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Digital Collaboration of Virtual Project Teams in the Transdisciplinary Educational Space

Olga Banit[1,a)], Marina Rostoka[2,b)], Yana Raievska[3, c)], Oksana Kravchuk[4, d)] and Gennadii Cherevychnyi[5, e)]

[1]Ivan Ziaziun Institute of Pedagogical and Adult Education of National Academy of Pedagogical Sciences of Ukraine, 9 Maksyma Berlynskoho Street, 04060, Kyiv, Ukraine;

[2]V O Sukhomlynskyi State Scientific and Pedagogical Library of Ukraine, National Academy of Pedagogical Sciences of Ukraine, 9/of.31 Maksyma Berlynskoho Street, 04060, Kyiv, Ukraine;

[3]Ukrainian State Employment Service Training Institute, 17 Novovokzalna Street, 03038, Kyiv, Ukraine;
[4]Kyiv National Economic University named after Vadym Hetman, Dehtiarivska str, 60b, 107, 04112, Kyiv, Ukraine;
[5]Taras Shevchenko National University of Kyiv, 60 Volodymyrska Street, 01033, Kyiv, Ukraine.

a) olgabanit@gmail.com
b) Corresponding author: marilvross@gmail.com
c) raewskaya@ukr.net
d) oksana.kravchuk@kneu.edu.ua
e) gscherevichnyj@gmail.com

Abstract. The authors note that in virtual teams in remote work, some processes are difficult or impossible to hold. Given that the representatives of such teams must work remotely, there is a need to find new forms, methods and ways of their communication and collaboration. Transdisciplinary presentation of key elements in the educational collaboration system in the virtual office space includes the following positions: collaboration tools, collaboration modes, collaboration rules, network etiquette, team spirit. The use of remote collaboration involves the establishment of basic and backup channels of communication, virtual planning, etc., which should be the same for all team members. The article provides examples of software for effective collaboration and project management, combining separate tools for their preparation and implementation. The collaboration mode creates the necessary rhythm for the work of the virtual project team and provides the ability to quickly solve all important tasks. Clearly defined rules and norms of collaboration make it possible to avoid misunderstandings in the digital environment. The article systematizes the optimal time, frequency, and duration of formal and informal meetings, as well as summarizes the protocol of online communication, considering digital etiquette. The authors substantiate the need for clear regulations of standards and rules of virtual teams' work; documentation of all collaboration processes, including the procedure and protocol for holding collective meetings and making collective decisions. Such regulations are important to ensure the transfer and exchange of knowledge during remote work, especially when people work asynchronously due to different time zones and helps reduce the need for all other control tools of project participants. Supporting team spirit is identified as an important factor in the effective operation of a virtual project team. Despite the limitations in live communication in remote mode, the virtual teams reveal the same patterns of group dynamics as in real interaction. But they can be implemented only by using digital communication tools. Recommendations have been developed for the use of "smart feedback" technologies, as well as modern types, forms, and tools for building team spirit to increase the efficiency of the virtual project team at different stages of its development.

Keywords: Virtual Project Team, Remote Team, Remote Work, Digital Technologies, Digital Communication, Digital Collaboration, Team Management, Transdisciplinary Education, Cooperation.

INTRODUCTION

Transformation of traditional learning management systems of virtual teams are increasingly characterized by the spread of social networks, social learning platforms, and facilitate both formal and nonformal learning; social learning practices are spreading, the systems of which provide a place to create, discuss, interact, and interact around learning goals. The actualization of the use of social engineering in the management of virtual teams is just beginning, and its peak will come, in our opinion, only with the advent of the 7th technological paradigm, the center of which will be a man as the main object of technology. If the 6th technological paradigm will use the possibilities of bio-, nano-, and information technologies, then the 7th, in our opinion, will have a cognitive basis, which will be based on psychological technologies of cognition, "programming without computers", and management of human consciousness.

RESEARCH PROBLEM

Currently, scientists and futurists are hypothesizing that the 7th technological paradigm will develop the space industry, a new alternative energy that will be its basis. However, in our opinion, the basis of production and a new productive force of society in the 7th technological paradigm will still be human consciousness; and it is the ability to use and manage human consciousness that will determine the effectiveness of organizations, and possibly states and economies, in the future.

However, if in the future the survival of the organization will depend on social engineering, today it can become an alternative technology for solving problems and improving the efficiency of virtual team management. You do not need to wait for the cognitive (7th) paradigm to understand the importance of social engineering in virtual team management. Man has become the organization's most important asset in the digital age, but it can also be its greatest threat and most important point of vulnerability when it comes to information security. Security breaches in the company occur almost every day, and this applies primarily to information and psychological security. At the present stage, one of the main areas of use of social engineering technologies in virtual team management should be personnel safety.

APPROACH

Obviously, the described approach considers social engineering only at the level of society and its use exclusively for the management of large groups of people. However, in our opinion, the use of social engineering as a tool for correcting human behavior and shaping values can be much broader. Accordingly, social engineering can be differentiated on several levels depending on its objects: at the macro level, when the objects of social engineering are the behavior of large groups of people at the regional or state level, and the tools – sociopolitical technologies; at the microlevel, when social engineering is used to manage the organization and its staff; on a personal level, ie by adjusting the behavior and relationships of an individual in the family, family, group of friends, etc.

ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

Modern research is increasingly paying attention to the technology of using virtual teams to gather experts who collaborate on the Internet to perform organizational tasks. Alsharo et al. (2017) note that virtuality creates challenges for effective cooperation and results of work, has social consequences of knowledge exchange for such teams. The authors have developed a conceptual model of the relationship between knowledge sharing, trust, collaboration, and the effectiveness of a virtual team, and argue that knowledge sharing has a positive effect on trust and collaboration between virtual team members; trust has a positive effect on virtual teamwork, it does not have a significant direct impact on team performance[1]. Jimenez et al. (2017) consider global virtual teams, their advantages and challenges, key factors influencing their success[2]. Studies of Zakaria & Mohd Yusof (2020), who developed a descriptive model of global virtual collaboration that explains the cyclical process of rapid trust building, are also devoted to the processes of rapid trust building in global virtual teams; formulated instructions for promoting behaviour with a high level of trust in such teams[3]. Olaisen & Revang (2017) explore the exchange of high-quality knowledge in the context of a virtual global project team and draw conclusions about the need to develop social interaction, fostering trust and knowledge sharing through online technology platforms without offline social interaction[4]. Schulze & Krumm (2016) note the growing demand for virtual collaboration and explore the knowledge, skills, abilities, and other characteristics

(CSR) needed by team members for people for virtual teamwork, thus forming an integrated holistic model of virtual teamwork with distal characteristics (personality, experience) and closer qualities (knowledge, skills, and motivation)[5]. Morrison-Smith & Ruiz (2020) explored the collaboration challenges faced by virtual teams and existing mitigation strategies; and it was found that the physical factors associated with distance are closely related to the cognitive, social, and emotional problems faced by virtual teams[6]. Abarca et al. (2020) identify determinants that can directly affect the performance of a virtual team – communication about tasks, trust in leadership, empowerment, and cohesion; and can serve as a basis for future research directions on the implementation of virtual work strategies in postpandemic work[7]. Lukianova et al. (2019) highlight the expansion of HR managers' functions and optimization of workforce management approaches and tools due to the labor market change and IT developments[8]. The transdisciplinary vision of the information and educational environment, where representatives of virtual teams represent their future, are viewed by Rostoka & Cherevychnyi (2018)[10] and Rostoka et al. (2021)[11].

STATEMENT OF BASIC MATERIAL AND THE SUBSTANTIATION OF THE OBTAINED RESULTS

The effectiveness of interaction between remote members of virtual teams is important aspect of the operation of virtual project teams. In the digital environment, in our opinion, the main tool for improving virtual team management can be social engineering. The specifics of social engineering to influence human behavior has led to its widespread use in the context of information security as a tool for manipulating human consciousness to commit various offenses, seizure of confidential information, and more. However, in our opinion, social engineering is a much broader concept, and in general can be considered as a set of tools, methods, models, and technologies of social interaction and human management without the use of technical means. According to Kholod (2017)[12] and Kholod (2018)[13] social engineering provides an opportunity to form public opinion, the system of human perception, its values through social communications.

In a virtual team, unlike a traditional one, some processes are difficult or impossible to maintain. However, the usual communication schemes do not work, so the search for new ways of communication is necessary. Note that this area is still insufficiently studied in theoretical terms. Instead, many practical publications describe the experience of organizing remote work. Especially their number has increased over the last year, when most organizations have switched to remote work due to the need for social distancing associated with the COVID-19 pandemic. The analysis of the posts of domestic and foreign theorists and practitioners created an opportunity to summarize the key elements of the virtual office space, which allow to systematize teamwork on the project and bring it to the level of maximum efficiency: communication tools; communication mode; communication rules; network etiquette, and team spirit.

Communication tools include design and organization of the main communication channels (they should be the same for all employees, because the use of different types of communication leads to confusion); of the alternate communication channels to be used for emergency communication (usually the contact person's telephone); of the virtual planning with a bulletin board (there are many services that allow you to quickly and easily organize them, we will talk about them below); of operational method of file exchange; of storage places for irrelevant information (in case it will be required); and of digital space for informal communication. Typically, the organization of employees' remote work requires the formation of three communication channels: general chat; horizontal communication between employees (corporate mail and messenger with groups working on each project); contact line. Our analysis of the functionality of different software types available on the market of specialized software products allows us to draw the following conclusions about the optimal use of some of them when working with virtual project teams.

1)   Team Collaboration Software creates opportunities for teams to work together through the organization of private communication between individual team members, specific groups, or even the entire organization, which includes messaging, video chat, and file sharing. The main types of Team Collaboration Software are: Collaborative Whiteboard Software (for example: Miro, Lucidspark, InVision, Webex (formerly Webex Teams), MURAL, Creately and others); Employee Intranet Software (for example: Microsoft SharePoint, Workplace by Facebook, Yammer, HCL Connections, Jive, SAP Jam Collaboration, etc.); Screen Sharing Software (for example: Zoom, Cisco Webex Meetings, GoToMeeting, Google Hangouts Meet, BlueJeans Meetings, join.me, etc.); Virtual Workspaces Software (for example: Walkabout Workplace, Sococo, Teemyco, WorkInSync, Wurkr, Spatial Chat, etc.).

2)   Project Management software creates opportunities to provide in the virtual digital environment tracking of all project stages, tasks coordination, management of project teams goals, workload management, performance monitoring and resource allocation, for example: Asana, Smartsheet, monday.com, ClickUp, Airtable, Wrike, Basecamp, Trello, Teamwork, BigTime, etc.

3) Video conferencing software creates opportunities to provide online communication, audio meetings, video meetings, and workshops with built in features such as chat, screen sharing, and recording, such as Zoom, Skype, Microsoft Teams, Cisco Webex Meetings, GoToMeeting, BlueJeans Meetings, Google Hangouts Meet, Jabber, join.me, Dialpad UberConference, etc.

4) Idea management software (innovation management software) creates opportunities to structure the processes of collecting information about products, organizations, and management of ideas for their improvement or development, for example: Brightidea, Coda, Ideanote, Planview Spigit, IdeaScale, Qmarkets, Sideways 6, Wazoku, Lapel, COMPASS, etc.).

5) Meeting management software creates opportunities to plan and manage team meetings to increase their effectiveness and focus, for example, Fellow, Hirebook, Coda, Docket, Boardable Board Management Software, Range, Soapbox, Parabol, adam.ai, Peoplebox, etc.

In addition, in our opinion, the functionality of CRM software (customer relationship management software) can be successfully used for the needs of teamwork in a digital environment. This group of software includes programs for customer data collection, transaction management, manager control, analytics and forecasting. CRM software creates opportunities to track and manage customer interaction in a single record system, facilitates communication at all stages of the customer life cycle, such as Salesforce, HubSpot Sales Hub, ActiveCampaign, Freshworks CRM, Zoho, Pipedrive, monday.com, Pipeliner, Zendesk Sell, SharpSpring.

Mail services have built in plans (calendars), task schedulers with a certain amount of free cloud storage. It is enough to share one of the email addresses, which will be the center of the planning, file sharing and bulletin board for the team. In addition, Google's suite of documents, drives, spreadsheets, and presentations can fully meet the need for remote file sharing channels and archives. During the work of teams, its leader must constantly monitor and maintain the efficiency of business processes in real time. Process Intelligence platforms, such as ABBYY Timeline or similar, can help. These intelligent solutions help to analyze intrateam processes at what stage the task is, whether there is a failure of deadlines and other violations. They are based on digital footprints that participants leave in digital systems. First, the project team needs to determine which tools it will use for each type of communication. To do this, in addition to the above, can be used Remote Work Software, which creates opportunities for efficient and productive work outside of a fixed office space, such as Google Drive, Zoom, Slack, Trello, GoToMeeting, Cisco WebEx Meetings, Notion, Basecamp, Notion, Basecamp, etc. You need to set clear rules for each of them, and when choosing the main communication channels, it is desirable to remember the "one button rule", which provides the user with a single unified communication channel without the use of multiple gadgets and applications.

The development of online communication and cooperation protocols is of particular importance to teams involving geographically remote participants living in other countries. Therefore, there is a need to establish separate interaction rules, which will consider the time difference it is important to agree on working hours. Working from home should not become a job at any time, as it will negatively affect the work life balance of team members and can dramatically reduce their productivity, until the termination of their team roles. Remote synchronization is very important, especially when one of the main requirements is to work simultaneously on the task of all team members. The tools and modes of communication that we believe can be used for collaboration and communication of the virtual project teams are summarized in Table 1.

Table 1. Tools and Modes of Communication in the Virtual Project Team

Communication processes	Minimum frequency	Individual meetings	Video call	Web meetings	Phone conversations	E-mail	Messenger
Discussion of current issues	Once a day	From 9 a.m. to 6 p.m.					
Agile communication and clarification of details	Once a day	From 9 a.m. to 6 p.m.	From 10 a.m. to 11 a.m.		From 9 a.m. to 6 p.m.		
General meeting of the team	Once in 2 weeks	–	From 10 a.m. to 12 a.m.		–	–	–
Maintaining information flow	Constantly						
Knowledge exchange	Once in 2 weeks	–	–	From 4 p.m. to 6 p.m.	–	–	–
Informal communication	If necessary						

Another aspect of social engineering – the impact on people's behavior and the formation of values is the basis of the motivational systems of most teams. However, so far social technologies are used in them so far, in most motivation systems in companies are based on material motivation. Thus, motivational management can become another potential

direction of using social engineering technologies at the microlevel. Also, social engineering as a function of virtual team management is especially relevant in managing change in restructuring, mergers, acquisitions, and downsizing of teams. It enables team leaders to develop, analyze and implement social management projects while performing basic operations: assessing the social situation; identify strategies for change; promptly implement solutions; implement restructuring and dismissal plans. In addition, social influence processes in teams include demonstrating specific behavioral tactics and strategies of individuals to influence behavioral outcomes controlled by others, so as to maximize positive outcomes and minimize negative consequences.

The shortest way to improve the process is to measure its performance. Such problems' solutions in virtual team interaction are possible through the sociometry method. To do this, it is appropriate to use online survey systems. These are remote feedback programs for employees. However, the disadvantage of such systems usage is their inefficiency, when surveys are distributed once a quarter or once a month, especially during the transformation process. The peculiarity of the virtual project team is that members need more feedback. The ability to read nonverbal signals clearly is possible during office working, for example: the inspiring eyes of the project manager when discussing a new project, the colleague's enthusiasm, the strict view of the chief accountant, etc. All this needs to be replaced into words when working remotely. At the same time the conditions for more regular feedback need to be created. On the other hand, surveying team members with excessive frequency will reduce the response of respondents. According to our-statistics, the percentage of participants who respond to weekly or daily surveys drops to 5–10%, because people do not see the expediency of wasting time on answers. To address this paradox, practitioners suggest creating smart surveys and smart feedback. These technologies can help to get feedback without asking questions. Employee digital interactions already carry a huge amount of information that can be measured and given back to team members in the form of personalized recommendations to improve their professional skills and create better working conditions. Modern digital technologies Yva.ai and People Analytics allow automatically measuring the quality of cooperation, involvement, fatigue, stress, burnout, successful leadership practices, conflicts, and many other signals. These technologies analyze passive feedback. Anonymous signals of team virtual interaction can be created in the corporate systems Slack, MS Teams, CRM, e-mail, as well as through active feedback – short 60-second individual surveys. In terms of the use of social engineering techniques, the filling of the social component of virtual team management has the following starting points, which are detailed in Table 2.

Table 2. Application of Social Engineering to Manage Virtual Teams

Application of Social Engineering	Characteristics of Team Management Methods
Getting Started Team	Recruitment, selection, hiring, adaptation of the employee: forums can be used to communicate with potential candidates, and/or answer questions for new employees; wikis and/or boards can be used by employees to offer counselling support to newcomers; social analytics can be used to evaluate the experience of new employment.
Team Development	Team development Social learning platforms enable a team member to design a social profile that reflects his knowledge and interests; create, discuss, exchange the content of educational material by objects of study; organize and find learning objects from a variety of sources, such as finding or ranking colleagues; interact with colleagues in your social network and go beyond their networks to other reliable sources of information; engage in experience-based learning; receive real-time online training and support.
Consolidation of Key Team Members	Technologies that are designed to motivate team members: gamification to combine work, productivity, and reward; social analytics to realistically assess the return on HR investment.
Teamwork Completion	Most companies have significant experience in conducting weekend interviews, but very few evaluate this process as a social function of team management. The use of social engineering technology can be the basis for feedback, for which such a survey is conducted.

In general, social engineering technologies can be implemented in a wide range of team management practices related to engagement management, learning management, incentive management, productivity management, and so on. However, this is an incomplete list of potential opportunities for the introduction of social engineering technologies in the practice of team management. Thus, technological innovations are increasingly changing the paradigm of team management software to the development of applications for cooperation and social technologies. Smart organizations implement innovative team management functions, such as feedback mechanisms for employees; social learning systems; social selection, recruitment through social networks; and social cooperation platforms (such as corporate

blogs and wikis), management of social development and social activities in general, the effective implementation of which is virtually impossible without social engineering. Therefore, we can talk about the integration of social technology and social engineering in the processes of team management throughout the life cycle of the employee in the organization.

CONCLUSION

Transdisciplinary presentation of key elements in the educational collaboration system requires transformation of traditional management systems of virtual teams. Virtual teams are characterized by the spread of social networks, social learning platforms, and facilitate both formal and non-formal learning; social learning practices are spreading, the systems of which provide a place to create, discuss, interact, and interact around learning goals.

The use of remote collaboration involves actualization of the use of social engineering in the management of virtual teams is just beginning. The article systematizes of the functionality of different software types available on the market of specialized software products. The establishment of basic and backup channels of communication, virtual planning, etc., which should be the same for all team members. The collaboration mode creates the necessary rhythm for the work of the virtual project team and provides the ability to quickly solve all important tasks. Clearly defined rules and norms of collaboration make it possible to avoid misunderstandings in the digital environment. The authors substantiate the need to use potential opportunities for the introduction of social engineering technologies in the practice of team management.

Concluding the analysis and characterization of the peculiarities of establishing effective communications in virtual project teams, we note the great potential of such forms of work organization. As practice shows, flexibility and rapid response to various changes are the main advantages of virtual project teams. Such teams can quickly change the project's portfolio, suppliers, and quickly attract new organizations and new professionals. In addition to flexibility and speed of response to change, virtual project teams are characterized by several other advantages, in particular, the lack of need to monitor compliance with labor discipline or workflow parameters. All relations between the partners are regulated by agreements. Instead, up to a third of working time can be spent controlling the movement of information, goods, and services both inside and outside the network. Experts predict that soon, virtual project teams will be in serious competition with traditional organizational forms. All the above gives us the opportunity to say that the demands of society and the economy require the socialization of the management of virtual teams. Already today, there are several team managements processes, the effectiveness of which is impossible without the introduction of social engineering technologies. Social engineering in team management can be considered as a set of tools, methods, models and technologies of social interaction and people management without the use of technical means through social communications. Further research is needed on the possibility of implementing social technologies in the implementation of team management processes at the organizational level.

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