

APPLICATION OF THE MULTI-METHOD ANALYSIS IN RESEARCH ON OCCUPATIONAL SAFETY OF YOUNG WORKERS

Irena Hejduk

Warsaw School of Economics, Poland
hejduk.irena@gmail.com

Piotr Maicki

Warsaw School of Economics, Poland
piotr@maicki.pl

Abstract:

The research will show the potential of multi-method analysis in the area of occupational safety and knowledge management. To accomplish the purpose of the research, the meta-analysis method will be performed. Based on the results of this analysis, the main methodological approaches will be identified and the essential advantages of multi-method analysis will be revealed. The main findings of this research will be used in terms of the study conducted by the Warsaw School of Economics team, implementing the scientific project in association with the Central Institute for Labour Protection, funded by the The National Centre for Research and Development. The purpose of this project is to find the key factors affecting the safety culture of young workers by verifying the relationships between explicit and tacit knowledge, safety attitudes and safety culture moderated by the tendency to use modern technology among young workers in manufacturing industry in Poland. In the article applicational case study (including elaborated models) is presented.

Keywords: occupational safety, safety culture, young workers, multi-method analysis

1. INTRODUCTION

The research conducted by the Warsaw School of Economics team, implementing the scientific project in association with the Central Institute for Labor Protection, founded by the National Centre for research and Development, shows the potential of multi-method analysis in the area of occupational safety and knowledge management. As an implication of historical creation of OHS (occupational health and safety) studies, there is a gap in studies which are more holistic, using multidisciplinary research basing on theory and empirical studies (Hejduk, Tomczyk, 2015, *Occupational Health and Safety Management in Organizations*). That is why, i.e., the objective research is conducted by the WSE team. Researchers in this area adopt a multidisciplinary approach which reflects in using a wide variety of research methodologies (quantitative, qualitative and mixed methodological approaches).

2. AIM OF THE WSE'S RESEARCH

The key factor of the work safety is the safety culture incorporated by young workers in enterprises. Hence, the aims of this paper are to describe multi-method analysis of safety culture components in the context of presented research of young workers occupational safety in Poland and present the value of this kind of approach, showing that multi-method analysis really matter. At the same time, the notion of safety culture will be described in the context of analyzed literature. That is the reason why an expert from the University of Central Florida professor Waldemar Karwowski with his deep experience cooperates as a project partner. The completion of empirical studies takes place in the next two years of the research project. Multi-method analysis in the context of safety culture and the basic assumptions of the project, especially presented in the conceptual model of knowledge transfer in the area of occupational safety, are the highlights of the article.

3. MULTI-METHOD ANALYSIS

One should indicate that quantitative, as well as, qualitative method could be used in the research. The combination of quantitative and qualitative methods might be also known as "mixed methods". "multi-method" or "multiple methods" research (Stecher, Borko, 2002, pp. 547-569). Standardizing the terminology, the combination of these both methodological approaches is called multi-method analysis. The role of quantitative components is to characterize the object, test the correctness, effectiveness, regularities and variability. On the other hand, qualitative tools are useful to get know the issue and create questions of a research form. Especially in multi-method analysis, the function of measurement tool is encountered. This kind of attitude is becoming popular especially in the area of educational and social research. Implementing multi-method analysis, researchers benefit from advantages of both methodological approaches. The complementarity of both methodological components is useful to, answer questions only answered using one type of methodology, see various aspects of the same scientific problem and help each other in reaching the most effective results.

For the young workers occupational safety researchers it is justified by the ubiquitous need of comprehensiveness to understand the complexity of the issue, getting higher level of confidence in findings including the voice of the whole variety of conditions, attitudes and beliefs, as well as, supporting the correctness and effectiveness (sampling, data collection, analysis) of different methods (O'Cathain, Thomas, 2006, pp. 102-111). By getting more extensive and varied results, the researchers have bigger opportunity to get known better the issue and give more adequate conclusions and recommendations in the area of occupational safety promotion among young workers. In the field of qualitative methodology, focus group studies and postquantitative experimental group studies will be used. These research tools are very common in this type of research.

The knowledge of young workers occupational safety is broad, but there are few effective solutions in this area. Moreover, the scientific knowledge is not sufficiently used in designing and implementing solutions aiming at young workers occupational safety in Poland. Using multi-method approach, researchers want to analyze the occupational safety system of young workers and aim at solutions to improve the creation system of safety-behavior attitudes among young workers by enhancing the educational system of young workers, especially by effective usage of existing sources of explicit and tacit knowledge in the area of occupational safety concerning implementation of mobile technologies. The basic tool in this area is the usage of existing sources of explicit and tacit knowledge in the area of the research. The contemporary system of the occupational education is mostly based on the transfer

of the explicit and formal knowledge in the form of procedures and instructions. At the same time the tacit and informal knowledge, which is generated by the individual practice, is ignored.

4. ORGANIZATIONAL AND SAFETY CULTURE

The evidence is published indicating that the usage of the tacit knowledge has the positive influence on enterprises in the area of occupational safety. The relevance of tacit knowledge elements in shaping the safety culture is confirmed by the workers opinion showed in the research which indicates that the tacit knowledge is complimentary to the explicit knowledge because the formal regulations do not consider all risky situations and even if, the solutions are not the most adequate to the situation.

Company's organizational culture is the source for safety culture. *There is no specific definition of organizational culture, but Reason (Reason, 1997) has defined Uttal's (Uttal, 1983) as one that recognizes the essence of the phenomenon without unnecessary noise:*

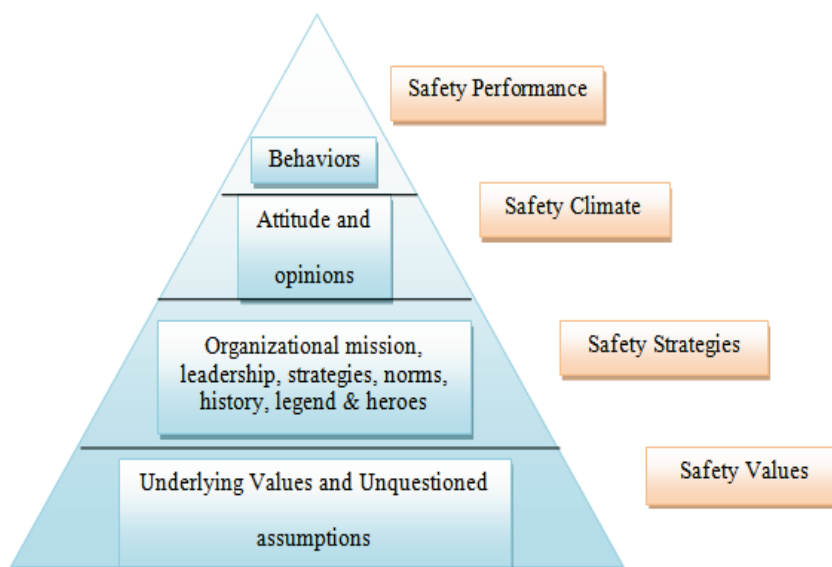
(This organizational culture is) the shared values ("what is important") and beliefs ("how it works"), which interact with the organizational structures and control system in order to produce norms of behavior ("how we do it here").

On the other hand Helmreich and Merritt (Helmreich, Merritt, 1998) define organizational culture as *the values, beliefs, assumptions, rituals, symbols and behaviors defining the group, in particular in its relations with other groups or organizations.*

Edgar. H. Schein says that *organizational culture is a pattern of basic assumptions invented, discovered or developed in the group while learning to cope with external adaptation and internal integration. This is the pattern of assumptions, which were considered important and which form the basis for training new members as the correct perspective of perception, thinking and feeling about these issues.*

Safety culture pyramid was built by Patankar and Sabin. *This concept characterizes relationship among four levels of culture. The model shows the influence on individuals in the organization in the context of their behavior and performance. Safety performance is placed at the top of the triangle (Patankar, Brown, Sabin, Bigda-Peyton, 2012). Pyramid of the value created by Patankar and Sabin was presented in the picture below (Picture 1).*

Picture 1: The safety culture pyramid



Source: Patankar, Brown, Sabin, Bigda-Peyton, 2012

5. BASIS OF THE WSE'S RESEARCH

The aims of the research determine three phases of the research:

1. creation of the conceptual model of the knowledge flow in the area of work safety regulations in the system of young workers occupational education;
2. evaluation of the effectiveness of the formal sources of explicit and tacit knowledge in the area of work safety regulations and educational methods using this sources, in the context of shaping attitudes towards work safety regulations among young workers; in order to achieve this objective, statistical analysis will be performed; the main objective of the work planned in the third stage of the project is to verify the developed model of training using explicit and hidden knowledge (Hejduk, Tomczyk, 2015, *Young workers' occupational safety knowledge creation and habits*);
3. verification of the elaborated model of the labor education with the usage of explicit and tacit knowledge.

The anticipated effect of the implementation of the results of the project is mainly the improvement of the educational labor system of young workers, particularly by using existing sources of explicit and tacit knowledge in the area of safety and, at the same time, enhancing processes of safety labor knowledge management. It will be reached by creating a model of safety culture which idea bases on the transfer of knowledge on occupational safety of young workers in Poland. This internal motion is a dynamic people's beliefs verification process (Duhigg, 2013). The management of knowledge is *systematic process aimed at knowledge-based capitalization of intellectual resources in the enterprise* (Duhigg, 2013).

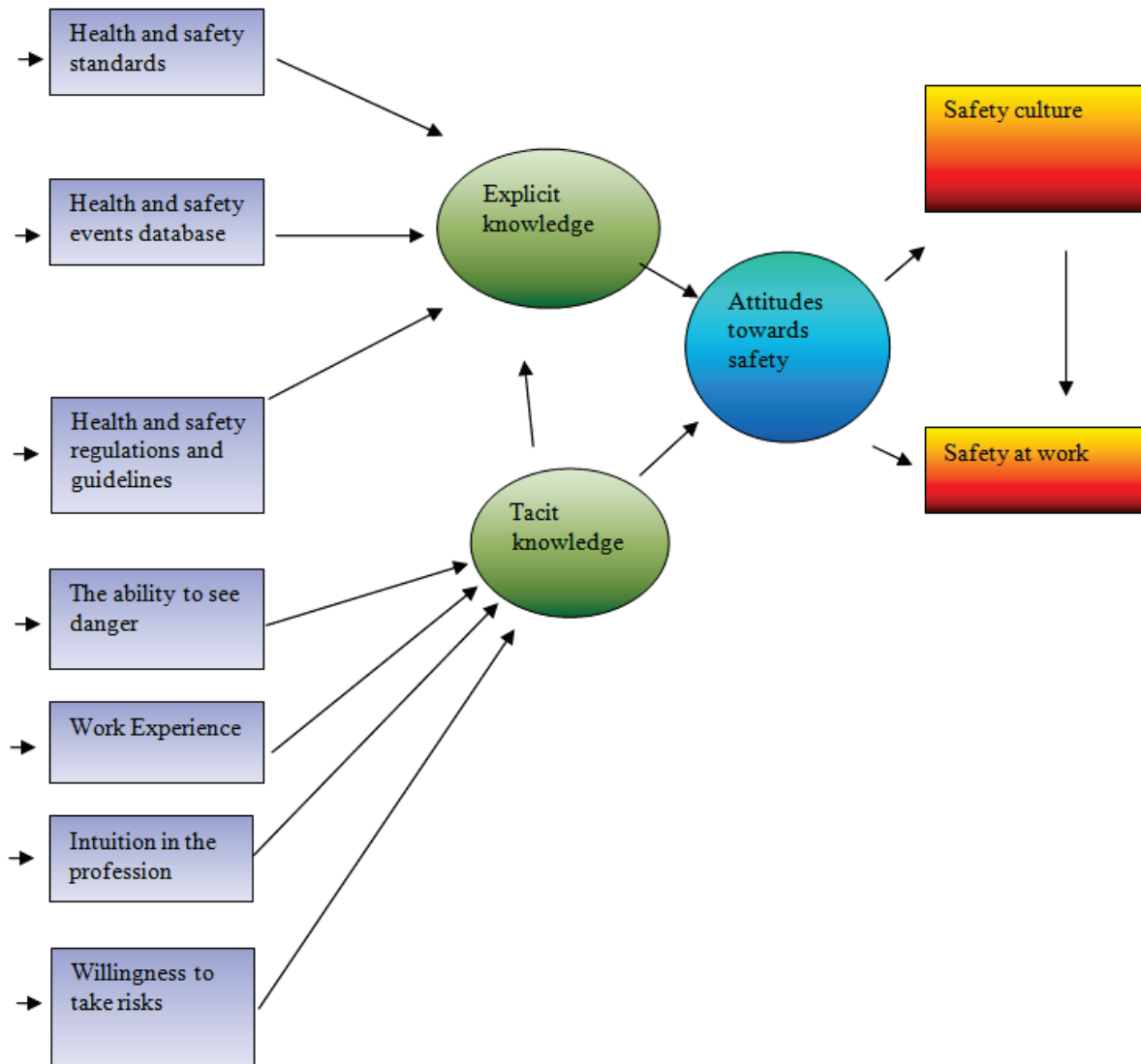
One could assume that the results of the project will be implemented at least in 20 vocational schools teaching 3 000 of the future workers. It might increase frequency of occupational safety behaviors among young workers connected with these cooperating schools.

If one can define knowledge management as the whole of actions to identify, retention, proliferation and usage of the explicit and tacit knowledge of the workers in order to improve effectiveness of their performance, knowledge management in the technical aspects might be understood as the combination of procedures and technical means providing the transfer of the personal experience and knowledge of the organization member to the organizational data base and providing storage and distribution of the necessary information among entitled members of organization (e.g. taking from the data base information about the current procedures and regulations, but also participating in e-learning trainings). Especially modern technologies, such as mobile technologies, Cloud Computing, should be taken into consideration.

Taking into consideration the research method of first phase of the research, one should indicate the broad analysis of the world's literature of knowledge management and labor safety of young workers. Scientific studies, papers and essays in English and Polish, reports and various laws were analyzed. In the course of the project, the method of metaanalysis was used which bases on the critical analysis of the discipline's output connected with systemized findings. Research questionnaires were compiled, currently verified. The research will embrace chosen OHS inspectors and young workers from branches where the level of occupational safety is the lowest or the highest. According to the research program, young workers are those whose job seniority do not exceed three years. In conclusions, there will be included results of broad discussions about the concept of a young worker and differences between the notions young and juvenile worker. One of the study's result should be the full interpretation of this notion.

The first phase of the research was aimed at development of a conceptual knowledge flow model in the area of occupational safety in the young workers educational system. The starting point for creation of the model were studies of organizational and safety culture. The model is mainly based on three groups of diverse variables. The first group consists of tangible ones - explicit knowledge: OHS standards, data base of cases, OHS regulations, laws and directives. The second group is made of abilities and internal characteristics of a worker – tacit knowledge: risk perception abilities, work experience, professional intuition, tendency to risk taking. In the group with additional variables, there are tendency to using new communicational technologies and moderator aspects. These three groups of variables influence on the attitudes towards occupational safety which, on the other hand, create the safety culture and the holistic work safety.

Picture 2: Conceptual model of knowledge transfer in the field of occupational safety.



This quantitative part of the research will be conducted in a form of a paper questionnaire. As it was said, the qualitative part of the research will interpret quantitative findings by using a tool of focus group study and postquantitative experimental group study. In this way multi-method analysis will be fully used in this research project.

6. CASE STUDY - LITERATURE REVIEW

Other researchers in this area also use multi-method analysis in their scientific projects. Taking into consideration of the cases in the similar subject, one could indicate a research “Occupational health and safety considerations for women employed in core mining positions” conducted by D. Botha and F. Cronjé. They studied the health and safety of women working in core mining positions. Measuring instruments, in the case of quantitative component, consisted of structured questionnaire. On the other hand, qualitative data were collected by means of individual and group interviews. According to the researchers, the qualitative approach supported the quantitative approach and aimed to provide more reliable results, because the researcher could ask probing questions of the participants and by so doing avoid misunderstanding of questions and gain better insight into the phenomenon of interest. In addition, the researcher could gain a deep understanding of the variables that have an impact on women in the mining sector. As indicated, purposive or judgemental sampling was used to select participants for the qualitative research (Botha, Cronjé, 2015) (Welman, Kruger, Mitchell, 2010).

Mentioned case of research in the field of the health and safety of women working in core mining positions is one of many examples that multi-method analysis is a coherent concept to conduct research in this area. That is the confirmation of the rightness of our methodological assumptions.

7. APPLICATIONAL CASE STUDY - SUPPLEMENT

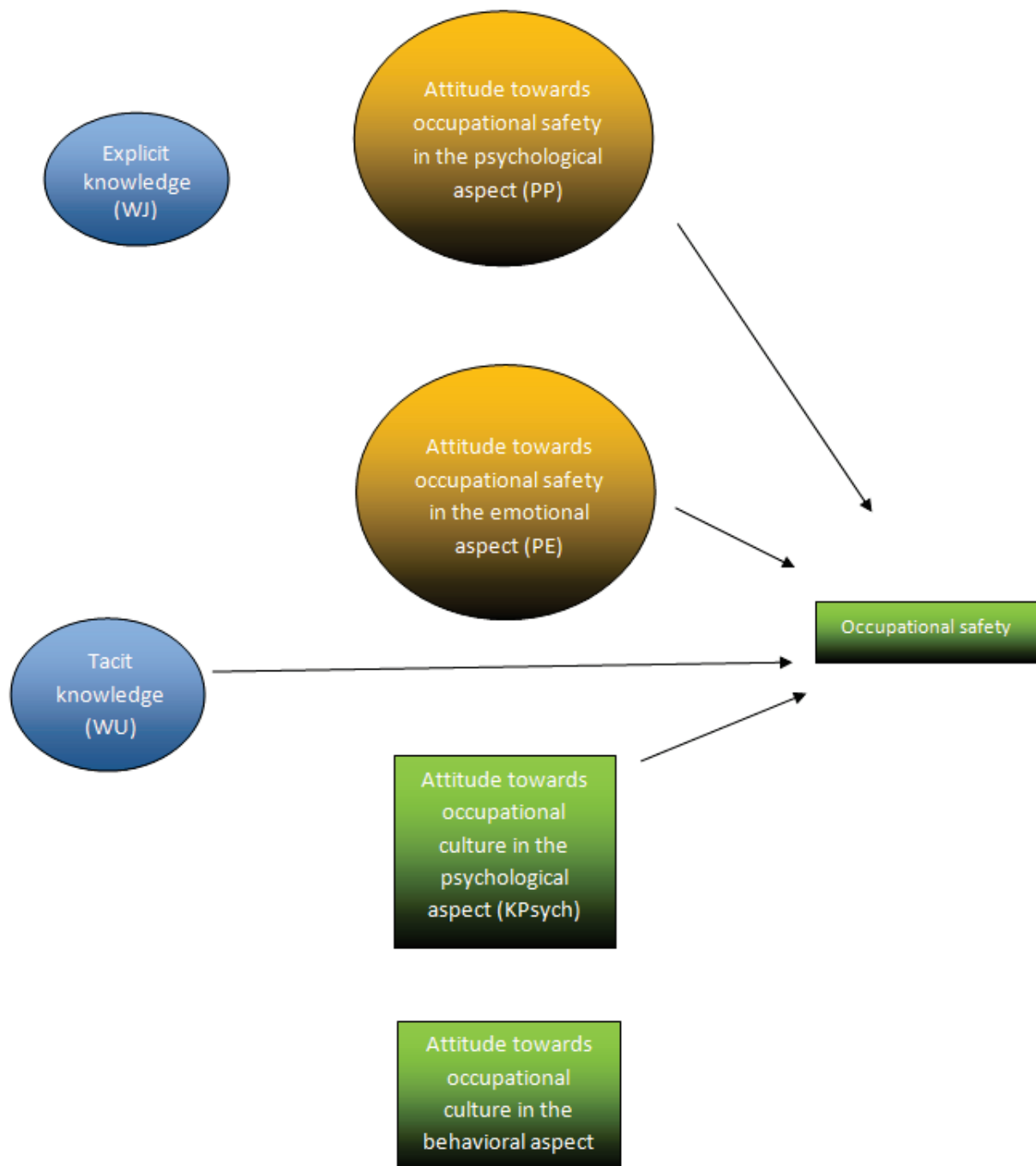
The second phase of the conducted research embraces preparing a model of occupational education with the use of explicit and tacit knowledge. The basic aim of the phase was evaluation of efficiency of formal sources of explicit and tacit knowledge in the range of OHS (occupational health and safety) and educational methods using these sources in the context of shaping young workers' attitudes towards OHS. To reach the aim, on the basis of the research results, one conducted statistical analyses between independent variables in the form of formal sources of explicit and tacit knowledge from the range of OHS, methods of transmission OHS knowledge in the education system and dependent variables in the form of particular components of attitudes towards safety (components: emotional, cognitive, behavioral).

Referring to the main aim of the second phase of the project, in the research one made an analysis and an evaluation of the relation between the focus on the usage of explicit knowledge and the focus on the usage of tacit knowledge and attitudes towards occupational safety. In the next step, one identified factors which influence occupational safety in the groups of experienced and young workers. Young worker is recognized as one not older than 30 years old and his current workplace is the first one for him. The research was conducted in enterprises classified according to the code list of classification of business activities in Poland PKD 2007 in the "C" section (Processing industry). The choice was justified by the high accident rate in the branch, the level of technical equipment, higher level of workers' competence, safety culture research output made by the Central Institute for Labour Protection (CIOP) on the group of workers representing the sector. As the consequence of conducted research, the model presented in the picture 2 was verified empirically for the two groups of workers – highly experienced and young ones.

The model for experienced workers

Occupational safety is influenced by four from six considered determinants: tendency to the usage of tacit knowledge (WU), attitude towards occupational safety in the psychological (PP) and emotional (PE) aspect, as well as, towards occupational culture in the psychological aspect (KP_{psych}). All four variables influence positively on occupational safety.

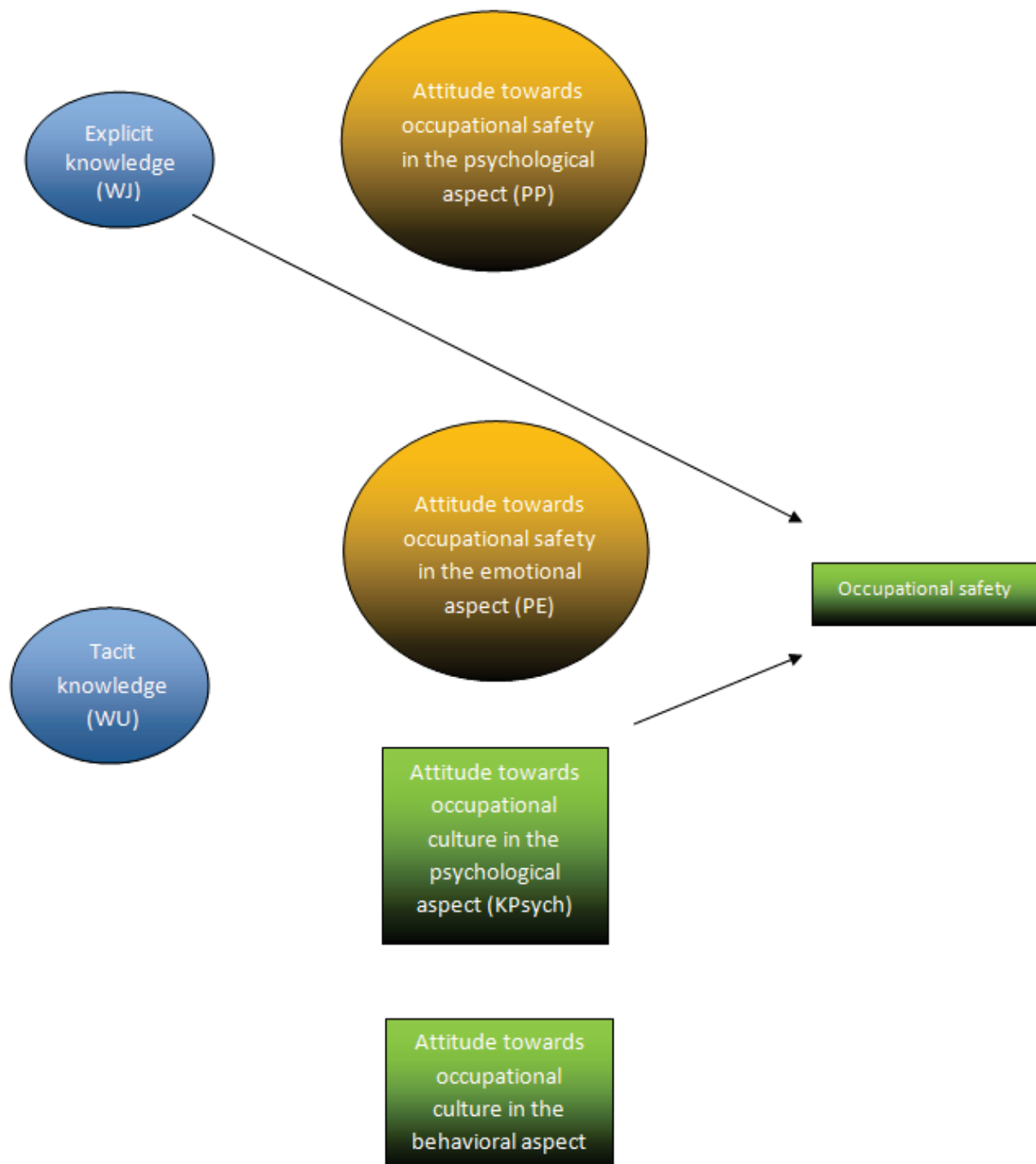
Picture 3: Conceptual model of knowledge transfer in the field of occupational safety – experienced workers group verification



The model for young workers

In the group of young workers only two variables from six ones considered in the model make statistically relevant influence on occupational safety. Increase in tendency to the use of explicit knowledge (WJ), as well as, increase in the level of safety culture in the psychological aspect (KPsych) affect positively occupational safety.

Picture 4: Conceptual model of knowledge transfer in the field of occupational safety – young workers group verification



In the group of mature workers, occupational safety is determined by the orientation on the use of tacit knowledge, attitudes towards occupational safety in the psychological and emotional aspect, as well as, safety culture in the psychological aspect.

In the group of young workers, occupational safety is only determined by the orientation on the use of explicit knowledge and safety culture in the psychological aspect. It might mean that safety among young workers is built mainly by the use of explicit knowledge. Access to explicit knowledge stimulates occupational safety.

The further phase of the research embraces preparing pilot verification of the developed model in the group of vocational schools. Preparing guidelines and informational materials. The main aim of the planned actions at this stage of the project is verification of the prepared vocational education model with the use of explicit and tacit knowledge. For that reason, it is going to be pilotly implemented in three vocational schools. Also guidelines supporting implementation of prepared solutions and informational materials for vocational schools will be implemented.

8. SUMMARY

In conclusion, the adopted methodology of the multi-method analysis in the research conducted by the Warsaw School of Economics team is used in the similar projects in the area of occupation safety. The complementarity of both approaches (quantitative and qualitative) included in one method makes the findings more complex and holistic. The researchers are able to get know better the situation and implement adequate measurement tools. The whole idea was presented in the conceptual model of knowledge in the field of occupational safety which includes chosen, the most important variables. Safety culture, as a derivative of the organizational culture, is the basic notion comprised of two main groups of variables – explicit and tacit knowledge. The main aim of the WSE's project is the improvement of the educational labor system of young workers in Poland, particularly by using existing sources of explicit and tacit knowledge in the area of safety and, at the same time, enhancing processes of safety labor knowledge management.

REFERENCE LIST

1. Botha, D., Cronjé, F. (2015). Occupational health and safety considerations for women employed in core mining positions. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, 13(1), Art. #652, 12 pages. Retrieved from <http://dx.doi.org/10.4102/sajhrm.v13i1.652>
2. Duhigg, C. (2013). *Sila nawyku*, Warszawa [In Polish].
3. Hejduk, I., Tomczyk, P. (2015). *Occupational Health and Safety Management in Organizations: A Review*.
4. Hejduk, I., Tomczyk, P. (2015). *Young workers' occupational safety knowledge creation and habits*, USA: Procedia Manufacturing.
5. Helmreich, R. L., Merritt, A.C. (1998). *Culture at work in aviation and medicine: national, organizational and professional influences* / Robert L. Helmreich, Ashleigh C. Merritt. Aldershot; Brookfield, VT, USA: Ashgate.
6. O'Cathain, A., Thomas, K. (2006). Combining qualitative and quantitative methods. *Qualitative Research in Health Care. Third edition*. Edited by Pope C, Mays N. Oxford: Blackwell Publishing, 102-111.
7. Patankar, M. S., Brown, J. P., Sabin, E. J., Bigda-Peyton, T. G. (2012). *Safety Culture*. Ashgate Publishing, Ltd.
8. Reason, J. T. (1997). *Managing the risks of organizational accidents* / James Reason, Aldershot, Hants, England; Brookfield, Vt., USA: Ashgate.
9. Stecher, B., Borko, H. (2002). Integrating findings from surveys and case studies: examples from a study of standards-based educational reform. *Journal of Educational Policy*, 17(5), 547-569.
10. Uttal, B. (1983). The corporate culture vultures, „Fortune Magazine” October 17.
11. Welman, C., Kruger, F., Mitchell, B. (2010). *Research methodology*. (3rd edn.). Cape Town: Oxford University Press Southern Africa.