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MANAGING VIRTUAL TEAMS – THEORY AND METHODOLOGY

This paper studies the types of management teams and identifies the essential characteristics of organizational models applied in management practice: work group – team – self-managed work team and virtual team. The focus is put on virtual teams. The key prerequisites, regularities and processes associated with the design and functioning of highly effective virtual teams are analyzed. The indicators of team effectiveness are specified and the factors influencing immediate results are analyzed. The multilateral relationships in the integrative models most cited in the last 20 years are explored not only at the input, but in the process of interaction, as well as the ways to achieve balance and good teamwork between team members. The aim is to find a common theoretical and methodological basis that brings together the fundamental models of virtual team effectiveness.

In modern management *virtual teams* are a new paradigm in theory and management practice. Information and communication technologies transform the economy, business and institutions in society. For a long period of the development of management the emphasis has been on establishing a sustainable environment, hierarchy, traditional roles and routine operations. The intensive market penetration in all sectors of the economy, globalization and development of means of information communication necessitate a change in the behavior of the organization associated with the growing demands of consumers, the shorter lifecycle of products, technological developments, political and economic instability. The driving force of these transformational changes are communication and information technologies. The new opportunities for generating and providing information change the lifestyle, way of working and way of thinking. The requirements are increasing at every level, from the individual through the team to the global. The unprecedented number of corporate bankruptcies and corporate mergers in recent years illustrates a negative trend in business today. It is characterized by the inability of a number of organizations in different sectors of the global economy to adapt to dynamic changes in the external environment. This requires a reassessment of a number of management schemes that were considered indisputable until now and generating new starting points and organizational solutions.

Risk and uncertainty dominate in modern global and national economy. In research, processes of evolution of the concepts, changes in attitudes and generally

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accepted truths are occurring that lead to qualitative development of accumulated knowledge.

In the business world the focus is increasingly placed on the need for teamwork on consultancy basis as a basic factor to achieve competitive advantage in an environment of high uncertainty. Teams are a natural supplement to individual initiative and realization as they include greater commitment to the common achievements. Despite the general recognition of the need for teams in Bulgarian organizational practice, subconsciously this phenomenon is highly underestimated by the management. This is an insurmountable barrier to realizing the potential of the team.

Types of management teams – nature and differentiation

In theory and management practice the terms 'group' and 'team' are used as synonyms, although they identify different organizational models. In many situations the boundaries are blurred and undefined. Management groups have a broader meaning than teams and are applied to a large number of social and organizational forms (Hackman, 1987). Research into group dynamics (therapeutic groups, T-groups, etc.) have shown that the main task of the group members is the implementation of individual goals. The term 'group' is a generic concept and is distinguished from the work group by two main criteria – differentiated roles and tasks performed by the members.

The team is a small group of people with additional knowledge and skills (technical, functional, interpersonal, social, cognitive) that are directly related in achieving specific common goals and unique results through an approach which holds them mutually responsible (Hadjiev, 2005, p. 154). If you remove the phrases 'specific common goals', 'unique results' and 'mutual responsibility', then this definition can refer to the groups. The main characteristic of team work is *coordination* through which team members self-regulate in the implementation of planned goals. The functional requirements that are identified as key features of the team environment are concurrency (parallel execution of activities) and consistency (team tasks and intermediate results are input for other members of the team).

In work groups the individual roles and responsibilities are the basis of the result. Group activities are related to the sharing of information, formation of basic values and making critical decisions. Their main characteristic is that the group members perform interchangeable functions. In the context of teams, roles and responsibilities are expanded (enriched) and functions and tasks previously distinguished.

Traditionally, teams have a history and future, while management groups are created to fulfil a specific purpose and disintegrate once the task is performed. But this should not be absolutized, since some types of teams (e.g. project) also have a transitory nature and are determined over time. Furthermore, some work groups function relatively constant in business organizations.

Leadership is another key distinguishing feature between teams and management groups. It is an indisputable fact that different situations and organizational models require adequate and specific styles of leadership. Efficiency in the work groups is

directly related to the optimization of the personal contribution and is functionally dependent on the potential of the individual parts. Leadership roles in this process are explicitly expressed. In a team environment higher levels of organizational efficiency are directly related to the synergistic effects – the whole is larger than the sum of its constituent parts. Leadership roles are shared among team members and are a function of the circumstances and the specifics of context. Effective leaders instinctively focus their efforts on the team results rather than on the perfection of performance of activities and individual achievements. This requires additional multifunctional skills that unite the individual competences to achieve common objectives and tasks. All this leads to a strong mutual responsibility.

Studying management teams has reached a qualitatively new level with the establishment of the SMWT-concept (self-managed work teams) (Hadjiev, 2010, p. 62 and subsequent). The SMWT phenomenon is a new management paradigm that creates preconditions for a unique balance between business, technical and social system. The SMWT members have the power to modify the technical characteristics of their work and the daily social behavior, which leads to minimizing costs and maximizing immediate results.

Self-managed work teams (SMWTs) are a group of employees who are in charge of the management and implementation of specific tasks related to the production and marketing of goods or services intended for internal or external consumers. Usually, teams consist of 5 to 15 employees responsible for the management of particular work processes or activities, including for example planning and scheduling, monitoring and raising human capital. They are also responsible for the technical aspects of the activity. Here the highlight is that the members of a SMWT usually alternate periodically in performing *these managerial and technical responsibilities*.

In the literature the term 'work groups' (Johnson & Johnson, 1994) is often used instead of self-managed work teams. It should be noted that SMWTs are not work groups, as defined by Johnson and Johnson, because *the interdependence between the members of the work group is usually low and the work responsibility is concentrated mainly on the individual rather than the group as a whole.* SMWTs are not teams with short-term goals, like virtual teams and teams for the implementation of a specific project. On the other hand, it is logical to expect that many of the factors that are important for the good performance of SMWTs are applicable to the work groups and short-term teams.

SMWTs function in a complex working environment. Members of the group are given the opportunity to use different skills, to perform interrelated tasks, to take important decisions and to receive adequate feedback on achieved results. This combination satisfies individuals who need independence, responsibility and significant tasks.

The SMWT-concept, as a derivative and evolutionary model of team philosophy, is the result of international competition and dynamic changes in the external and internal environment. This motivates businesses to seek adequate ways to implement

this new management concept. The immediate benefits from the involvement of corporate networks in SMWT are higher levels of organizational effectiveness and implementation of the planned activities at the costs of less costs. Consequently, these results are difficult to prove statistically due to the difficulty to isolate self-management individual effects from the action of many other factors at the work-place. For this reason, the effects of SMWT can be determined best by the use of methodologies that are closely related to qualitative research (case studies) rather than qualitative analyses.

Studies have shown that under appropriate conditions SMWTs achieve much better results compared to employees organized in a hierarchical traditional structure. The reason is that they invest not only technical, but also managerial skills. Moreover, decisions taken by SMWTs are much more efficient because their members are directly involved in the entire activity. This creates prerequisites for innovation and creativity.

The basic competitive advantages of SMWTs are expressed in the achievement of high levels of cooperation and degree of substitutability in the implementation of planned activities. They are able to allocate roles and responsibilities based on the needs and competence. Compared to the traditional working environment, in SMWTs the number of supervisors is reduced, as the members have larger managerial responsibilities.

On the other hand, the ability of SMWTs to achieve better performance at lower costs depends on many factors such as work and interpersonal processes, the immediate environment, management support and qualification, the structure of the team and the characteristics of the members. If these are not planned and implemented in their close relationship, SMWT cannot reveal their potential.

The conclusion to be made is that the uniqueness of SMWTs compared to the studied organizational models (group and team) consists in the fact that SMWT members have the power to make decisions and manage their internal processes associated with the generation of a specific product, service or decision, while performing managerial and technical responsibilities.

Recently, the dynamic development of information and communication technologies (ICT) has strongly promoted the globalization of companies. As a consequence, many organizations transform their business by initiating changes. New methods of working are entering on a large scale and it is experimented constantly. The former exotic requirement for employees to work in a virtual team now dominates everyday activities. The advantages of virtual work permit for certain activities to multiply productivity at minimum costs. Virtual communications have become standard for many organizations (Bergiel et al., 2008). The barriers that are put by time and distance can be overcome with the development of technologies. Access to experts from around the world is expanding. Management of virtual teams and involvement of the management in the organization of their activities has become a major problem and task.

Virtual teams evolve naturally from traditional. The main barriers to working in a virtual team are caused by differences in cultures, lack of understanding of the role and

importance of communication and information technologies for their effective functioning. The challenges are associated with difficulties to managing the team from a distance and building trust and adequate interpersonal relationships.

The functioning of organizations in an environment of high uncertainty, the rapid development of ICT and globalization in business are prerequisites for the development of virtual management teams.

Theoretical framework of the functioning
of virtual teams

Working from a distance and at different times is not new in organizational theory and practice. It emerged over past two decades. The development of virtual teams is also a direct result of the SMWT-concept. In the 80s and 90s of the 20th century a number of companies in the US (Motorola, General Electric, etc.) introduced self-regulated teams. In these new structures the traditional core functions of the management (planning, organization, management and control) are transferred to the team. The main purpose is to reduce bureaucracy and increase efficiency.

The evolutionary development of this organizational technology in the conditions of information society and knowledge economy is the work from a distance (telework) and the formation of virtual teams. Martins, in his literary review on the subject, concludes that 'with few exceptions teams in all organizations are virtual to some extent' (Martins, et al., 2004).

Hertel et.al. (2005) analyze and distinguish the different forms of organization when working from a distance – virtual groups, virtual teams and virtual communities. The different forms of 'virtuality' are defined according to the number of participants and the degree of interaction between them. Work from a distance is carried out partially or fully outside the organizational boundaries through information and telecommunications means. For '*virtual groups*' it is typical that individuals work remotely, as each of them reports to a particular manager. In contrast, members of *virtual teams* interact with each other in the process of accomplishment of common goals.

Virtual communities are larger units in which members participate via the web. They have common goals, roles and norms. One of the main differences from the virtual groups and teams is that these communities are not included in the organizational structure and in most cases are formed as an initiative of some members. An example thereof are open source projects.

In theory there is no single definition of the term 'virtual team'. Some authors (Gassmann & von Zedtwitz, 2003; Leenders et.al., 2003) focus on physical distribution and degree of virtuality. But in fact members of virtual teams can work together at the same place, but be present at different times. What unites them actually is the application of information and communication technologies in working and interpersonal processes.

In the context of this analysis and based on theoretical monitoring we can define virtual teams as small temporary groups of people with additional knowledge and skills,

who work (communicate, interact and form relationships) outside the spatial, temporal and organizational boundaries through networks of communication technologies to achieve specific common goals and objectives. If you remove the phases 'network of communication technologies' and 'spatial, temporal and organizational boundaries', this definition can also apply to teams (Hadjiev, 2005, p. 154).

Depending on the nature of the performed activities and specific challenges, Duarte and Snyder distinguish the following types of virtual teams (Duarte & Snyder, 2006):

• Network teams. They consist of people who interact to achieve a common goal. These teams work together, but at different time, from a distance and outside the organizational boundaries. It is possible that in some situations the team members are not aware of all participants in the network.

• Parallel teams. They perform specific tasks or functions that traditional organization does not want or is not technically able to perform. The difference with network teams is in the separate membership. They are set up to implement short-term projects related to the optimization of processes or the solution of specific business problems.

• Project teams. They are created to achieve a specific result and disintegrate upon completion of the project activities. Unlike *parallel teams*, project teams exist and operate for a longer period of time. The common feature of the project and network teams is that the participants may join or leave the team when their expertise is needed. The key difference is that the members of project teams *belong permanently* to other teams in the organization, but are integrated within the project team for a particular time, thus becoming part of two structures. Project teams are a current business model when developing new products and services, building internal systems in the organization, introducing changes or achieving results with defined parameters and time period for implementation.

• Work teams. They perform a regular and continuous activity. They exist within one function of the organization, such as for example finance, marketing, training, etc. They have distinct boundaries and expressed membership, which distinguishes them from other structures in the organization. Many work teams function virtually, separated in time and space.

• Management teams. They perform regular and continuous *management* functions. They exist outside the national, but within the organizational boundaries. They are a typical business model for transnational and international corporations. The team members are part of one organizational structure, but in order to optimize processes they are geographically separated.

• Action teams. They are used in critical situations. They function virtually, separated in time and space.

Unlike traditional management models, virtual teams have a number of indisputable advantages. The main positive aspects can be reduced to the following several aspects:

• Unprecedented level of flexibility. Attracting human capital in the organization is carried out without initiating changes in the administrative structure, workspace and other complications typical of traditional teams;

• Reducing time and cost through information and communication technologies;

• Ensuring equal opportunities in the workplace by reducing age and racial discrimination. Virtual teams are evaluated primarily on the basis of results and the physical appearance of the members remains anonymous. In addition, they ensure even participation in heterogeneous groups. Non-verbal signs and status differences are eliminated through technologies;

• High levels of productivity associated with shortening the time for release on the market - for example through the parallel work of several teams on the product design. Virtual teams apply the principle of 'follow-the-sun' – i.e. members are activated at different points of the globe, depending on the moving line of the day, in order to ensure 24/7 availability of the service or process;

• Transfer of knowledge and access to talents regardless of the organizational and national boundaries – international virtual teams are a source of direct access to information, practices and ideas;

• Low cost of training.

The business is looking for opportunities to take advantage of these benefits, but the remote method is a new management philosophy that poses challenges to the management of virtual teams. Generally, the main disadvantages are:

• Use of sophisticated technology applications, the learning of which increases the costs and time for training;

• Lack of physical interactions, leading to contamination of the communication and not understanding the messages communicated through indirect media (Skype, e-mail, etc.). Regardless of the dynamic development of remote means of transmitting information, the thought patterns are set up to direct level of communication. Working together (face to face) is more effective in creating a concept for solving problems;

• Lack of trust due to interruptions in communication and the reduced influence of the manager. Prerequisites are created for conflicts and struggle for power;

• Challenges in determining the appropriate technology. The reason is that the activities for the implementation of a specific project can be coordinated both asynchronously and synchronously. In each of these two categories, there are a number of IT solutions for teamwork;

• Challenges in managing conflicts. The lack of social contact creates an environment, in which virtual team members inadequately interpret the facts and make wrong assumptions. Interpersonal relationships are distorted and prerequisites are created for conflicts that negatively affect the productivity of the virtual team;

• Cultural and functional diversity in the virtual team causes differences in the process of thinking of its members. As a result, building trust is a challenge for the team management;

• The need for specialized training and technical expertise is an essential prerequisite for the effective functioning of the virtual team.

Despite the above disadvantages, virtual teams are becoming standard in business organizations. The effects of cost minimization, unprecedented levels of flexibility and overcoming time and geographic barriers significantly exceed the problems related to the inclusion of IT solutions and the lack of physical interaction. The conclusion to be made is that, when designing virtual teams, the advantages of the design and management of work from a distance should be maximized and the disadvantages associated with technology applications, coordination mechanisms, conflict resolution, leadership and motivation should be neutralized.

Model of virtual team effectiveness

Much of the models of virtual team effectiveness presented in the literature are modifications of the classical model of Hackman for teamwork: input - process - output (Hackman & Morris, 1978). These models identify and analyze factors that are unique for virtual teams, which directly affect the effectiveness.

In theory and social practice there is no generally accepted model of virtual team effectiveness. This article makes a critical analysis of the models of virtual team effectiveness most cited in the last 20 years, while exploring their advantages and disadvantages.

Model of Bal & Gundry

Bal & Gundry present a model of the main factors that influence effective teamwork (Bal & Gundry, 1999). These factors in the model are composed into three main groups: people, processes and technologies (see Figure 1).

The *category of people* includes factors related to the interaction among individuals:

• Virtual team objectives that unite and motivate team members. They must be specifically defined due to the nature of work of virtual teams, which function outside the boundaries of the traditional organization with less bureaucratic rules in the management process;

• Training – the focus is on the need for social contacts in order to build trust;

• Structure of remuneration – typical of virtual teams is the syndrome 'out of sight', which is associated with the problem that the work of the team members will not be adequately assessed, as well as with the loss of some privileges;

• Team selection – based on knowledge, skills, competence and expertise. Selection of the virtual team members is particularly difficult because of the geographic and organizational separation. The relative autonomy requires high levels of interaction among the virtual team members, but local support and social contact are often absent, although these links are legitimized.

The *category of technology* includes the following factors:

• System selection – the main factors are three: task specificity, organizational abilities and individual skills;

• Security – unauthorized access to the internal networks of companies;

• Location – matters due to the physical distribution of the team members and access to technology;

• Training – the lack of training to work with a tool is a barrier to communication.

The *category of process* includes the following factors:

• Synchronization – the need for additional synchronization of processes in the company because they are designed for direct contacts;

• Structure of meetings – due to restrictions imposed by the environment, the structure and content of meetings of virtual teams need to be changed in comparison to those of traditional teams;

• Measuring performance – due to difficulties in assessing performance, the authors of the model suggest to bind performance to remuneration;

• Facilitation of team – the focus is put on the need for internal facilitator of the virtual team.

Figure 1
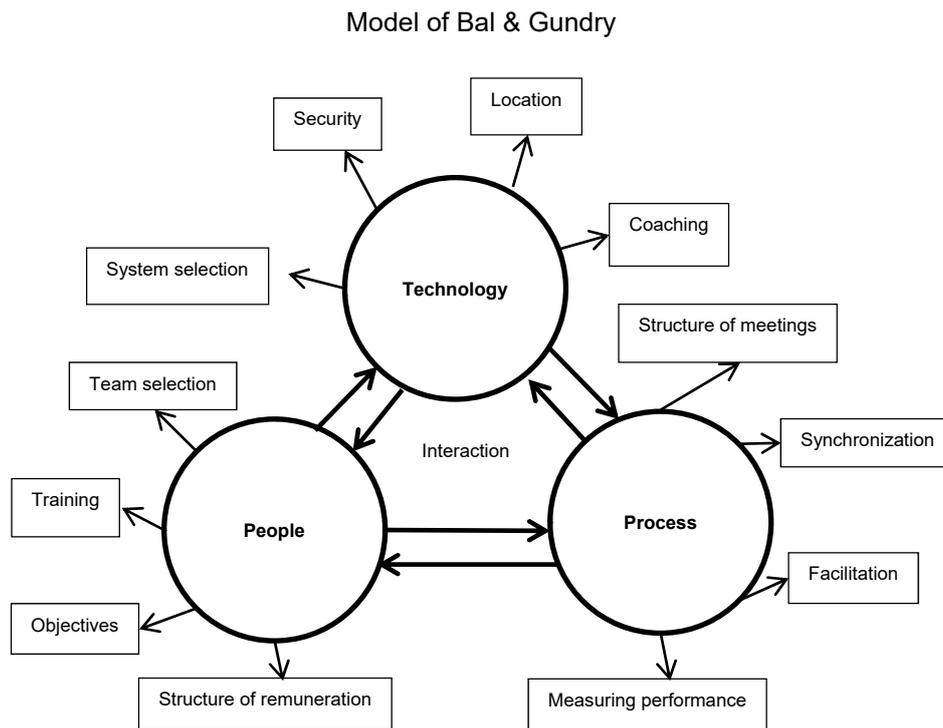
Model of Bal & Gundry

Sourse. Bal & Gundry, 1999.

The model of Bal & Gundry identifies 12 critical factors that influence virtual team effectiveness. The relationship between factors and effectiveness is not linear. The authors categorize the factors into three main groups and indicate the influence of the groups to one another in the model.

The presented model has a number of disadvantages. It is mainly based on the personal observations of the authors, which is not an empirical evidence of its validity. Another major disadvantage is that the model is static. The issue of how the influence of factors changes over time has not been explored.

Model of virtual team life cycle

Powell et.al. have made a meta-analysis of 43 publications for actually functioning virtual teams in business (Powell, Piccoli & Ives, 2004). The variables derived have been organized into four categories: input, socio-emotional processes, task processes and output. So grouped, the results are presented according to the model of virtual team life cycle of Saunders (Saunders, 2000) (Figure 2).

Figure 2

Model of virtual team life cycle
of Saunders
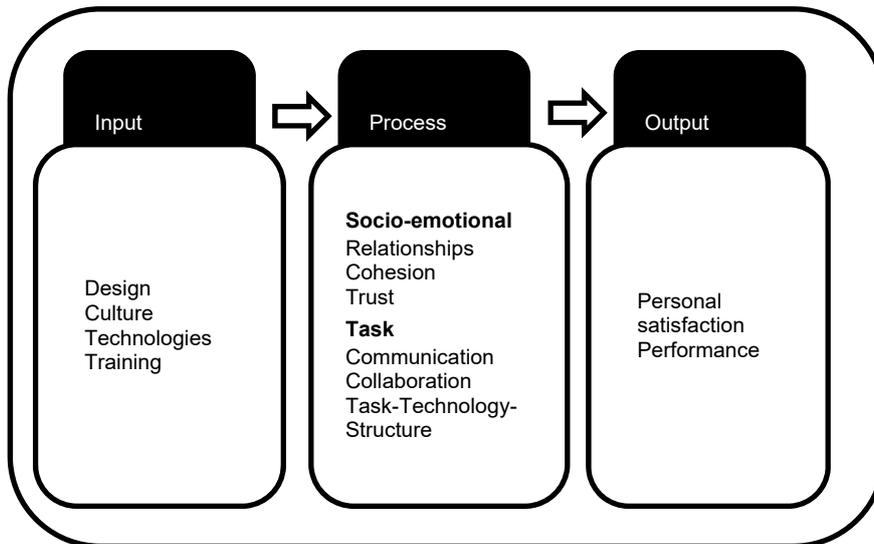
Sourse. Saunders, 2000.

The model consists of three main stages:

1. Input – at this stage of the model the following sub-elements are defined: design, which includes a shared understanding of the team task, identifying the strengths and weaknesses of the team members; culture that relates to personal

impacts on the environment; technological competence (knowledge and skills) for the technology used by the team; training as a tool for establishing the appropriate relationships among the team members in a virtual environment;

2. Process – this stage has two sub-elements: socio-emotional and task-oriented. The socio-emotional sub-element relates to relationships, trust and cohesion in the team. The task-oriented sub-element involves communication, collaboration activities and synchronization of: task-technology-structure.

3. Output – the last stage of the model is characterized by two elements: personal satisfaction and team performance.

Powell's contribution to the model of Saunders is that he explores teams over time. The method is linear and reviews the development of teams at three main stages, identifying the factors derived from previous empirical studies for each stage. The new is that the team effectiveness is reviewed from two perspectives – achieved results and personal satisfaction of team members.

However, the disadvantage of the model is that it presents relationships among factors in an unidirectional way. Correlations among factors are not identified within the groups. The authors limit the impact on team effectiveness only to the factors, which are inherent to the team, but not to the larger system – organization, society, etc. The team input has an indirect impact on the output through its impact on the processes.

Contextual model of group development

The main thesis of Driskell & Salas (2006) is that software systems, united under the name 'groupware', fail to meet the needs and challenges of virtual teams. They define groupware (from the English: groupware) as an application software designed to help people involved in a common task to achieve their goals. In most cases groupware integrates a wide range of software applications: e-mail, software sharing, platform for electronic meetings, video conferences, etc.

The model of Driskell & Salas is based on the classical 'input-process-output' model of Hackman (see Figure 3).

Driskell & Salas have introduced eight specific functions of the team that influence the results of teamwork:

• Adaptability – mutual adjustment, compensating behavior, reallocation of resources to achieve the team goals;

• Shared situational perception – adequate information provision to the team members in terms of contextual task (project);

• Performance monitoring and feedback - team members should monitor individual contributions, group progress, identify errors and provide feedback;

• Team management – coordinating group efforts to achieve the objectives;

• Interpersonal relations – conflict resolution, promoting openness and trust in the process of collaboration, establishing moral and ethical standards;

• Coordination – the matrix for allocating roles and responsibilities is the tool in a team environment (responsible chart);

• Communication – effective and timely exchange of information;

• Decision-making – identifying and assessing problems, generating and implementing decisions and assessing consequences.

Figure 3

Contextual model of groupware development
of Driskell & Salas
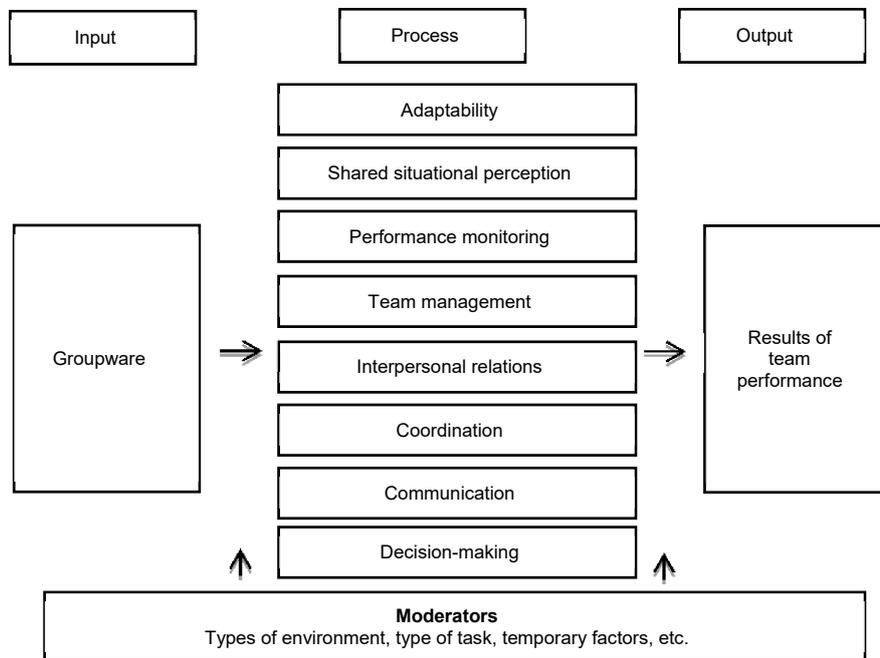
Sourse. Driskell & Salas, 2006.

The second distinctive aspect of the model is the introduction of critical contextual factors or the so-called *moderators*. The authors offer the following several categories of moderators:

• Type of environment – the relationship that communication of contextual information in the team deteriorates when switching to telework is identified in a categorical manner;

• Type of task – here the following variables are included: cognitive versus physical requirements; mechanical (technical, intellectual); analytical, with rich

imagination (creative, socially manipulative); logical, precise objectives; creation, selection, negotiation or implementation; task uncertainty; independence;

• Teamwork development phase – newly formed groups are able to effectively perform tasks that require mostly individual efforts. There are five main stages, through which the group passes in order to develop productive relationships: orientation, conflict, cohesion, performance and satisfaction;

• Group size – directly influences the team effectiveness and performance through the competence diversity of the participants, the requirements and mechanisms of coordination, tools to achieve consensus, opportunities for participation, individual performance and satisfaction;

• Status structure – this factor influences the team members in the requirements for interaction, resource management and decision-making. The existence of status structure can help or hinder the group performance depending on the type of task;

• High level of stress – the dynamics of the environment and high demands on the team members can increase interpersonal aggression and lead to neglect of social tasks.

Although the focus of the model is on the context of groupware, it presents a different perspective for factors that influence the effectiveness of the virtual team.

The authors explore the classical model of team life cycle from a different perspective, based on the main stages arranged in a linear sequence. They add the so-called 'moderators', in which they list the factors of the external environment that influence team effectiveness. The focus is on eight specific processes.

The model of Driskell & Salas is linear. The main disadvantage is the lack of links between the analyzed processes and moderators. The authors do not provide information on the results of empirical research, which casts doubt on the validity of the model. The impact of the processes on virtual team effectiveness is not considered.

Input-process-output model of virtual team
functioning

Martins et.al. (2004) examine the functioning of virtual teams based on the classical model of Hackman. The authors have introduced a special group of variables, which they call 'performance moderators'. By these unforeseen factors, they try to explain the fluctuating performance of virtual teams. The model is presented schematically on Figure 4.

Each category presents the variables that influence virtual team effectiveness. The studied factors, as classified in the literature, are located in the upper left corner, while those that should be further analyzed empirically are located in the lower right corner.

Figure 4

Input-process-output model of virtual team functioning
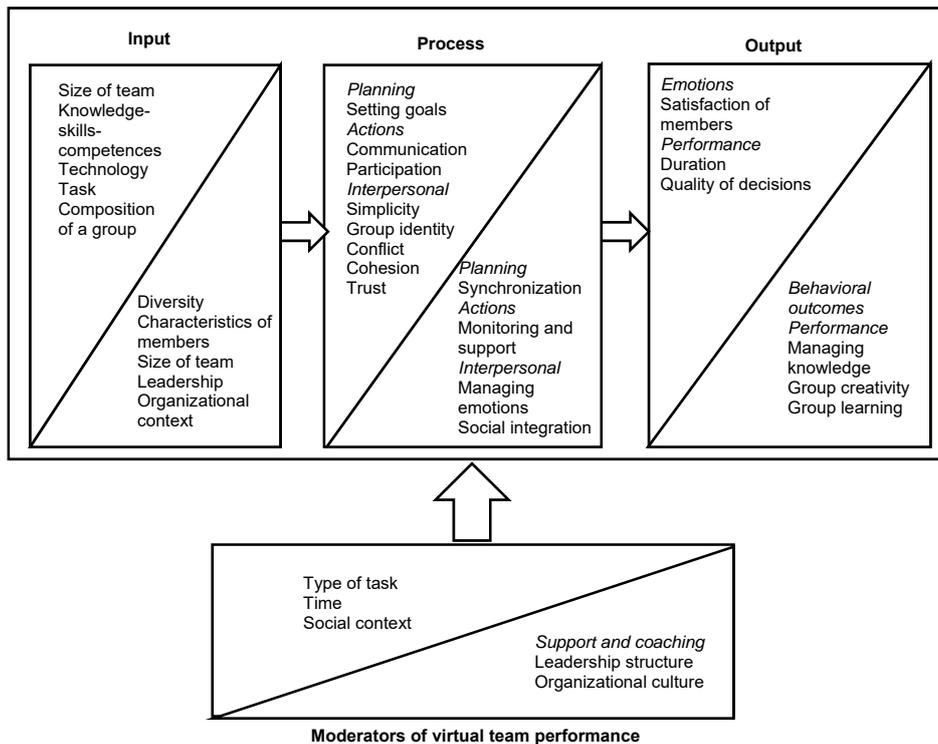
Sourse. Martins et.al., 2004.

The basic conditions of the group such as material and human resources are presented *at the input of the model.* In this group the following variables are identified:

• Team size – a traditionally critical variable in managing teams. In general, technologies minimize the negative effects of the virtual team size in comparison with the traditional ones. This variable is directly related to the nature of work of the team and the technology used;

• Knowledge, skills and abilities – in this factor the focus is primarily on the technical skills of the team members. They are existential, because technical and functional expertise influence positively the immediate results, the ability of the team to cope with any uncertainty of technical nature and building trust;

• Technology – an important variable that influences positively the group effectiveness, efficiency, scope of communication, interpersonal relationships and

commitment of the team members. On the other hand, the lack of non-verbal and visual signs is a reason to extend the time in decision-making and a natural barrier to use and realize the potential of the participants on key issues and problems;

• Task – a critical factor that influences success and speed of making decisions and establishing commitment to common objectives by virtual teams;

• Group composition – the effect of status has a controversial nature in virtual teams. According to some authors, its impact in a virtual environment decreases, but according to others, it increases, copying the hierarchical structure of the organization.

The *process criteria* identify factors that are the basis of results. Martins et.al. distinguish three sub-groups of processes:

• Processes of planning – these include an analysis of the mission, formulating the objectives, strategy and processes associated with focusing the efforts of the group;

• Processes of action – these are the dynamics that occur during the performance of the group tasks such as communication, participation, coordination and monitoring of the progress of the group;

• Interpersonal processes – associated with the relationships between the team members – conflict, trust, cohesion, emotions, social integration, etc.

In the *category of results* Martins identifies two main sub-groups in the model – emotional and performance results. The two groups cannot be considered independent, since they are interrelated:

• Emotional results – the satisfaction of the virtual team members is determined by the nature of work and team composition;

• Performance results – as a rule, the time required to perform a task by virtual teams is longer than that required for traditional teams. The reasons are mainly associated with the asynchronous nature of communication. With respect to the originality and quality of the decisions the results of studies are contradictory when comparing virtual teams with traditional teams.

In order to explain the fluctuating performance results of virtual teams the authors identify as reasons the following unforeseen factors, which they systematize as moderators of performance:

• *Type of task* – this factor moderates the effect of virtuality on the results of the team. Some tasks (e.g. brainstorming) are more effective in virtual teams than in traditional teams, while with others a deterioration of the results is observed (e.g. negotiations);

• *Time* – teams develop over time and difficulties from the lack of physical contact and derivative problems decrease, while increasing the satisfaction of the team members;

• *Social context* – this factor moderates the effects of the virtual relationships on the results of the team.

The studied model is built on the classical model of Hackman and therefore has most of its advantages and disadvantages. This addition by the authors makes the model similar to that of Driskell & Salas (moderators of performance). The main advantages of the model are in the identification of specific factors and their impact on the results of the team.

Model of virtual team effectiveness

Mortensen et.al. (2009) have created a model to present the complex relationships that occur in virtual teams between people, tasks and technologies. The model is based on the research of Hackman, who emphasizes the importance of examining group performance effectiveness from different perspectives, but on the other hand the model rests on the models of Marks (Marks et al., 2001) and Ilgen (Ilgen et al., 2005), which identify the main categories in every aspect with specific prerequisites (Figure 5).

Figure 5

Model of virtual team effectiveness
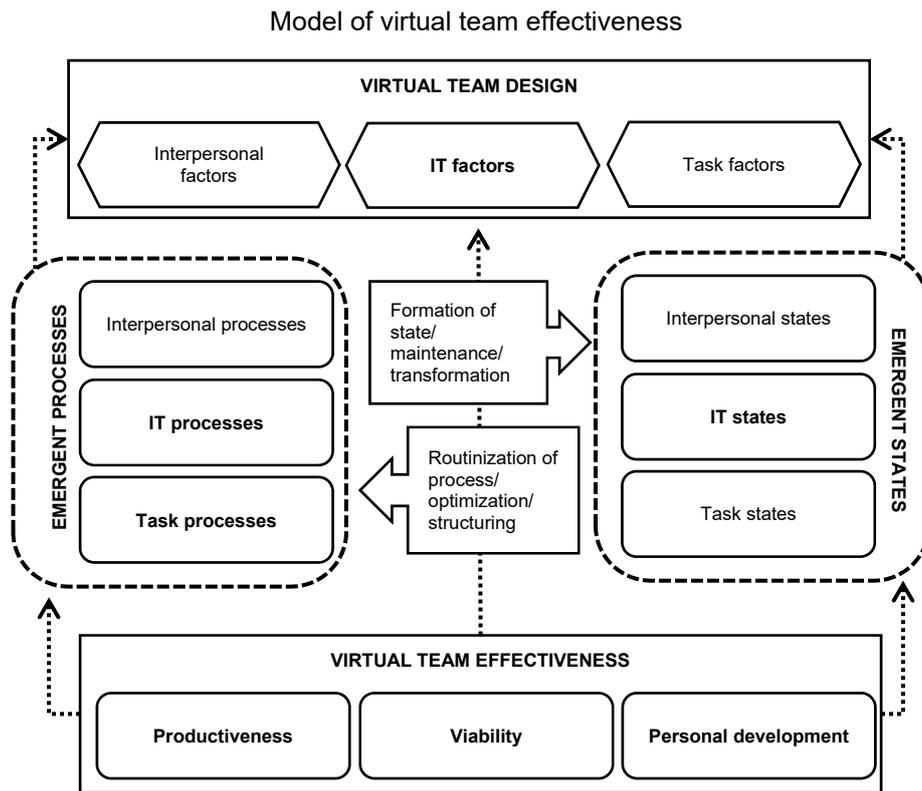
Sourse. Mortensen et al., 2009.

In the model of Mortensen virtual team effectiveness is analyzed from three different perspectives:

- *Productivity* – the ability to achieve standards of quality, quantity, time, etc.;
- *Viability* – the ability of the team to maintain the integrity of the group. Specific measures are satisfaction and desire to work together;
- *Personal development of the team members* – the extent to which the knowledge and skills of the team meet the personal needs of the participants.

Three main categories with prerequisites are distinguished: *design* factors, emergent *team processes* and emergent *team states*. Each of these categories is examined from three perspectives – interpersonal factors, task and information technologies.

The design of the virtual team provides the structural context in which individuals function and develop. Mortensen groups factors into the following three perspectives:

- Interpersonal factors – these include the individual characteristics of the team members and the ways of interaction within the group. Key indicators are: expertise (knowledge, skills, competence), size of the team, geographic and temporal dispersion, cultural and functional diversity, team virtuality index, etc.;
- Task – nature and characteristics of the task which the virtual team must implement. Factors in this perspective are the degree of interdependence, complexity, uniqueness, management structure (formal and informal) and the nature of task (e.g. software development, development of new products, research, etc.);
- Information technologies – these include technological factors that relate to the media itself (i.e. conference systems - computer, audio or video) and the relevant characteristics of a given platform – immediacy or asynchrony of feedback.

Emergent team processes identify the ways and mechanisms of interaction. The processes are not static. They change over time or new processes are formed. The factors are grouped into three main perspectives:

- Emergent interpersonal processes – the activities through which the virtual team members manage interpersonal relationships. This perspective includes: strategies for conflict management, building trust and other cognitive, verbal and behavioral activities used by the team members to manage socio-emotional dynamics;
- Emergent processes related to the task – the activities through which the virtual team members structure, organize and control the work within the team. This perspective includes: exchange of information and knowledge related to the task, using formal mechanisms for coordination of the team, etc.;
- Emergent processes related to information technology – cognitive, verbal and behavioral activities related to the use and application of information technologies. This perspective includes communication via web-based platform and adapting information technologies to the context of the virtual team.

Emergent team states are characteristics of the virtual team, which are usually dynamic and vary as a function of the context of the team, input, process and output. The factors that influence this category have been studied in three main perspectives:

● Emergent interpersonal states – the focus is on the socio-emotional characteristics of the team. This perspective includes: shared team identity, trust, cohesion and conflict;

● Emergent states related to the task – these are states that present relationships, values, knowledge and motivation of the team members related to the activities performed. This perspective includes: shared mental models, transactive memory systems and team awareness;

● Emergent processes related to information technology – these are states that present attitudes, relationships, values, knowledge and motivation of the team members for information technologies and their role in providing team activities. This perspective includes: IT-knowledge, sensitivity to media, computer self-efficiency and technological culture.

The design of the team provides the initial context that forms the direction of development of the emergent team processes and states. Thus, the factors that influence the design of the team may lead to direct or indirect impact on the effectiveness of the team.

The integrative model proposed by Mortensen analyzes the relationships between emergent team states and processes, which are in dynamic interaction. It identifies the relationship between the result and the characteristics of the team. In the model this is presented graphically through a system of feedback depicted with a dotted line. The conclusion to be made is that the results influence the design of the team both in initiating a new project and in its functioning over time.

The main disadvantage of the model is the lack of empirical evidence of the validity of relations both among main categories (emergent processes and states) and among individual perspectives, factors and element within them.

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Teamwork is the basis of every great achievement. There is hardly a significant event in the history of mankind, which is a result of the efforts of a single person. The models addressed in this article categorically justify the thesis that virtual teams are a new paradigm in the theory and practice of modern management. Based on the innovative technologies, they are an integral part and a basic building block of the organizations of the future. The strength and synergistic effects of virtual teams are a direct consequence of the following unique features:

● Virtual teams involve individuals with additional skills (technical, functional, interpersonal, cognitive and social), develop unique cultural attitudes and commitment to specific common goals, approaches and methods; therefore, they have more resources, ideas and energy;

● Virtual teams maximize the potential and minimize the individual weaknesses. Leadership balances the work and interpersonal processes, providing focus on immediate results;

● Virtual teams generate alternative solutions, as they offer more prospects for the implementation of defined goals;

• Virtual teams share the triumph of success and severity of loss. Their shared responsibility promotes sincere sympathy and strengthens the feeling of empathy;

• Virtual teams are individually and jointly responsible for achieving the goal;

• Virtual teams multiply effects for the implementation of strategic corporate goals and objectives.

In particular, based on the theoretical and methodological characteristics analyzed in this article the following main conclusions can be drawn:

Virtual teams are complex socio-technical systems, which in the process of design and operation are influenced by different categories of factors – both external to the team (organizational environment and culture, available IT technologies) and internal such as coordination, communication, collaboration, ability to work with IT applications, etc.;

Virtual teams are dynamic systems, in which the degree of influence of a factor changes over time. For example, IT skills are critical, but over time the team members acquire them and their impact on the team effectiveness decreases;

Still, none of the analyzed models explores the impact of the working processes of a team member, if he or she is involved in other virtual teams in parallel;

The analyzed models are conceptual, but are not validated by empirical evidence.

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