

A Proposed Occupational Health and Safety Infrastructure as Enabler for Sustainability-Oriented Innovation

Doctoral thesis – Summary

for Obtaining the Scientific Title of PhD in Engineering
from Politehnica University Timisoara
in the Field of Engineering and Management

by

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1 Research context and motivation

This research project stemmed from my own work experience. I have always been passionate about the operational environment as I enjoy the effervescence of “production”, the hustle and bustle of shifts changing, problems arising and being solved, in the rhythm of the technical expertise and insight that are unique to the organization and to the people that are its heart and soul. I have had the opportunity to work alongside people of unique expertise in their technical fields, but who had the insight to always remind me that the organization works with and because of the people in it. Decisions involving people are the most difficult to make; they are built with patience and careful consideration and bloom through the care and unity of those they fall upon. I shall forever be grateful to those persons who have had the open-mindedness to teach me this in principle and action.

I often go back to this pivotal learning of my early days on the managerial front, and I go to work every day telling myself that up to the end of a career we can still learn from our own team. Some years onwards, I decided to take a step back and try to find answers to some of my deeper questions, that everyday management life did not provide the time for; here I was set on the path of a PhD. It gave me a powerful insight into the path of management that I shall strive to walk upon in the many following years.

Looking forward, I settled for a research theme blending personal managerial questions regarding Organizational Health and Safety (*OHS*) and new societal concerns as reflected by Sustainability-Oriented Innovation (*SOI*). OHS is not a new field, and by dealing with the protection of employees and the environment is one of the oldest precursors of sustainable development. Indeed, from both environmental and social points of view, Occupational Health and Safety was one of the first non-financial issues to disrupt the production-consumption patterns (as suggested by the Brundtland report in 1987).

Decades of organizational, industrial, academic, or legislative efforts, have unfortunately not eradicated OHS events (incidents, accidents etc.). Industry and academia both agree that the results of traditional approaches have reached a plateau and that new innovative approaches are required. The organization is a complex system that is constantly adapting. In a short span, the world has changed as

the Industrial revolution propelled mankind in the era of possibilities as travelling, agriculture, commodities became not just tangible realities but part of the minimum living standard. In the second half of the 20th century the post-war international economic system (as mentioned in 1987, in the Brundtland Report, “Our common future”) was born and with it emerged new nations. This brought forward issues regarding the access and distribution of important natural resources reserves, environmental concerns in a context of civil and political awareness. Sadly enough, despite a long-standing understanding that the environment and society are not alienable from economic action, these issues are as acute today as they were decades ago. The 21st century brought its own set of complexity through the internet era and globalization. Today, organizations are faced with natural resource scarcity, demographic, and political change, rising and discrepancies in legal constraints and the emergence of a new resource which is knowledge.

Societal and environmental change are now setting the tempo for organizations as they struggle to keep up and stay ahead, become more agile and customer-oriented, more innovative to expand their market or create new markets, to be attractive employers and highly performant for their shareholders while proving sustainability to stakeholders. In one generation, Schumpeter’s disruptive creation theory which defined agility and innovation as the new eruptions in the equation for success, has been itself disrupted by the sustainability factor.

If in the past, sustainable development was most often assimilated to environmental concern; the shifting of the public eye to wider societal concerns has repositioned Occupational Health and Safety (OHS) and Sustainability-Oriented Innovation as vectors of strategic agility and sustainable competitive advantage.

Throughout the present thesis, the author focused on the problem of interconnection between Occupational Health and Safety and Sustainability-Oriented Innovation. The main motivations driving the author’s research include current limitations in the advancement of Occupational Health and Safety, limited comprehension of Sustainability-Oriented Innovation both in academia and in practice and finally, the growing importance of the human/social axis of sustainability, which underlies both Occupational Health and Safety and drives Sustainability-Oriented Innovation. It is the author’s belief that the future will be driven by strong social voices and, while the understanding of individual phenomenon has shown its limits, we are to turn to the understanding of interconnections to avoid disparate and partitioned efforts. Therefore, ***the general scope of the PhD program was to characterize the relationship between Occupational Health and Safety and Sustainability-Oriented Innovation.***

If OHS has a long-standing tradition in the field of management, SOI is a rather novel concept, yet both are approached by numerous streams of the management literature leading to diverse, disparate, or even ambiguous approaches. The novelty of the present research project is its research agenda combining the two fields of study and investigating the interrelationship between them.

2 Research Approach and Objectives

Considering the scope of the research, current understanding of each of the studied phenomena was scrutinized to construct the foundations for the theoretical and applied research studies.

The general objective of the present research is concerned with the characterization of the relationship between Occupational Health and Safety and Sustainability-Oriented Innovation. The intention is (a) to investigate whether a relationship exists between OHS and SOI and (b) to delineate this relationship through the identification of mediating factors. To this end, from a theoretical standpoint research streams and gaps were analysed through sequential research on themes convergent to the doctoral scope. The author proposed a theoretical ***Mutual Influence Model***. The applied research focused on the study of current-day organizational practices regarding OHS and SOI through a mixed-methods approach. The theoretical Mutual Influence Model was then overlapped to the practical findings.

The operational objectives of the PhD. research program are:

OP1. The theoretical investigation of the existence of mediating factors between Occupational Health and Safety and Sustainability-Oriented Innovation. This is achieved through the identification, synthesis, and critical analysis of the state-of-the-art research on OHS and SOI – Chapter 2 and on the specific question of the relationship between OHS and SOI from a theoretical perspective (existence, mediating factors) – Chapter 3.

OP2. Identification of theoretical mediating factors in organizational practices and understanding of their interrelationships. This requires the identification of the best-fit research approach and construction of the research design – Chapter 4 and specific experimental research regarding organizational practices relative to OHS and SOI – Chapter 5.

OP3. Theoretical and experimental development of the Mutual Influence Model – Chapter 5. This objective is dedicated to identifying similarities and dissimilarities between the theoretical hypothesis and organizational practices.

A systematic development of the PhD Scope and Objectives in the chapters of the thesis is given in Figure 1.

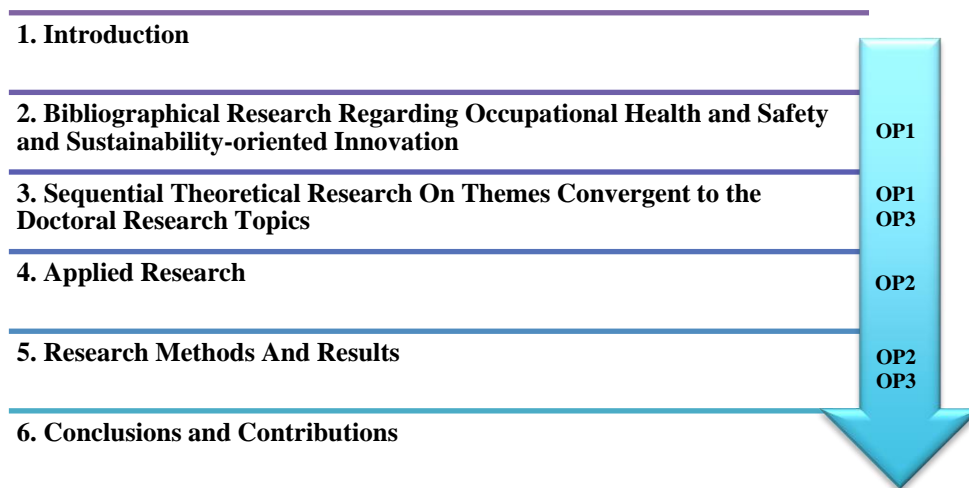


Figure 1. PhD Thesis Logic.

3 The Thesis Structure. Brief Presentation of Each Chapter

The author’s research quest is depicted in six chapters (notwithstanding Bibliographical and Appendix sections, Lists of Figures and Tables). Each chapter contributes to the attainment of the operational objectives through extensive descriptions of the research process in terms of structure, results, and conclusions.

Chapter **Error! Reference source not found., Error! Reference source not found.**, was thought as a depiction of the author’s research objective: compare theoretical findings with self-reported existing practices and beliefs. To this end five sustainability reports were considered as a mirror of organizational practices. Sustainability reports are periodical communications dedicated to organizational efforts in the field of sustainability, with focus on OHS and innovative approaches implemented by and in the organization.

Chapter **Error! Reference source not found., Error! Reference source not found.**, discusses current understanding of the researched phenomenon. The author resumed state-of-the-art understanding regarding Occupational Health and Safety and Sustainability-Oriented Innovation, respectively. The chapter points out the vastness of the two subjects and the variety of the research angles that can be adopted. The focus of this chapter is on the absence of academic consensus regarding OHS and SOI, respectively, and therefore to paint the wideness of the subject: definitions, legal considerations, management systems implications and structural variety.

In Chapter **Error! Reference source not found., Error! Reference source not found.**, the author leaned over the problem of interconnection between OHS and SOI, which is superficially mentioned in literature. The author presented original theoretical research on themes convergent to the research theme to outline the interconnections between OHS and SOI. Given the lack of common ground regarding OHS and SOI, respectively, the problem of interconnection was complex to trace, as individual continuants of each phenomenon are not clearly defined. Consequently, the author departed from traditional research configurations of in-depth understanding of each phenomenon before the understanding of interconnections and adopted an innovative research approach of direct study of

interconnections. Therefore, and mostly based on the author's co-authored research, theoretically mediating factors between OHS and SOI were identified.

Chapter **Error! Reference source not found., Error! Reference source not found.**, is focused on methodological considerations for the applied research. It dedicates sections to theoretical considerations regarding mixed methods research and goes on to discuss the research design, as well as data collection and analysis procedures.

Chapter **Error! Reference source not found., Error! Reference source not found.**, is dedicated to the research results: mixed methods (qualitative and quantitative) results are presented and discussed in depth; the author also critically reviews the conclusions regarding "sharp-edge" practices in comparison to those theoretically hypothesized.

Finally, Chapter 4, Conclusions and Contributions, is a distilled synthesis of the bibliographical, theoretical and applied research, and discusses the author's personal contributions at each stage of the research. The author considers also future avenues and implications of the current research.

The thesis concludes with a chapter listing the bibliographical references (articles, books, and web pages) and a chapter dedicated to appendix which details the different research phases and results, the author's CV, and list of publications.

The research results were disseminated in 16 articles published in international conferences' proceedings and journals, from which 5 articles published in ISI journals, 4 articles published in ISI proceedings, 3 articles in BDI index journal and 4 articles in BDI index proceedings.

4 Conclusions and Contributions

a. General Conclusions of the Research

Throughout the thesis, the author has researched the existence and characterization of the relationship between Occupational Health and Safety and Sustainability-Oriented Innovation, with specific focus on the identification and characterization of mediating factors. The purpose is to identify leverages that industry and academia can focus upon to the mutual advantage of OHS and SOI.

The study was theory-driven but was built as a comparison between the findings of the bibliographical study to those defined by organizational practices as self-described in the sustainability reports of five organizations.

To this end, the first step consisted in a bibliographical study of each phenomenon with the purpose of summarizing current state of knowledge in each field. This bibliographical study highlighted that up-to-date research regarding OHS and SOI is characterized by a large variety of research streams and subsequent definitions and concepts. Recurring concepts surfaced: Knowledge Management and Stakeholder Management are perceived as influencing both OHS and SOI from a theoretical standpoint, as both are at least tangent to the wider concept of Sustainability.

This implied that that the investigation of the existence of an interrelation between OHS and SOI could be hypothesized. The absence of a unified structural canvas research constitutes a major challenge to the study of interrelations between SOI and OHS.

To overcome this barrier, the individual complexities of OHS and SOI were bypassed through the identification of mediating factors based on sequential theoretical research convergent to the research theme. These theoretical findings led to the proposal of a Mutual Influence Model, describing the connections between OHS and SOI. The identified convergent research issues helped formulate the research hypothesis.

Both scientific and grey literature recognize that, in practice, organizations are already addressing social and environmental concerns and that these are documented in organizational sustainability reports. Consequently, the applied research consisted in analysing organizational practices with regards to OHS and SOI as self-reported in sustainability reports. Sustainability reports are mainly textual, but also visual and numerical testimonies of organizational attitudes, beliefs, and practices, obtained through voluntary self-declaration. Indeed, despite strong interest towards sustainability, there is no obligation for organizations to declare their sustainability practices, let alone by publishing a sustainability report. Being voluntary publications, sustainability reports are mainly meant for third-party communication. They depict, among others, innovative approaches implemented by the

organizations in support of the three sustainability dimensions, as well as organizational practices in safeguarding employee health and safety.

Sustainability reports were analysed from the prism of theoretical mediating factors. The objective was to establish the practice-based interrelationships between mediating factors in organizational practices and contribute to the understanding of interrelationships with OHS and SOI. This analysis was based on mixed methods as most appropriate for the identification of convergence and divergence axis between practice-based findings and theoretical assumptions. The mixed methods included qualitative components (semantic and content analysis), and quantitative (descriptive and inferential statistics). The legitimation was addressed in terms of process, through the systematic justification of the use of a given method, and of results, through critical interpretation and in-depth contextualization.

In the construction of the research process, the author purposefully decided that the applied research does not come in validation of the theoretical research but shall be built as a comparison. As constructed, the research hypothesis defends the existence of multiple realities: a theoretical or academic reality and a practice-based one. The research hypothesis proposes that these two realities are not mutually exclusive nor are they perfectly overlapping, but rather complementary. Both realities are multi-faceted as they combine several views and both contribute to an in-depth understanding of OHS and SOI phenomena, as to a causal understanding of the interrelationship between the two phenomena.

Finally, the Mutual Influence Model was adapted to consider theoretical and practice-based findings which pointed out that all the theoretically identified mediating factors are not confirmed through organizational practice. The current research endeavour concluded that the theoretically identified mediating factors “education”, “external factors”, “contextualization”, “technology”, “leadership” and “management systems” are also practice based mediating factors between OHS and SOI. With regards to “Knowledge Management”, “Stakeholder Management” and “Organizational Culture” organizational practice does not align with the theoretical conclusion of them being mediating factors between OHS and SOI, but only contributors to SOI. Finally, “responsibility”, as highlighted by the bibliographical study is perceived by organizations as a free electron.

In this regard, the Mutual Influence Model is a useful map for academia and industry alike as it identifies potential avenues of research/practice development that could jointly further OHS and SOI.

b. Original Contributions

Current research, as proven by the literature review, has shown its limitations, and mixed methods research is a new avenue for the contextualized understanding of the relationship between Occupational Health and Safety and Sustainability-Oriented Innovation.

The author’s contributions are multiple: bibliographical study regarding current state of knowledge on up-to-date independently studied management streams: OHS and SOI. The literature review is multi-faceted and proposes an original delimitation according to historical, structural, process, stakeholder, and management system viewpoints. The critical analysis of research obstacles and the identification of elements of convergence represent another theoretical contribution.

Followingly and based on the author’s published research on themes convergent to the research themes, the interweaving of OHS and SOI was studied at a theoretical level, which led to the identification of theoretical key elements and their regrouping into theoretically mediating factors. Finally, the author synthesized the conclusions by proposing a Mutual Influence Model (MIM).

With regards to the applied research, the author proposed a novel research design: theory-driven and based on a mixed methods research approach. Theoretical considerations of qualitative and quantitative analysis are described, as those relative to the implementation process, results, and interpretation. Inferences are made at every step of the research based on data collection and extensive description of the research process. Detailed research results are listed in an Appendix section.

The author awarded specific care to transferability through extensive and detailed description of the organizations as participants to the study, the selection of the data set and of the research method. Also, legitimation is ensured by the links between the qualitative and quantitative analysis.

Finally, the interpretation of results, i.e., theory and practice-based mediating factors are identified and modelled in a synthetic Mutual Influence Model.

From an applied research perspective, the critical and extensive discussions and conclusions of the theoretical results led to the identification of potential future avenues of research, among which the decomposition of mediating factors into lower-level mediating factors to investigate specific contributions to OHS and SOL.

The original contributions are listed in the following paragraphs per thesis chapter.

Chapter 2. The chapter surveys the current state of the knowledge on two topics: Occupational Health and Safety and Sustainability-Oriented Innovation. Consequently, the author's research contributions are theoretical; the juxtaposition of the two management streams constitutes a first original contribution.

The comprehensive literature review is the author's following contribution. The multi-faceted presentation that was proposed by the author is also original as discusses historical, structural, process, stakeholder, and management system viewpoints.

Another research contribution is the distillation of research streams and research obstacles for the two domains and the identification of elements of convergence in literature.

Chapter 3. The author contributed to the chapter as follows:

- The chapter is based on the author's published research on themes convergent to the research themes to pass from the juxtaposition of the research theme to their interweaving at the theoretical level. This approach as well as its conclusions constitute an original contribution.
- The identification of theoretical key elements and their regrouping into theoretically mediating factors.
- The modelling of the Mutual Influence Model (MIM) which synthesizes the theoretical research.

Chapter 4. The author's main contribution to the chapter is the in-depth presentation of the applied research approach. The chapter overviews theoretical and historical considerations regarding mixed methods: the underlying paradigm, the articulation of quantitative-qualitative methods and the subsequent issues relative to the legitimation of the research process and results.

The mixed method strategy is characterized in terms of timing, weight, data mixing and strategy-driver; justifications are proposed at each step, to ensure legitimation of the process.

Followingly, the author reviewed three Computer Assisted Qualitative Data Analysis Software for the identification of the best-fit analytical tool. Each software was briefly presented in terms of construction, functionalities, or user friendliness. Finally, a hardware and feature based comparison chart was proposed. The selection of the MAXQDA software was duly justified.

Chapter 5. The author's main contributions to the chapter are practical contributions. The first is conceiving and building the experimental set-up for the mixed methods analysis. The qualitative and quantitative analysis are presented from a theoretical perspective, but also with regards to implementation process, results, and interpretation. Legitimation is ensured by the links between the qualitative and quantitative analysis; to this end an extensive appendix section is dedicated to ensuring the link between data and results. Contextualization of findings is done at each step of the research.

The qualitative analysis is extensive and propose two approaches: semantic and content analysis for the entire data set. Taken independently, this applied research is a novel approach through the complementary qualitative analysis that were proposed. From a quantitative perspective, the author's contributions include the characterization of organizational perception relative to each variable as a distribution curve through the wider population. Finally, a more global contribution is the interpretation of results which allow to establish interactions and associations among the mediating factors which leads to the author modelling the sharp-edge Mutual Influence Model in parallel to the practice based one.

c. Considerations on Research Limitations and Future Research Avenues

First, the limitation of the present work relates to the applied research. The selected companies although multisectoral, are European based, meaning that the data set may not be fully representative of the global one. Future research should include a wider geographical panel of organizations. Furthermore, given the amount of time necessary for the coding process despite the use of Computer Assisted Qualitative Data Analysis Software – CAQDAS, the data set was limited to five organizations due to time constraints relative to the PhD. research. An extension of the data set would also contribute to reinforce the legitimation of the research results.

Secondly, and unlike the multiple reviewer process implemented for the identification of mediating factors, the sustainability report coding process was done by one reviewer in an iterative manner. The inclusion of another reviewer would be interesting to reinforce the legitimation of the coding process and coding results.

The qualitative analysis was theory-driven. A complementary research could consider a grounded-theory approach for the coding process, and a comparison of the thus obtained mediating factors could be undertaken.

Similarly, an extension of the quantitative study could include further investigation of statistical relationships based on non-monotonic relationships.

Another future research domain can aim at the establishment of trends, by comparing the coding results of sustainability reports issued over a 5- or 10-year period by the same organization. Such a temporal approach may confirm evolutions in practice within the same organizations and contribute to the development of sustainability maturity models.

Finally, from a theoretical perspective, each mediating factor can be studied in-depth and the way in which it contributes to OHS and SOI can be characterized. Furthermore, the theoretical framework can be extended to include contributing factors (i.e., those theoretically mediating factors which are not practice-based mediating factors).

All in all, the present doctoral thesis has proposed a new impulse related to two fields (OHS and SOI) the understanding of which is problematic for both academia and industry. The research approach that consisted in bypassing the individual understanding of each field to consider that of the interactions/interrelationships/interconnections among them has shed new light into future avenues of research for the comprehension of each field but also on a novel approach of advancing the sustainable development efforts.