Green Organizational Culture as Mediator of the Effect of Knowledge Creation on Green Performance

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Abstract. Limited resources and environmental degradation encourage green economy practices. Green performance can not only be assessed from the production results in the form of products or services in one production chain, but it is a production process in a sustainable cycle or known as a circular economy. Green performance at tertiary institutions can be achieved through an organizational culture system approach integrated between values, habitual behavior, curriculum, teaching and learning activities, research, community service, slogans, and artifacts (physical and visual). University also needs to develop organizational learning by acquiring and creating new knowledge to achieve opportunities and be adaptive and innovative toward ever-evolving green knowledge. This study aims to discuss the relationship between knowledge creation, green organizational culture, and green performance. The study was conducted on 211 university managerial staff in Semarang, Indonesia. The analysis was conducted using the path analysis approach. This study shows that knowledge creation and green organizational culture influence green performance. Green organizational culture mediates the effect of knowledge creation on green performance. This study provides implications of the importance of knowledge-based strategies and organizational culture development in the development of green performance.

Keywords: Knowledge Creation · Green Organizational Culture · Organizational Performance

1 Introduction

The development of population, limitations, and degradation of natural resources and the environment increase global awareness about working and living sustainably. According to United Nations (2020) data, the world's total population in 2020 was 7.8 billion people and has increased by 1.7 billion (27.8%) compared to 2000 by 6.1 billion people. The world population in 2030 is estimated to be 8.6 billion and will keep increasing to 9.8 billion in 2050. An increase in the global population will increase the need for food, water, and energy, while the supply of land, water, and energy are scarce. On the other hand, air, land, and water quality has also decreased due to various human activities in various sectors.

Population growth, resource degradation, and the environment encourage green performance management practices. The concept of green performance is resources management to produce a performance that not only consumables in the production cycle but also creates a continuous cycle (circular economy) [1] that does not run out with zero production waste (zero waste). Awareness of the way of working and living sustainably changes the orientation of production in many sectors. Sustainable and green are two different concepts, but they complement each other, often used alternately or together. The concept of sustainability is more about working and living sustainably, while the concept of green is more about making the earth become green and sustainable earth. Green performance is generally measured from products and processes that save resources and energy, clean production or zero waste, use of environmentally friendly materials, renewable energy, and environments with high oxygen production and low pollutants. Green performance appears in the certification of processes and products, such as eco-labeling and operational system procedures.

The application of green performance management is pro-environment in nature and can increase cost efficiency (e.g., the use of resources, water, and energy), public and market trust, and support access to capital. The application of pro-environmental performance management practices is beneficial in terms of the effectiveness of economic, social, and environmental performance. The application of pro-environment performance management practices can influence economic performance through resource savings and the concept of clean production (zero waste) [2, 3]. Social performance is achieved by increasing the community's trust and other stakeholders (markets, governments, financiers, creditors, and other partner institutions). In higher education institutions, environmental performance is the creation of an environment of learning and teaching activities that are conducive, clean, healthy, high oxygen production, low pollution, and pro-environment behavior. Environmental performance in tertiary education is also related to research, development, and community service toward environmentally friendly production practices and services [3].

Green performance practice is a concept that continues to grow. Currently, there are no global standards on green performance. Organizations need to continually learn about new knowledge and innovations related to environmentally friendly production systems and services. Green performance practices require prior knowledge to be developed into new knowledge (new technology, new methods, and best practice experience). On the other hand, green performance management is a process that is not instantaneous, but it is a continuous process. Knowledge management integrates internal and external organizational knowledge (knowledge, technology, open innovation, financial resources, and networking for innovation activities) in supporting green performance. Organizations need to continue to learn both by acquiring best practices and creating new knowledge to be adaptive and catch opportunities for change [4]. The strategy of knowledge actuation is easier but provides little competitive advantage because imitators usually lag behind their inventors. Strategies through knowledge creation provide organizational potential in leading change.

Knowledge creation can be done by developing, discovering, or capturing knowledge [5]. Knowledge creation is built by integrating tacit knowledge of the unique and valuable individuals possess in the organization's body. Knowledge creation is built socially from

interaction and interdependence between agents (people, ideas), hierarchical divisions, organizations, and the environment. Tacit knowledge needs to be managed so that it is not only owned by individuals but is integrated and becomes an organizational culture. The company must create a system that allows tacit knowledge to be made explicit, combined, socialized, and internalized within the company. At the organizational level, these processes are carried out in an iterative cycle known as knowledge creation. Knowledge creation focuses on strategies and behaviors that encourage organizations and organizational subunits to be more creative, learn, and adaptable. Individuals provide and strengthen knowledge, which is then crystallized and integrated into an organization's knowledge system through knowledge creation [6].

Green performance can be achieved through the production and service (process approach) and knowledge management support and needs to be built with an organizational culture approach (system approach). Organizational culture is embodied in attitudes and behavior, habits, slogans, and visuals (facilities and infrastructure). In higher education institutions, green organizations are reflected in curriculum content, program activities, attitudes, behavior, habits, and physical infrastructure. Higher education needs to prepare human resources to come through education, learning, and cultural systems with sustainable content. The relationship between knowledge creation and organizational performance, the relationship between organizational culture and organizational performance [7–9] have been widely explained in the theoretical and empirical literature but are limited in the context of green economy performance. This background motivates the authors to conduct this study.

Performance management literature has shifted from the productivity approach at the beginning of the industrial revolution toward a sustainable systems approach. At the beginning of industrialization, resources (land, forests, water, minerals, and energy) were still abundant. Production activities were still high in the agricultural sector, the environment was still natural, and had high oxygen production. Population growth, growth in industrial activities, and transportation using fossil fuels reduced the number of green areas, increased pollutants (land, water, air), decreased groundwater supply, and fossil-based energy availability. Research, development, and transfer of technology were aimed to increase product and service products that increased rapidly between the 1940s and 1970s.

H1: Knowledge creation has a positive effect on green performance.

H2: Knowledge creation has a positive effect on organizational culture.

H3: Organizational culture has a positive effect on organizational performance.

H4: Organizational culture can mediate the effect of knowledge creation on performance.

2   Research Method

This study was conducted using a survey approach on 211 heads of tertiary study programs both in state and private universities in Semarang. The variables in this study consisted of one independent variable, one mediating variable, and one dependent variable.

Knowledge creation (KC) as an independent variable was measured by the socialization, externalization, combination, and internalization (SECI) indicator[4, 6, 9]. Green Performance (GP) was measured by indicators Hervani et al. [10]: use of water resources, efficient energy, zero waste practices, and oxygen production.

Green Organizational Culture (GOC) can be measured using four indicators: (1) Involvement, which entails taking part in and feeling accountable for environmental performance. (2) The attitude of appropriateness between ways of acting and what the organization specifies via explicit and implicit rules (also known as consistency). (3) Adaptation, which is defined as norms and beliefs that improve tertiary institutions' ability to interpret or translate signals from the environment into changes in the organization and internal behavior of tertiary institutions, and (4) Mission, which is defined as direction, goals, and shared strategies used as a foundation for university-related pro-environmental activities. Indicator measurements using a Likert scale held scoring 1 to 5 where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

The data analysis method used in this study used structural equation modeling (Structural Equation Modeling) based on variance or component-based SEM. This study used a structural equation model, namely Partial Least Square. The reliability test of a construct with reflective indicators was done by assessing Composite Reliability and Cronbach's Alpha. The goodness of Fit model using R-squared dependent latent variables with the same interpretation as regression; Q-Squared predictive relevance for structural models, measuring how well the conservation values generated by the model and also the estimated parameters. Q-squared value > 0 indicates that the model has predictive relevance; conversely, if the Q-Squared value ≤ 0 indicates that the model lacks predictive relevance. Q-Squared calculation is shown by Eq. (1):

$$Q^2 = 1 - \left(1 - R1^2\right)\left(1 - R2^2\right)\ldots\left(1 - RP^2\right)$$

(1)

where R12, R22… Rp2 is the R-squared endogenous variable in the equation model. The Q-squared has a value between 0 and 1, with the closer to 1 indicating a better model. In route analysis, this quantity of Q-squared is similar to the coefficient of total determination. Rm The influence of specific exogenous latent variables on endogenous variables and whether they have substantive effects are explained using changes in the R-Squared value. The number of variances of the constructs explained by the model is presented in the PLS R-Squared results.

PLS was used in hypothesis testing to look at the p-value or t-value in each hypothesis. The supported hypothesis of a study is considered supported if (1) the variable's coefficient or direction (as indicated by the original sample value) is consistent with the hypothesis, and (2) the statistical t-value is greater than 1.64 (two-tiled) or 1.96 (one-tiled) [11]. The Sobel test will be used to determine whether or not mediating variables exist, which is a test that determines whether or not a variable is truly (significant) as a mediator of the effect of independent factors on the dependent variable. The mediating variable has a substantial role as a mediator if the significance level or probability (p.) is less than 0.05.

3 Results and Discussion

Performance in a systems approach [1] starts from the basic principle that performance management is not only a linear stage but also a continuous cycle or improvement process. Performance in a systems approach assumes that various resources (economic, social, and environmental) are not only used in one production or service chain but are managed in a sustainable cycle. Performance in a systems approach cannot be achieved by concentrating on one aspect of a partial approach. However, components interact with each other (interrelated) and work together interdependently to achieve performance. The system's hallmark is effectiveness, which is a basic to control complex economic activities to benefit both increased satisfaction and lower costs.

Based on the Resource-based View organizations have heterogeneous resources, which are not easy to move and transfer between one organization and another). These include knowledge resources both at the organizational and individual levels. Unique and valuable knowledge developed by organizations in culture (social norms, behavior and habits, symbols, and artifacts). Based on the Resource-based View, organizational culture distinguishes an organization from other organizations [12].

Outer loading value can be explained that all instrument items have a value of outer loading > 0.5, which means that all valid research instruments (feasible) were used in this study. The result of composite reliability and Cronbach alpha shows satisfactory values, which is the value of each variable above the minimum value of 0.70.

Based on Table 1, it can be explained that we obtained a composite reliability value > 0.70, which shows that the instruments utilized have a high level of consistency and stability. In other words, all of the study's constructs or variables have become suitable measuring instruments, and all of the questions used to assess each construct have a high level of reliability. Predictive - relevance value is obtained by the Eq. (2).

$$Q^2 = 1 - \left(1 - R1^2\right)\left(1 - R2^2\right)$$
$$Q^2 = 1 - \left(1 - 0.113^2\right)(1 - 0.715)$$
$$Q^2 = 0.747 \tag{2}$$

The results of Eq. (2) show the predictive-relevance value to 0.747; this value > 0. So it can be interpreted that 74.7% of variation on green performance can be explained

Table 1. Value of AVE, Composite Reliability, and Cronbach's Alpha

	AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality
GOC	0.948	0.987	0.113	0.983	0.949
GP	0.971	0.990	0.715	0.985	0.971
KC	0.929	0.981		0.975	0.929

GP = Green performance, GOC = Green Organizational Culture, KC = Knowledge creation

Table 2. Summary of Path Analysis Results

	β	Standard Error	T-Statistics
GOC → GP	0.172	0.027	6.455
KC → GOC	0.336	0.052	6.427
KC → GP	0.772	0.018	41.891

OP = Organizational performance, OC = Organizational Culture, KC = Knowledge creation

by the proposed model. The model has relevant predictive value since the majority of variance can be explained. Hypothesis testing is seen from the t-value of statistics and p-value by using an alpha value of 5%, and the statistical value used is 1.96. Test analysis using Bootstrapping model, Path Coefficient will be accepted if the value of t-statistics > 1.96. Test the hypothesis of the direct effect of the independent variable with the dependent variable. The acceptance and rejection of the hypothesis can be seen in the path coefficients as in Table 2. Summarized in Table 2, all hypotheses were found significant and thus accepted (p < 0.05).

The hypothesis which states that Knowledge Creation (KC) affects the green performance (GP) can be accepted with a path coefficient of 0.772 with t-statistics = 41.891 > 1.96.

The hypothesis which states that knowledge creation (KC) affects green organizational performance (GOC) can be accepted with a path coefficient of 0.336 with t-statistics = 6.427 > 1.96. The hypothesis which states that green organizational performance (GOC) influences green performance (GP) can be accepted with a direct path coefficient of 0.172 with t-statistics = 6.455 > 1.96.

After testing the hypothesis, which states that there is a direct effect of the independent variable on the dependent variable, the next step is to test the role of the moderator variable. Variables will have an effective (significant) moderating role if they pass the Sobel test using a 5% (=0.05) significance level. If the Sobel test statistic results are significance < 0.05, then that variable has a mediating role. Results from the role of mediation testing show that green organizational performance as a mediator of the influence between knowledge creation on green performance can be accepted, because the Sobel test result has a significance level (p) of 0.002, smaller than 0.05.

4   Conclusion

The findings of this study reveal that knowledge creation has a direct and indirect impact on university green performance as assessed by productivity, research, employee commitment, and industrial/institutional collaboration. The impact of knowledge generation on green performance is mediated by green organizational culture. Through involvement, consistency, adaption, and mission, knowledge production improves organizational culture. This research has significance for the establishment of green organizational culture and knowledge creation at universities. The use of knowledge management is not just aided by organizational culture. Knowledge generation, on the other hand, can have an

impact on organizational culture changes in adaptive systems. There are a few limitations in this study. First, the study was conducted with a survey approach and cross-sectional design. A survey-based study has flaws throughout time, such as changes in the economic environment, society, and regulation, as well as the influence of technology. The study results may alter with time (technology, social, culture, policy), necessitating new research as well as technological, social, cultural, and policy advances. Second, this study was carried out in a university setting. With varied organizational qualities, a study can provide diverse outcomes. Further research can be done on different aspects of organizations or on organizations that represent different industries, regions, or nations with diverse cultures.

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