

ORIGINAL SCIENTIFIC PAPER

THE IMPACT OF KNOWLEDGE MANAGEMENT ON GREEN INNOVATION AND SUSTAINABLE BUSINESS OF MINING COMPANIES: THE SEM APPROACH

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ABSTRACT

The aim of this paper is to analyse the impact of knowledge management on green innovation and sustainable business of mining companies on the one hand, and to analyse the impact of green innovation on the sustainable business of these companies on the other. Cause-and-effect relationships between the selected variables were explained applying structural equation modelling (SEM). The results of the study show that knowledge management significantly improves green innovation and sustainable business practises of the observed companies, and, also show a direct benefit for sustainable companies from green progress. The results emphasise the importance of knowledge management, which in combination with green innovations - new technological advances - enables companies to adopt the idea of sustainable business and thus contribute to the achievement of development goals.

Keywords: Knowledge management, sustainable business, green innovation, mining companies, Structural Equation Modeling

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INTRODUCTION

Every organizational unit and every life activity that takes place within it requires management. Management leads to the set goal, ie to the completion of the started activities. As all activities are aligned with the time protocol, the need for management becomes greater. Management is becoming a key resource and an element that gives life to business, and there is no substitute for good governance. Good governance implies the correct allocation of production resources (people, machines, materials, money), as well as making the right decisions. The correctness of the decision is influenced by the competencies of managers, as well as their knowledge, which must be multidisciplinary. When comes the mining industry, has its specifics and is one of the biggest polluters of the environment. Therefore, the management of companies in this area is specific, and above all, it must meet the most important condition, ie. sustainability. This means that through every activity of the management process, managers must respect the principles of sustainable development.

In light of the fact that knowledge management is one of the most efficient ways to enhance organizational innovation, which in turn helps to uncover new opportunities for sustainable business operations [1][2], and that modern conditions are characterized by a high level of technology on the one hand and the destruction of the environment on the other [3], the aim of the study is to analyse the impact of knowledge management on green innovation and sustainable business of mining companies, and to analyse the impact of green innovation on the sustainable business of these companies. The paper is structured in five parts. After the introduction, a theoretical overview and research hypotheses were presented, followed by the methodology and results, and discussion. The conclusion reviews the key conclusions, and practical implications, and provides recommendations for future research.

THEORETICAL BACKGROUND AND HYPOTHESIS

Numerous empirical research have looked at the connections between knowledge management and green innovation [4–7], knowledge management and corporate sustainability [8–11], as well as green innovation and corporate sustainability [12–15]. However, only few research [6, 7] have looked into the connection between corporate sustainable business and green innovation.

Unquestionably, knowledge management plays a crucial part in the innovation process since it serves as the foundation for investigative and analytical work [16]. Breznik [17] examined how knowledge management affected organizational innovation and came to the conclusion that this procedure is what motivates the business' innovative efforts. Lee et al.[18], however, argue that government support, facilitation, and encouragement of business innovation is necessary to promote green innovation since it will allow businesses to provide high-quality goods and services with the least amount of natural resources. Companies could make use of previously obtained information to improve innovation and performance [4,5]. Studies by the authors [6,7,19] have demonstrated the beneficial effects of knowledge management on green innovation. In light of this, the following supposition is made: H1: Knowledge management positively impacts green innovations.

According to Shahzad et al. [20], an organization's capacity to absorb knowledge has a substantial impact on its environmental performance. As a result, the sustainability of the business can be improved through knowledge management, utilizing staff knowledge. In his research, Kun [11] sought to ascertain the effects of the knowledge management dimensions (acquisition, distribution, and application of information) on sustainable business as well as the connections between these dimensions through economic innovation. The results showed that economic innovations and the chosen knowledge management characteristics had a good and significant impact on viability. Similar to this, all aspects of knowledge management considerably and favorably influence sustainable business, according to the findings of the study by Kordab et al. [21]. Accordingly, the following hypothesis is set: H2: Knowledge management positively impacts sustainable business.

According to studies, innovation is a crucial component for businesses that want to keep their competitive edge, solidify their market dominance, and generate sustainable net profit growth in a complex, dynamic environment [22,23]. Due to its dual externalities to the environment and innovation, green innovation among the various types of corporate development has special advantages that cannot be compared to other traditional innovations and demonstrates to be an effective way to consolidate the

benefits of corporate development [24]. According to study by Eiadat et al. [25], the use of green technologies minimizes waste and pollution in the company's production process, which helps it build a positive reputation in society and increase its competitiveness. Accordingly, the following hypothesis is set: H3: Green innovation positively impacts sustainable business.

METHODOLOGY

For the purposes of quantitative research, employees of mining companies located in the territory of the Republic of Serbia were surveyed. The research covered 4 companies. The survey was conducted in the period from April to May, 2022. Pilot testing was not carried out, since the scales used in the paper were validated, in the context of Serbia, in the research by Jovanović et al. [26]. A total of 509 questionnaires were collected. A review of the questionnaire determined that 9 questionnaires should be excluded from the analysis, due to observed irregularities, i.e. random completion and missing data.

The sample includes 70.6% men and 29.4% women. According to the age structure, most respondents were 41-50 years old (29.2%), followed by 51-60 (25.4%), 31-40 (25.2%), and ≥ 30 (15.8%), while the fewest respondents in the sample were over 60 years (4.4%). The target population in the research, i.e. the convenience sample of research, consisted of employees in mining companies in the territory of the Republic of Serbia. Regardless of the unrepresentativeness, this form of selection of respondents is a very common occurrence, when it comes to scientific research that does not have some external sources of funding. Questionnaires were distributed by e-mail. Respondents, after explaining the aim of the research, were asked to rate their attitudes in the questionnaire, having in mind the company in which they work. The questionnaire, constructed for research purposes, consisted of four parts. The first unit contained the demographic characteristics of the respondents. The second part contained attitudes related to knowledge management. The third unit contained attitudes related to the sustainable development of the company. The fourth part contained attitudes toward green innovation. Attitudes were measured using the Likert scale, from 1 - I do not agree at all, to 5 - I completely agree.

Fourteen attitudes made up the knowledge management (KM) measurement. Six attitudes were the green innovation (GI) assessment instrument. Ten attitudes were used as the measuring instrument for sustainable business (SusBus) in companies. Each of the constructs in the model was viewed as a second-order construct. The first construct (KM) has four aspects (dimensions), the second construct (GI) has two and the third construct (SusBus) has three aspects. The conceptual model of the study is displayed in Figure 1.

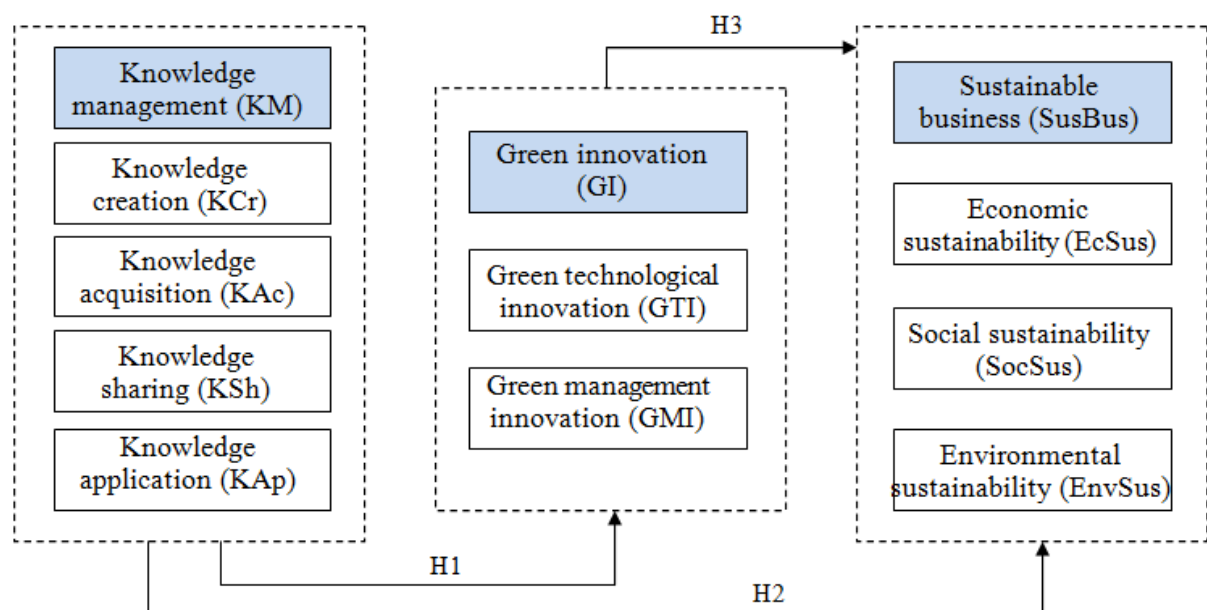


Figure 1. Conceptual model

The processing of the collected data from the survey questionnaire was carried out using multivariate data analysis techniques. Data were analyzed using statistical software IBM SPSS 21 and AMOS graphics. The sample structure is presented using frequency analysis and descriptive statistics. The causal relationships between observed variables were assessed applying the structural equation modeling (SEM) method. As a multivariate technique, SEM is increasingly applied in scientific research to test and evaluate multivariate cause-and-effect relationships. SEM is distinct from other modeling techniques in that it evaluates both direct and indirect impacts on assumed causal linkages.

RESULTS AND DISCUSSION

According to the two-step method proposed by Anderson and Gerbing [27], which involves first estimating the measurement model and then estimating the structural model, structural equation modeling was used for the hypothesized relationships. Following a confirmatory factor analysis, it was found that the conceptual model's fit indicators are all at an adequate level ($\chi^2 = 60.612$, $df = 23$, $p < 0.001$; $\chi^2 / df = 2.635$, $NFI = 0.971$, $TLI = 0.982$, $CFI = 0.976$, $SRMR = 0.029$, $RMSEA = 0.057$).

Since the model fit values were achieved at the appropriate level, convergent and discriminant validity were evaluated in the next phase. The values of the standardized factor loadings, the internal reliability coefficient, the composite reliability, and the value of the share explained in the total variability indicate the fulfillment of convergent validity (Table 3).

Table 3. Factor loading, reliability coefficient, and convergent validity

Construct	Factor loading	Cronbach's alpha	CR	AVE
KM		.801	.795	.502
KCr	.581			
KAc	.534			
KSh	.790			
KAp	.872			
GI		.813	.849	.583
GTI	.653			
GMI	.841			
SubBus		.784	.785	.549
EcSus	.733			
SocSus	.739			
EnvSus	.750			

In order to evaluate discriminant validity, the AVE square root was computed. The discriminant validity was verified since each construct's square root of the average extracted variance is higher than its correlation with the other two constructs. Table 4 presents the findings.

Table 4. Discriminant validity

	KM	GI	SusBus
KM	.709*		
GI	.614	.764*	
SusBus	.668	.620	.741*

Note: * - Square root of the average extracted variance

Based on the tabular representation of the obtained results (Table 5), knowledge management has a significant positive impact on green innovation ($\beta = 0.810$, $p < 0.001$), as well as on sustainable business ($\beta = 0.358$, $p < 0.001$). The results also indicate a direct positive impact of green innovations on sustainable business ($\beta = 0.629$, $p < 0.001$). It supports the idea that knowledge management plays a key role in determining green innovation, which in turn influences corporate sustainable business. It also plays a major role in determining sustainable business in mining businesses. Similar evidence can be found in the pertinent literature. Knowledge management, according to Jovanović et al. [26] and Abbas and Sagsan [6], is crucial in deciding a company's sustainable business practices and green innovation. Green innovation, on the other hand, plays a major role in determining sustainable business. Similar findings were reached by Shahzad et al. in their study of manufacturing firms [7].

Table 5. Standardized estimates of measurement model parameters, t and p values

H	Paths	β	t	p	R ²	Decision
H1	KM → GI	.810	16.209	.0001	R ² _{GI} = .656	Supported
H2	KM → SusBus	.358	3.657	.0001	R ² _{SB} = .889	Supported
H3	GI → SusBus	.629	5.703	.0001		Supported

CONCLUSION

Using four knowledge management aspects, two green innovation aspects, and three sustainable development aspects, this study investigates how knowledge management affect green innovation and sustainability in mining companies. The acquired results are consistent with the research findings of the writers who addressed this topic and validate the set of research hypotheses [6, 7, 26].

The study that was done has a few limitations. First off, because this study only looked at the mining industry in one country, it may be advised that future researchers broaden their scope to include more countries and regions in order to get the most comprehensive findings. Moreover, this study's results can be compared to those from other countries. Its generalizability could be improved by doing additional industry testing on the proposed approach. Additionally, moderating variables like organizational agility, employees' dynamic and absorptive abilities, and personality traits could be included by future researchers. This is because personality traits, such as introversion or extrovertism, and absorption capacity are crucial for knowledge acquisition and exchange, which can support effective knowledge management process.

The study's findings emphasize the significance of knowledge management, which, when combined with environmentally friendly technologies, helps businesses to apply the idea of sustainable business, assisting in the accomplishment of development objectives.

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