-skills competences based on the employers' expectations from the employed graduates of technical faculties. The graph shows that most expectations of soft-skills competencies are ranked as a very well-developed competence. Expectations of competences for assertiveness, organizational skills and conflict resolution are well-developed competencies at the assessment ranking.

Tab. 5.3 The mean values of graduates' competences for ICT skills expected by enterprises

ASSESSMENT AREA	MARKED AS	ASSESSMENT MEDIANS
Standard Office	OFF_OS	1 – excellently developed
PowerPoint presentations	PP_OS	1 – excellently developed
Internet, e-mail	I-E_OS	1 – excellently developed
Graphical CAD programs	CAD_OS	3 – well-developed
Analytical programs	AP_OS	3 – well-developed
Simulation programs	SP_OS	3 – well-developed

Based on the results shown in Tab. 5.3, a competency model for the field of information and communication technologies, which expresses the expectations of companies or employers for knowledge competencies in individual areas of soft-skills recruited by graduates of technical universities.

The Competency Model of ICT skills represents a graphical representation of the level of assessed skills based on the employers' expectations of graduates to be employed. The radar chart shows that enterprises´ expectations for skills in standard Office and presentation programs, as well as the use of the Internet and e-mail communications, are rated at the highest required level – excellently developed. The knowledge of graphics, analysis and simulation software are expected only to be well developed. However, it should be noted here that this

assessment is generalized and, in specific cases, e.g. designer, excellent knowledge of graphics software is still required.
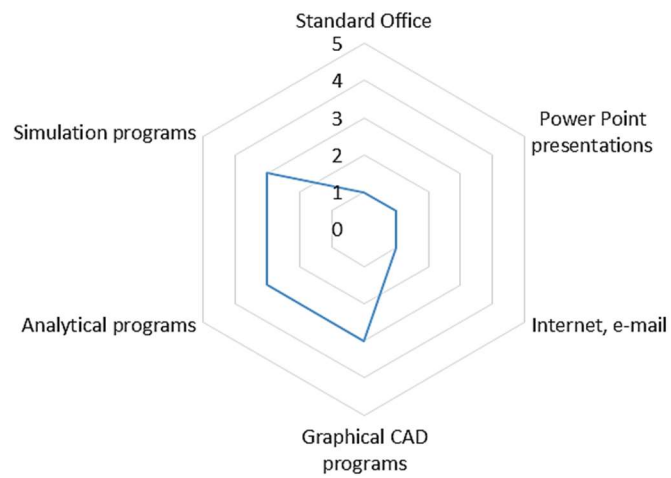

Fig. 5.2 Competences model of information-communication skills

6 CONCLUSIONS

Increasing demands on the efficiency and effectiveness of business entities are inevitably generating efforts to introduce improved management systems that take into account a number of rules and documents, thus changing labour market requirements. Employers' demands on candidates' expertise change, with the individual personality of each candidate coming to the forefront. These are features that are not usually included in qualification training.

In this context, there is a controversy as to how the higher education institutions in Slovakia are prepared for the change of the attitude of employers to their future employees. Higher education and its successful completion from the historical and cultural point of view has always represented a paramount of one´s effort in developing their own personality potential, and at the same time embodied the concentrated social requirements for training of professionals for the needs of individual areas of practice. The form of higher education in our conditions has undergone fundamental changes, reforms or transformation processes in the last decades. Their results and, more importantly, the consequences, in the form of the level and quality of university training of future professionals, will be verified only by the practice and the labour market itself. Today's labour market is characterized by its global nature, which is a challenge to present the required knowledge competencies and represents a choice for university graduates to work in a domestic or multinational context.

At present, several dozen qualified graduates with the same or similar educational background often apply for a job. What gives one candidate an advantage over others is the added value showed by various professional certificates presenting hard-skills or one´s interpersonal skills represented by soft-skills. Its added value can be candidate´s ability to respond flexibly and efficiently to these parameters before the first contact with a future employer, the ability to conduct successful negotiations with supervisors, subordinates and colleagues, business partners or customers, or the ability to lead a team or to take a back seat and participate in team´s work and others.

It is the task of universities to produce quality graduate with a wide range of hard and soft skills. In our research, we focused on the analysis of soft-skills and summarizing the requirements for the soft-skills competences of university graduates in terms of employers' expectations. The research was carried out in the form of a questionnaire survey, in which the respondents - employees of companies evaluated the expected and actual state of competences of soft-skills and ICT of university graduates. In the next questionnaire, university students evaluated their own level of knowledge in the specified areas. The results of the questionnaire survey were evaluated by the method of mathematical- statistical analysis by nonparametric testing of significance of the mean value difference by Mann - Whitney U - test. On the basis of the testing of significance, the hypothesis of the statistical significance of the difference for specific areas of soft skills and ICT competences was confirmed, suggesting that students' competencies in these areas do not reach the level demanded by enterprises, and therefore, it is necessary to improve the quality of education in that area to balance students' real knowledge with business requirements.

In accordance with the objectives and findings of the research we present proposals for improving the quality of education in study programs focused on production process management:

1. Within the process of improving soft skills competences, to include in the teaching activities focused on practicing creative thinking, time management, stress resistance, and

communication. We think that it is communication from the above-mentioned areas which is a key area and has great potential for improvement in targeted activities of work with students.

2. It is clear from the presented research results that it is important and desirable to strengthen the soft skills of students of technical universities by implementing specific activities into the educational process. Working with people using soft skills is an essential part of the work of people with a university degree, i.e., over time, it affects every graduate involved in industrial practice. This implies that soft skills competencies must inevitably form part of the knowledge provided by higher education.

3. All examined areas need to be improved in the context of the requirement to improve ICT competences, since the difference between requirements and reality in the survey results was statistically significant. Research results in the area showed that although we live in a time of information and communication technology and students work intensively with them in their personal lives, their competence in practical activities, that they can apply in businesses, is not at the level required by practice.

Based on the results of the research, proposals were made for the competency model of soft skills and ICT skills, which represent the employers' expectations of the skills for the graduates to be employed. In our opinion, competency models present a comprehensive picture of the soft skills and ICT skills that university graduates should achieve to meet employers' expectations. These competency models are our initial designs, which are based on research conducted at two technical faculties in Slovakia as well as in enterprises. We are aware of the need for public professional discussion or verification of our competency models proposed by us in a broader context, the scope of several technical universities. Nevertheless, we believe that the competency models we are proposing are the first step to reflect on the possibility of using models in practice by the academic community and the professional public alike. It is an important and positive example of possible cooperation between theory and practice.

The aim of the publication is to give the reader an overview of soft-skills focusing on interpersonal and communication skills, to orientate them in the possibilities of their use in the work process and to point out possible pitfalls. We believe that the content of the publication will help a profound and attentive reader to prepare for professional practice so that they are always one step ahead of their competitors.

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SOFT-SKILLS INTEGRATION INTO PRODUCTION PROCESSES

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