Humanities and Social Sciences **2024**
Research Journal 31, No. 1 (2024), pp 65-75 **January-March**

Received: June 2023
Accepted: March 2024
DOI: 10.7862/rz.2024.hss.04

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THE SIGNIFICANCE OF KNOWLEDGE MANAGEMENT PROCESSES FOR BUSINESS SUSTIANABILITY: THE ROLE OF SUSTAINABILITY-ORIENTED PROJECTS

The paper aims to investigate the correlation between knowledge management and business sustainability through sustainability-oriented projects. The role of projects in promoting sustainability is already recognized, with sustainability-oriented projects emerging as a pivotal mechanism for companies to actively contribute to sustainability goals. Theoretical arguments also suggest that the enhancement of knowledge management is crucial for the advancement of sustainable business. Still, assertions in both areas lack solid empirical verification. Simultaneously, there is a growing emphasis on exploring the connection between knowledge management and project management, as existing studies indicate that knowledge management enhances the efficiency and effectiveness of projects. However, the nexus between knowledge management, project management, and business sustainability remains largely unexplored. This study aims to address two questions: whether knowledge management has a positive effect on business sustainability, and whether it is mediated by sustainability-oriented projects. The research hypotheses are verified through a large-scale empirical study utilizing SEM.

Keywords: knowledge management, knowledge processes, business sustainability, sustainability-oriented projects, management, project management.

1. INTRODUCTION

Sustainable development, considered as one of humanity's most critical and urgent challenges, cannot be achieved without significant business involvement. The role of projects in the sustainable development of organizations and society is recognized and

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investigated (Sabini, Alderman, 2021), which has resulted in fast-growing stream of research on sustainable project management (Silvius, 2017). While business sustainability (BS) is realized through a variety of business commitments and activities for the benefit of contributing to sustainable development (Zgrzywa-Ziemak, Walecka-Jankowska, 2020), sustainability-oriented projects (SOP) are a direct way for business to be involved. These projects are possibly potent means of developing, implementing and validating new sustainable solutions within the business (internal projects), by the business (external projects) and in the space of inter-organisational collaboration (inter-organisational projects).

Knowledge management (KM) is considered as having a significant positive impact on BS. There are theoretical arguments that the intensification of KM processes, *incl.* acquisition, development, transfer and implementation of new knowledge in the area of sustainability, is essential for the development of a sustainable organization (Velazquez et al., 2011). There are also individual empirical results confirming that KM positively effects the sustainability of enterprise operations and that companies which promote creating, sharing and implementing new knowledge are more likely to engage in sustainable development practices (Kumari, Saharan, 2020; Sun et al., 2022). Some studies indicate that KM improves project management (PM) efficiency and effectiveness (Hu et al., 2019; Oluikpe et al., 2010). However, it is still an under-research topic (Moutinho, Silva, 2022; Todorović et al., 2015).

The main purpose of the article is to explore the relationship between KM and BS through SOP. The current study addresses three main research questions:

RQ1: Does knowledge management affect positively business sustainability?

RQ2: Does knowledge management affect positively business sustainability, through sustainability-oriented projects?

Literature research was carried out to identify relationships between KM (process approach is adopted), PM (sustainability-oriented projects are chosen) and BS (sustainable performance approach is adopted). Research model was tested using SEM on a sample of 694 Polish and Danish companies.

2. LITERATURE REVIEW

2.1. Sustainability-Oriented Projects

Concepts of BS refer to the organization's objectives – in relation to sustainable development goals, processes or activities which constitute BS, characteristics of a sustainable organization and results – the contribution of organizations to sustainable development. Zgrzywa-Ziemak and Walecka-Jankowska (2021) propose the BS approach based on the sustainable performance (SP) construct and this approach is adopted in the paper.

Growing body of knowledge have coupled sustainability and PM (Goel et al., 2020; Sabini, Alderman, 2021). Different types of relationship between sustainability and PM are considered in the literature, foremost: the sustainability of the deliverable that the project realizes (content perspective) and the sustainability of the project's process of delivering and managing the project (process perspective) (Silvius, 2017). More recently, additional perspective has emerged that shifts the emphasis from management of specific project to project management within an organisation or even wider network arrangement (Silvius, Marnewick, 2022).

In the paper, SOP are considered. In this case, projects are potentially important organisational forms supporting the business involvement into sustainable development. Projects can be a form of developing, implementing and validating new solutions for sustainable development within the business (internal projects), by the business (external projects) and in the space of inter-organisational collaboration (inter-organisational projects).

2.2. Knowledge Management Processes

KM lacks an universally accepted definition, with various perspectives from theorists and practitioners. Bukovitz and Williams (2000) define KM as a process that enables an organization to generate value from intellectual assets or other knowledge-based resources, generating wealth for the organization. While Probst, Raub and Romhardt (2000) specifies it as an integrated set of activities aimed at the appropriate formation of knowledge resources. Initially, practitioners emphasized safeguarding intellectual capital and gaining a competitive edge through knowledge use (e.g. KPMG, PWC). Currently, these definitions increasingly include sustainability goals as well: KPMG for instance, describes it as a business model utilizing knowledge as an asset for sustainable advantage. Finally, the definitions presented in the literature revolve around three approaches: resource-based (based on Leonard-Barton's concept of wellsprings of knowledge, core competences), Japanese (concentrates on knowledge creating and development through socialization) and process-based (developed by practitioners). A process approach is the most commonly used, built on the experience of consultancies, in which the emphasis is on KM processes such as acquisition, development, transfer, codification and use (logic and ordering are characteristic of this approach, but knowledge is identified as information).

2.3. Knowledge Management and Business Sustainability

It is possible to point to studies by other authors in the literature in the context of KM's links to the concept of sustainability (e.g. López-Torres et al, 2019; Sun et al., 2022). It is worth to highlight the research contained in Abbas' work (2020), which reviled a significant and positive impact of KM on corporate sustainability, environmental and economic sustainability (not social sustainability) and, research model by Abbas and Sağsan (2019) linking KM, green innovation and corporate sustainable development. Iqbal and Malik (2019) in turn indicate that companies that promote their executives to discover, share and implement new knowledge (whether that knowledge relates to business processes, business policies, technological developments or other new trends in the business environment) are more likely to engage in sustainability practices, especially with regard to the environment, human resource management, community development and local development. Similar conclusions (although this time in the banking environment) are developed by Kumari and Saharan (2020), who found out that centralized banking systems are supported by KM systems, providing support for such sustainability efforts. Siebenhüner and Arnold (2007) emphasize the importance of KM processes for BS and the intensification of KM processes, *incl.* the acquisition, development, transfer and implementation of new knowledge in the area of sustainability, seems extremely relevant.

The empirical study aimed at verifying the following hypothesis: *H1: The knowledge management effects positively the sustainable performance.*

2.4. Knowledge Management and Project Management

A literature analysis addressed the importance of KM for PM results and project success, for shaping a project-oriented organisation, the role of KM in inter-organisational projects, knowledge transfer in projects, and the project as a source of knowledge. Moutinho and Silva (2022) indicate that KM improves PM efficiency. KM solves scheduling problems (Rokou et al., 2012), underpins risk management (Neves et al., 2014), improves project cost and quality management (Suresh et al., 2017). Several benefits of KM applied to PM are recognized in the literature, among other KM have an positive impact on lead time, innovation, project success, operational efficiency and generation of new knowledge, and other benefits (Oluikpe et al., 2010; Wu, Chen, 2010). On the other hand, a lack of KM has on projects, namely it is: inefficiency, repetition of mistakes and a lack of lessons learned (Suresh et al., 2017). In turn, Liu and Liu (2009) propose a framework for KM in PM for those companies that implement projects. Kaiser et al. (2016) provide conceptual considerations for an information management system and a KM system in projects, with a focus on collaborative learning and knowledge sharing processes. Todorović et al. (2015) indicate that one of the main problems in KM in a project environment is poor analysis of project success and lack of adequate documentation of the results of previous projects.

Despite the growing number of publications on the topic, KM is still an under-researched topic in PM (Moutinho, Silva, 2022; Todorović et al., 2015). This article is therefore part of this research strand. The empirical study aimed at verifying the following hypothesis: *H2: The sustainability-oriented projects mediate the relationship between KM and sustainable performance.*

3. RESEARCH RESULTS

An empirical study was aimed at verifying the research hypotheses regarding the relationship between the KM process and SP and the role of SOP for this relationship. A conceptual model was developed (Figure 1).

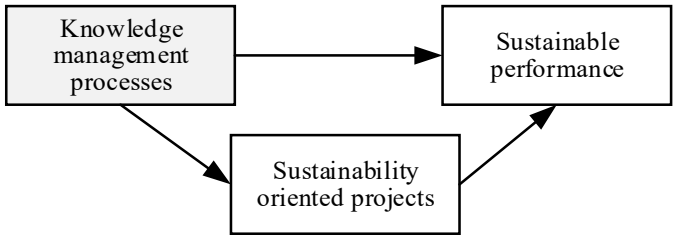

Figure 1. Conceptual framework of the relationship between KMP, SOP and SP

Source: Author's own work.

3.1. Research methodology

The survey was composed of the questions measuring each of 5 dimensions of KM processes (19 items), those referring to SOP (6 items), and 3 dimensions of SP (15 items). All items are rated on a 5-point Likert scale. The studies were conducted in the businesses functioning in Poland (391) and in Denmark (303). The research covered business organizations, employing at least 10 people. Higher-level managers or other people who

have a broad view of the entire enterprise were the respondents. Numerically similar groups as far as their sizes and significant diversification in terms of their industries were obtained. The primary statistical method was SEM (in AMOS 28).

3.2. The measurement of sustainability-oriented projects

The measurement scale has been developed based on the assumption that SOPs are projects focused on sustainable value-building. Model developed by Hart and Milstein (2003) is adopted, as it is an important model for structuring the notion of sustainable value in the context of the business contribution to both social and environmental problems, now and in the future (Senge et al., 2010). Accordingly, SOPs are those in which business engages in research initiatives on:

- radically new, proecological technological solutions, and products and/ or services oriented on solving significant social problems,
- improving the processes and/ or products to limit the negative impact of our operations on the natural environment,
- adapting the products and/ or services to clients that have been excluded so far (e.g. disabled, elderly, poor, minorities),
- whereby the company's product and/or process development projects are carried out in collaboration with stakeholders (suppliers, customers, local community, legislators, NGOs, etc.).

Secondly, commitment to SOPs manifests itself in the company's participation in inter-organizational projects for developing solutions that are socially and/or environmentally beneficial (with other organizations or the local community). The confirmatory factor analysis (CFA) was used to test SOP scale. The measures of the overall fit indicate the fit of the structural model: $X^2(9)=45.357$, $X^2/df=5.04$, NFI=0.96, CFI=0.967, RMSEA=0.076, SRMR=0.043.

3.3. The measurement of knowledge management processes

Processes-based approach to KM is adopted in the study. The KM process model is the result of solutions and practices developed in large consulting firms (Zieba, 2021). The measurement scale used for the research focused on the following processes: knowledge acquisition, development, transfer, utilization and storage (described by i.e. Zaim et al., 2007). Knowledge generation (acquisition and development) refers to activities that increase the stock of organizational knowledge, which can be done by improving and developing existing or by buying/renting information. In organizations there is a strong focus on mutual learning in teams. Moreover, the organization ensures that employees have access to the necessary knowledge, to various sources of knowledge and various channels of information exchange. The organization's information systems and their support services demonstrate high usability and reliability by providing a robust and trustworthy technological infrastructure. The final process that makes up the measurement of KM is utilization. It is important that organizations have robust early warning systems to monitor internal processes and those in the environment. The CFA was used to test the model. The measures of the overall fit indicate the fit of the structural model: $X^2(142)=459.598$, $X^2/df=3.237$, NFI=0.924, CFI=0.946, RMSEA=0.057, SRMR=0.046.

3.4. The measurement of sustainable performance

In the paper, organizational performance is understood holistically as sustainable performance (SP) and multi-dimensional scale which combines economic, social and

environmental performance is adopted (Tworek et al., 2019). The social performance is measured by: employee satisfaction, health and safety at work, customer satisfaction, the organization's contribution to the development of healthy and life-friendly communities in general, and the suppliers' compliance with social and environmental criteria. The economic performance is assessed by revenues, productivity (low costs), quality (robustness, reliability, diligence), return on investment (ROI), the number of new products and/or services successfully implemented. The environmental impact of the business' activities in terms of resources consumed and emissions and waste generated, the environmental performance. The CFA was used to test the SP scale. The measures of the overall fit indicate the fit of the structural model: $X^2(87) = 301.02$, $p<0.001$, $X^2/df = 3.46$, NFI=0.911, CFI=0.935, RMSEA=0.06, SRMR=0.03. SP variable and the variables measuring each of the dimensions of SP should be considered reliable (Cronbach's α exceeds 0.7).

The reliability of the constructs and scales was assessed using Cronbach's α and composite reliability, indicating the adequate reliability of all constructs (cf., Appx. 1).

3.5. Study results

Table 1 contains descriptive statistics for all variables and Mann–Whitney U test statistics verifying the significance of differences in variables between Polish and Danish companies.

Table 1. Variables descriptive statistics and Mann–Whitney U test statistics (n=694).

Variable				Mann–Whitney *U* test	
	M	*ME*	*SD*	*Z*	*p*
SOP	2.05	2.12	0.55	-4.660	**< 0.01**
KMP	3.01	3.07	0.56	-1.929	0.054
KMP - acquisition	2.43	2.44	0.67	-5.398	**< 0.01**
KMP - development	2.80	2.86	0.62	-2.407	**< 0.05**
KMP - transfer	3.67	3.75	0.76	-1.745	0.081
KMP - storage	3.60	3.75	0.79	-1.795	0.073
KMP - utilization	3.53	3.67	0.83	-0.455	0.649
SP	3.47	3.44	0.51	-2.097	**0.036**
Economic performance	3.42	3.43	0.56	-1.070	0.285
Environmental performance	3.46	3.40	0.61	-2.897	**< 0.01**
Social performance	3.54	3.60	0.67	-1.009	0.313
M – mean; *ME* – median; *SD* – standard deviation; *Z* – Mann–Whitney *U* test, *p* – significance level.					

Source: Author's own work.

The Mann–Whitney U test was used to check whether the organizations from Poland and Denmark differ in terms of their KMP, SOP and SP (cf., Table 1). The results revealed that there are significant differences between companies operating in Poland and Denmark with regard to the intensity of knowledge acquisition and new knowledge development processes (they are statistically significantly higher in Denmark). In addition, companies operating in Denmark are more committed to SOP than those in Poland, and they also achieve higher SP (due to the environmental dimension). There are no significant differences in total KM processes depending on the country.

The correlation analysis showed that all three variables are significantly correlated with each other (p<0.01): KMP, SOP and SP (Appx. 1). However, understanding the nature of the relationship between the phenomena under study requires in-depth analyses, SEM was developed (Figure 2).

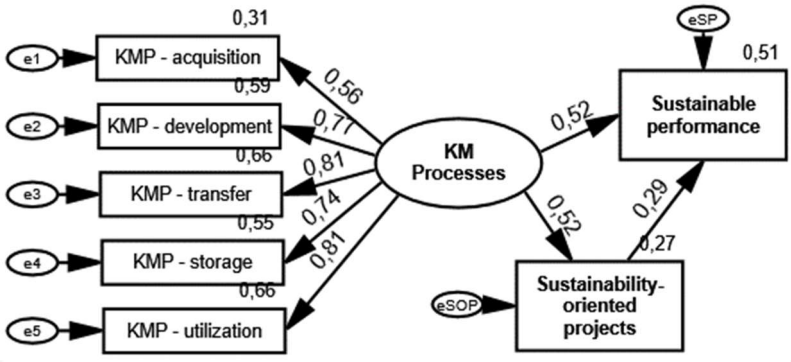

Figure 2. The mediation model of the effect of KMP on SP, where SOP is a mediator

Source: Author's own work.

The measures of overall model fit indicate the fit of the structural model: X^2(39)=310.786, X^2/df=7.960, NFI=0.933, CFI=0.94, RMSEA=0.071, SRMR=0.028. All estimated parameters are significant (p<0.001). Constraint Multi-Group Analysis revealed that there are not significant differences between groups of companies operating in Denmark and Poland in relation to: the effect of KMP on SP (X^2(1)=3.271, p=0.071), KMP on SOP (X^2(1)=0.131, p=0.718) and SOP on SP (X^2(1)=1.213, p=0.271).

To verify research hypotheses, whether KMP positively effects SOP and SP, and whether SOP mediates the relationship between KMP and SP (in accordance to conceptual model, Figure 1), the Hayes Process macro was used. It is dedicated to perform mediation analysis and it provides the results of the analysis in a more systematic and comprehensive manner than SEM. The main results of the analysis are presented in Appx. 2.

The study revealed a significant positive effect of KMP on SOP (b=0. 502, t=15.556, p<0.001). The R-square is 0.259 (F(1,692)=241.999; p<0.001), indicating that 26% variation in SOP is accounted by KMP. According to total effect model KMP has a significant positive impact on SP (F(1,692)=466.962; p<0.001), 40% change of SP is accounted by KMP (the R-square is 0.403). There is a significant direct effect of KMP on SP in presence of the mediator (b=0.433, t=14.783, p<0.001) and significant indirect effect of KMP on SP (b=0.149, p<0.001) with mediating role of SOP. It should be noticed that SOP has a significant, positive impact on SP (b=0.298, t=10.051, p<0.001).

The study assessed the mediating role of commitment to SOP on the relation between KM processes and SP. This is a partial and complimentary mediation – KMP effects SP directly and indirectly through SOP (Table 2).

To sum up, both hypotheses H1 and H2 are accepted: KMP effects both SOP and SP, and SOP mediates the relationship between KMP and SP. Model appeared to appropriately characterise the relationship between KMP, SOP and SP. KMP emerges as a significant factor influencing positively SOP and BS. At the same time, the effect of KMP on BS is greater the higher commitment to SOP.

Table 2. Mediation Analysis Summary for relationship: KMP → SOP → SP

Model	Total Effect	Direct Effect	Indirect Effect	Confidence Interval		Conclusion
				Lower Bound	Upper Bound	
Total sample (n=694)	0.582 (p<0.001)	0.433 (p<0.001)	0.149	0.115	0.186	partial and complementary mediation

Source: Author's own work.

4. CONCLUSIONS

Empirical research underscores the crucial and positive role of KM on commitment in SOPs. In addition, studies have also shown that KM has a key role for SP. The study underscores the mutual interdependence of these two factors, suggesting that as organizations refine their KM practices, a simultaneous and discernible enhancement in their commitment to sustainable initiatives occurs. Furthermore, the research findings emphasize that the impact of KM on SP becomes more pronounced with a higher degree of commitment to SOPs. This implies the existence of a reinforcing cycle wherein a strategic focus on KM not only fortifies commitment but also amplifies positive outcomes concerning sustainable practices within organizations. The study suggests that concerted efforts directed toward improving KM can contribute to the establishment of more sustainable organizational practices.

It is essential to underline that the research presented above has some limitations. First, model verification is based only on two samples (from Poland and Denmark). Secondly, the research sample was not representative. However, efforts were made to ensure that the number of groups of organizations of different sizes was similar for both countries.

Further research could attempt to test continuity to see changes in KM, SP and SOPs (this study represents a snapshot in time). Likewise, increasing the size of the research sample and expanding the research to include companies operating in other countries (replication of research) would allow for generalization of the results. Moreover, the hypotheses require further verification in different business contexts – i.e., considering other (internal and external) factors that impact organizational performance and BS, as emerges from the literature review. In addition, the conclusion referring to the differences between countries (cultural or technological advancement and resources) is undoubtedly an attention-grabbing direction.

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Appendix 1. Correlations and coefficients for all variables (n=694)

Variables	*It*	*α*	*CR*	*AVE*
1. SOP	6	0.80	0.80	0.41
2. KMP total	5	0.85	0.86	0.55
3. KMP – acquisition	3	0.72	0.77	0.53
4. KMP – development	4	0.83	0.88	0.65
5. KMP – transfer	4	0.82	0.85	0.60
6. KMP – storage	4	0.84	0.85	0.59
7. KMP – utilization	4	0.75	0.83	0.54
8. SP	3	0.78	0.87	0.69

All correlations are significant at the 0.01 level.
α – Cronbach's alpha, *CR* – composite reliability,
AVE – average variance extracted, *It* – number of items

Appendix 2. Regression results for KMP and SP relationship – SOP as a mediator (n=694)

Output variable	Variable	Coeff.	*SE*	*t-Stat*	*P value*	*R*	*Adj. R^2*	*MSE*	*F-statistic*	*P Value*
SOP	constant	0.537	0.099	5.428	0.000	0.509	0.259	0.223	241.999	0.000
	KMP	0.502	0.032	15.556	0.000					
SP	constant	1.557	0.079	19.752	0.000	0.692	0.479	0.136	317.731	0.000
	KMP	0.433	0.029	14.783	0.000					
	SOP	0.298	0.029	10.051	0.000					
SP	constant	1.717	0.083	20.790	0.000	0.635	0.403	0.156	466.9621	0.000
	KMP	0.582	0.027	21.609	0.000					