“The effect of human capital on innovation: The mediation role of knowledge creation and knowledge sharing in small companies”

AUTHORS	Ida Ketut Kusumawijaya Partiwi Dwi Astuti

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Ida Ketut Kusumawijaya (Indonesia), **Partiwi Dwi Astuti** (Indonesia)

THE EFFECT OF HUMAN CAPITAL ON INNOVATION: THE MEDIATION ROLE OF KNOWLEDGE CREATION AND KNOWLEDGE SHARING IN SMALL COMPANIES

Abstract

Small companies face many obstacles and limitations that require more attention, especially the low quality of human resources, so that they continue to make a strategic contribution in creating innovation and becoming a driving force for a country's economy. The purpose of this study is to examine the effect of human capital, knowledge creation and knowledge sharing on innovation. Data were collected using an online questionnaire. The research sample consisted of 396 small companies, and 187 were returned, filled in completely by managers of small companies in the Province of Bali, Indonesia. Data were analyzed using SEM with the PLS approach with WarpPLS 7.0. The results demonstrate that human capital has a significant positive influence on knowledge creation ($\beta = 0.784$; $p < 0.001$), human capital was found to have an effect on innovation ($\beta = 0.212$; $p < 0.001$), human capital has an effect on knowledge sharing ($\beta = 0.853$; $p < 0.001$), knowledge creation influences innovation ($\beta = 0.428$; $p < 0.001$), knowledge sharing has an effect on innovation ($\beta = 0.323$; $p < 0.001$), knowledge creation successfully mediates the influence of human capital on innovation, and knowledge sharing mediation is successful in the influence of human capital on innovation. This study improves the understanding of human capital by reducing the scarcity of empirical research and by uncovering the mechanisms through knowledge creation and knowledge sharing that influence innovation.

Keywords resource, competitive, performance, individual, creative, intangible, asset, advantage

JEL Classification D83, J24, O31

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Ida Ketut Kusumawijaya, Dr, Associate Professor, Business Faculty, Triatma Mulya University, Bali, Indonesia. (Corresponding author)

Partiwi Dwi Astuti, Dr, Lecturer, Economic and Business Faculty, Warmadewa University, Bali, Indonesia.

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INTRODUCTION

The existence of small companies amid globalization and high competition can strengthen the fundamentals of the national economy. As a buffer for the economy, small companies make a very strategic and dynamic contribution to a country's economy. Small companies can survive the global crisis (Gherghina et al., 2020). However, in reality, small companies face various serious problems in becoming cogs of the economy (Yoshino & Taghizadeh-Hesary, 2016), such as limited market access, limited access to finance, limited adoption of information technology, lack of innovation, and challenges of low-quality human capital for small companies (Wijaya et al., 2017). Until now, very few small companies are interested in building human capital competitiveness. Even the findings of Fix (2018) doubt the human capital approach, because in most cases, human capital is only a theory that is not supported by evidence that reflects empirical weakness. Though Kiran et al. (2022) show that human capital is a source of business innovation and company performance. So human capital becomes a

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resource that must be exploited and translated to build an advantageous performance sustainability strategy for a company.

The role of human capital as an intangible asset refers to Mutamba (2016) having the strategic capability to create valuable, rare knowledge that is difficult for competitors to imitate. This human capital capability cannot be replaced by other resources, so it becomes an important resource for creating knowledge, innovation, and value added for business growth. Nonaka and Nishiguchi (2002) show that knowledge is created from the process of knowledge sharing through individual interactions that occur within the organization and the environment. Human capital uses a closed analytical system (Marginson, 2019), so it is considered to have no realism and no consistency in measuring human capital (Bassi & Mcmurrer, 2008).

All the problems and challenges faced are seen as a cause of hampering the potential of small companies to grow and develop.

1. LITERATURE REVIEW, AIMS AND HYPOTHESES

The phenomenon of knowledge-based competition is marked by the increased use of information and communication technology. This type of competition requires companies to prepare human capital as resources who have knowledge in managing other company resources to build economic value added. Human capital is one of the company's capitals with all the capabilities that exist in individuals obtained through the accumulated process of developing knowledge, skill, and attitudes. So human capital is a basic instrument of differentiation in a company's competitive advantage. Furthermore, Lenihan et al. (2019) indicate that human capital is the skills, knowledge, abilities, and attributes that are embodied in humans and are very important for the innovation capacity of a company, and always needed to drive innovation performance (Alpkan et al., 2010; Mariz-Perez et al., 2012). This is supported by Vinding (2006), and Santos-Rodrigues et al. (2010) demonstrate the impact of human capital on innovation (Munjal & Kundu, 2017). However, the results are different from Koroglu and Eceral (2015) that human capital is not well organized for innovation, thus having a relatively low impact on innovation performance (Andreeva et al., 2021). Even Santos-Rodrigues et al. (2010) show that there is no human capital that is considered to influence innovation directly (D'Amore & Iorio, 2017). These results confirm that there are human capital barriers in directly influencing innovation so that it requires a mediating role and at the same time serves as evidence for the findings of Wu et al. (2007) which show the difficulty to measure human capital because it is very easy to change.

Innovation is an interrelated strategic activity consisting of managing resources, processes, and outputs that are beneficial to the company. Innovation in companies requires individual knowledge by using work methods or techniques in the innovation process to produce something new. Thus, innovation capability is very important for companies using technology and information creativity to manage future competitive advantages (Lastres, 2017; da Silva & Silva Cirani, 2020) involving process capability and product capability (Yu et al., 2017). Although innovation can lead to a sustainable competitive advantage, innovation cannot be separated from criticism as conveyed by MacLeod (2001) and Marques (2011) that innovation does not accommodate the importance of economic and business environmental issues. Furthermore, Markusen (2003) indicates that innovation is only more focused on profit contribution. Even Moulaert and Sekia (2003) show that attention to innovation is more partial and fragmented, so it does not contribute to overall company productivity. This criticism is a challenge for innovation that has an impact on the management of resource allocation (MacLeod, 2001), which causes the company difficulty in finding human capital involved in innovation (Khadan, 2018).

The important contribution of a company's intangible resources (Barney, 1991; Grant, 1991; Spender, 2009) in the knowledge creation process becomes

a knowledge-based competitive advantage strategy in a sustainable manner. Knowledge creation is organizational capabilities in developing new knowledge that is useful for sustainable company processes. Knowledge creation refers to Teece et al. (1997), it is the process of creating new knowledge by managing the innovation potential of individuals within the organization. Knowledge creation is identified by Nonaka and Takeuchi (1994), namely socialization, externalization, internalization and combination.

Knowledge sharing as individual knowledge becomes organizational knowledge through internalization and socialization processes. Individuals' and organizations knowledge sharing through externalization and combination processes (Chang et al., 2007; Tang et al., 2017). Knowledge sharing plays a role in increasing the ability of innovation to respond quickly to dynamic business competition. The contribution of knowledge sharing to business organizations is shown in the application of knowledge, innovation, and competitive advantage (Z. Wang & N. Wang, 2012). Knowledge sharing is becoming a company's method of gaining knowledge to create superior performance, because sharing company knowledge can increase innovation.

A company's ability to manage human capital can create innovations as a driver of sustainable competitive advantage. However, organizations often do not pay more attention to human capital (Lenihan et al., 2019). This is because organizational activities are only seen from a business perspective and are often not assessed as unique human capital knowledge as a source of innovation that can differentiate from competitors (Mathis & Jackson, 2011). It cannot be denied, the important role of human capital in innovation (Lenihan et al., 2019), is due to human capital having the capability of knowledge creation as stated by Von Krogh and Wallin (2011), Huang and Wu (2010) and Kaldeen & Nawaz (2020) and knowledge sharing (Ngah & Ibrahim, 2010; Stoyanov, 2014; Kaldeen & Nawaz, 2020). So, with these capabilities, human capital refers to Lenihan et al. (2019) is critical to a company's innovation by creating and sharing knowledge. Furthermore, the knowledge creation process aims to develop innovation capabilities for a sustainable competitive advantage (Yu et al., 2017). Likewise, both explicit and tacit knowledge-sharing practices can enhance firm innovation (Z. Wang & N. Wang, 2012). Human capital shows invest in knowledge (Von Krogh & Wallin, 2011), especially the increase in human capital capabilities contributes to knowledge creation (Asongu & Tchamyou, 2018) and organizational knowledge sharing (Ngah & Ibrahim, 2010) and strives to facilitate firm innovation (Z. Wang & N. Wang, 2012).

The purpose of this study is to investigate the link between human capital, knowledge creation, and human capital on innovation of the small companies in Bali. The hypotheses were formulated as follows:

H1: Human capital has an impact on knowledge creation.

H2: Human capital has an effect on innovation.

H3: Human capital influences knowledge sharing.

H4: Knowledge creation has an effect on innovation.

H5: Knowledge sharing has an impact on innovation.

H6: Knowledge creation mediates the impact of human capital on innovation.

H7: Knowledge sharing mediates the effect of human capital on innovation.

2. METHODS

This study was applied in 42,902 small-scale companies in Bali Province, Indonesia (Bali Provincial Government, 2022). A sample of 396 is determined using the Slovin formula, assuming a 5% sampling error. Assuming a response rate of 70%, 277 of the questionnaires sent to respondents and 187 completely collected gives a usable response rate of 67.46%. The respondents of this research are managers who represent small companies. This study used an online questionnaire due to the COVID-19 pandemic situation with the Google Forms application. The questionnaire link was sent by e-mail with a cover letter indicating the purpose of the research and a guarantee to

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keep the data confidential. After sending out the questionnaires, two weeks later responses to the questionnaires from respondents began to be received. SEM PLS refers to Hair et al. (2017), was used in the analysis of this study, with WarpsPLS 7.0 (Kock, 2021).

Measurement of items in this study was conducted using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Human capital items were adapted from Lepak and Snell (2002). Sample items include:

(a) individuals in a company have skills that are instrumental for creating innovations; and

(b) individuals in a company have skills that would be very difficult to replace.

Knowledge creation items were adapted from Yu et al. (2017). Sample items include:

(a) my firm usually captures and transfers experts' knowledge; and

(b) my firm usually adopts learning by doing.

Items for knowledge sharing were adapted from Z. Wang and N. Wang (2012). Sample items include:

(a) individuals in my company are frequently encouraged by knowledge sharing mechanisms; and

(b) individuals in my company frequently share and collect knowledge based on their expertise.

Items for innovation were adapted from Yu et al. (2017). Sample items include:

(a) my company has valuable knowledge for innovating manufacturing and technological processes; and

(b) my company can develop environmentally friendly products.

The mean value (see Table 1) close to 4.00 indicates that the respondent agrees with the item in question, for human capital (4.24), knowledge creation (4.15), knowledge sharing (4.09), and innovation (4.15).

3. RESULTS

The value suggested by Hair et al. (2017) to fulfill the significance and goodness of fit of this research model (see Table 2) shows the APC value of 0.520, ARS of 0.727, AARS of 0.725 with p value < 0.001 and AVIF value accepted of 3,563.

Table 2. Results of goodness of fit research model

Evaluation	Value	Criterion
APC	0.520*	Significant if < 0.05
ARS	0.727*	Significant if < 0.05
AARS	0.725*	Significant if p < 0.001
AVIF	3.563	Acceptable if <= 5

Note: * All significant at p < 0.001.

The validity criteria in this study refer to Fornell and Larcker (1981), namely, convergent validity with an AVE value greater than 0.5 for all variables, namely: human capital of 0.519, knowledge creation of 0.565, knowledge sharing of 0.538 and innovation of 0.562. Discriminant validity can be seen from the √AVE value of all research variables which is greater than the correlation coefficient value of latent variables in all research variables. In this study, all validity criteria have been met (see Table 3), i.e., human capital of 0.721, knowledge creation of 0.804, knowledge sharing of 0.862, and innovation of 0.880. For predictive validity, all research variables are measured from the q-square value of the endogenous variables of the research model, greater than 0 (zero), meets predictive validity, namely: the knowledge creation of 0.605, knowledge sharing of 0.719, and innovation of 0.831.

Table 1. Descriptive statistics of variables studied

Variable	Theoretical Score		Actual Score		Mean	SD
	Min	Max	Min	Max		
Human capital	1	5	3.13	5.00	4.24	0.53
Knowledge creation	1	5	3.13	4.88	4.15	0.44
Knowledge sharing	1	5	3.13	4.75	4.09	0.50
Innovation	1	5	3.00	4.88	4.15	0.50

Table 3. Validity and reliability testing results

Variables		Factor Loading	AVE > 0.5	Q-square > 0	Sq.r AVE	Composite reliability > 0.7	Cronbach's alpha > 0.7	Full Collinearity VIP < 3.3
Human Capital	Hc1	0.826	0.519	–	0.721	0.896	0.867	3.099
	Hc2	0.730						
	Hc3	0.747						
	Hc4	0. 808						
	Hc5	0. 778						
	Hc6	0.753						
	Hc7	0.835						
	Hc8	0.774						
Knowledge Creation	Kc1	0.799	0.565	0.605	0.804	0.814	0.737	2.317
	Kc2	0.781						
	Kc3	0.784						
	Kc4	0.797						
	Kc5	0.843						
	Kc6	0.801						
	Kc7	0.831						
	Kc8	0.778						
Knowledge Sharing	Ks1	0.800	0.538	0.719	0.862	0.860	0.813	2.815
	Ks2	0.748						
	Ks3	0.729						
	Ks4	0.740						
	Ks5	0.887						
	Ks6	0.881						
	Ks7	0.767						
	Ks8	0.706						
Innovation	Inn1	0.737	0.562	0.831	0.880	0.871	0.830	2.694
	Inn2	0.897						
	Inn3	0.707						
	Inn4	0.751						
	Inn5	0.757						
	Inn6	0.709						
	Inn7	0.876						
	Inn8	0.770						

Note: * All significant at $p < 0.001$.

Composite reliability and Cronbach's alpha greater than 0.7 according to Fornell and Larcker (1981) are used to measure reliability in this study. The composite reliability value (human capital of 0.896, knowledge creation of 0.814, knowledge sharing of 0.860, and innovation of 0.871) and Cronbach's alpha value (human capital of 0.867, knowledge creation of 0.737, knowledge sharing of 0.813, and innovation of 0.830). Multicollinearity between indicators is measured by full collinearity VIP < 3.3. This study (see Table 3) meets these criteria (Hair et al., 2017), i.e., human capital of 3,099, knowledge creation of 2,317, knowledge sharing of 2,815, and innovation of 2,694. Convergent validity is demonstrated by a combination of loadings and cross-loadings that have a value above 0.70 and a significant p-value (< 0.05), fulfilled in this study (see Table 3) (Hair et al., 2017). The outer loading value in this study, i.e., for human capital, knowledge creation, knowledge sharing, and innovation were above 0.70 and were significant ($p < 0.001$).

Table 4. Effect size

Effect Size	Knowledge creation	Knowledge sharing	Innovation
Human capital	0.615	0.727	0.181
Knowledge creation	–	–	0.374
Knowledge sharing	–	–	0.284
Innovation	–	–	

The effect size refers to Hair et al. (2017) for a structural research model, with a criterion value of 0.02 (weak), 0.15 (medium), and 0.35 (large).

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Effect size (see Table 4), the value of human capital on knowledge creation and knowledge sharing, is in the large category, and knowledge creation and knowledge sharing on innovation are in the large category. This study shows an important role of human capital, knowledge creation and knowledge sharing from a practical perspective in increasing innovation.

Table 5. Path coefficient

Variable	Knowledge creation	Knowledge sharing	Innovation
Human capital	0.784	0.853	0.212
Knowledge creation	–	–	0.428
Knowledge sharing	–	–	0.323

Note: * All significant at p < 0.001.

Figure 1 and Table 5 prove: *H1* that human capital influences knowledge creation significantly (β = 0.784; p < 0.001), *H2* that human capital has a significant positive influence on innovation (β = 0.212; p < 0.001); *H3* that human capital has a significant positive effect on knowledge sharing (β = 0.853; p < 0.001). This study also proves *H4* that knowledge creation has a significant effect on innovation (β = 0.428; p < 0.001) and *H5* that knowledge sharing has a significant positive effect on innovation (β = 0.323; p < 0.001).

Mediation testing uses Variance Accounted For (VAF) (Hair et al., 2017). The value of VAF 1 for *H7* is 0.283, it was between 20-80% and categorized as a partial mediator. And knowledge creation can mediate the influence of human capital on innovation partially. Meanwhile, the value of VAF 2 for *H8* is 0.244, that knowledge sharing mediates the effect of human capital on innovation partially. The mediating variable (see Table 6) refers to Preacher and Hayes (2004) based on the path coefficient of the predictor of the dependent variable with the mediating variable (VAF 1 of 0.415 and 0.852), the value decreases but remains significant compared to the path coefficient of the predictor on the dependent variable without a mediating variable (VAF 2 of 0.311 and 0.852). So, knowledge creation and knowledge sharing can mediate the influence of human capital on innovation partially.

Table 6. Mediation analysis

No. VAF	Variable relationship	P → D without M	P → M	M → D	P → D with M	VAF value	Result
1	Human capital → Knowledge creation → Innovation	0.852*	0.784*	0.538*	0.415*	0.283	Partial mediation
2	Human capital → Knowledge sharing → Innovation	0.852*	0.853*	0.598*	0.311*	0.244	Partial mediation

Note: P: predictor, D: dependent, M: mediator variable; * means *p* < 0.001.

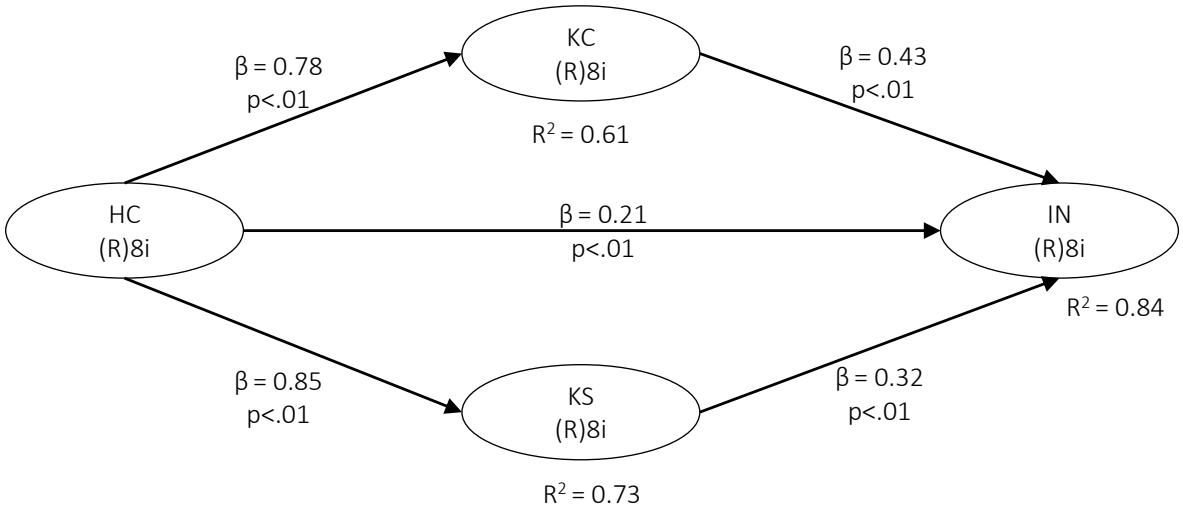

Figure 1. PLS results

4. DISCUSSION

This study supports Huang and Wu (2010) and Von Krogh and Wallin (2011) who indicate that human capital participation can improve the process of knowledge creation. The practice of knowledge creation in small companies in Bali is determined by the human capital competitiveness with human capital value and uniqueness. Knowledge creation activity is indicated by the interaction of knowledge possessed by human capital, which will be very irreplaceable and unique so that it becomes an instrument for creating company innovation. Human capital is a strategy for the integration of knowledge creation mechanisms and intangible asset values needed by companies. This is in line with Von Krogh and Wallin (2011) that the leverage of human capital to the knowledge creation process is very significant in creating a competitive advantage in the knowledge-based competition era (Kaldeen & Nawaz, 2020b). The involvement of human capital in knowledge creation, according to Mitra et al. (2011), is interrelated with building knowledge-based company intangible assets (Marr et al., 2004). This study is the same as Shih et al. (2010) that human capital is a collective ability in knowledge creation to produce sustainable company competitiveness (Yu et al., 2017).

The positive influence of human capital on innovation significantly supports Gloet and Terziovski (2004) that a simultaneous approach to human capital management can improve innovation performance. The potential value of human capital for small companies in Bali in this study is used to create superior innovation capability. Human capital management practices contribute to the growth of innovation capability in the form of process and product innovation capability. The need for innovation capability is a result of the increasing dynamics of a company's competitive environment. Thus, the successful management of a company's human capital determines the company's competitive capability. Further, Gloet and Terziovski (2004) show that human capital is a critical success for innovation and business strategy (Stewart, 1997). The creation of a conducive environment for innovation, according to Von Krogh and Wallin (2011), is largely determined by the knowledge possessed by a company's human capital. The involvement of human capital is a determinant of several features of knowledge management in organizational innovations (Stoyanov, 2014).

This study notes similar findings to Hsu (2008), namely human capital influences knowledge sharing. These findings show that the human capital competence of small companies in Bali is a determinant of knowledge sharing activities in a systematic manner. The success of a company's human capital management strategy has become a mechanism for creating equal opportunities for company members to access, study, and share explicit and tacit knowledge. So that knowledge sharing shows the interaction conditions of company human capital such as human capital value and uniqueness by contributing knowledge effectively to increase innovation capability. Human capital plays an important role in the process of knowledge sharing in a company's innovation (Stoyanov, 2014). This study supports Lepak and Snell (2002), and Z. Wang and N. Wang (2012), which shows that human capital significantly influences explicit and tacit knowledge sharing (Kaldeen & Nawaz, 2020).

The finding that knowledge creation influences innovation in this study supports Popadiuk and Choo (2006) and Yu et al. (2017). This study confirmed that the mechanism of knowledge creation in small companies in Bali which consists of socialization, externalization, combination, and internalization can create innovation capability. Knowledge creation activities can create valuable company knowledge for innovating manufacturing and technology on the best work systems for a company. The process of knowledge creation within a company is a dynamic interaction between individuals and the environment by involving the company's perspective on innovation and changes in social values to achieve sustainable competitive advantage. This is similar with Grimsdottir and Edvardsson (2018) that a company's continuous innovation is created through a process of knowledge creation (Shih et al., 2010; Iyer et al., 2017). Furthermore, Riordan (2013) indicates that the knowledge creation process is very important and related to the innovation-creating process in accordance with the development of knowledge (Hautamäki, 2014).

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Hypothesis 5, which states that knowledge sharing can influence innovation, is the finding of this study. Explicit and tacit knowledge sharing according to Z. Wang and N. Wang (2012) in this study have contributed to process innovation capability and product innovation capability (Yu et al., 2017). These findings indicate that the activity of creating explicit and tacit knowledge in small companies in Bali is an interconnection between the process of generating knowledge and applying knowledge to increase innovation. Sharing knowledge is very important for a company as a culture of social interaction between individual's knowledge, experience, and skills to improve innovation performance. This study supports Yeşil et al. (2013), which shows that knowledge sharing plays an important role in improving innovation (Nham et al., 2020). Furthermore, Gubbins and Dooley (2014) show that the successful management of knowledge sharing is a key driver and key resource of the success of innovation. Similar findings were shown by Cheung et al. (2016) that company innovation is created from the involvement of the process of knowledge sharing (Lo & Tian, 2020).

This study found that the influence of human capital on innovation is mediated by knowledge creation. This result is similar to Koroglu and Eceral (2015), which suggests that human capital directly influences innovation with low impact relatively. However, knowledge creation in small companies in Bali mediates the impact of human capital on innovation. These results support Santos-Rodrigues et al. (2010) and D'Amore and Iorio (2017), which shows that none of the human capital is considered directly influence innovativeness. Thus, the practice of knowledge creation in small companies in Bali can increase the influence of human capital in creating value and uniqueness toward the development of processes and products innovative. This also shows the ability of knowledge creation to intervene, such as the knowledge creation mediation conducted by Taneo et al. (2019) on the influence between the speed of innovation and competitiveness.

Hypothesis 7 states that knowledge sharing mediates the influence of human capital on innovation. The findings also prove the ability of knowledge sharing as a mediating role as research conducted by Kaewchur et al. (2009), Camelo-Ordaz et al. (2011), Qammach (2016), and Ha (2021). This study also simultaneously provides answers to criticisms and constraints of human capital's low impact on innovation directly from Koroglu and Eceral (2015) and Andreeva et al. (2021). The practice of explicit and tacit knowledge sharing in small companies in Bali can strengthen the value and uniqueness of human capital in creating process and product innovation capabilities. The ability to mediate from knowledge sharing shows the need for an interactive process between human capital and the environment in small companies in Bali to produce individual innovation capabilities to support the sustainability of future competitive advantage strategies.

CONCLUSION

The objective of the study is to examine the influence of human capital, knowledge creation and knowledge sharing on innovation. This study finds that human capital has a positive and significant effect on knowledge creation, knowledge sharing, and innovation. Then, knowledge creation and knowledge sharing were found to influence innovation significantly. Furthermore, knowledge creation and knowledge sharing were found to be partial mediators that had an indirect positive effect on the human capital and innovation relationship. These findings mean that updating in human capital competencies will increase knowledge creation process activities, maintain individual interaction in knowledge sharing, and foster innovation in small companies. This provides an understanding that the knowledge creation process integrates systematically with knowledge sharing activities that are always carried out in daily practices to create sustainable business innovations. Knowledge creation and knowledge sharing contributed to overcoming a company's weaknesses and challenges in finding quality human capital. It must be done to have more discussions about the strategic importance of human capital as a key differentiator for companies in today's knowledge-based economy. The ability of knowledge creation and

knowledge sharing is a unique characteristic of human capital, which distinguishes it from other organizational resources. Investing in human capital becomes a company's culture that grows the basis of the learning process to create and share knowledge in fostering innovation. Therefore, these findings open up opportunities for further research to examine other factors that can extend the existing literature by involving various aspects of employing the integrated model of individual foundations in aligning innovation in small companies.

AUTHOR CONTRIBUTIONS

Conceptualization: Ida Ketut Kusumawijaya, Partiwi Dwi Astuti.
Data curation: Partiwi Dwi Astuti.
Formal analysis: Ida Ketut Kusumawijaya, Partiwi Dwi Astuti.
Funding acquisition: Ida Ketut Kusumawijaya, Partiwi Dwi Astuti.
Investigation: Ida Ketut Kusumawijaya.
Methodology: Ida Ketut Kusumawijaya, Partiwi Dwi Astuti.
Project administration: Ida Ketut Kusumawijaya, Partiwi Dwi Astuti.
Resources: Ida Ketut Kusumawijaya.
Software: Ida Ketut Kusumawijaya
Supervision: Partiwi Dwi Astuti.
Validation: Ida Ketut Kusumawijaya, Partiwi Dwi Astuti.
Visualization: Ida Ketut Kusumawijaya.
Writing – original draft: Ida Ketut Kusumawijaya.
Writing – review & editing: Partiwi Dwi Astuti.

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