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## INFLUENCE OF FACTORS RELATING TO AN ORGANIZATION'S SAFETY CULTURE ON THE IMPLEMENTATION OF PRO-ERGONOMIC PROJECTS

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The dynamically changing operating conditions of modern organizations cause changes in their processes, including project management. It can be observed that, increasingly often, projects are a structured response to problems occurring in the company, especially in the sphere of production and work organization. Therefore, there is a need to determine the factors and conditions that require proper management in order to increase the chances of a successful implementation of a project. This relationship is also recognized in the case of pro-ergonomic projects that implement goals and tasks relating to ergonomics. For this reason, this article addresses the issue of identifying and assessing such factors – those in relation to the way projects are conducted as well as those which concern organizational and safety culture. The main goal of this article is to examine the opinions of experts on the factors which determine the success of pro-ergonomic projects in terms of their importance, and to determine the significance of factors relating to safety culture in comparison. The results of the expert opinion research were analyzed using descriptive statistics and presented in a box-plot chart. The analysis pointed to the conclusion that factors relating to safety culture were assessed by experts as the most important (compared to the factors connected with organization of the project and factors linked to carrying out ergonomic activities in the organization). It can also be stated that the factors relating to organization of the project (usually resulting from the project management methodology adopted) were rated the lowest.

**Keywords:** project management, safety culture, pro-ergonomic projects

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## 1. INTRODUCTION

The dynamically changing operating conditions of modern organizations cause changes in their processes, including project management. It can be observed that, increasingly often, projects are a structured response to problems occurring in the company, especially in the sphere of production and work organization. Therefore, there is a need to determine the factors and conditions that require proper management in order to increase the chances of a successful implementation of a project. This relationship is also recognized in the case of pro-ergonomic projects that implement goals and tasks relating to ergonomics. The success of such projects do not only depend strictly on project factors (e.g. implementation time, schedule, and budget), but also on factors connected with organizational culture and safety (a project often requires the involvement of many employees during its lifespan). For this reason, this article addresses the issue of identifying and assessing such factors – those strictly relating to the way projects are conducted as well as those connected with organizational and safety culture. The main goal of this article is to examine the opinions of experts on the factors which determine the success of pro-ergonomic projects in terms of their importance, and to determine the significance of factors relating to safety culture in comparison.

## 2. LITERATURE REVIEW

### 2.1. Safety culture in modern organizations and its connection with ergonomic aspects

Safety culture is treated as a subcategory of the concept of organizational culture. It can be defined as the result of adopting specific values, attitudes, and behavioral patterns in order to manage safety (Cooper, 2000, p. 114). It also relates to the style and quality of safety management in an organization. A high safety culture is characterized by a high value being placed on safety, on trust in the adequacy and effectiveness of preventive measures, as well as on communication based on mutual trust (Glendon and Stanton, 2000, p. 201). The following areas may indicate safety culture (Martyka and Lebecki, 2014, p. 562; Jin and Chen, 2013, p. 60; Guldenmund, 2000, p. 230-231; Gabryelewicz, Krupa and Sadłowska-Wrzesińska, 2017, p. 2):

- the company's vision and goals regarding safety,
- employee awareness of the importance of developing safe working conditions,
- the value assigned to safety in the organization – safety treated as one of the highest values within the enterprise,



- training and education in the development of safe working conditions (including safety issues in employee training),
- employee participation in activities aimed at shaping safe working conditions,
- analysis of the causes of accidents at work and of dangerous behavior, with preventive actions taken.

The importance of ensuring ergonomic working conditions and the shaping of a (high) level of safety culture has been acknowledged (Bentley and Tappin, 2010, p. 1169). The relationships between safety culture, the safety management system and ergonomic activities are shown in Figure 1.

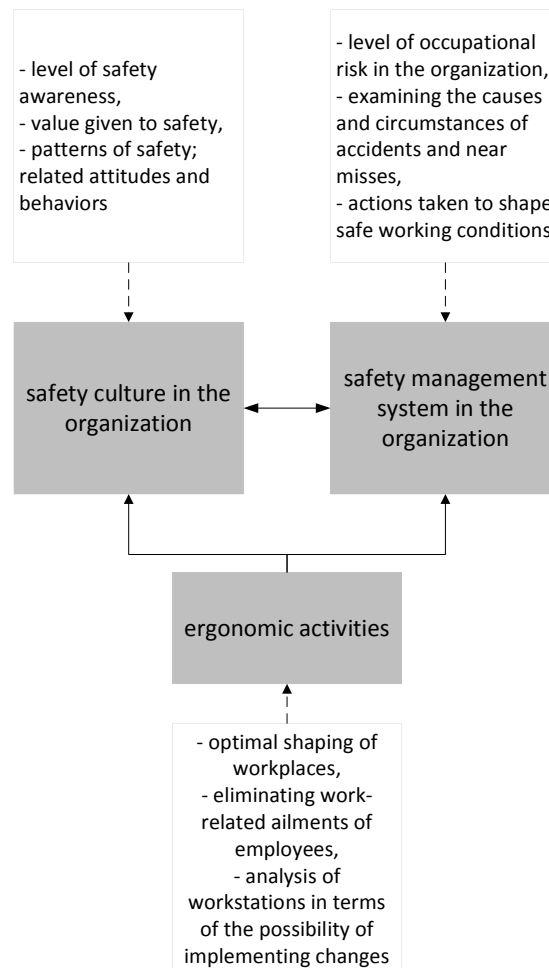


Fig. 1. Relationships between safety culture, safety management system in an organization and ergonomic activities (authors' own elaboration based on Bentley, Tappin, 2010, p. 1170; Lallemand, 2012, p. 3285; Rozlina et al., 2013, p. 94-95)

Shaping the level of safety culture through the implementation of ergonomic activities within the enterprise is supported by the following results of implementing such undertakings (Christy, 2019, p. 107-108; Kalteh and Mokarami, 2022, p. 2228-2231; Fernández-Muñiz., Montes-Peón and Vázquez-Ordás, 2007, p. 630-638):

- involving employees in activities undertaken at work and their participation in additional related training,
- increasing the awareness among all the organization's employees of the importance of a high level of safety and the ergonomic quality of workstations, thereby avoiding long-term health problems caused by workload,
- linking the causes of accidents at work and of dangerous incidents with working conditions in the context of ergonomics: this facilitates a more thorough analysis of these events and may eliminate the causes of their occurrence,
- creating the basis for supporting systemic safety management through ergonomic activities,
- taking into account ergonomic aspects in the assessment of occupational risk at each workstation,
- building open communication concerning the safety and ergonomics of workplaces.

It is recognized that the implementation of ergonomic activities is also important for shaping a safety culture in the context of promoting safety-related issues, which can be implemented through: information campaigns (e.g. on health at work and in everyday life), and the presentation of examples of dangerous and safe behaviors, promoting solutions that make work easier (Haslam, 2002, p. 243-245).

## **2.2. Success factors for pro-ergonomic projects relating to safety culture in an organization**

A project's success is defined as the achievement of the overall project goals using the inputs and producing the desired outputs from the project (Joslin and Müller, 2015, p. 1378-1385; Al-Hodiany and Misztal, 2022, p. 72-73). These goals are attained by completing the project on time, within a specified budget, and in accordance with established specifications (Saadé, Dong and Wan, 2015, p. 65-70). The success of a project depends on specific factors that may be related to the specificity of the organization, the method of running the project and the project management methodology adopted, as well as other internal and external factors within and affecting the enterprise (Gemünden, Sören and Krieger, 2014, p. 368-370). In pro-ergonomic projects that achieve ergonomic goals, it is also possible to identify factors that will determine their success. They may concern the organization of a project, the requirements of stakeholders, and the company's external environment. Success factors can also be observed with regard to organizational culture and safety culture in the context



of (Gauthier and Lagacé, 2015, p. 5643; Theberge et al., 2006, p. 241-242; Beleiu, Crisan and Nistor, 2015, p. 60-70):

- the awareness of employees and management regarding the importance of safety,
- the engagement of employees in safety activities,
- the motivation of employees to behave safely,
- safety training,
- an atmosphere of cooperation in an organization and openness to ideas for improving work processes,
- a consideration of ergonomic factors in examining occupational accidents and diseases, and in assessing occupational risk.

In enterprises where there is a great awareness of the need to shape safe working conditions (also through project activities), pro-ergonomic projects will be supported by (Attaianese and Duca, 2010, p. 190-192; Czernecka & Butlewski, 2021, p. 441-442):

- ensuring a priority for ergonomic and safe conditions at workstations,
- providing technical, organizational, and financial support for project activities in the context of ergonomics,
- ensuring the possibility of employee participation (specialists in a given field and often end users of ergonomic solutions), which guarantees better results from such projects,
- ensuring the possibility of organizing the work of ergonomic consulting teams (during the implementation of a given project, but also in other cases requiring ergonomic analyses).

The description of the research presented later in this article includes a set of factors identified as significant for the success of pro-ergonomic projects (also relating to safety culture).

### 3. METHODOLOGICAL APPROACH

In the research undertaken, 11 experts (employees of ergonomic units working in manufacturing companies employing over 250 people and implementing pro-ergonomic projects) assessed the importance of the factors which determine the success of pro-ergonomic projects. These success factors were divided into 3 groups: factors relating to the organization of the project, factors connected with the ergonomic activities of the enterprise, and factors concerning the organization's safety culture (see Table 1).

A five-point scale (scale 1-5, where 1 corresponded with very low importance, 2 – low importance, 3 – medium importance, 4 – high importance, and 5 – very high importance) was adopted in the assessment.



Table 1. Success factors for pro-ergonomic projects according to expert opinion study

<b>1. FACTORS RELATING TO THE ORGANIZATION OF A PROJECT</b>
Detailed identification of the problem requiring a solution and the setting of the project goals
Detailed preliminary analysis of the feasibility of implementing the project
Management of the project in accordance with the selected project management methodology
Setting of a schedule for the implementation of the project, detailing all the planned tasks (assigned to responsible persons)
Precise determination of the budget for the project, taking into account the tasks to be performed
Definition of understandable rules and communication channels during project implementation (including the reporting of completed tasks by members of the team implementing them)
Appointment of a competent team to implement the project
Appointment of a competent project manager with leadership qualities
Detailed identification of the requirements of stakeholders (at various levels of the organization, and in some cases also outside it) for each project undertaken within the company
Regular updating of the requirements of stakeholders (at various levels of the organization, and in some cases also outside it) for each project undertaken
Determination of scenarios for responding to unforeseen situations during project implementation (as a basis for change management)
Detailed identification of risks relating to project implementation and development of plans to respond to them
Detailed identification of external factors that may influence the implementation of the project (e.g. legal regulations, market requirements, impact of competition on the implementation of the project, and dependence of the project's success on suppliers/subcontractors).
<b>2. FACTORS CONNECTED WITH THE ERGONOMIC ACTIVITIES OF THE ENTERPRISE</b>
Selection of competent members of the ergonomics unit
Selection of a competent manager of the ergonomics unit
Recognition of the training needs of ergonomic unit members and provision of this training
Provision of the opportunity to expand the knowledge of ergonomic unit members (e.g. by participating in conferences)
Detailed determination of operational goals of the ergonomics unit
Detailed determination of strategic (long-term) goals of the ergonomic unit's activities
Preparation of a meeting schedule for the ergonomics unit, taking into account the specific work of its members
Determination of the official location of the ergonomics unit in the organizational structure of the company (in a given department or the assignment of a person supervising its activities within senior management structure)
Effective communication about the activities of the ergonomics unit within the company to all employees (e.g. by sending information)
Establishment of clear rules for communication between the ergonomics unit and the company's employees (e.g. dedicated form, assignment of shifts, and e-mail address)
Provision of support for the ergonomics unit in direct contact with employees (e.g. effective communication of duty dates, publication of e-mail addresses of unit members, and issue of a form to report non-ergonomic working conditions)



Table 1 – continue

Establishment of clear rules for the ergonomics unit in considering employee complaints regarding working conditions and complying with them (e.g. time for consideration, procedure, providing feedback, and documenting activities)
Establishment of clear templates for reports, instructions, and procedures for the ergonomics unit
Determination of the method and frequency for reporting the activities of the ergonomics unit to the company's top management
Provision of appropriate technical support for the activities of the ergonomics unit (e.g. hardware and the required software)
Provision of full organizational support for the ergonomics unit during the project's lifespan
Provision of members of the ergonomics unit with the opportunity to perform tasks within the project by limiting other responsibilities
Guarantee of full support of top management in the activities of the ergonomics unit (e.g. support for ideas for ergonomic improvements, and inclusion of the unit's advice in projects carried out within the company)
Determination of the budget available to the ergonomics unit within the project
Granting of appropriate powers to the ergonomics unit (e.g. the ability to suspend work at a workstation that does not meet ergonomic requirements)
Establishment of monitorable criteria and indicators for assessing the activities of the ergonomics unit
Setting of precisely defined ergonomic goals in projects relating to the production processes within the enterprise
Guarantee that the ergonomics unit can receive external advice in justified cases (e.g. ergonomics specialists and euro ergonomists)
Guarantee of the exchange of experiences with ergonomics units operating in other manufacturing companies
Establishment of an understandable ergonomics policy for the company (e.g. in the form of a White Book of Ergonomics)
Establishment of clear rules for the involvement of the ergonomics unit in projects carried out within the company relating to production
Establishment of a schedule for the implementation of each pro-ergonomics project and following it
Effective communication about the activities of the ergonomics unit in the company to all employees
Continuous identification of risks that may arise during the implementation of pro-ergonomic projects and scenarios for responding to them
Guarantee of effective integration of activities within pro-ergonomic projects with production processes (the proposed ergonomic solutions must be adequate to the processes)
Establishment of strictly defined criteria for assessing the implementation of pro-ergonomic projects within the company
Effective involvement of senior and lower-level employees in the implementation of pro-ergonomic projects (use of experience and exchange of views)
Effective involvement of employees at the analyzed workplaces in the implementation of pro-ergonomic projects (e.g. through surveys and interviews regarding the workplace)
Guarantee of adequate time for employees at the examined workplaces to participate in ergonomic analyses

Table 1 – continue

Detailed acquaintance of the members of the ergonomics unit with the course of the production process covered by the planned pro-ergonomics project
Proposal of ergonomic solutions each time, taking into account the specificity of the workplace and the possibility of implementation (e.g. testing prototypes)
Proposal of ergonomic solutions only taking into account the resources allocated for the implementation of the pro-ergonomic project (e.g. budget and technical possibilities)
Provision of detailed training in the use of the proposed new ergonomic solutions for employees at the workplaces affected by the changes.
<b>3. FACTORS CONCERNING THE ORGANIZATION'S SAFETY CULTURE</b>
High level of awareness among top management about the importance of safe and ergonomic working conditions in the company
High level of awareness of lower-level employees about the importance of safe and ergonomic working conditions in the company
Effective involvement of production employees in activities aimed at improving working conditions
Provision of appropriate training in the field of occupational health and safety, including building employee awareness of the importance of ergonomic working conditions
Establishment of a culture of cooperation between all employees of the company to ensure safe working conditions
Cultivation of a friendly atmosphere in the organization and openness to employees' ideas
Establishment of an effective system for motivating employees to behave safely and report irregularities at work
Consideration of ergonomic factors each time in the analysis of accidents at work, near misses and employee health problems
Guarantee of effective communication within the company about activities aimed at improving working conditions (including shaping ergonomic workstations)
Consideration of ergonomic aspects every time in the analysis of occupational risk in the enterprise
Prioritization of the safety of employees within the enterprise (safety as the highest value.)

Source: authors' own study (a list of selected factors and further research results are presented in the article: *Success factor driven adaptive approach to pro-ergonomic project management*, accepted for Manufacturing Conference, 14-16.05.2024, Poznań, Poland).

#### 4. RESEARCH RESULTS

Due to the division of the pro-ergonomic project success factors into 3 groups (1 – factors relating to the organization of a project, 2 – factors connected with the ergonomic activities of the enterprise, and 3 – factors concerning the organization's safety culture) in the elaboration of the results, descriptive statistics were developed for each of them, which are presented in Table 2.

Analyzing the data contained in Table 2, it can be concluded that, on average, the experts rated the factors in group 3 the highest. The minimum and maximum values awarded during the assessment were also determined in the third group of factors. It





can be seen that there were differences in the assessment of the factors, as visualized in Figure 2.

Table 2. Descriptive statistics for each group of factors

Group	Descriptive statistics					
	N	Median	Minimum	Maximum	Lower quartile	Upper quartile
1	11	3.54	2.85	4.38	3.08	4.00
2	11	3.76	3.47	4.71	3.68	4.03
3	11	4.18	3.73	4.82	3.8	4.45

Source: authors' own study.

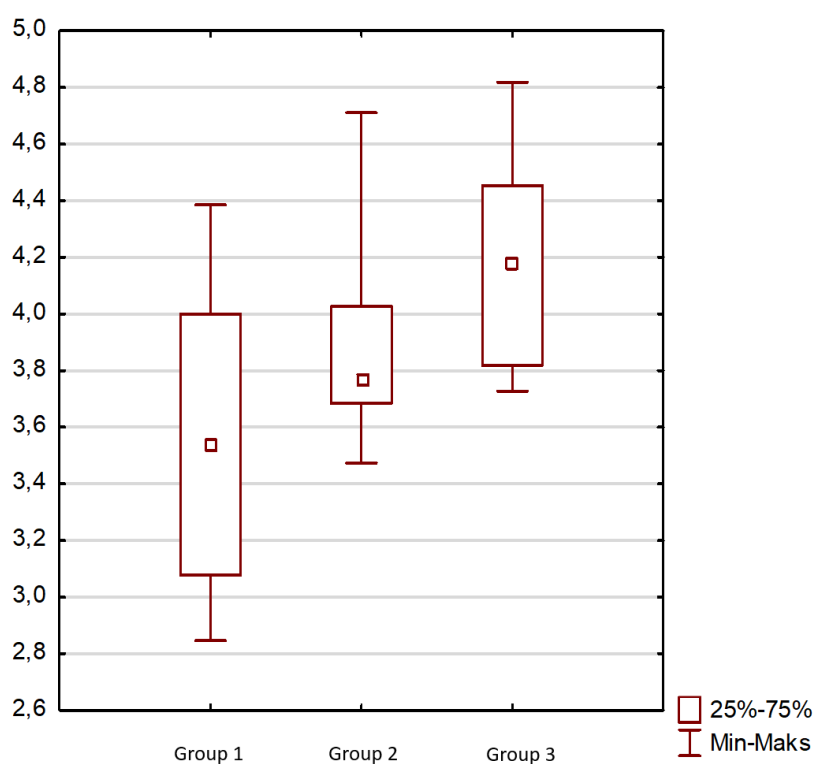


Fig. 2. Box-plot chart for assessing the success factors for pro-ergonomic projects for the presented groups of factors (authors' own elaboration)

Analyzing Figure 2 presented above, the following conclusions can be drawn regarding the importance of the factors indicated in each group:

1. In the group of factors relating to the organization of a project (i.e. those relating to the methodology of running the project and its general organization), there were the greatest differences in the assessment of their importance by the experts. There are factors in this group that were assessed as being of low importance for the successful completion of the project. This may be due to the fact that the method of running the project is often the same (approved by management) for all projects within the organization (Fernandes, Ward and Araújo, 2013, p. 10-13) and also applies to pro-ergonomic projects. Often, factors relating to the resources necessary to validate the project (e.g. time, budget, and schedule) also depend on the internal and external conditions of the enterprise (Ionel, 2008, p. 435-440).
2. In the group of factors connected with the ergonomic activities of the enterprise, the smallest discrepancies in the assessment of the experts were found in the case of 25-75% of the assessments. This may be due to the fact that these concerned their area of activity specifically, both in the company and in pro-ergonomics projects.
3. In the case of the group of factors concerning the organization's safety culture, it can be seen that these factors were rated the highest by the experts, and here there was also the smallest discrepancy in the distribution of answers. This may be due to the fact that the involvement of people inside the organization is a very important matter when it come to the implementation of any project (including pro-ergonomic ones). This involvement can be achieved by building safe working conditions and a friendly environment which encourages employees to get involved in the activities undertaken by the company (also in the implementation of projects).

## 5. CONCLUSIONS

The development of modern enterprises towards project-oriented organizations generates the need to constantly change the approach to project management. Additionally, there are specific types of projects (e.g. pro-ergonomic) which require companies to adapt to their implementation in terms of defining goals, resources, and methods for monitoring their results. For this reason, the analysis and shaping of factors that will support the successful implementation of such projects may contribute to a better adaptation by enterprises to the requirements posed by the dynamically developing external environment. An interesting direction in analyzing such factors seems to be to include factors relating to an organization's safety culture in terms of projects. The research presented above shows that their high importance, according to the experts, may have a significant impact on the course of a project due to the fact that they directly concern the health, well-being, and safety of employees whose involvement in projects is necessary. Safe working conditions (understood as the absence of danger but also as friendly treatment) may make employees more willing to engage in project activities carried out within the company. Since the topic of



safety culture and its components in the context of pro-ergonomic projects is extensive, the research presented above could be developed to identify more factors determining project success. Additionally, an interesting direction of research would be an assessment of the validity of such factors not only by specialists implementing pro-ergonomic projects, but also by project and safety managers.

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## WPLYW CZYNNIKÓW ZWIĄZANYCH Z KULTURĄ BEZPIECZEŃSTWA W ORGANIZACJI NA WDRAŻANIE PROJEKTÓW PROERGONOMICZNYCH

### Streszczenie

Zmieniające się dynamicznie warunki funkcjonowania współczesnych organizacji powodują także zmiany w prowadzonych w nich procesach, również w zarządzaniu projektami. Można zauważyć, że coraz częściej projekty są ustrukturyzowaną odpowiedzią na pojawiające się w firmie problemy, zwłaszcza w sferze produkcyjnej i organizacji pracy. Poszukuje się więc czynników i warunków, którymi należy odpowiednio zarządzać, aby zwiększyć szanse na wdrożenie projektu z sukcesem. Zależność tę można dostrzec także w przypadku projektów proergonomicznych, w których realizuje się cele i zadania dotyczące ergonomii. Z tego względu w niniejszym artykule podjęto tematykę zidentyfikowania oraz oceny takich czynników – ściśle związanych ze sposobem prowadzenia projektów, ale również związanych z kulturą organizacyjną i bezpieczeństwem. Głównym celem pracy jest ocena zestawienia czynników sukcesu projektu proergonomicznego przez ekspertów pod kątem ich ważności w powodzeniu projektu oraz ustalenie znaczenia czynników związanych z kulturą bezpieczeństwa na tle pozostałych. Wyniki badania opinii ekspertów przeanalizowano za pomocą statystyk opisowych i przedstawiono na wykresie ramka-wąsy. Przeprowadzona analiza pozwoliła na wyciągnięcie wniosku, że czynniki związane z kulturą bezpieczeństwa były przez ekspertów oceniane jako najważniejsze (w zestawieniu z czynnikami związanymi z organizacją projektu oraz czynnikami związanymi z prowadzeniem działań ergonomicznych w organizacji). Można także stwierdzić, że najniżej były oceniane czynniki związane z organizacją projektu (wynikające przeważnie z przyjętej metodyki zarządzania projektem).

**Słowa kluczowe:** kultura bezpieczeństwa, projekty proergonomiczne, zarządzanie projektami

