

# Interactive Teaching of Risk Management in the Russian Construction Industry

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**Abstract.** As one of the strategic sectors of the Russian economy, the construction industry plays a special role in the economy of the state. The industry is sensitive to a variety of systemic and project-based risks. The construction industry as a whole bears the risk of painful responses to global or local economic conditions such as inflation, constriction of capital, financial system collapse, changes in tax law, etc. Construction managers and engineers can benefit from familiarity with globally tested methodologies of enterprise risk management (ERM) so they can apply these principles and techniques to the companies and projects they manage, as well as contribute to the health of the construction sector and the economy. Research and practice in industries and professions across many developed economies have demonstrated the enhanced effectiveness of experiential, interactive teaching techniques generally, and specifically in the development of risk management insights and skills. This paper will (i) review ERM as a recognized discipline, describing techniques for identifying and quantifying the impact of various categories of risk; (ii) show that ERM is a critical skillset in the Russian construction industry; and (iii) provide illustrations of and theoretical support for various interactive teaching techniques which enhance the development of insights and skills in risk managers and industry leaders. These interactive pedagogical techniques can be effective in either academic settings or within professional training programs.

## 1. Setting the Stage

**(1.1) A Hypothetical Situation:** It is the beginning of Spring. Construction sites are alive with demolition, excavation, deliveries, staging, rigging and pouring concrete. As Head of Operations at your company, you are in your office surveying the issues your business faces in the year ahead.

As always, there are more issues to deal with than there are hours in the day. You start making a st:

**Problem:** Your firm has just acquired a regional construction firm that has a record of winning major construction projects in its region, but has a spotty record for worker safety. You need many of the acquired company's project managers and supervisors to continue ongoing projects and manage new business, but you are concerned about the acquired firm's safety culture and level of their worker safety training.

**Problem:** Your business is entering into a new type of construction work. After many years in road and bridge construction, you want to enter the facility construction business, starting with



preparing a bid for a new football stadium in your city. You have some, but not all, of the expertise in this kind of construction, and you need to quickly hire and train the right talent in financial modelling, engineering and project management for this type of structure.

**Problem:** Your firm took on debt, to the full extent of your borrowing capacity, in order to expand during a building boom. You have a current backlog of projects, but business activity is slowing and interest rates are rising right at a time when much of your debt is maturing and needs to be rolled over into new loans.

**Problem:** Your company has had longstanding relationships with reliable subcontractors in most of the building trades. But recently, one of your main subcontractors began to have problems with local authorities (for reasons that are not clear to you), resulting in delayed permits, surprise inspections, and other harassment. You may need to cut back on that relationship and find new subcontractors while you are in the middle of several major projects.

Before you continue, it occurs to you that each of these problems is a significant risk to your business. You begin thinking about what common challenges might arise from these seemingly unrelated problems and how to get all your key leadership colleagues thinking broadly about how the company is going to deal with them [3]:

- Which of these risks are *most likely* to materialize into threats to the business?
- Which risks are *most dangerous* to your strategy and business objectives?
- Who on your leadership team is *responsible* for developing and implementing strategies to mitigate the consequences from each of these risks?
- Do the various leaders in your firm *understand the relationships* among these problems?
- Are there *safety implications* in all of these risks? For example, how might tighter cash flow from rising interest rates affect worker safety? How do you ensure safety in a new kind of construction?
- How do you get all your leadership team “on the same page” in prioritizing and managing these risks?

**(1.2) Substantive Discussion.** Without consciously realizing it, you have been spending your morning immersed in Enterprise Risk Management. The modern discipline of Enterprise Risk Management (further in the text, **ERM**) is generally recognized to be comprised of the (i) identification, (ii) assessment, and (iii) mitigation of risk within parameters established by the leadership and management of an organization or undertaking (sometimes known as the “risk appetite” of the organization or undertaking). Or, as defined by one of the leading authorities, enterprise risk management consists of “the culture, capabilities, and practices, integrated with strategy-setting and its execution, that organizations rely on to manage risk in creating, preserving, and realizing value. (COSO, 2017) [1]

What you *do* realize, with clarity and urgency, is that you need to raise risk awareness among your executives, managers and supervisors: how to identify risks, assess risks, prioritize them and mitigate them. [12]

There is much for your team to learn. How do we learn about risk? How do we learn about anything?

### **(1.3) Interactive Teaching Methodology – Brief Statement of Practice and Theory**

The use of the introductory hypothetical situation to begin this paper is intended to advance this paper’s twin goals for construction managers, civil engineers and other readers: to provide an introduction to ERM and its application in Russia and to demonstrate and to elaborate on the use of interactive methodology to teach ERM [14]. Our idea is that we want you, the reader, to actually experience the methodology rather than simply read about it abstractly. Did the hypothetical engage you in the topic? Did it help to make the topic meaningful to you in your professional or intellectual capacity? How helpful to understand ERM was envisioning the range of issues and their implications

as they arose for the hypothetical manager? Were you able to bring your own experience and insights into play in ways that informed your appreciation of enterprise risk management? On a different level, imagine yourself as the teacher of a class using this hypothetical. How is your role as a teacher different from the conventional teacher role? [10, 14]

The hypothetical was designed to reveal a number of methodological qualities. For instance, we assert that an interactive activity should be at the same time engaging, doable and challenging. The engaging aspect combines a number of qualities pertaining to raising a reader's interest and motivation to learn. It should be accessible, familiar, within the reader's prior knowledge, "ken" or awareness. It should connect with the reader's "life world" in some way [18]. Another way to think about learner engagement is "investing" the learner, where the learner becomes more willing to join in or become involved in the ideas or issues presented.

The "doable" and the "challenging" aspects pertain to what the reader or class participant is asked to do in the activity. It should be accessible enough to be accomplished successfully, not overly complex, difficult, or hard to comprehend or accomplish. The learner should be able to succeed at what is asked. At the very same time, it should offer a challenge in that it is worthwhile for the learners to undertake, adds a new dimension to their knowledge or skills, or takes them to a new place in realms of comprehension, expression, understanding or action. It should add value for them. One recently popularized dimension of this is that the brain is like a muscle; it develops when it is exercised [19].

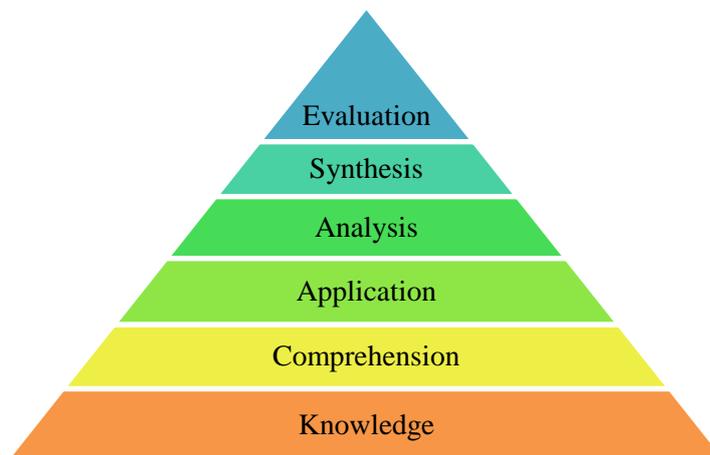
The educational principles of interactive teaching and learning are founded on and supported by research in cognitive science and information processing. Learning is most effective when the learner "constructs knowledge" rather than receives it. This is an active process, enhanced by learner questions, rather than a passive process of answering teacher questions. The core idea of learning as construction of knowledge was developed by Piaget. [17] We all create cognitive structures that organize the facts and ideas we encounter into relational categories that grow in complexity with learning over time through experience and reflection. When we experience a new fact or concept, we compare it to our existing cognitive structure. If we can fit it in, we assimilate it. However, when we can't fit it into existing categories or classifications, we must reformulate our cognitive structure to accommodate it. Our cognitive structures grow in this way from novice to expert. Thinkers such as Lev Vygotsky, John Dewey, and Jerome Bruner have expanded and refined the notion of the construction of knowledge. Cognitive structures and interactive activities to develop them can be highly sophisticated and complex. [6, 7, 20]

Our hypothetical construction manager example also demonstrates the linkage between product and process - between knowledge and analytical thinking - at the core of interactive learning. The conventional teaching and learning process involves direct instruction in which the learner typically repeats or recites what is communicated by the instructor. There is little attention or regard to the analytical process - the capability to think analytically by the learner. It is teaching by telling. The essence of interactive methods is that the participant/ learner interacts with the material to make sense of it, to place it appropriately in his/her cognitive structure. It is a personal, active process. The learner acts as a meaning maker, not a meaning receiver or recipient of knowledge. The emphasis is not only on what is learned but also on the process of learning. The process of learning can be considered the most significant product of learning. In other words, the process is the product.

What is it about our hypothetical situation that makes it "interactive," instead of simply "active?" Perhaps you can take a moment to review the hypothetical to consider this. Active learning may only involve doing activities in a routine way, doing or moving without necessarily thinking or reflecting. Isn't it a major distinction that interactivity involves responding, and typically in higher cognitive and expressive ways? For instance, the reader first is asked to imagine how the manager would deal with a variety of distinct and challenging situations. Later in the hypothetical, he/she is asked to consider how to organize and manage his/her superiors and subordinates, to identify, understand, categorize, and evaluate factors to develop a plan of action to deal with the various situations.

In interactive learning, there is an interplay between knowledge and thinking. For the manager to succeed, and for the reader to appreciate the manager's situation, knowledge is required. Knowledge is the building block of learning. Some knowledge is provided or implied in the problem. Most of the knowledge useful in solving this problem, however, is supplied by the hypothetical manager and the reader from their prior knowledge (activating the engagement and doable prongs, above) but also from their questions, imagination and research that they would do to learn more about the matter (corresponding with the third prong, above). It is the thinking about the knowledge, the processing of it in higher cognitive ways by the managers/ readers themselves, that make it interactive. The participants interact with the materials, gathering data, interpreting it, classifying it, evaluating it, and synthesizing into a plan and action - and again reflecting on the process and the results to assess the degree of success or failure. Interactive lessons can be substantially enhanced by activities that involve participants exchanging and comparing ideas with each other, e.g. in a problem-based workshop or a simulation. Interactivity is enhanced when the participants engage with each other, as in small groups.

A useful guide to the range of cognitive objectives to be included in higher cognitive and expressive teaching and learning is Bloom's Taxonomy. Over 50 years ago Bloom and his colleagues gathered thousands of learning objectives from educators representing a wide range of grade levels and subjects. His team classified them into what became six categories that are useful in thinking, planning or teaching at increasingly higher levels. (B.Bloom, 1956): [13]



**Figure 1.** The Cognitive Domain of Bloom's Taxonomy

**Knowledge:** the basic building block is on the base (E.g., List different types of buildings)

**Comprehension:** what something means, is second (E.g., What are the components of a building, such as roof, foundation, walls, etc?)

**Application:** associating the meaning of something with something else, is third (How is the type of construction of a building useful or not useful in the construction of another type of building?)

**Analysis:** fourth, separating into parts, arranging, classifying something's component parts in relationship to each other, other subparts, and the whole (What are the similarities and differences between types of buildings, e.g. houses, apartments, offices, stores, factories, schools, etc?)

**Synthesis:** fifth, putting together in sequence, creating (Develop construction codes or standards for various types of buildings; designing the detailed components of a building)

**Evaluation:** the highest tier, assessing, ranking or determining the value of something (Does the building function well? Is its structure suitable for its function?)

What is the role of the teacher in this process when it is conducted in the classroom? The first and primary role is as an expert in the field to be taught. Despite all the emphasis on process, the first step

is knowledge of subject matter terrain. This enables us to design an appropriate and stimulating activity.

For example, among the authors, Prof. Bardenwerper is an expert on ERM generally. However, to write the hypothetical he had to conduct research on construction practices and ERM issues in Russia. Moreover, he realizes that he is not an expert in either construction or ERM in Russia. Rather, he is an expert on advising others how to determine what their considerations may be for assessing and dealing with their risks. This is what this paper seeks to do - to introduce the concepts of ERM to the reader, for the reader to conduct the particular risk assessments and plans to ameliorate the risks. The second and, we would suggest, equally important role of the teacher is to design an activity which will prompt the participants to engage with selected materials and with each other. The activity should be purposely aligned with the learning goals of the course of study. The third role, beyond the scope of this present paper, is conducting the activity in ways that promote and maximize the learning growth of the participants - where the teacher takes on the role of coach rather than of direct instructor. [10]

In a second hypothetical, below in section 4.0, we will explore a narrower application of interactive methods based on the ERM principles set out in the following sections 2 and 3.

## **2. Learning Risk Management from Experience and Insights**

As early an authority as Sun Tse, who likely never encountered the expression “risk management,” articulated a core insight applicable not only to the “art of war,” but to almost any enterprise:

In the wise leader's plans, considerations of advantage and of disadvantage will be blended together. If our expectation of advantage be tempered in this way, we may succeed in accomplishing the essential part of our schemes. If, on the other hand, in the midst of difficulties we are always ready to seize an advantage, we may extricate ourselves from misfortune. (Sun Tsu, Ch 8) [2]

As economic activity has become increasingly complex, and industrialization has supplanted much human production that was once achieved through individualized enterprise and artisanship, risk has come to be considered in increasingly methodical ways, utilizing fundamental mathematical concepts (e.g., statistical inference, regression to the mean, proportionality) and borrowing insights from a wide array of disciplines, including finance, economics, engineering, actuarial science and law. An entire nomenclature of risk has evolved, including core concepts such as correlation, probability, severity, volatility, time horizon, adverse selection, positive and negative externalities, moral hazard, asymmetric information and the “signal value” of an incident or event. These concepts, accessible to anyone versed in basic mathematics and economics, are fundamental to modern risk analysis. And, increasingly, the assessment of risk and opportunity, particularly in business and public policy decision-making, is incomplete without considering also the psychological underpinnings of human behavior, especially risk aversion, as described in the seminal experiments and insights of Daniel Kahneman and Amos Tversky. (Kahneman & Tversky, 1979) [5]

Throughout the second half of the twentieth century, events and insights combined to stimulate the emergence of a professional discipline known as “Enterprise Risk Management.” Industrial thinkers like W. Edwards Deming, who helped Japan revive its economy from the devastation of the Second World War, or General Electric’s Jack Welch, who became the champion of “Six Sigma” defect control in all of that conglomerate’s diverse operations, contributed to the conceptual and experiential underpinnings of enterprise risk management and elevated the stature of its practitioners. [8, 12]

At the same time, various catastrophic events involving both loss of life and devastating financial (and sometimes political) loss, also served as catalysts to more methodical understanding of risk. From well-known disasters early in the century such as New York’s Triangle Shirtwaist Fire in 1911 and the sinking of the HMS Titanic in 1912, to the Space Shuttle Challenger explosion in 1981 and the Chernobyl nuclear disaster in 1986, “loss events,” sometimes spectacular, gave rise to professional and political investigations, which in turn spawned reforms, both regulatory and technological. The insights produced by these events and investigations, as well as through the process of developing

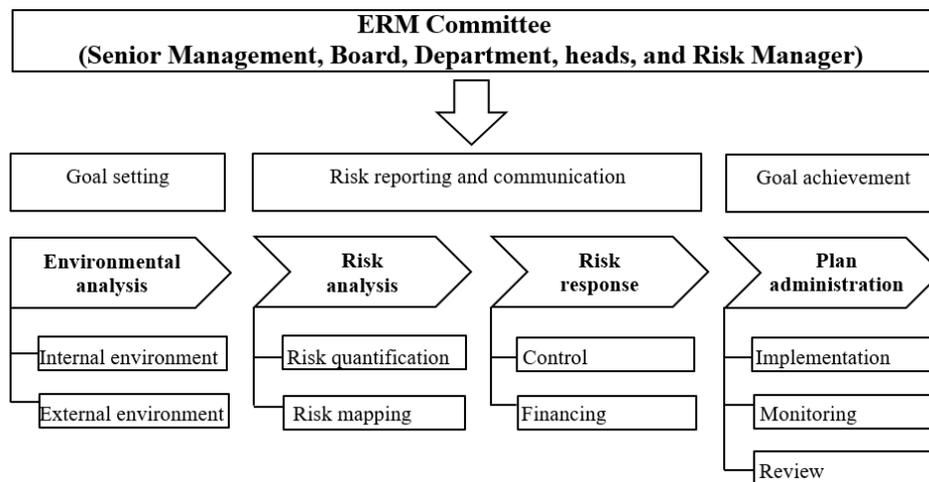
reforms, gave added impetus to the refinement of risk management discipline. (Skipper & Kwan, 2007) [4]

Modern economic conditions require companies to promptly identify, prevent and manage risks in various areas of activity. Many of the best practices of corporate risk management are adopted and applied in large Russian companies in various sectors of industry. At the same time, the results of the research demonstrate the opportunities for further development. The key areas for development include: the process of integrating risk management into the company's development strategy, the collection and accumulation of statistical data, interaction between units, involvement and active participation of key stakeholders, and the quality of information on key risks [3, 12]

### 3. The Objective of Learning Risk Management

Complex and highly sophisticated endeavors such as construction give rise to a wide array of risk exposures, covering everything from financial loss to structural calamity to personal injury and death. The complexity of modern structures, as well as the mechanization and automation of building processes and the intricate web of financial, governmental, legal, environmental and social factors that are associated with almost any construction project in the modern world, have vastly multiplied and diversified the risks that actors in construction and other sophisticated industries must understand and manage. [3, 8, 12]

The Enterprise Risk Management (ERM) process can be customized to the enterprise or the undertaking, but the following is a typical schematic. [8]



**Figure 2.** ERM Process Framework (Skipper & Kawn, 2007) [4]

It is senior management's responsibility to set broad goals consistent with the organization's overall business strategy. But the goals of the organization, including the mitigation of risks to its business objectives, cannot be achieved by senior leadership alone. Interactive learning is the means for cascading a holistic recognition of the business's objectives, and risks to achievement of those objectives, down through the organization. Typically, a general risk policy will be articulated, with responsibilities assigned for various categories of risk. The first step in the process is the identification and assessment of specific, individual risks, both internal to the organization (or project) and external factors that will impact the business or project. This may typically be done through custom-designed questionnaires and interviews completed by management and supervisory personnel with a wide range of responsibilities in the organization. Many examples of such questionnaires and

interview guidelines are available in the literature. It is easy to visualize interactive exercises to teach the techniques of gathering useful information and informed assessments of risk. [3, 8, 12]

Once a comprehensive list of risks is identified, the risks should be categorized – both for convenience of analysis and assignment of responsibility -- into several (frequently four) general categories: Strategic, Financial, Hazard and Operational Risks. Some risks will fall into obvious categories. Others may require an iterative process, carried out by individuals from various disciplines within the organization. The personnel most knowledgeable about each risk should be canvassed to recommend where the risk falls on a matrix of frequency and severity, these recommendations being debated among personnel with varied backgrounds and expertise. Both the practical experience of people who do the actual work and the broader strategic perspective of senior management are required to arrive at a realistic assessment of the probability of a risk - and of the scale of the business impact if it does. [3, 8, 12]

Let us consider how a resulting “picture” of risk might look for a construction enterprise, using just a few typical risks for illustration purposes:



**Figure 3.** Illustrative Construction Project Risk Quadrants

In Russia, risk in project management is sometimes viewed as a random event, which in the case of its occurrence has a negative impact on the project (the case when the event has a positive impact on the project is called an opportunity). This negative impact can be manifested in failure to meet deadlines for the completion of work, and as a result, the project completion is delayed, the cost of work exceeds the estimate, the quality of work may suffer, the reputation of the contractor is damaged, etc. With greater attention to ERM, the construction industry can become a leader in effective use of ERM across the national economy. [8, 12]

#### 4. Hypothetical 2: Exercise: “Dying for Sports”

##### (4.1) Learning Objectives:

- Learners will be able to develop a plan for a collaborative investigative project

- Learners will be able to develop a list of sources of probative information on worker safety risks
- Learners will be able to develop collaboratively a sequence of questions required to ascertain the origins of safety risks

**(4.2) Process:**

- Divide learners into working groups of approximately five people
- To the extent feasible, create mixed groups of learners from different disciplines (e.g., engineering, finance, project management, etc.)
- Have each group collaboratively develop an investigation plan and risk identification questions based on the hypothetical problem provided

**(4.3) the Hypothetical problem:** You have recently been hired as the executive assistant to the CEO of The Krasnogorsk Group, a Moscow-area construction company locally known as “KG.” The company has just begun to prepare a bid for the construction work on a new 20,000 capacity football stadium for FC Zorky Krasnogorsk to replace the 70 year old Zorky Stadium. Despite twenty years of success in building office buildings, industrial parks and apartment buildings, your company has never built a stadium before and the CEO is eager to win this contract to develop a reputation in sports facility construction. He envisions bigger opportunities for renovating Premier League stadiums and other major sports complexes. One of the things the CEO prides himself on is KG’s safety record. But he has been reading about sports stadiums in anticipation of preparing the FC Zorky stadium bid, and has become worried by the number of headlines he has found about workplace accidents and worker deaths at high-profile stadium projects worldwide. [15,16] For example:

- **Rio auditor says 11 workers killed during Olympic construction**  
ESPN.com news services Apr 26, 2016
- **China Acknowledges 6 Deaths in Olympic Construction Work**  
By Maureen Fan Washington Post Foreign Service, January 29, 2008
- **Death toll rises in the lead up to the QATAR 2022 World Cup**  
Ally Foster News.com.au September 29, 2017
- **Human Right Watch says 17 workers have died during preparations for the tournament**  
Financial Times Max Seddon in Moscow June 14, 2017

Your CEO has instructed you to assemble a team of supervisors at KG and to contact project managers and others anywhere in the world (including journalists) who are knowledgeable about accidents at major sports facilities projects, to learn everything you can about how the accidents happened; why they happened; what went wrong; what lessons were learned [15,16]. You see this project as possibly a stepping stone to greater responsibilities – perhaps being promoted to Risk Manager for KG.

- What areas of expertise will you look for in recruiting colleagues to serve on your team for this project?
- What departments/areas of the company’s business do you think might be involved in reducing risk of accidents and injuries?
- Who will you try to contact?
- Develop a list of questions your team will ask.

As you gather information about what underlying factors give rise to worker accidents, try to classify the types of risk you may learn about as either strategic, financial, operational or hazard risks.

**(4.4) Discussion of the interactive methods**

The authors have experienced the efficacy and effectiveness of teaching through the use of interactive exercises, simulations and student projects such as the one illustrated above, eschewing as much as

possible more didactic forms of teaching, such as the traditional lecture. We believe these experiential teaching techniques can be as effective in teaching enterprise risk management concepts in industry as they are in academic settings. The following discussion of this hypothetical problem in terms of interactive methodology is written from the perspective of classroom teaching or professional training, where genuine interaction among learners and the materials can take place.

Let's examine the hypothetical from the three qualities set forth in Section 1.3, above - how is it engaging, doable, and challenging? The hypothetical is written as a stand-alone exercise that could be conducted in class period, but could be extended with added components. The subject of this hypothetical is worker safety, an important concern to project managers and engineers, the general public, and workers themselves. News about harm typically captures public attention, which makes this topic engaging. Learner investment can be enhanced by a warm-up activity or "anticipatory set" that connects the topic directly to the participant, such as reading a short recent news article, examining a photograph or video, or conducting a simple survey (e.g., "Workplace safety for all workers needs greater safeguards and protections:" Circle one: strongly agree; agree; undecided; disagree, strongly disagree) followed by discussion. The hypothetical provides a set of readings that bring a variety of perspectives to the issue of workplace safety in construction. Learners could be invited to conduct additional research individually or in small groups, and to report this to the class. [10]

After the participants read and digest the informative articles, they are given the task of responding to four assigned tasks in small groups. The size of the group could vary from pairs to a larger number (groups of 5 are mentioned in the objectives, above). There is a synergy of teamwork weighed against diminishing returns in bigger group sizes. The hypothetical appeals to the learners' imagination by suggesting that as managers they could be rewarded with a promotion for their efforts to respond to this matter. Each group could be assigned all tasks or one of them. The groups can be provided with chart paper and markers to outline their recommendations and then asked to report back. This is followed by a discussion by the class as a whole. Another approach could be to reform the groups, redistributing the members of original groups to report to and carry out the discussions in the new groups. The teacher should observe and monitor the groups to answer questions, provide guidance, and note significant comments to be used in the larger discussion. To conclude the class, the learners as a class as a whole could be tasked to determine general principles for ERM that would be useful in situations like this and applied to other situations.

The above hypothetical is one many examples of interactive methodology. Interactive methods are successfully utilized across all educational levels, from preschool to graduate school, and in all disciplines. The authors have relied on interactive methodology not only in their own university courses but also in a wide variety of teaching and professional training, most often in the field of law, such as the Law Society of Ireland in Dublin (Arthurs, 2017) and Kozminski University Law Faculty in Warsaw (Roe, 2017) [6]. Moreover, the learning value that results from interactive methodology is extensive and profound (Sawyer, 2006). [9]

Why does risk management lend itself to interactive, experiential learning? In essence, risk management is a common human activity we all do every day. We barely take a step out our front door without subconsciously identifying and assessing risk. Every person or entity seeks survival and opportunity, facing uncertainty in the pursuit of what we might describe generically as "value." Uncertainty is generally understood to be something not completely known. Thus, it is a universal challenge, particularly in business, to determine how much uncertainty – that is, "risk" – one is prepared to, and able to, accept in pursuing opportunity. In the context of the risks facing a business such as construction, the risks faced involve not just possible economic loss, but personal injury and even death. [12]

## 5. Conclusion

Risk management is one of the important functional areas of project management methodology. There is considerable research in Russia on the *quantification* of risk. Quantitative risks are mainly

definitions of the likelihood of a risky event and damage when it occurs. The methods of probability of damage are specific for each individual area. This paper describes the principles of ERM in *qualitative* terms, emphasizing how to determine the *quality*, identity or nature of the risk and the risk factors to be measured and to suggest effective methods to instil in industry participants the skills and tools to do so. By teaching ERM in industry trainings and universities using interactive and experiential methodology and by employing ERM approaches in projects and enterprises, the Russian construction industry and engineering profession can serve as leaders in bringing innovative management practices throughout the economy.

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