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Dissertation Thesis Abstract

PROPOSAL OF METHODOLOGY FOR EVALUATING THE EFFECTIVENESS OF WORK WITH UNUSUAL WORKING CONDITIONS

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SÚHRN

SCHMACHER, Benjamin Abdullah Karl: Návrh metodiky hodnotenia efektívnosti práce s neobvyklými pracovnými podmienkami (dizertačná práca) Slovenská technická univerzita v Bratislave; Materiálovotechnologická fakulta v Trnave; Ústav priemyselného inžinierstva a manažmentu.
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Kľúčové slová: *neobvyklé pracovné podmienky, efektívnosť, riziko, pracovný výsledok*

Zámerom tejto dizertačnej práce je navrhnúť metodiku, ktorá je nápomocná pri hodnotení efektívnosti práce s neobvyklými pracovnými podmienkami. Pilotná spoločnosť je chápaná ako základná spoločnosť. Analýza bola vykonaná vo vybraných spoločnostiach, ktoré pôsobia v odvetví renovácie.

Vzhľadom na dané rámcové podmienky a skutočnosti zistené pri výskume je potrebné vypracovať metodiku, ktorú je možné aplikovať aj na najmenšie zmeny rámcových podmienok vo fyzickej oblasti.

Najprv sa uskutočnila analýza literatúry zameranej na efektívnosť, riziká, neobvyklé pracovné podmienky atď., pri zohľadnení rámcových podmienok. Tento výskum je prepojený s praxou.
Následne sa realizovala analýza a vyhodnotenie výsledkov prieskumu základnej spoločnosti a medzinárodných spoločností a prestavenie návrhu metodiky, ktorá sa má použiť.

V závere dizertačnej práce je uvedené zhrnutie práce ako aj uplatnenie metodiky v praxi pre tento podnikateľský sektor.

Dizertačná práca je súčasťou výskumného projektu VEGA č. 2/0013/24 *"Akceptácia a používanie inovácií 4.0 vo vzťahu ku kognitívnym prínosom a záťaži v kontexte cieľov udržateľného rozvoja."*

ABSTRACT

SCHMACHER, Benjamin Abdullah Karl: Designing a methodology for assessing the effectiveness of work with unusual working conditions (dissertation); Slovak University of Technology in Bratislava; Faculty of Materials and Technology; Institute of Industrial Engineering and Management.
Supervisor: Assoc. Prof. Ing. Helena Fidlerova, PhD. *Trnava 2025. 195 pages.*

Key words: *unusual working conditions, effectiveness, risks, work achievement*

The aim of this dissertation is to design a methodology that is helpful in evaluating the effectiveness of work with unusual working conditions. The Pilot Company is used as the base company. The analysis was done in chosen companies which are working in the Renovation industry.

In view of the given framework conditions and the documents found during the research, a methodology must be developed which can be applied to even the smallest changes in the framework conditions in the physical area.

Further literature research regarding effectiveness, risks, unusual working conditions, etc. is carried out in advance, taking these framework conditions into account. This research is related to what happens in practice.
This is followed by an evaluation and analysis of the survey results of the base company and the international companies and a presentation of the methodology to be used.

At the end of this dissertation a summary or a conclusion of the work as well as the application of the methodology in practice for this business sector are provided.

The dissertation is a part of the Research Project VEGA no. 2/0013/24” Acceptance and use of innovations 4.0 in relation to cognitive gains and load in the context of sustainable development goals.

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INTRODUCTION

This dissertation is a project which deals with drafting a methodology for a pilot company first and thereafter conducting surveys with companies worldwide.

> ***"Proposal of methodology for the evaluation of the effectiveness of work with unusual work conditions (WwUWC)"***

Before the development of the methodology could start, it was necessary to first outline the actual status of the problem set related to this topic. This included the definitions of the basic concepts of risks, effectiveness, efficiency as well as the work process and unusual working conditions. These were explained in a short, concise and precise manner in the spirit of this dissertation.

Furthermore, possible options for obtaining information as well as evaluation options were examined and selected. For this study, a survey questionnaire was chosen because of the decentralised set-up of the pilot company as well as the international operations. For the analysis of the survey, the SWOT analysis was chosen, as this very simply shows strengths, weaknesses, opportunities and threats.

To be able to finally apply the methodology to all international businesses, the survey of the national business (Pilot Company) was compared to those of international companies. The development of the methodology should thereby raise the standard in the field of natural hazard claims handling worldwide. At the same time, the effectiveness should achieve a boost for the businesses and a reduction of the physical burden of people working in this field worldwide.

The objective of this study is to **design a methodology** to improve identification and evaluation of risks in businesses with variable working conditions as well as outlining the effectiveness of work.

1 CURRENT STATUS OF THE PROBLEM OF WORK WITH UNUSUAL WORKING CONDITIONS

In this section, the current status of theoretical knowledge and management as well as basic concepts and definitions are explained. This serves to understand the further procedure followed in the dissertation. At the same time it also serves to reconcile the interrelationships of the individual points regarding the subsequent survey and evaluation.

1.1 Current status of the theoretical knowledge on the topic of the dissertation

In this chapter, focus is placed on the theoretical knowledge available in the field of effectiveness of unusual working conditions in the market. In the course of this, the work of highly respected professors in these fields is highlighted and analysed. Furthermore, the problem set is examined to obtain an exact picture of the market situation. The results of this research are used as basic concepts to ensure that the methodology can also be applied by international corporations.

In order to be able to provide exact details and conduct precise research, the topic of the subject matter is finally formulated as follows:

Proposal of methodology for the evaluation of the effectiveness of work with unusual working conditions (WwUWC).

This topic was chosen, as there are only rigid statements regarding the evaluation of the effectiveness with unusual working conditions to date. The unusual working conditions here are in the form of a family business - the Pilot Company - which exists since 2005 and has a form of management that is a mixture of various theories. This company operates in the service sector. The activities are in the processing of elementary damage, which can occur in the form of water, fire and / or storm. The unusual working conditions explained below result from the service profile of this branch.

It should be noted that the management consists of managing directors, regional directors, regional managers, division managers, area managers as well as project managers. The top management only consists of the managing directors of the business, however. Naturally, it does not make sense to only look at the managers, but rather to include and consider all individuals who work in the business.

The problem of categorising the types of managers in the Pilot Company lies in the fact that this business has a hybrid form of management.

The importance and the **benefit** of the solution or solutions of this dissertation does not only apply to the Pilot Company, but should enhance enterprises worldwide: enhancement in the form of further outlining an increase in effectiveness in the pilot companies which to date wish to manage according to the existing theory of management, but cannot do this in a business with unusual working conditions. The resistance of the existing rigid theory prevents businesses with increasing personnel numbers and growth to maintain the atmosphere of a “family business”.

The objective of this study is also to explain and process the main part in the theoretic part of this study, so that all ambiguities are removed for the practical implementation in the business of the Pilot Company as well as all other businesses.

Unusual working conditions

The concept **“unusual working conditions**” (daswirtschaftslexikon.com 2019) is one of the most important concepts denoting the object of the solution (solution objective) of this dissertation.

The unusual nature of the working conditions of the work to be undertaken is mainly prescribed or determined by the nature of the work (work processes). Based on this, one can differentiate between the following unusual working conditions:

- those that have negative values of parameters,
- those that are experienced as negative by employees,
- those that cause illnesses (incapacity for work),

- those that lower the amount and effectiveness of the work performance,
- those that pose a safety risk during the execution of work.

Definition Unusual working conditions

Unusual working conditions are to be viewed as a current and important problem (dysfunction) of the management of work processes, especially from an economic perspective and for safety reasons (risk of work processes).

After long research in renowned magazines and books, the definition of unusual working conditions could not be fully clarified.

In connection with research work and the area of activity of companies whose core business focuses on recurring special activities such as interior and exterior renovations, laying floors and tiles, fire damage restoration, odor neutralization, etc., the unusual working conditions are evaluated using several parameters.

Basically, unusual working conditions are circumstances that make normal activities such as painting a wall more difficult. unusual working conditions is not the work itself, but the parameters that change this circumstance. These parameters were determined based on years of personal experience and can be found in practice.

The parameters such as the location, noise, smell, air, ambient light, the customer himself, personal body condition influence the upcoming activity.

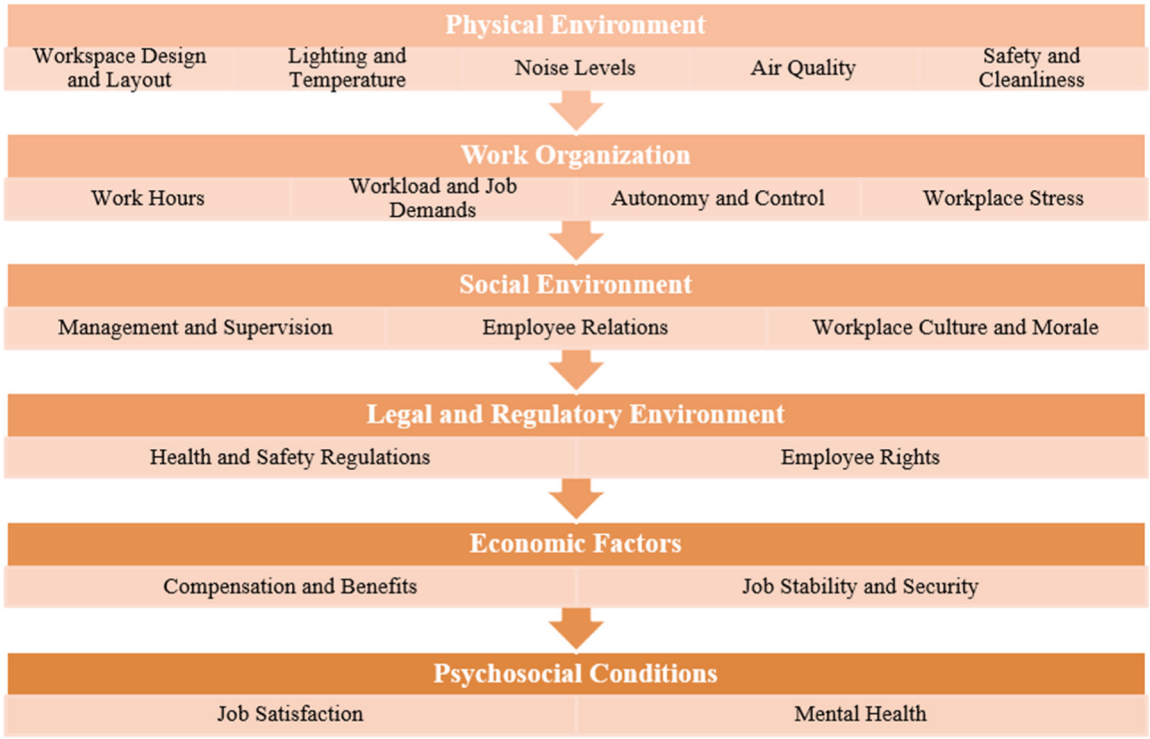

Fig. 1: The five important pillars of working conditions detailed shown. (Own depiction, 2024)

1.2 Sustainability with the SDGs REWORK

The plan for peace and prosperity for every person and the planet now and for the future, agreed by all member states of the United Nations in 2015, is on the 2030 Agenda for Sustainable Development. The urgent call for help from all countries to create global sponsorship is supported by the 17 Sustainable Development Goals at its core. They show that ending poverty and other disadvantages must be accompanied by strategies that improve health and education, minimize inequality and stimulate or maximize economic growth - all while combating climate change and protecting our planet, special for oceans and forests (United Nations 2024).

1.2.1 SDG 8 - Promote inclusive and sustainable economic growth, employment and decent work for all

Economic growth on a sustainable and inclusive basis can and should drive progress, make jobs humane and improve and create living standards for all. COVID 19 has endangered the lives and livelihoods of billions of people worldwide - not only personally, but also economically. The International Monetary Fund (IMF) expects a global recession in 2009. A global job loss of around 50% was also expected. Even before COVID 19, one in five countries where poverty already existed experienced a decline in income in 2020. Disruptions in industrial production, falling raw material prices, volatility on the financial markets and increasing uncertainty lead to this. Other factors increase the risk that poverty and unemployment could continue to rise (United Nation 2024)

1.3 Summary of the current status of the Problem Set of the Dissertation

The current state of knowledge regarding the topic “Designing a methodology for the identification and evaluation of the risks and effectiveness of work that can be performed under unusual working conditions” comprises, from the present perspective, the work of numerous highly regarded professors in the fields of:

The distribution of references in the area of **risk management** was carried out by Burger, Anton; Buchhart, Anton Risk controlling, 2024, Keitsch, Detlef Risk management, and Schlachta, Carsten Strategic risk management system, building a strategic risk management system.
In the area of **management**, Dr Christian, Scholz Personnel management: information-oriented and behavioral theory basics 2013, Jürgen Berthel, Fred G. Becker Personnel management: basic principles of operational personnel work 2022, Maccoby, Michael The new bosses - The first social psychology study of managers in large companies 1979 and A. Aaker, David Strategic market management: recognizing competitive advantages – developing markets – developing strategies 2023.

An important area is **team development** where the following links were rated as very knowledgeable such as Rainer, Niermeyer Leading Teams, 2016 and Susanne, Bender Team development: The effective path to “we”.
Since **motivation** is an important factor in the following work, Bruno S. Frey, Margit Osterloh Managing Motivation, (2002) and Felser, Georg Motivational Techniques 2 used in 2004.

Furthermore, parts of the listed publications outline the basic concepts and definitions. At the same time, they will clearly show that the literature for businesses regarding the topic of “unusual working conditions” is insufficient.

2 OBJECTIVES, RESEARCH QUESTIONS AND HYPOTHESES OF THE DISSERTATION

In this chapter of the dissertation, a solution is formulated based on the evaluations of the analyses as well as the actuals. Likewise, basic research questions are created on the basis of the prospective solution/methodology. Furthermore, methods as well as procedures for the solution of the dissertation topic are presented.

2.1 Formulation of objectives for the solution of the dissertation topic

Based on the results from the analysis of the actual state of the dissertation problem can derive the main objective or synthetic objective for the solution of the topic of this dissertation, which is responsible for the following title change. The title change is carried out as follows:

"Proposal a methodology for evaluating the effectiveness of work with unusual working conditions."

The achievement (fulfilment) of the formulated basic objectives requires the successive fulfilment of the entire complementary objectives (secondary objectives, analytical objectives) of the solution of this dissertation:

- Limiting the nature and defining the essence of the work to be studied (solved)
- Delimitation of the structure of features (characteristics) of the unusual working conditions
- Definition of the set of methods for assessing the unusualness of working conditions and estimating the risks and effectiveness of works
- Confirmation of the contributions of the solution of the topic of the dissertation
- Optimisation of the knowledge transfer from top to bottom
- Methodology is part of training of each staff member on social skills, leadership, management, controlling, etc.
- Methodology as part of leadership courses for young entrepreneurs or generational changes
- Shaping working conditions more individually

The focus in this dissertation is on the design of a methodology.

In order to assess the correctness of the designed solutions of the dissertation topic, it is necessary to answer the given research questions (RQ):

- **RQ 1**
  To what extent do variables related to the effectiveness of work activities influence work performance?

- **RQ 2**
  What are the key parameters of risk and effectiveness in work activities, and how can they be evaluated?

The confirmation or rejection of the presented research questions (RQ) should be proven as a result of the evaluation of designed solutions through verification during tactical realisation of management activities in the enterprise.

In our case, we base our assumptions on the following hypotheses, which are described in Chapter 4, "Analysis of the Basis for Assessing the Effectiveness of Working with Unusual Working Conditions." They are formulated based on the relationship between professional experience and the associated perceived risks and then tested and explained.

They are formulated as follows.

- $\mathbf{H_0}$ (null hypothesis): We assume that there is no statistically significant relationship between professional experience and the perception of occupational risks.

- $\mathbf{H_1}$ (alternative hypothesis): We assume that there is a statistically significant relationship between professional experience and the perception of occupational risks.

3 METHODOLOGY AND METHODS OF RESEARCH AND PROCESSING OF THE DISSERTATION

In the following chapter of this dissertation, fundamental research questions are developed based on the prospective solution/methodology. Furthermore, methods and approaches for addressing the dissertation topic are presented.

3.1 Methods of solving the dissertation topic

The selection and use of relevant solution methods is required for the processing of the topic of the dissertation at all stages of the solution.
The methods of solution are chosen depending on the size of the portfolio and the methods of individual subjects of the undergraduate and doctoral studies in the subject area.
For the elaboration of the analytical part of the dissertation, especially for the extraction, collection, sorting, evaluation and correction of information, the following methods are used:

- survey method (questionnaire, etc.) as well as
- SWOT analysis incl. SWOT matrix
- chi-square-method

The following methods are available for the formation, processing and evaluation of the variants for the solution of the problems to be identified, their presentation and estimation:

- Method of induction and deduction,
- SWOT analysis as well as
- methods of evaluation of parameters of work activities.

Apart from the mentioned methods, there are real preconditions that may occur during the processing of the dissertation and therefore other methods not mentioned may be necessary (graphic methods, heuristic methods,

development diagram, histogram, etc.). It is also very likely that the totality of solution methods needs to be specified and supplemented.

3.2 Procedure of solving the topic of the dissertation

The outline of the procedure for solving the dissertation problem represents the choice of the individual steps of the solution. It is the timing of relevant methods and their exploitation.

When designing the solution procedure for the diss., the following generally applicable rules should be observed:

- generally valid principles (principles) of solving the research problems
- character of the problem set to be solved (technical-economic character of the solution)
- verified (confirmed) standards of solving scientific work of a certain type (thesis).

Based on this and taking into account the recommendations of the training body, the solution procedure of the dissertation can be compiled as follows:

- characteristics of the topic of the dissertation and confirmation of the relevance (need) of this solution
- obtaining and analysing the information about the actual state of the dissertation problem
- design of the methodology for the solution of the dissertation (objectives, research questions, methods, procedures)
- evaluation of relevant variants of the solution and choice of optimal variants
- description, elaboration as well as graphic representation of the designed solutions
- assessment of the expected contributions of the designed solutions
- summary

The presented solution procedure finds its reflection (transformation) in the structural design of the dissertation.

Formulation of the objectives of the solution

Risks mainly mean uncertainties which could have negative effects. These risks and uncertainties are considered the arch enemy for planning.

In order to present the procedure graphically at a glance, a flow chart was created showing the entire process of finding a solution.

Procedure in the form of a flow chart

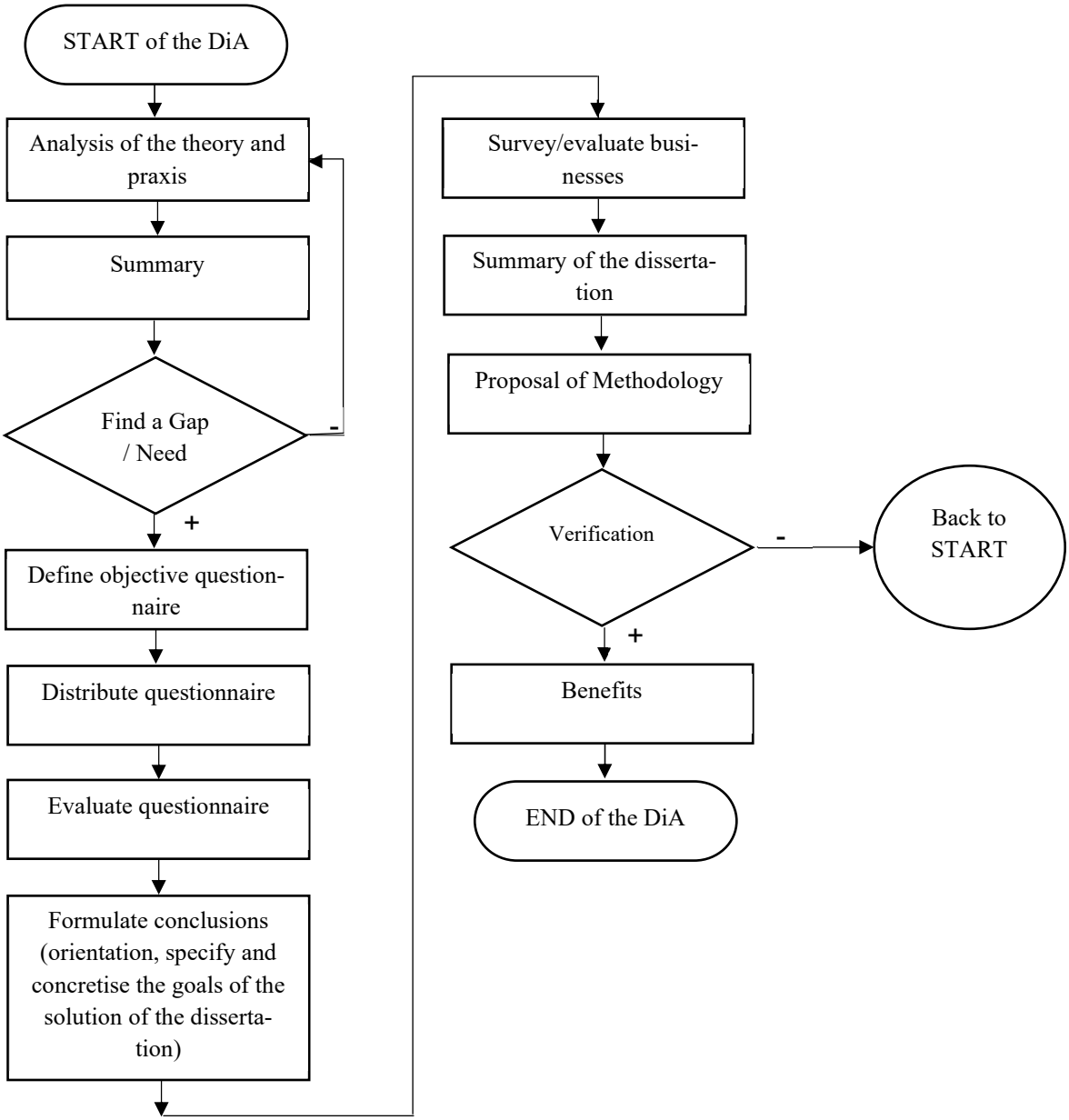

Fig. 2: Flow chart dissertation process (own depiction)

Choice of methods for solution

The choice of method for solution leads back to a questionnaire. Due to the discrete survey, it is assumed that the answers are honest and that the questions were answered in their entirety. This was also a decisive criterion for the businesses operating in the same field(s).

Chosing the method for the solution

After finding the method, the different questionnaires are analysed individually. Subsequently, both questionnaires are compared in order to identify relationships between the surveyed businesses (national or international). The SWOT analysis is used to further evaluate the questionnaire. Likewise, the required methodology will be elaborated on the basis of the SWOT analysis and put into practice. After implementation it will be evident that this researched methodology achieves an increase in effectiveness and that the physical burdens are minimised or optimised as much as possible.

Finally, the chi-square method is used to examine the relationship between the high probability of an association/effect between professional experience and perceptions of occupational risks. It is intended to demonstrate how the relationship between professional experience and risks should be understood. The reason for this is that the chi-square test of independence is a statistical hypothesis test and is used to examine whether two categorical or nominal variables are likely to be related.

4 ANALYSIS OF THE BASIS FOR EVALUATING THE EFFECTIVENESS OF WORK WITH UNUSAL WORKING CONDITIONS

In this part of the dissertation, the data collected so far are analyzed and evaluated in the form of a SWOT analysis, including the matrix for the pilot company as well as for the international companies, the evaluation of the questionnaires and the assessment using the Chi-square test.
After the entire evaluation by the pilot company and the international companies, a summary and a conclusion are drawn.

4.1 Choice of operations (processes) for the analysis

The Pilot Company, which currently employs 300 people in Austria, Germany, Hungary, Slovenia as well as Croatia, was taken as a basis.
The reason for choosing Pilot Company for the first analysis is the level of knowledge compared to the other businesses, which are called Mibag Sanierungs GmbH, Belfor Austria GmbH and Polygon Austria Service GmbH. These are not only Austrian businesses, but global corporations, and they thereby extend the level of knowledge regarding the process flow in other businesses. In this way, the analysis is also expanded by the level of knowledge in the entire industry. The result is that the developed methodology can be partially or even completely incorporated for the entire sector worldwide.

It is a basic requirement that the entire survey of this dissertation work was not only carried out in Austria and one branch. The survey was carried out in different countries and in a wide variety of branches, which also have a wide variety of framework conditions in terms of area, people, unusual working conditions, etc. Another important fact is that the survey was also carried out in several companies in this industry.
More than 50% of the people who conducted this survey to the best of their knowledge and belief have been working in companies in this industry for at least 5 years. It can be assumed that the affiliation to the company does not

indicate the actual level of knowledge of the people on this topic, since many people have already worked in this industry for years, but in a wide variety of companies.

4.2 Summary of RQ's

What is most valuable is not only the assessment of the individual construction sites with their PPE concept (correct footwear, equipment to defuse hazards such as tripping hazards, noise, dust, etc.) but also the consideration of the connection between the individual parameters of the effectiveness of the work activity and the efficiency of the person carrying out the work process.

Answering RQ1 to RQ2 is also essential.
In the case of RQ1, the variables noise, smell, air quality, etc. influence work performance differently. In this case, it depends on the sensitivity of the individual. It also depends on the degree of salience of the respective variable.
The key parameters in the risk area are the existing conditions on the construction site, such as the client (type of person, interaction with third parties, etc.), air quality, location, how the work is carried out, etc. Ensuring safe physical conditions (ergonomics, ventilation, protective equipment) reduces risks and injuries, thus promoting healthier and more productive workers. A positive work culture and job satisfaction are crucial for retaining young workers.
The assessment is carried out from both a technical and health perspective. From a technical perspective, it is the choice of tools and what needs to be done; from a health perspective, it is the environmental conditions such as noise, the client themselves, etc.
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4.3 Conclusions of the analysis of the pilot company

The analytical part of this thesis the current state of the knowledge base in the field of the dissertation and was carried out with the aim of delineating the approach from the starting position for the solution of the dissertation topic.

I have gained the bulk of knowledge about the evaluation of the effectiveness and risk of the work/work processes mainly in companies of the Pilot Company (Austria, Germany, Slovenia, Hungary, Croatia, etc.) or acquired it through the following methods:

- often from interviews,
- own observations/experiences and
- survey.

I was able to conduct **interviews** quite often during my work activities (Pilot Group). The acquired information (knowledge) was current information that was connected with realised case studies. Interviews were conducted with managers and project managers.

Own observations have been realised in the Pilot companies and are linked to the experiences of the employees. They have carried out work with unusual working conditions - the focus was put on these. The information (knowledge) acquired through own observations was used as verification points for estimating (evaluating, specifying) the conclusions from the surveys (questionnaires).

A **survey** was used as a method to collect the information on the topic of the dissertation and has helped or strongly influenced the formulation of the solutions for the design of the methodology.

- Identification (existence) of work with unusual working conditions;
- Determination (limitation) of the parameters of the working conditions that workers have classified as unusual;
- Confirmation of the possibilities for the analysis of such work (choice of methods of analysis);

- Limitation (choice) of the totality of parameters (type, number, form, construction, standard sizes, etc.) for the evaluation (estimation) of working conditions;
- Assessing and deciding on the effectiveness and risk of carrying out work with unusual working conditions;
- Confirmation that the designed methodology for assessing the effectiveness and risk of performing work with unusual working conditions is real and useful.

- Orientation of the designed methodology based on:
    - Assessment (identification) of the existence of significant influences of individual parameters (indicators) in the unusual working conditions, as well as considering the effectiveness and risk in their execution;
    - Quantifying the level (extent) of the impact of unusual working conditions on the effectiveness (risk) of work performance;
    - Contribution to the specification of the procedures for the assessment (evaluation) of the impact of non-standardised values of the parameters of working conditions in the area of effectiveness and risk within the work process;
    - Designing a mechanism (procedure) for determining the strength (extent) of the influence of the parameters of working conditions on the change (reduction) in work performance.

In practice, the business Pilot Company is a pioneer in the new forms of management to be developed, respectively in dealing with the staff and working conditions. The current status is that there is a manager type survey in the business, from which it clearly emerged that the predefined managers can certainly blend with each other. Likewise, in connection with unusual working conditions (drinks machine incl. bar, go-karts, etc.), an improvement in the working conditions as well as the manager and a resulting positive relationship with the staff is evident. This survey will now be extended to all positions reporting to the manager in order to get the view of

these persons as well. It is also a concern to obtain the framework conditions in the areas of physical as well as mental work (work processes).
The draft solutions for the dissertation problem are:

- Optimisation of the knowledge transfer from top to bottom
- Training of each staff member in terms of
    - social competence,
    - leadership,
    - management,
    - controlling, etc.
- Creation of leadership courses for young entrepreneurs or generational changes
- Shaping working conditions more individually
- Optimising physical as well as mental work (activities)
- Building up long-term staff
- Optimising procedural processes

According to further research and feedback received to date, the focus in this dissertation is not only on the connections between managers and working conditions. Equally, working conditions - regardless of physical or mental work - have been brought into focus.
The increase in value in all areas, especially in the areas of effectiveness and efficiency of the work process (business), comes from people who have to deal with the unusual working conditions with physical or mental know-how. In order to be able to design a profitable methodology that can be used in the entire elementary sector, the answers from the surveys must be analysed in detail and taken into account down to the smallest detail.
From the details, one can see very precisely and well that most of the people interviewed are very loyal to the business, but that one or two framework conditions are not in order, e.g. the noise level is too high, the instruments and machines are outdated or hardly work. That means, put simply, that personal protection is not a priority. This can be a reason for staff to assess these conditions as a deterioration of working conditions and an obstacle to work performance.

The challenge of this dissertation is to design a methodology that can be applied to the work process, in particular, for the persons working on site at the client. In this case, a process would have to be developed on how to support and motivate each person in their position.

The formulated conclusions of the analysis (especially the results of the survey) form the clues (focus) for the solution of the topic of the dissertation.

4.4 Conclusions of the analysis of the international companies

In the evaluation of the first two questions it was noticeable that the participants in the family business were to be found in all age categories, whereas in the international comparison the majority was in the middle age range (30-55 years) and a very large proportion was male.
With regard to questions 3 and 4, which referred to school education and position in the business, the answers in both surveys show a similar ratio: very strong in the area of basic and middle school education. With regard to the position in the business, many participants were technicians. This allows for a very good and practical evaluation, as there are naturally more technicians than managers in every business. The length of employment in a family and international comparison was above average at 5 to 15 years.
In terms of workload, the ratio is just as close, which again shows that the work in family businesses as well as in international companies is very similar. From this it can be concluded that all businesses have to work with identical challenges in this area and therefore, from the current point of view, the methodology can be applied to all businesses in the area of natural hazard relief.
The two points "physical work with a small load" as well as "work with a predominantly varied mental load" are rated very highly by both surveys, with the varied mental load being used more highly or more often as an answer. It can be concluded from this that the work environment is very extensive and that each individual construction project would have to be assessed separately; therefore a methodology is required.

Similarly, the activities carried out by all, from the cleaning staff to the technical area and from project management to the management level, are assessed without risk. If a risk were to be assessed, the risks in the health area were rated higher than in the technical area.

Work performance is considered at a very high level in the area of "efficiency" and "effectiveness". This can also be seen very well in the direct comparison of the two surveys.

The question dealing with the physical work and the direct connection with the (physical) load, according to the answers, shows very clearly that this is a minor issue: Or rather, it is of no importance.

The influence of the organisation of the work process on the work performance also results in a clear "hardly", i.e. a little, or slightly up to "not at all".

The working environment has physical parameters such as lighting, noise, vibrations, etc., which, according to the feedback from the respondents, were answered with "health" on both sides by more than 30%. Hygiene/occupational health and safety is selected with around 20%, also on both sides. Finally, more than 40% are negative influences on work performance. It can be concluded that the general work performance as well as its effectiveness (Are we doing the right things?) and efficiency (Are we doing things right?) are decreasing. The following question 12 of the questionnaire or table shows a detailed evaluation of the parameters of the working environment.

For the other questions related to health, i.e. "unhealthy (inability to work)" and "accidents (injuries)", the answers are very similar and are rated as very rare or never. What makes it very clear is that an incapacity to work was rated a maximum of 2% and accidents a maximum of 1% as "very often".

An equally important point is the question regarding the weakening of work performance. In this feedback the family and the international field are very close to each other, as this point was rated as insignificant by well over 60% and as significantly large by just under 5% in both feedbacks. Here, in the middle range "partly (10 to 15%)" there is a deviation of just under 7%. In the family sector, there is a deviation of 25.9% and in the international sector about 32.7% of the responses.

The personal views are a little lower in the family sector than in the international sector. A major reason for this may be that people in family businesses assume that the responses are traceable, but this was not the case in this survey. This survey is structured in such a way that the answers or personal views are 100% anonymous and thus an honest answer can be given without any consequences.
From the personal views, the most diverse characters are very visible. For some groups of people, this topic is unavoidable and they are glad that this is being tackled. Others see more of a mediocre to little need for action in this area. Many people also noted that the feedback could only be reflected from the perspective of their position. There is a need for action because the majority of the persons interviewed consider this area to be very complex and interesting. A methodology for application in family businesses as well as international companies in the field of natural hazards is an unavoidable goal that will increase the quality in this sector and bring about a simplification for all involved.

5 DESIGNING A METHODOLGY FOR EVALUATING THE EFFECTIVENESS OF WORK WITH UNUSUAL WORKING CONDITIONS

In the following chapter, based on the acquired theoretical as well as practical knowledge, a methodology is designed or described which in the future should enable a more effective as well as higher quality approach in the practical procedure in enterprises, which carry out the work (work processes) with unusual working conditions. This methodology should also reduce the risks in health and technical areas and motivate the entire staff.
In this chapter, the following designs are presented:

- the assignment of the topic of the dissertation and
- the collected information about the (actual) state of knowledge in the field, which has been determined and the formulated goals of the solution, which should be fulfilled by this dissertation.

5.1 Design of the methodology

The philosophy (basic principles) of the "Methodology for evaluation of effectiveness of work with unusual working conditions" is basically defined (determined) by the formulated objectives (main objective) of the solution of the topic of the dissertation.

5.1.1 Basic principles of the methodology

The project (design) of the methodology takes into account the generally valid principles and procedures of evaluation of effectiveness (OUTPUT/INPUT) and risk of the work (work processes). In our case, it is the assessment (estimation) of works to be carried out under unusual conditions. This justifies the requirement of **specific access** to the compilation (projecting) of the methodology for the specific (non-standard) conditions of the implementation as follows:

- in collecting data on the (actual) state of implementation and assessment of the work with unusual working conditions;
- for the division of the activities of the analysis of the collected information;
- in the design (projecting) of the methodology, i.e. clear and unambiguous presentation of the individual steps of the procedure (precise and comprehensible determination of the objectives for all steps of the application);
- simple but accurate assessment (determination) of the effectiveness (contributions) of the application of the methodology (formalisation for ITT application);
- predefined set of relevant and accessible methods for application in individual steps of the methodology;
- defined standard values of indicators (parameters) of unusual working conditions.

In order for the application of the designed methodology to be helpful for the plant managers (in terms of the defined objectives), it is necessary to define very clear objectives (analytical specific objectives) for each step of the procedure and to assign the corresponding method(s) when designing the methodology.

Finally, it is useful to work out the concrete procedure and a concrete time schedule for the implementation of the designed methodology.

5.1.2 Structure of the methodical procedure

For a better representation of the graphic structure of the content of the designed methodical procedure's individual steps for the evaluation of the effectiveness of selected works and for the rational course of the application and use of the designed methodology, there is an appropriate, accessible, graphic method for the elaboration of the graphic representation (graphic model) of the application process of the designed methodology.

Model of methodical process

The object of the solution of this dissertation (analysis and evaluation of the effectiveness of WwUWC) is a widely branched (diversified) process with a complex system and variable parameters in the totality of defined objectives and designed distribution (stages) of the solution process.

The need to represent the solution object in a simple, understandable, executable and at the same time complex model is based on the necessity of rational creation of a graphic representation (graphic model) of the course of implementation and use of the designed methodology.

The objective of mapping the methodical process is to record and present the structure and content of the process (its steps and stages):

- data collection,
- data processing,
- data analysis,

- decision on the character (quality) of acquired information (knowledge) and the impact of the parameters of working conditions on the effectiveness and risk of the work to be carried out,
- endeavour to present (visualise) the dynamics (time course) of the methodical process,
- formulation and presentation of the results of the solution of the dissertation topic.

A suitable form for the presentation of the methodical procedure (methods accessible and verified from the totality) is a graphic model, i.e. graphic presentation of the time course of the implementation of individual activities (in accordance with the designed methodology): FLOW DIAGRAM of the course of solution of the dissertation problem.

This conclusion was derived from the following, known and verified characteristics of the flow chart:

- enables the registration through the analysis of acquired (verified, reliable) information about the ACTUAL state (current state) of the solution object (solution objectives),
- enables the division (descriptive) of the solution object (its parameters) for the discovery of dysfunctions of individual parts of the object,
- represents the possibility of the real variant of the solution (elimination of dysfunctions),
- formality of the decision (+,-) in the decision blocks of the flow chart and helps to design activities for innovation (rationalisation) of the solution object,
- integrates the positive (+) decisions for designing the reconstruction of the solution object.

The flow chart provides the totality of information for the compilation of the document (work regulations) for the work process management (working with unusual working conditions).

The flow chart is supported as a kind of a map of the solution object. It is a fusion of the activities of the designs and users in the practical exploitation

of the designed solutions. At the same time, it is a good approach to prepare for the creation of an IT programme (exploitation of ITT).

Implementation and utilisation of the flow chart

The complexity of the structure (composition) of the flow chart is determined as a graphic representation of designed, methodical procedures and the complexity of understanding (interpretation) during practical implementation:

- Complexity of the internal structure (content) of analysed processes (various types of work),
- the totality of the various parameters of the working conditions of the analysed processes,
- necessity of the broad data base of the input information to be put together (collected, processed, preserved, maintained, protected).

The content, scope (structure) and implementation of individual steps (stages) of the flow chart of the designed methodical procedure are determined by the following influencing factors:

- The data base (totality) of the entry information on the current status of the analysed works was acquired through the survey in the analytical part of the dissertation.
- Complexity of the parameters of the working conditions of the analysed work processes (selection according to the planned accuracies of the identification of the work with unusual working conditions),
- accessibility (timeliness, reliability) of parameter values (standard and normative values) of working conditions of analysed works (necessity of elaboration or acquisition of the information or combination of both possibilities),
- methods (complexity, accuracy) of assessment of unusual working conditions (own estimation, expert estimation, comparison, extrapolation, etc.),

- methods (manner) of assessment (evaluation) of deviations of real and normative values of parameters of UWC (measurement, observation, comparison, expert estimation, etc.),
- classification of (unusual) working conditions according to complex chosen parameters (standard – usual – unusual),
- classification of work (work processes) according to the character (impact) of working conditions → effective work - ineffective work - standardised work (timing, cost, work performance) or risk work (health, accidents, convenience, etc.),
- expected form of output (results) of the solution for practical application (agenda, print-manual, supported software, etc.).

For the use of defined conditions (type of work and character of working conditions parameters), the designed construction (diagram) of the flow chart is corrected (adjusted) and applied to a small extent. It could be rationally shown that the construction (diagram) of the flow chart (branching) can be simplified and thus the number of steps can be reduced.

The process of practical application of the designed methodology with the help of the flow chart will require some (theoretical) knowledge, experience and practical skill from the users as well as the ability to operationally (optimally and quickly) choose the appropriate method of solution in the concrete step of the procedure according to the specification of the concrete work process.

Short Explanation of the processes:

After the start, data from the information as well as our own research knowledge, company documentation, etc. are collected and recorded. The research findings are contained in the theoretical section. The knowledge gap, or rather the definition gap, that emerged during the research was filled with my own definition. The company documentation, which was compiled over time through practice and continuously documented, also forms part of the data. This is followed by the classifications according to the nature of predominant works. The processes are divided into work regarding work of

a bodily (physical) nature, work of a mental (psychological) nature and risk work (risk factor).
Crucial parameters of the working conditions for the 3 classifications are then presented.
After assessing the individual criteria in the divided classifications, you come straight to the end or all the way to the evaluation (comparison) of real and normative values of par meters.
If you have successfully completed this area, you will come to the process with the UWC's up to the individual classification results and the end or positive introduction.

To explain the entire process in more detail, the individual processes are described in detail as follows:

Process 1: Processes in work of a bodily (physical) nature
After the start and classification, the processes involved in work involving physical (physical) nature are defined, and the key parameters of the working conditions are declared. If the force/muscle load, the load due to the duration of the work, or the load due to environmental parameters predominate, further approaches are selected. If none of these loads predominates, the process is completed; however, if one parameter is positive, the process continues.
In the area of force/muscle strain, it is determined whether heavy loads are being manipulated. This determines whether excessive muscle strength or unsuitable muscles are required.
Then, a comparison of the parameter values is performed.

In the area of work load duration, it is determined whether the work duration is long. This determines whether work saturates, or unsuitable breaks are present.
Then, a comparison of the parameter values is performed.
In the area of environmental stress, it is determined whether excessive noise is present. This determines whether unsuitable lighting is present or the microclimate is not ideal.

Then, a comparison of the parameter values is performed.

Next, it is determined whether this is a process with unusual working conditions. If this is not the case, the process is terminated. However, if this is a case with unusual working conditions, the work processes that involve physical/muscular strain under unusual working conditions follow.

Further parameters such as reduced work performance, endangerment of employee health, and the threat of non-compliance with occupational safety regulations give the process the opportunity to be terminated immediately. If any of these parameters are assessed positively, the entirety of the work involves physical strain under unusual working conditions that affect effectiveness.

Process 2: Processes in work of a mental (psychological) nature

After the start and classification, the processes in work of a mental (psychological) nature are defined, and the decisive parameters of the working conditions are declared.

If the strain on the sensory organs outweighs the strain on the brain (thinking, etc.) or the strain on work capacity, further approaches are chosen. If none of these strains predominates, the process is completed; however, if one parameter is positive, the process continues.

With regard to strain on the sensory organs, it is determined whether memory impairment could be compromised. This also determines whether unsuitable conditions exist for the optic nerve or hearing.

Then, the values of the parameters are compared.

In the area of brain strain (thinking, etc.), it is determined whether there is a threat to decision-making ability. This is determined whether there is a reduction in attention or an increase in reaction time.

The values of the parameters are then compared.

In the area of work capacity strain, it is determined whether there is an increase in manual dexterity. This is determined whether there is a reduction in muscle effectiveness or a reduction in coordination.
The values of the parameters are then compared.
Next, it is determined whether this is a process with unusual working conditions. If this is not the case, the process is terminated. However, if this is a case with unusual working conditions, the work processes that are carried out with mental and muscular strain under unusual working conditions follow.

Further parameters such as reduced work performance, endangerment of employee health, and the threat of non-compliance with occupational safety regulations give the process the opportunity to terminate it immediately. If any of these parameters are assessed positively, the entirety of the work is considered to be involving mental stress under unusual working conditions, which impacts effectiveness.

Process 3: Processes in risk work (risk factor)
After the start and classification, the processes in risk work (risk factors) are defined, and the key parameters of the working conditions are declared.
If the impact on the occupational environment, health and occupational hygiene, or the impact on occupational safety and health risks predominates, further approaches are chosen. If none of these impacts predominates, the process is completed; however, if one parameter is positive, the process continues.

In the area of the impact on the occupational environment, it is clarified whether excessive noise could occur. This determines whether unsuitable conditions or unacceptable vibrations exist or could occur.
Then, a comparison of the parameter values takes place.
In the area of health and occupational hygiene, it is determined whether there is a threat to decision-making ability. This determines whether there is a reduction in work capacity or an increase in accidents.
The values of the parameters are then compared.

In the area of occupational safety risk, it is determined whether there is an increase in manual dexterity. This determines whether there is an unsuitable microclimate or a threat to occupational safety.
The values of the parameters are then compared.

Next, it is determined whether this is a process with unusual working conditions. If not, the process is terminated. However, if this is a case with unusual working conditions, the work processes that involve mental and muscular activity under unusual working conditions follow.

It is important that the person responsible for the project is also an expert as well. He not only has responsibility for the project, but he also has a duty of care for the employees who will work with him on this project.

When inspecting and assessing each individual project, he must adhere to the given regulations regarding the handling of the project and the protection of colleagues.

Other parameters, such as reduced work performance, endangerment of employee health, and increased sickness absence and accidents, allow the process to be terminated immediately. If any of these parameters are assessed positively, the entire risky work is considered to be under unusual working conditions, which impacts effectiveness.

6 CONTRIBUTIONS OF THE DISSERTATION

In this chapter, the contributions of theory as well as the contributions of practice and training are explained. Short descriptions in both areas make it easier to understand and show possible integrations in companies.

6.1 Contributions to theory

The current theoretical contributions are general explanations, definitions and descriptions of the framework effects. They talk about risks, effectiveness as well as efficiency, operations management, usable methods for finding a methodology and, of course, unusual working conditions in general; however, these are not sector related.

Extensive research in a wide range of sectors does not provide a precise definition of a methodology for assessing such unusual working conditions. For theory across the sector or even in similar sectors, this dissertation should be used for information reading. Likewise, the methodology designed is intended to be theoretically available for further development. There is a possibility that this methodology could be used to create a basis for further related business sectors in which a methodology could be developed, for an as yet unknown case in specific areas of application.

With regard to this dissertation, ISO 9001:2015 can be used to anchor a permanent control instance in the management after the survey evaluation and the creation of the methodology. In addition, ISO 22301:2019 provides the opportunity to react very quickly to possible physical disruptions. This can prevent a prolonged system failure in the business. It also serves to identify and minimise vulnerabilities or eliminate them altogether.

6.2 Contributions to practice and training

Since this methodology has been designed for businesses in the national or international as well as family-owned sector or strategically managed businesses, these documents and the basic knowledge are also integrated into practice as well as training.

In the pilot company, the basis in the areas of risks, operations management, effectiveness, efficiency and of course physical stress is already integrated in the training programme.

There, not only the theory is taught, but also the handling in practice is discussed on the basis of case studies, where this methodology has to be used. For this reason, the pilot company also decided to expand the “TEAM SCHMACHER ACADEMY" programme with training courses such as risk management, operations management, communication, stress management, etc. This allows this methodology to be taught and implemented in its entirety, which strengthens the overall success at every level of the business. Likewise, other courses such as mindfulness, conflict management and NLP are offered for even better implementation of the designed methodology.

Another essential objective for the practice as well as for the training is to present this methodology in such an interesting, efficient and economical way that it is not only interesting for the businesses or entrepreneurs but also reaches the individuals in the company. The case study in the appendix shows that in practice there are several parameters that can be optimised (physical, emotional, etc.). An important element is the unusual working conditions that prevail in any form of enterprise in the elementary sector but are not perceived as such.

The methodology has to be lived by the management of the company in order to be accepted by the whole staff. Companies do have there own Building Academy as well including their own logo.

Fig. 3: Logo of the TeamS Academy in the Team Schmacher GmbH(own depiction).

CONCLUSION

The analyses carried out within the framework of this dissertation, as well as surveys titled DESIGNING A METHODOLOGY FOR EVALUATING THE EFFECTIVENESS OF WORK WITH UNUSUAL WORKING CONDITIONS have shown that a draft for a special, adapted methodology for businesses operating in the field of natural hazard restoration is inevitable.

At the beginning, the necessary and required theory in the entire field of risks, operations management, effectiveness as well as efficiency, working conditions, PPE, etc. was collected and briefly presented. In the course of this, no suitable theory could be found that presents, describes or graphically explains such a methodology. In order to be able to develop a methodology with the acquired theoretical knowledge, it was also necessary to find and elaborate a suitable survey option (decentralised staff deployment) and its subsequent evaluation.

The survey was divided into two questionnaires: one in the pilot company and another in various international companies or groups, whereby the questionnaires were identical.

The subsequent evaluation showed an identical result or a result with minor deviations and gives a clear direction. The identical direction with regard to the surveys led me to conclude that the requirements as well as challenges for businesses in the natural hazards sector are the same.

The challenge or question of the proposal methodology was the same nationally as well as internationally and affected the entire staff on the health as well as technical spectrum equally. Through this feedback, optimisation approaches or basic research questions could be created and clarified quickly.

For the methodology, a basic theory of PPE as well as a methodical guideline was given, but no exact methodology as to how such a process should look like and especially not when there is to be a methodology in the process to facilitate site work. Likewise, the methodology for easy selection of PPE for each type of construction project has been integrated into this process.

It has been found that prior to the drafting of the methodology, work was done on construction projects without any assessment and hence the level of effectiveness as well as the quality of each was greatly affected. This was also communicated to the outside world - to clients as well as suppliers.

Finally, it should be mentioned that the current approach to site assessment and the use of PPE by the staff can only be carried out with the appropriate experience, as there is no "methodology" here. The evaluations and resulting processes with the methodology specifically designed for this sector are assumed to have a positive impact on the people working nationally as well as internationally. It will also reduce physical strain and thus increase the effectiveness, quality and value of the businesses.
There will always be people in various businesses who will not be in favour of this methodology, as they believe it represents extra work. However, this is only the case as long as people refuse to see the added value for themselves and other colleagues.

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