sustainability

MDPI

Article

How do Knowledge Management Practices Affect Sustainable Balanced Performance? Mediating Role of Innovation Practices

Changiz Valmohammadi [1,2,*], Javad Sofiyabadi [3] and Bahare Kolahi [4]

1 CENTRUM Católica Graduate Business School (CCGBS), Lima 15023, Peru
2 Pontificia Universidad Católica del Perú (PUCP), Lima 15023, Peru
3 Firoozkooh Branch, Islamic Azad University, Firoozkooh 3981838381, Iran; j.sofiyabadi@gmail.com
4 Department of Business Administration, Faculty of Economic and Management, Semnan University, Semnan 3513119111, Iran; b.kolahi@semnan.ac.ir
* Correspondence: valmohammadi@pucp.edu.pe

Received: 5 June 2019; Accepted: 23 July 2019; Published: 19 September 2019

Abstract: The main purpose of this study is to investigate the mediating role of innovation practices (IP) amidst relations of knowledge management practices (KMP) and sustainable balanced performance (SBP). Furthermore, this research illustrates a comprehensive empirical study in the Iranian knowledge-based industrial companies that are the manufacturers of advanced machineries and equipment. First- and second-order exploratory factor analysis (EFA) was done to confirm constructs validity. Then, relations among variables were studied by applying the partial least squares (PLS) technique to collected data from 104 industrial knowledge-based companies. The results obtained from the analysis supported all the research hypotheses. KPM significantly and strongly affects IP and SBP. Also, IP mediates the relations between KPM and SBP in industrial knowledge-based firms.

Keywords: knowledge management practices; innovation practices; sustainable organizational performance; sustainable balanced scorecard; Iran

1. Introduction

Due to the importance of knowledge-based companies in the Iranian industry [1], it is necessary to pay particular attention to the performance management of these companies because the emergence and sensitivity of knowledge-based companies performance management affects their survival, growth, and maturity. Performance is a multi-dimensional concept and can be affected by many components, but with a balanced and sustainable approach, it is possible to see how a comprehensive approach could improve performance. In fact, the main topic of the present research is to address the issue of empirical study about sustainable balanced performance (SBP) in the context of Iranian knowledge-based companies. These companies, in order to attain their set corporate vision, should attempt to increase the existing synergy in all the aspects of business. To achieve this important goal, top managers of knowledge-based companies select, implement, and develop activities related to business and make attempts to cope with the inconsistencies. Ref. [2] states, that implementation of sustainability issue related to strategic system (such as performance management) requires knowledge and the application of management tools. Knowledge, activities focusing on knowledge, and knowledge management systems have continuously been able to act as a suitable drive for the growth and development of organizational performance [3–6]. Knowledge-based and technology-driven companies, as a knowledge system, are always counted as a main resource for social growth and wealth creation [7] that, because of their roles in social, economic, and international competitiveness, paying attention to their activities was crucial [8]. Researcher believes that innovation activities are considered as an

important and key source in accessing competitive sustainable advantages, flexibility, and overcoming inconsistencies [9]. According to study by [10], and by searching in scientific engines like Web of science and Scopus, we found that most research and studies in the domain of SBP are based on a mathematical approach [11,12]. In addition, other researchers have paid attention to performance issues according to traditional approaches [13–15]. Although these studies [11,12] have addressed SBP issues, to the best knowledge of the authors, the concept of SBP has not been addressed in an empirical study. Therefore, in order to bridge the extant gap in the literature, this study was done.

The main objective of this research is to study the impact of knowledge management practices (KMP) on SBP by emphasizing the mediating role of IP among industrial knowledge-based companies manufacturing advanced equipment and machinery. The main question for activists and business owners in a knowledge-based economy is how organizations can create value and a new business model as well as how to present appropriate performance of their products and services by exploring and exploiting different layers of knowledge in order to obtain strategic results, growth, and survival of a business along with a sustainable balanced performance by focusing on potentials and capacities of knowledge according to environment changes and activities of competitors. However, paying attention to different aspects of performance has always had an impact on activities of managers and organizations. It must be noted that organizations can develop organizational capacities by considering activities related to business development such as knowledge activities or increase the organization strength in face of changes and inconsistencies by enhancing acquisition capacities [16] such that the business environment improves by focusing on innovation activities.

With the increase in global competitiveness in main industries, governments have attempted to emphasize the growth and development of industrial activities based on knowledge by presenting support policies. One of these most used industries is the machinery industry (the industry of producing advanced equipment and machinery), such that its status had an impact on industrial and productive development of the country. The survey of the situation of the Iranian machinery industry showed that this industry, despite high human capacity and industrial opportunities and a desirable market at the national and international level, has not been able to achieve a superior performance against its competitors.

In this research, we have tried to answer the two identified scientific and applied gaps. First, as previously mentioned, there is a negligence of empirical research on SBP. Also, the relationship between KMP and SBP and the mediating role of IP have not been considered. Second, due to the role of knowledge-based companies in the national economy of Iran, efforts have been made to improve the performance gap among the surveyed companies through presenting and validating a conceptual model that might serve a set of guidelines and a comprehensive view for executive managers and policymakers in this industry in order to be able to play an effective role in the improvement and growth of knowledge-based industries. Managers and policymakers, by paying attention to the presented conceptual model and development of this model at the macro level, can help increase the capabilities of the industry. Pursuing current research objectives may be relevant from both a scientific and a managerial standpoint because knowledge-based companies, in addition to executive activities, need to keep their operating structures up-to-date by the scientific approach. Since the resources of countries for entering in all the aspects of technology is not sufficient, it is important to inspire economic growth and business dynamism by concentrating on the most important industrial activities with the maximum competitive advantage. In this regard, the current research has attempted to fill the performance gap within the studied firms by examining a scientific hypothesis. This research provides the concepts, functions, and guidelines in the field of organization and management for active entrepreneurs in the knowledge-based economy to enable their firms to achieve higher success in value and wealth creation through the application of the presented concepts. The main issue of the present research can possibly be studied under the following question:

> How do KMP and IP impact SBP of industrial knowledge-based companies, manufacturing advanced equipment and machineries?

Although research on the subject of knowledge management, innovation, and performance has been vastly investigated by other researchers, as discussed, the novelty of the current study is to develop an empirical study about SBP in Iranian knowledge-based industrial companies, which are the manufacturer of advanced machinery and equipment. In the following paper, after explaining theoretical foundations, the research background will be studied, and the conceptual model and research hypotheses obtained from theoretical foundations and background will be presented. Then, the research methodology is studied, and finally, the results are scrutinized through an analysis of the findings.

2. Theoretical Foundations and Research Background

In this research, the influence of three main variables in organization is studied (knowledge management, innovation, and sustainable balanced performance). Therefore, it is advisable to consider a conceptual and inter-functional chain for these concepts. To achieve desirable performance, organizations must enhance infrastructures and soft and hard currents to become able to shape regular mechanisms by adapting infrastructures and working systems such that they get remarkable results through exploitation of this field and business dynamicity. By adapting current dynamisms in knowledge management and innovation practices, organizations can expect proper results and improved performance. KMP has a holistic effect on business dimensions. In this regard, Garcia-Morales et. al. [17] and Tang et. al. [18] refer to the role of activities and capabilities of knowledge and innovation for the benefit of businesses. Other benefits of knowledge management activities for the organization include the following:

- KMP reinforces purchasing activities [19];
- KMP reinforces logistics activities [20];
- KMP is appropriate enabler for firm performance [21];
- KMP shows its effects on performance evaluation and creation of a proper value chain [22].

Ahmad et al. [23] add that knowledge management is a topic around the increase in strength of an organization to benefit from correct methods of information management and organizational acquisition, which can influence operative performance, business, and organization. Focusing on innovation activities, we can expect the business to grow and flourish [24] such that the business becomes hopeful of its survival by improving performance [25]. Shujahat [26] believes that knowledge-based employees can boost the relationship and the impact between knowledge management and innovation. In the following, each studied variable is presented with a review of the literature.

2.1. Knowledge Management Practices

Knowledge management practices result in the supply of competencies and required capacities to empower the organization (value creation) through knowledge discovery and novel methods [27]. Knowledge management functions develop innovation capacities [28] and functional outcomes [29,30]. Applying knowledge management practices like creating and sharing knowledge leads organizations to growth, innovation, the creation of new business models, and the creation of proper position in their own industry. It can be stated that, with creation and expansion of knowledge networks, not only organizations benefit, but it can be beneficial for the society, environment, and economy [31]. By developing knowledge activities, an organization designs a proper strategy to interact with the environment [32], which create a sustainable competitive advantage by leading these activities [33]. The vastness of knowledge management practices is of high importance, to the extent that it fertilizes general and technical capacities in the organization along with the impact on innovation practices within the organization [34]. Knowledge management increases the formality of accessing experience, knowledge, expertise, and new abilities and increases the value transferred to customers by encouraging innovation procedures. The results obtained from this procedure, improves knowledge and experience in organization along with improvement of innovation [35]. By collecting experiences of presented

values to customers, innovation capacities remain in the long run [36]. Knowledge management practices in this research are considered through four aspects (knowledge creation, knowledge acquisition, knowledge storage, and knowledge sharing) based on the studies of Valmohammadi and Ahmadi [37].

2.2. Innovation Practices

Innovation is a vital element for the success of organizations to create a series of profitable long-term activities [38]. Innovation and soft activities in an organization are inseparable. The dependence of these two dues on social changes and economic challenges makes innovation systems more complex [39]. As a consequence, it is best that organizations cooperate with academics to overcome this complexity and lead to new and innovative products, services, and work procedures. Innovation consists of exploring, discovering, sharing, and benefiting from knowledge to achieve a new product, knowledge, or process that can alter the skills, standards, technologies, services, and products of the organization [40]. In fact, innovation in a product refers to the invention and creation of new products and services and making them commercialized, but innovation in processes refers to the application of novel technologies and the creation of fundamental changes in a product manufacturing or a service [41]. Un and Asakawa [42] believe that cooperation of organizations and knowledge centers can positively affect innovation within the process of products and services. Innovation changes science and technology, leads to growth and economic development, and provides proper solutions for removing social issues and economic crises by introducing products and services based on benefits of society, environment, and economy, such that it creates new values by creation of new chances [43]. Many aspects of innovation process must be considered to make research and development policies during the changes. Innovation is a challenge for alternative manufacturing but is responsible for its implementation and study of the results. In other words, innovation is responsible for research development, statement, and stability [44]. It must be noted that cooperation between knowledge-based organizations and universities can help in meeting the expectations of innovation [45]. Also, cooperation between industry and university can be as a driving force for growth and development of innovation in all its aspects [46]. Researchers emphasize that the components applied for studying innovation variable in conceptual model of research is based on studies conducted by Valmohammadi [47].

2.3. Sustainable Balanced Performance

In order to create a comprehensive mechanism for success against economic dangers and confronting environmental, economic, and social problems, organizations need comprehensive approaches to overcome threats, obtain success, and react properly to responsibilities in society and the environment [10]. The origin of these approaches and tools considering sustainable balanced performance and sustainable-oriented management can be traced in the concepts presented by Kaplan and Norton [48,49]. Sustainable balanced performance can be sought in the goals of integration and organizational strategies with social, ethnical, and environmental goals [50]. This integration of goals can be created by considering current performative measures, designing a new performative measure, and linking among measures. Studying the impacts of knowledge management and innovation practices in the studied companies was going to discover the effects of these variables on corporate sustainability management. Studying these effects on sustainable balanced performance and corporate sustainability management was conducted through a sustainable balanced scorecard. Paying attention to corporate sustainable management and sustainable balanced performance lets the organization consider all three dimensions of the sustainability issue and avoid parallel systems by perceiving economic, environmental, and social matters. It should mention that the operational definition of variables regarding SBP and the society ad environment perspective were adopted based on [10,50–52] and [50,53], respectively.

3. Research Design

3.1. Conceptual Model of Research and Hypotheses

According to the literature, it can be expected that sustainable balanced performance (as a dependent variable) of industrial knowledge-based companies, manufacturing advanced machineries, and equipment can be boosted through the development of knowledge management practices (as an independent variable). In addition, innovation in these companies can be influenced by the development and focus on knowledge management practices toward positive changes in sustainable balanced performance, especially by integrating innovation and knowledge management practices. Based on the presented discussions in previous sections, the conceptual model is presented in Figure 1. Therefore, and based on the presented conceptual model, this study puts forth the following three hypotheses:

Hypothesis 1 (H1). *Knowledge management practices affect positively and significantly sustainable balanced performance.*

Hypothesis 2 (H2). *Knowledge management practices affect positively and significantly innovation practices.*

Hypothesis 3 (H3). *Innovation practices affect positively and significantly sustainable balanced performance.*

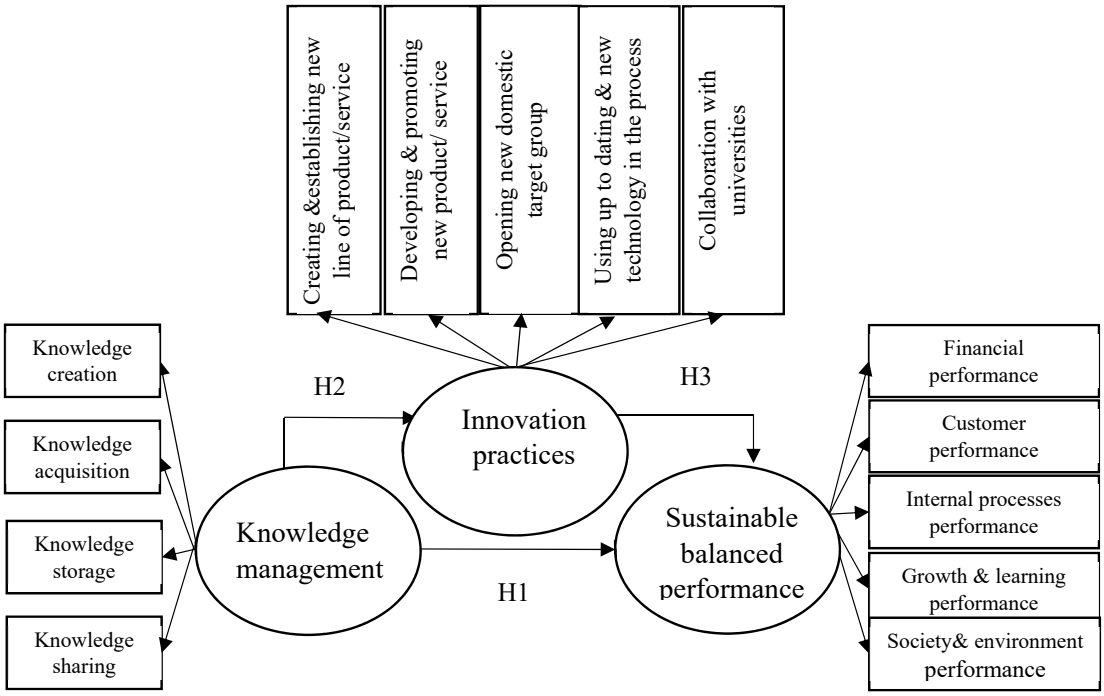

Figure 1. Research conceptual model.

3.2. Research Methodology

Given the main objective of the study, the current research is empirical and applied. As was mentioned earlier, the present research tries to study the relationships among the following three latent variables: knowledge management practices, innovation practices, and sustainable balanced performance. It is noteworthy that the latent variables were studied by measuring observed variables, as pointed out in Figure 1. In order to examine the accuracy of research constructs and implement structural model and measurement model, a questionnaire according to the Likert scale was designed, and respondents were asked to answer the questions ranging from 1 to 5 (extremely disagree and to extremely agree). In order to ascertain the accuracy and precision of the questionnaires, 25% of the

comments of the population was studied, and then questionnaires were distributed to collect data from a sample population. It should be mentioned that the designed questionnaire was distributed among senior managers of the surveyed companies. To have a higher rate of response among the sample population, a reminder was sent after 10 days asking the respondents to answer the questionnaire within five days. After confirmation of the accuracy and precision of the questionnaire, other steps of research were followed. It is noteworthy that the population of current research is knowledge-based companies active in the industry of manufacturing advanced machinery and equipment of Iran. According to reports from websites as subsets of the Information Technology Deputy of presidency of Iran, the number of companies active in this industry is 154. Based on Conchran sampling formula [54], the sample size of the present research was estimated as follows:

$$n = \frac{N \times Z^2_{\frac{\alpha}{2}} \times \sigma^2}{\varepsilon^2 \times (N-1) + Z^2_{\frac{\alpha}{2}} \times \sigma^2}$$

N = Population size, σ = "Standard deviation", α = significant level, and ε = accuracy.

$$n = \frac{154 \times (1.96)^2 \times 0.5 \times 0.5}{(0.05)^2 \times 153 + (1.96)^2 \times 0.5 \times 0.5} = 110$$

Content validity of questionnaires was confirmed by referring to supporter comments and reviewed literature as well as the consensus of experts. The reliability of the information collection tool was studied through exploratory factor analysis and factor loading determination. Regarding the return rate of questionnaires, it must be noted that, with respect to the questionnaires, 15 of them were not used, or they were partially filled out, because of which senior managers were asked to fill them out, again according to the guidance made in introductory sessions. After two months, all questionnaires were entirely readable and accurate and used for analyses. A statistics method was set and applied at two stages. The first stage is the exploratory factor analysis to confirm variables and questionnaires used within the research. In this stage, it was run in SPSS V.25 by extraction factor loading related to each variable. The second stage, after reiteration and update of the research model based on outputs of exploratory factor analysis, partial least square technique was run in Smart PLS V.3 and measurement model of the research and fit indices were studied. To minimize self-report bias in the data gathering, due to Chong et al. [55], researchers assured all respondents that their personal information would not be revealed. In order to minimize the possibility of common method variance, researchers first used multiple-item scales to measure the constructs and scattered questions pertaining to the independent and dependent variables throughout the questionnaire [24]. As Baruch and Holtom [56] recommend, a non-response bias test (wave analysis) was done. Student's *t*-tests showed no statistically significant differences between early wave and late-wave groups, so we can conclude that non-response bias was not a problem [57]. Also, for controlling common method bias (CMB) in partial least squares method, as Kock and Lynn [58] proposed, the collinearity test is a comprehensive procedure for the simultaneous assessment of both vertical and lateral collinearity [59]. Collinearity has been defined as a predictor-predictor phenomenon in multiple regression models. By applying collinearity through analyzing variance inflation factors (VIFs) in the model, the researcher controls the CBM. The occurrence of a VIF greater than 3.3 is proposed as an indication of pathological collinearity and also as an indication that a model might be contaminated by common method bias [60]. In the current research, all VIFs are lower than 3.3. Thus, based on the obtained result, it is concluded that common method bias is not a concern. It is noteworthy that information related to respondents, like gender, education, work experience, and age, are presented in Table 1.

Table 1. Demographics of the respondents.

Demographics Variables	Level	Frequency (%)
Gender	Male	81%
	Female	19%
Educational background	Under graduate	11.1%
	Graduate	46.6%
	PhD	42.3%
Work Experience	Under 5 years	52%
	5–10	40.3
	Upper 10 years	7.7
Age	Under 25 years	15%
	25–35	50%
	35–40	20%
	Upper 40 years	15%

3.3. Exploratory Factor Analysis (EFA)

Since the questionnaires are researcher-made, observed and latent infrastructures must be confirmed, and then other steps must be followed. In this regard, first- and second-order exploratory factor analysis are analyzed for the research variables. In this analysis, Varimax matrix was used to determine ultimate categorization and elements of each index in an element. Tables 2–4 show results of the first order exploratory factor analysis. The analyses made in this section were done by SPSS V.25. As it is seen in Table 2, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) test was used to study the partial correlation of variables. In this scrutiny, we determined whether variance of the research variables is influenced by some main latent variables or not. This index is in range of 0 to 1. If this index is near to 1, the intended data are proper for factor analysis [61]. The result of KMO test with its value at 0.803 show that the related data are gradable to some infrastructure and fundamental factors.

Table 2. KMO and Bartlett's Test.

KMO		**0.803**
Bartlett's Test of Sphericity	Approx. Chi-Square	1267.174
	Df	91
	Sig.	0.000

Bartlett's test also shows that the structure of factor model is appropriate because the hypothesis of knowing correlation matrix is rejected. The test result, 1267.174, shows that correlation matrix between items is not a similar matrix, i.e., there is a high correlation among items of each factor, and there is no correlation among triple items of the research.

Table 3. Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.622	47.300	47.300	6.622	47.300	47.300	3.638	25.985	25.985
2	2.389	17.067	64.368	2.389	17.067	64.368	3.604	25.744	51.729
3	1.286	9.183	73.551	1.286	9.183	73.551	3.055	21.822	73.551

Table 4. External loading.

	Innovation Practices	Knowledge Management Practices	Sustainable Balanced Scorecard
Society & environment performance			0.917
Growth & learning performance			0.862
Internal processes performance			0.884
Financial performance			0.884
Customer performance			0.895
Knowledge acquisition		0.897	
knowledge creation		0.924	
knowledge sharing		0.929	
knowledge storage		0.905	
developing environment-friendly products	0.822		
Collaboration with universities	0.902		
Creating & establishing new line of product/service	0.832		
opening of new domestic target groups	0.817		
promoting new products/services	0.869		

According to the obtained results, discovering a new structure from data is possible. The rotation sums of squared loadings for all factors are more than 0.5 [62]. Hence, all factors remain in exploratory factor analysis (confirming meaningfulness of items). In explained variances by items, 73.551 concepts of this research are covered. By forming Varimax matrix, it could be stated that 60 questions used in the research questionnaires are categorized in 14 observed variables. Results of the first order exploratory factor analysis are presented in Table A1 (see Appendix A). According to the obtained results, it can be said that 14 observed variables are categorized by three factors (latent variable). Four observed variables (knowledge creation, knowledge acquisition, knowledge storage, and knowledge sharing) determine the KMP as an independent variable. Five variables (financial performance, customer performance, internal processes performance, learning and growth performance, and society and environment performance) determine SBP as a dependent variable of the research. Five variables (creating and establishing new line of product/service, developing and promoting new product/service, opening new domestic target group, using up to dating and new technology in the process, and collaboration with universities) determine IP as a mediating variable. The final results of the second order exploratory factor analysis are presented in Appendix A Table A2.

3.4. Partial Least Square Model

A PLS path model can consist of two parts—the internal or structural model showing the construct and measurement models showing the relationships among constructs and variables (external model) [63]. The structural model applied in the present research was previously shown in the research conceptual model. However, the measurement model (Figures 2 and 3) (external model or confirmatory factor analysis) refers to how latent variables are measured by observed ones [64]. The computations of the partial regression model for each internal latent variable is used to meet all path coefficients. This partial regression model can be estimated in two steps—estimation of construct values and then final estimate of external loadings and weights (path coefficient of structural model and R2 values for internal latent variables) [65,66]. It must be noted that, in the present research, all designed models are reflective. In fact, estimation of model shows the relationships between relevancies and constructs within measurement models and determines to what extent the applied theories are in proportion with data [67]. As mentioned, each research hypothesis is analyzed separately using the Partial least squares method. In the partial least square technique, the following points are important:

1- The effect of latent variable on observed variable is shown by factor loading. Factor loading is somewhere between 0–1. If the factor loading is less than 0.3, the effect of two variables is

considered to be weak. Factors loading between 0.3–0.6 are acceptable, and greater than 0.6 are very desirable [68].

2- When the correlation of the variables is identified, a meaningful test should be made. To examine the significance of the observed correlations, bootstrapping or Jack Neff crossover methods are used. The current study used the bootstrapping method. In this study, the self-regulation method is used to give the t-statistic. At a 5% error level, if the value of the bootstrapping t-value is greater than 1.96, then the observed correlations are significant [69]. It is desirable to assess measurement models before studying models and obtained coefficients from research variables to use the analysis results with more certainty. Internal consistency, relevancy reliability, convergent validity, and discriminant validity must be studied for a reflective measurement model. In structural model evaluation, determination coefficients (R2) can be studied [70]. The essential nature of multivariate statistical analyses uses multivariate measurements and improves the accuracy of the research findings. Henceforth, based on what we have presented above, we first evaluate reflective measurement model of the current research and then study the obtained coefficients from the effect among research variables. As was mentioned earlier, an external model can be considered along with confirmatory factor analysis. The results of external loading are shown in Table 4.

In order to study the model, first, an external model is applied to evaluate the relationships between latent variables with their evaluation items. The external model of item relations or those questions of questionnaire are studied with constructs. Relationships cannot be evaluated unless questions of questionnaire prove that they evaluate latent variables properly. The threshold value for external loading is 0.708 [71]. Among relevancies of observed variables, society and environment performance has the highest relevancy reliability at 0.840. All relevancies for three reflective structures of the research have external loadings of higher than threshold. The results obtained from review of quality measurements of the model for study of internal consistency are presented in Table 5.

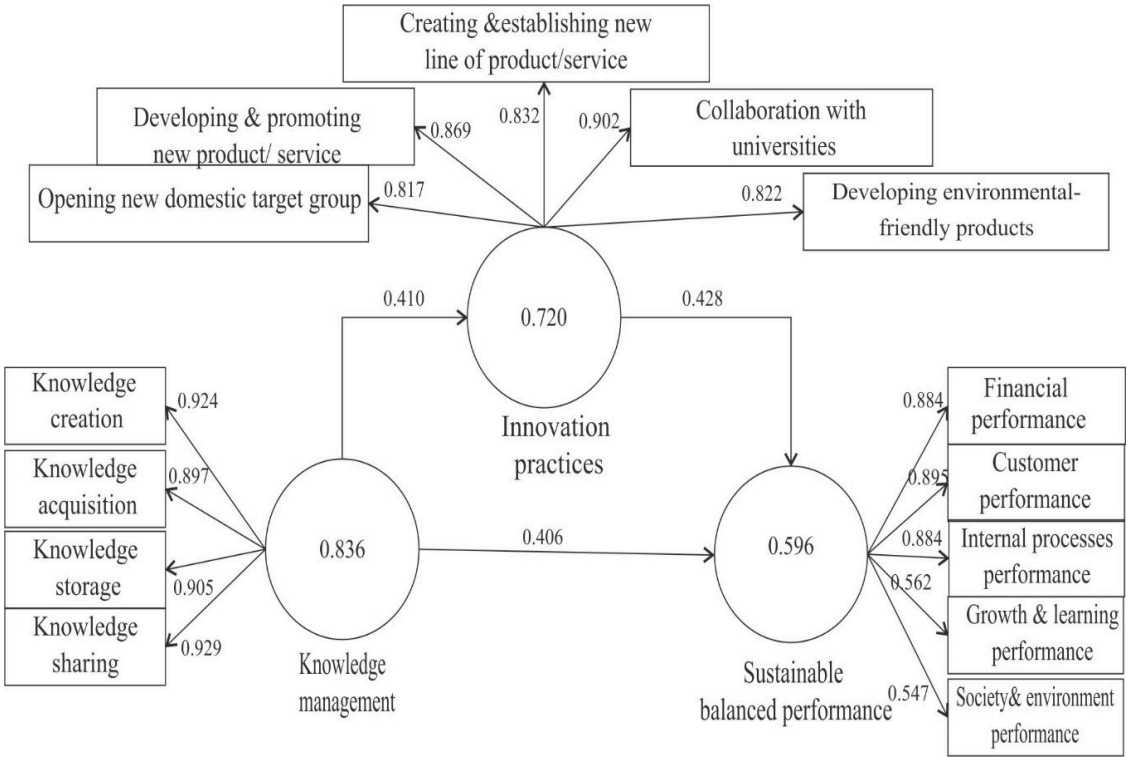

Figure 2. Average variance extracted (AVE).

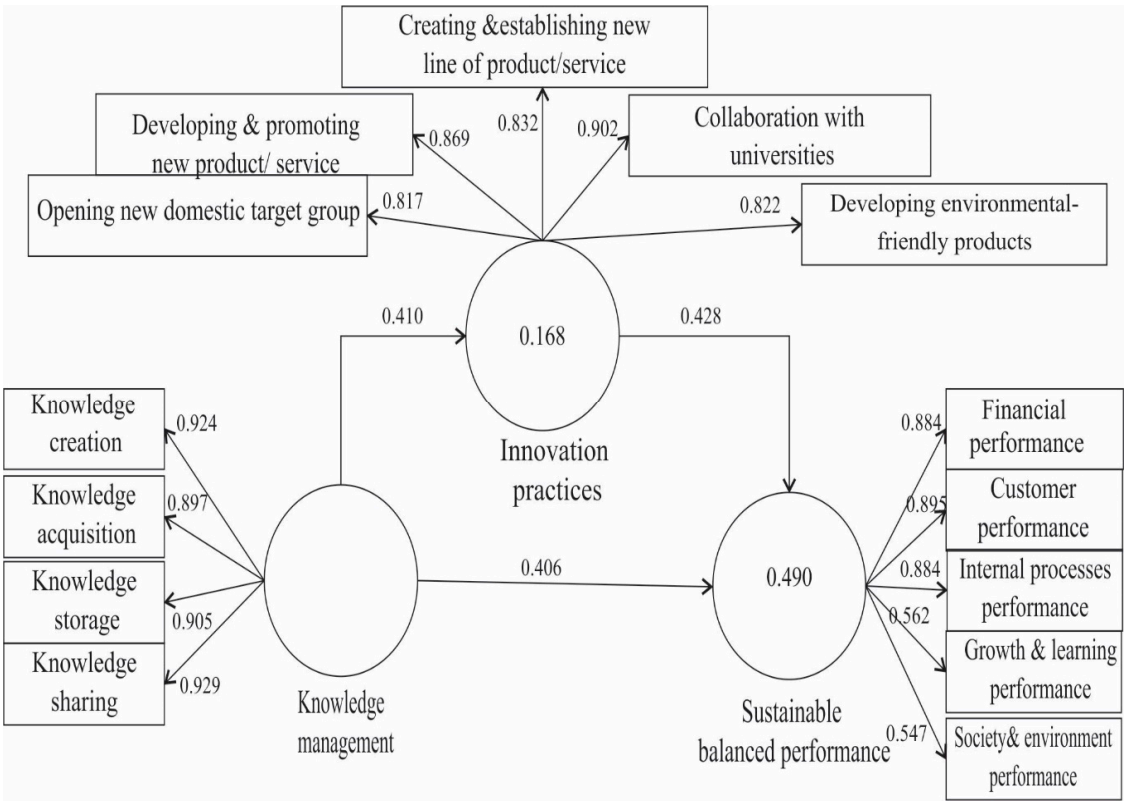

Figure 3. Coefficient of determination (R2).

Table 5. The criteria of the model.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
	0.904	0.926	0.828	0.720
Knowledge Management Practices	0.936	0.989	0.753	0.836
sustainable organizational performance	0.820	0.867	0.876	0.596

One of the most important criteria of evaluating the model is internal consistency reliability. For this end, the traditional criterion Cronbach's alpha is always used, but it would be better to prioritize and study relevancy based on their reliability. Composite reliability of external loadings considers that relevancy variables' value is between zero to one. The values between 0.7 to 0.9 are considered desirable in composite reliability [72]. With respect to convergent validity, it can be noted that principal research variables, emphasizing results obtained from average variance extracted above 0.5, received a high level of convergent validity. The internal consistency or reliability was measured through composite reliability (also known as Dillon-Goldstein's rho or Jöreskog's) as proposed by Chin [73]. He recommends that acceptable scores for the Jöreskog's rho should be higher than 0.70. Dillon-Goldstein's rho is a better reliability measure than Cronbach's alpha in Structural Equation Modeling because it is based on the loadings rather than the correlations observed between the observed variables. According to the measurement studied earlier, it can be stated that the model used in this research has convergent validity. Based on the pattern presented by Fornell and Larcker [74] presented in Tables 6 and 7, and by studying square root of average extracted variance in each construct, it can be said that AVE in each construct has the maximum correlation with other construct in the model. Therefore, we can certainly confirm the discriminant validity of the model.

Table 6. Fornell-Larcker criterion.

	Innovation Practices	Knowledge Management Practices	Sustainable Organizational Performance
Innovation practices	0.849		
Knowledge Management Practices	0.410	0.914	
sustainable organizational performance	0.594	0.581	0.772

Table 7. Cross loadings.

	Innovation Practices	Knowledge Management Practices	Sustainable Organizational Performance
Collaboration with universities	**0.902**	0.415	0.607
Creating & establishing new line of product/service	**0.832**	0.224	0.387
opening of new domestic target groups	**0.817**	0.476	0.549
promoting new products/services	**0.869**	0.243	0.430
developing environment-friendly products	**0.822**	0.286	0.473
Customer performance	0.528	0.498	**0.895**
Financial performance	0.535	0.526	**0.884**
Growth & learning performance	0.341	0.173	**0.562**
Internal processes performance	0.458	0.597	**0.884**
society & environment performance	0.407	0.322	**0.547**
Knowledge acquisition	0.273	**0.897**	0.457
knowledge creation	0.377	**0.924**	0.451
knowledge sharing	0.262	**0.929**	0.426
knowledge storage	0.500	**0.905**	0.693

According to this criterion, the square root of average extracted variance has the maximum correlation of the construct with other constructs. Based on the presented information, in the following table, it is stated that the current research is properly respondent to procedures of measurement model.

With respect to cross loadings studied in the Table 7, relevancy cross loadings for each construct has the maximum external loading and the cross loading is in comparison with other variables. Hence, based on the scrutiny of two Fornell-Larcker criteria and cross loadings, it is noted that constructs of current research have discriminant validity. Henseler et al. [75] believe that, in addition to Fornell and Larcker criterion, divergent validity must be studied by Heterotrait-Monotrait Ratio (HTMT) (see Table 8). If the HTMT value is under 0.90, discriminant validity has been established between two reflective constructs. Since the results obtained from this index among research variables is under 0.9, it can be said that collected and analyzed data have enough originality and the results obtained from the study of researchers have high accuracy and are trustable.

Table 8. Heterotrait-Monotrait Ratio (HTMT).

	Innovation Practices	Knowledge Management Practices	Sustainable Balance Performance
Innovation practices	-	-	-
Knowledge Management Practices	0.394	-	-
sustainable organizational performance	0.668	0.602	-

4. Results and Discussion

By analyzing reflective measurement model, in the following, we study a path model. Considering the confirmation of the measurement model, information related to implementation of partial least squares and coefficient of determination are presented in Figure 3, and average extracted variance is presented in Figure 2.

In line with Zhao et al. [76], if two basic variables (knowledge management practices and sustainable balanced performance) are meaningful, the third variable (innovation practices) is meaningful, and all three variables are positive, then it is concluded that mediating variable has made a complementary relation between independent variable and dependent variable. Therefore, considering the presented information, it is concluded that innovation practices have mediating and complementary role for improvement of sustainable balanced performance. The relationship of studied variables in each hypothesis of research is examined based on a causal structure with the partial least square (PLS) technique. In the overall research model, the measurement model (relation of each observed variable to latent variable) and path model (relations of latent variables with each other) are computed. To evaluate meaningfulness of relations, t-statistic is calculated with a bootstrapping technique. In this model, which is an output of the Smart PLS application, the summary of results related to standard factor loading for research variables is presented. An examination of research hypotheses, based on relations of each variable, is presented separately.

The information presented in Figure 4 shows that t-statistic is bigger than critical value of t-student at confidence level of 95 percent that is 1.96. This means relations considered for all research hypotheses are positive and meaningful. A summary of the research hypotheses being studied is presented in Table 9.

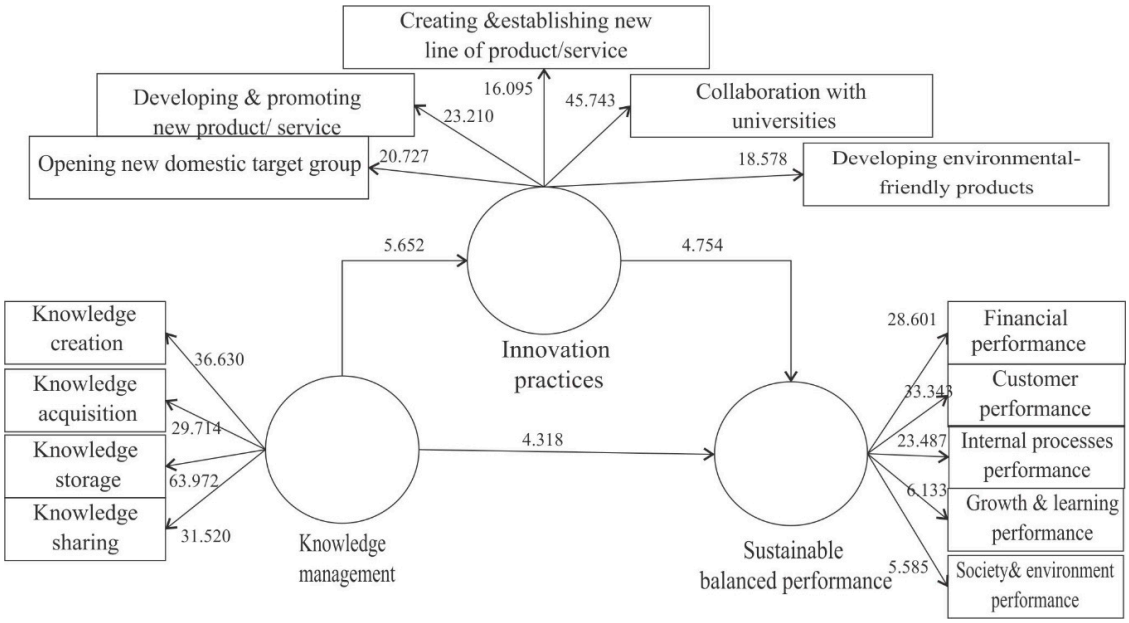

Figure 4. Bootstrapping and t-statistic.

As seen in Table 9 and Figure 4, all the relations of conceptual mode are confirmed. Thus, it becomes clear that knowledge management practices can positively and significantly influence sustainable balanced performance of industrial knowledge-based companies manufacturing advanced machinery and equipment. According to studies made from the first-hand resources like Scopus and Web of Science, it is possible to say that researchers like Houck et al. [11] and Pislaru et al. [12] have provided frameworks to evaluate sustainable balanced performance through a sustainable balanced scoreboard. However, the current research has presented a sustainable balanced performance in

the factor analysis and multivariate statistical analysis. Also, it must be noted that the concept of sustainable balanced performance was not found inside the results and findings of other researchers in any conducted studies. Hence, the framework of sustainable balanced performance presented in this research could be known as an advantage. Although researchers [77,78] studied concepts related to expansion of activities related to business with sustainable performance, and the fact that most studies in sustainable performance are related to supply chain [79], we dare to say that sustainable balanced performance has not been pinpointed by other researchers. In this regard, other researchers can benefit from this view to expand and develop concepts related to evaluation and management of performance, and corporate managers can benefit from this aspect of performance evaluation (due to the support of presented model from sustainable balanced scoreboard and a systematic structure for performance review).

Table 9. Studying the research hypotheses.

Research Hypotheses		Coefficient of Determination	t-Statistic	Sig	Result
The main research hypothesis	Knowledge Management Practices -sustainable balance performance	0.406	4.318	0.00	Accept
The first subsidiary hypothesis	Knowledge Management Practices- Innovation practices	0.410	5.652	0.00	Accept
The second subsidiary hypothesis	Innovation practices-sustainable balance performance	0.428	4.754	0.00	Accept

Based on what elicited from examination of the first hypothesis, we can suggest that knowledge-based companies can help the overall growth of this industry by focusing on the exploration of current knowledge and by sharing goals, work flows, resources, and income with stakeholders and also by creating a strategic unity. Moreover, conscious integration of capabilities and dynamicity of this industry and the focus on knowledge networks [80] and knowledge flows [81] along with technologic unities can help improve key abilities and internal capacities of companies to move toward the development of business targets and improve the overall situation of the workplace. It must be noted that the focus of knowledge-based companies on knowledge flows and technologic processes are the most important elements in gaining competitive advantage [82] and a sustainable balanced performance. With respect to the results obtained from examination of the second hypothesis, it could be said that results of this test are in line with results of other research [83–85]. Based on the observations made by researchers in this this industry, it is suggested that knowledge-based companies help their organizations by improving innovation in conscious management activities and creating target internal groups. In addition, due to high level of information and knowledge in these companies, it is recommended that these companies benefit from systematic method of problem solving to promote new products and services. It is suggested that industrial knowledge-based companies manufacturing advanced machinery and equipment increase their competitiveness through innovation in servicing products [86]. According to the results obtained from the last research hypothesis, it can be stated that innovation practices with innovation procedures can increase the power of organizations in seeking chances and overcoming environment inconsistencies and empower organizations to overcome difficulties, stresses, errors, and failures, and also guarantee their survival by presenting an innovative model for the business [87] through exploration and merge of innovation [88]. Even though the concept of innovation has been deeply studied previously by researchers [89–92], its mediating role in sustainable balanced performance has been neglected. Thus, through more studies and closer observation of the effects, the effects between these two variables can be examined. Based on analyses made from the research data, it is recommended that knowledge-based companies increase their customers' performance by innovation in the value presented to customers and to digitalize the product

service system in order to operate in today's competitive market. Furthermore, paying attention to innovative products and services that support the environment and society can become a crucial social responsibility to upgrade the brand value of these firms. It is suggested that the industry of manufacturing advanced machinery and equipment tries to boost a learning system through innovation in learning to benefit from its advantages in crisis.

5. Managerial Implication

With respect to activities and studies of researchers in knowledge-based companies, it is suggested that these companies select their corporate structures in relation to developmental activities related to their business and follow traditional models of the organization. The necessity of confronting crises or errors is considered as an advantage in these firms. Henceforth, these companies, focusing on their current knowledge and exploration of novel solutions, can become pioneer organizations instead of defeated ones. Principally, development of activities of these companies with foreign partners and the creation of long-term mechanisms in mutual cooperation can bring common strategic benefits for the parties. Researchers suggest that studied companies enrich machines and devices with deep perception to promote technologic level of products and services such that they decrease the competitors' pressures. Finally, it can be highlighted that working systems of knowledge-based companies need innovation in business and financial models to empower these corporates achieve growth and development in their customers' performance as well as their own financial performance along with academic capacity and technical abilities.

6. Conclusions

The current research tries to study the effects of variables in knowledge management practices, innovation practices, and sustainable balanced performance in industrial knowledge-based companies that manufacture advanced machinery and equipment. This is done by applying partial least square and a statistical analysis. Based on the results of the first research hypothesis, it can be admitted that KMP has a positive and significant effect on SBP. According to [93], it can be concluded that knowledge-oriented leadership can influence KPM and IP. The results obtained from the first research hypothesis are aligned with [94–99]. Sustainable balanced performance components grow and develop from knowledge management practices. For example, through knowledge sharing, learning and growth perspective are strengthened, and consequently, internal processes, by optimizing workflows, enhance the other three perspectives. Also, the role of empowerment of employees by knowledge management activities toward improving their performance should be pointed out [100]. KMP reinforces key performance indicators through a positive and direct impact on all components, activities and operations. Therefore, it can be expected that, through the extension of KMP, key performance indicators and key results will be promoted and improved in general, leading to the improvement of SBP.

Due to the results obtained from the second hypothesis test, it can be concluded that KMP has a positive and significant effect on IP. The results obtained from this hypothesis are in line with the results obtained from [101,102]. KMP can be considered as the basis of IP. Innovation activities help to explore and exploit the opportunities for creating new products and services, which are always dependent on knowledge flows in the organization. By strengthening the knowledge flows in the organization, innovation activities and programs can be optimized [103] from the viewpoint of time and cost of accessing a new product, service or process.

Based on the third hypothesis, we can conclude that SBP can be positively and significantly influenced through IP. IP as an appropriate enabler of SBP can directly affect the internal processes and customer perspective. Results obtained from this hypothesis support the findings of [104–106]. Regarding the mediating role of innovation practices, it can be pointed out that innovation practices are always supported through knowledge management practices. Regarding the impact of KMP on IP, we can expect that the synergy of these variables would have a positive effect on the SBP in various dimensions.

7. Suggestion for Future Researchers

Based on the obtained results and given the nature the surveyed companies, it can be inferred that knowledge-based companies can focus on digital innovation and digital servitization to develop their business. Therefore, it is worthwhile to study and present a conceptual model of the impact of digital innovation and servitization on business models and organizational performance. Given the multi-dimensionality of the concept of performance, it is suggested that researchers, by studying other performance drivers in knowledge-based companies, try to help improve the performance of these companies. It is also suggested that researchers investigate how to influence the performance of knowledge-based companies by focusing on industry 4.0.

Author Contributions: C.V. was responsible for the design of the whole research and wrote the paper; J.S. collected and analyzed the data. B.K. reviewed the relevant literature, particularly for the revision.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A First Order Principle Component Analysis

Table A1. First order principle component analysis.

	Principle Component (First order)													
	Financial Performance	**Customer Performance**	**Internal Process**	**Learning and Growth**	**Society and Environment Performance**	**Opening of New Domestic Target Groups**	**Promoting New Products/Services**	**Creating & Establishing Line of Product/Service New**	**Collaboration with Universities**	**Developing Environment Friendly Products**	**Knowledge Creation**	**Knowledge Acquisition**	**Knowledge Storage**	**Knowledge Sharing**
x1	***0.842***	0.225	−0.041	0.134	0.289	−0.117	−0.078	0.145	−0.036	0.569	0.364	0.378	−0.453	0.036
x2	***0.761***	0.628	0.073	0.264	0.341	0.181	0.257	−0.225	0.089	0.147	−0.147	0.258	0.364	0.047
x3	***0.685***	0.059	0.119	−0.019	0.048	0.302	−0.259	0.021	−0.245	0.259	0.369	−0.279	0.0514	0.308
x4	***0.626***	0.478	0.082	0.422	0.091	0.146	0.423	0.147	0.256	0.131	−0.423	0.025	0.079	0.123
x5	0.238	***0.858***	−0.083	0.318	0.011	0.173	0.345	0.334	−0.161	0.183	−0.523	0.014	0.082	0.243
x6	0.251	***0.891***	−0.623	0.012	0.142	0.236	−0.14	0.247	0.147	−0.253	−0.123	0.175	0.236	0.452
x7	−0.230	***0.613***	0.123	−0.325	0.045	0.012	−0.413	0.015	0.036	0.045	−0.163	0.045	−0.457	0.322
x8	0.123	***0.779***	0.036	−0.145	0.364	−0.034	0.234	−0.036	0.569	0.364	0.378	−0.453	−0.136	0.253
x9	−0.078	0.253	***0.687***	0.403	−0.602	0.214	0.085	0.604	0.190	−0.654	0.306	0.014	0.224	−0.112
x10	0.012	0.325	***0.785***	0.012	0.125	0.2360	−0.355	0.009	0.243	0.456	0.238	0.55	0.409	0.263
x11	0.021	0.123	***0.742***	0.325	0.045	0.623	0.412	0.030	0.187	0.642	0.080	−0.004	0.230	0.521
x12	0.123	0.145	***0.862***	0.101	−0.598	0.365	0.452	−0.025	0.493	0.348	0.328	0.121	−0.175	0.485
x13	0.456	0.625	0.452	***0.712***	0.159	−0.145	0.025	0.207	0.446	0.269	0.080	0.286	0.347	0.036
x14	0.324	0.147	0.289	***0.845***	0.687	0.321	0.412	−0.036	0.569	0.364	0.378	−0.453	−0.106	0.105
x15	−0.124	0.024	0.078	***0.753***	−0.014	0.358	0.230	0.654	0.190	−0.654	0.306	0.014	0.154	0.023
x16	0.156	0.532	0.142	***0.796***	0.654	0.214	0.234	0.009	0.243	0.456	0.238	0.55	0.409	0.069
x17	0.356	0.189	0.259	***0.143***	***0.796***	−0.343	0.038	0.201	0.535	−0.073	0.265	0.308	−0.083	0.124
x18	−0.342	0.235	0.365	0.379	***0.638***	0.428	0.207	0.068	0.135	0.368	0.401	−0.053	0.018	0.325
x19	0.642	0.369	0.423	0.187	***0.713***	0.209	0.152	−0.037	0.394	0.129	0.129	0.323	0.479	0.412
x20	0.564	0.357	0.791	0.635	***0.852***	0.258	0.426	0.164	0.068	0.063	0.179	0.658	−0.425	0.236
x21	0.275	0.387	0.174	0.691	***0.849***	0.187	0.021	0.122	−0.016	0.769	0.164	0.078	−0.353	−0.206

Table A1. *Cont.*

	Principle Component (First order)													
	Financial Performance	**Customer Performance**	**Internal Process**	**Learning and Growth**	**Society and Environment Performance**	**Opening of New Domestic Target Groups**	**Promoting New Products/Services**	**Creating & Establishing Line of Product/Service New**	**Collaboration with Universities**	**Developing Environment Friendly Products**	**Knowledge Creation**	**Knowledge Acquisition**	**Knowledge Storage**	**Knowledge Sharing**
x22	0.489	0.451	0.357	0.121	0.023	***0.789***	−0.543	0.258	0.741	0.632	0.413	0.674	0.432	0.198
x23	0.654	0.241	0.387	−0.241	0.781	***0.852***	0.489	0.287	0.255	0.333	0.398	0.153	0.803	0.321
x24	0.345	0.587	0.178	0.369	0.620	***0.712***	0.468	−0.631	0.546	0.321	0.463	0.157	0.012	0.687
x25	0.587	0.477	0.121	0.369	0.485	***0.689***	0.111	0.321	0.596	0.326	0.274	0.374	0.475	0.587
x26	0.331	0.074	−0.136	0.701	0.031	0.631	***0.742***	0.333	0.248	0.641	0.354	0.157	0.189	0.379
x27	0.347	0.546	0.159	0.456	0.624	0.235	***0.789***	0.653	0.154	0.532	0.413	0.253	0.689	0.421
x28	0.054	0.796	0.369	0.756	0.063	0.364	***0.897***	0.746	−0.543	0.796	0.456	0.357	0.326	0.693
x29	0.463	0.763	0.532	0.423	0.612	0.035	***0.812***	0.396	0.736	0.632	0.198	0.463	0.326	0.125
x30	−0.313	0.068	0.101	0.035	−0.143	0.475	0.258	***0.678***	0.159	0.593	0.198	0.463	0.476	0.298
x31	0.218	0.257	0.068	0.145	0.018	0.311	−0.153	***0.745***	0.389	0.365	0.159	0.497	0.325	0.156
x32	0.379	0.052	−0.437	0.324	0.379	0.429	0.223	***0.713***	0.533	0.701	0.111	0.349	0.241	0.444
x33	−0.235	0.324	−0.065	0.138	0.236	0.179	0.558	***0.792***	0.153	0.369	0.236	0.156	0.671	0.349
x34	0.632	0.045	0.632	0.461	0.356	0.463	0.169	***0.741***	0.596	0.324	0.0632	0.333	0.452	0.364
x35	0.362	0.125	0.637	0.163	0.763	0.356	0.146	0.763	***0.891***	0.763	0.196	0.036	0.476	0.736
x36	0.123	0.023	0.698	0.236	0.677	0.426	0.623	0.123	***0.785***	0.369	0.163	0.486	0.326	0.346
x37	0.196	0.036	0.639	0.496	0.536	0.362	0.222	0.634	***0.736***	0.369	0.463	0.156	0.496	0.362
x38	0.693	0.013	−0.763	0.639	0.136	0.634	0.243	0.678	***0.702***	0.555	0.639	0.136	0.700	0.649
x39	0.649	0.467	0.268	0.467	0.136	0.177	0.394	0.319	0.301	***0.745***	0.364	0.358	0.236	0.197
x40	0.163	0.259	0.196	0.498	0.236	0.168	0.416	0.387	0.398	***0.729***	0.496	0.374	0.269	0.279
x41	−0.143	−0.632	0.111	0.125	−0.053	0.125	0.148	−0.033	0.197	***0.697***	0.533	0.416	0.387	0.296
x42	0.128	0.147	0.068	0.235	0.228	0.111	−0.423	0.128	0.136	***0.728***	0.298	0.499	−0.031	0.291
x43	0.079	0.032	−0.057	0.404	0.139	0.209	0.123	0.159	0.701	***0.738***	0.496	0.136	0.563	0.279
x44	0.558	0.206	0.144	0.308	0.423	0.249	0.218	−0.145	0.146	0.012	***0.741***	0.367	0.496	0.276

Table A1. *Cont.*

	Principle Component (First order)													
	Financial Performance	**Customer Performance**	**Internal Process**	**Learning and Growth**	**Society and Environment Performance**	**Opening of New Domestic Target Groups**	**Promoting New Products/Services**	**Creating & Establishing Line of Product/Service New**	**Collaboration with Universities**	**Developing Environment Friendly Products**	**Knowledge Creation**	**Knowledge Acquisition**	**Knowledge Storage**	**Knowledge Sharing**
x45	−0.143	0.158	0.421	0.105	−0.103	0.125	0.158	−0.013	0.136	0.496	***0.695***	0.532	0.413	0.346
x46	0.218	0.367	0.138	0.115	0.128	0.121	−0.123	0.148	0.075	0.346	***0.763***	0.036	0.536	0.493
x47	0.632	0.634	0.249	0.513	0.013	0.413	0.456	0.135	0.598	0.326	***0.721***	0.469	0.374	0.236
x48	0.263	0.723	−0.236	0.131	0.387	−0.194	0.328	0.127	0.195	0.185	0.349	***0.852***	0.496	0.222
x49	0.746	0.023	0.270	0.161	0.357	−0.030	−0.038	−0.485	0.261	0.268	0.496	***0.841***	0.496	0.379
x50	0.349	0.532	0.061	0.156	0.008	−0.100	−0.037	0.018	0.239	0.325	0.041	***0.782***	0.637	0.423
x51	0.289	0.362	0.356	0.131	0.647	−0.072	0.346	0.478	0.165	0.268	0.639	***0.796***	0.633	0.384
x52	0.196	0.158	0.121	0.057	0.478	−0.194	0.456	0.147	0.251	0.357	0.463	0.015	***0.756***	−0.362
X53	0.623	0.253	0.146	−0.043	0.083	−0.030	0.343	−0.088	0.058	0.346	0.069	0.379	***0.699***	0.582
X54	0.158	0.632	0.105	0.218	0.052	−0.100	−0.647	0.082	0.085	0.243	0.415	0.258	***0.762***	0.222
X55	0.693	0.356	0.131	0.179	0.283	−0.072	0.174	0.026	−0.512	0.191	0.346	0.036	***0.781***	0.369
X56	0.506	−0.324	0.247	−0.365	0.029	−0.452	0.325	0.632	0.369	0.349	0.136	0.269	0.163	***0.745***
X57	0.452	0.352	−0.324	0.002	0.426	0.036	0.145	0.369	0.159	0.489	0.236	0.159	0.578	***0.782***
X58	−0.145	0.365	0.485	−0.654	0.97	0.085	0.354	0.369	0.168	0.496	0.125	0.700	0.023	***0.752***
X59	0.45	−0.485	0.147	0.254	−0.007	0.365	0.453	0.386	0.416	0.536	0.346	0.156	0.689	***0.761***
X60	0.256	0.324	−0.452	0.333	−0.100	0.042	−0.220	0.653	0.163	0.789	0.687	0.367	0.196	***0.869***

Table A2. Second order principle component analysis.

	Components		
	KM Practices	**Innovation Practices**	**Sustainable Balanced Scorecard**
opening of new domestic target groups	0.307	**0.656**	0.328
promoting new products/services	0.054	**0.903**	0.153
Creating & establishing new line of product/service	0.050	**0.897**	0.096
Collaboration with universities	0.208	**0.781**	0.369
developing environment−friendly products	0.074	**0.764**	0.288
knowledge creation	**0.913**	0.198	0.104
Knowledge acquisition	**0.887**	0.043	0.190
knowledge storage	**0.755**	0.244	0.444
knowledge sharing	**0.944**	0.059	0.114
Financial performance	0.343	0.272	**0.728**
Customer performance	0.289	0.247	**0.795**
Internal processes performance	0.417	0.187	**0.731**
learning and Growth performance	−0.102	0.137	**0.716**
society and environment performance	0.147	0.259	**0.481**

References

1. Zahedi, A.E.; Mirghfoori, S.H.; Morovati Sharif Abadi, A. An integrated map to developing the innovation and commercialization potential of Iranian knowledge-based companies. *Cogent Bus. Manag.* **2018**, *5*, 1523345. [CrossRef]
2. Hörisch, J.; Johnson, M.P.; Schaltegger, S. Implementation of sustainability management and company size: A knowledge-based view. *Bus. Strategy Environ.* **2015**, *24*, 765–779. [CrossRef]
3. Dzenopoljac, V.; Alasadi, R.; Zaim, H.; Bontis, N. Impact of knowledge management processes on business performance: Evidence from Kuwait. *Knowl. Process Manag.* **2018**, *25*, 77–87. [CrossRef]
4. Giampaoli, D.; Ciambotti, M.; Bontis, N. Knowledge management, problem solving and performance in top Italian firms. *J. Knowl. Manag.* **2017**, *21*, 355–375. [CrossRef]
5. Inkinen, H. Review of empirical research on knowledge management practices and firm performance. *J. Knowl. Manag.* **2016**, *20*, 230–257. [CrossRef]
6. Zaim, H.; Muhammed, S.; Tarim, M. Relationship between knowledge management processes and performance: Critical role of knowledge utilization in organizations. *Knowl. Manag. Res. Pract.* **2019**, *17*, 24–38. [CrossRef]
7. Bergek, A.; Norrman, C. Integrating the supply and demand sides of public support to new technology-based firms. *Sci. Public Policy* **2014**, *42*, 514–529. [CrossRef]
8. Noori, J.; Nasrabadi, M.B.; Yazdi, N.; Babakhan, A.R. Innovative performance of Iranian knowledge-based firms: Large firms or SMEs? *Technol. Forecast. Soc. Chang.* **2017**, *122*, 179–185. [CrossRef]
9. Valmohammadi, C. Investigating innovation management practices in Iranian organizations. *Innovation* **2012**, *14*, 247–255. [CrossRef]
10. Valmohammadi, C.; Sofiyabadi, J. Modeling cause and effect relationships of strategy map using fuzzy DEMATEL and fourth generation of balanced scorecard. *Benchmarking* **2015**, *22*, 1175–1191. [CrossRef]
11. Houck, M.; Speaker, P.J.; Fleming, A.S.; Riley, R.A., Jr. The balanced scorecard: Sustainable performance assessment for forensic laboratories. *Sci. Justice* **2012**, *52*, 209–216. [CrossRef] [PubMed]
12. Pislaru, M.; Herghiligiu, I.; Robu, I.B. Corporate sustainable performance assessment based on fuzzy logic. *J. Clean. Prod.* **2019**, *223*, 998–1013. [CrossRef]
13. Schechner, R. *Performance Theory*; Routledge: New York, NY, USA, 2003.
14. Nickell, S.J. Competition and corporate performance. *J. Political Econ.* **1996**, *104*, 724–746. [CrossRef]
15. Rummler, G.A.; Brache, A.P. *Improving Performance*; Jossey-Bass: San Francisco, CA, USA, 1995.
16. Taleb, N.N. *Antifragile: Things That Gain from Disorder*; Random House: New York, NY, USA, 2012; Volume 3.
17. Garcia-Morales, V.J.; Martín-Rojas, R.; Lardón-López, M.E. Influence of social media technologies on organizational performance through knowledge and innovation. *Balt. J. Manag.* **2018**, *13*, 345–367. [CrossRef]

18. Tang, V.; Yanine, F.; Valenzuela, L. Data, information, knowledge and intelligence: The mega-nano hypothesis and its implications in innovation. *Int. J. Innov. Sci.* **2016**, *8*, 199–216. [CrossRef]
19. Aloini, D.; Dulmin, R.; Mininno, V.; Zerbino, P. Leveraging Procurement-Related Knowledge through a Fuzzy-Based DSS: A Refinement of Purchasing Portfolio Models. Available online: https://www.emerald.com/insight/content/doi/10.1108/JKM-10-2018-0614/full/html (accessed on 23 July 2019).
20. Zerbino, P.; Aloini, D.; Dulmin, R.; Mininno, V. Knowledge Management in PCS-enabled ports: An assessment of the barriers. *Knowl. Manag. Res. Pract.* **2018**, *16*, 435–450. [CrossRef]
21. Cerchione, R.; Esposito, E.; Spadaro, M.R. A literature review on knowledge management in SMEs. *Knowl. Manag. Res. Pract.* **2016**, *14*, 169–177. [CrossRef]
22. Manfredi Latilla, V.; Frattini, F.; Messeni Petruzzelli, A.; Berner, M. Knowledge management, knowledge transfer and organizational performance in the arts and crafts industry: A literature review. *J. Knowl. Manag.* **2018**, *22*, 1310–1331. [CrossRef]
23. Ahmad, N.; Lodhi, M.S.; Zaman, K.; Naseem, I. Knowledge management: A gateway for organizational performance. *J. Knowl. Econ.* **2017**, *8*, 859–876. [CrossRef]
24. Bai, J.; Ren, J. Organizational Ambidexterity and Innovation Performance: The Moderating Effect of Entrepreneurial Orientation. *Front. Bus. Res. China* **2017**, *10*, 664–693.
25. Maldonado-Guzmán, G.; Garza-Reyes, J.A.; Pinzón-Castro, S.Y.; Kumar, V. Innovation capabilities and performance: Are they truly linked in SMEs? *Int. J. Innov. Sci.* **2019**, *11*, 48–62. [CrossRef]
26. Shujahat, M.; Sousa, M.J.; Hussain, S.; Nawaz, F.; Wang, M.; Umer, M. Translating the impact of knowledge management processes into knowledge-based innovation: The neglected and mediating role of knowledge-worker productivity. *J. Bus. Res.* **2019**, *94*, 442–450. [CrossRef]
27. Farooq, R. Developing a conceptual framework of knowledge management. *Int. J. Innov. Sci.* **2019**, *11*, 139–160. [CrossRef]
28. Lawson, B.; Samson, D.; Roden, S. Appropriating the value from innovation: Inimitability and the effectiveness of isolating mechanisms. *R D Manag.* **2012**, *42*, 420–434. [CrossRef]
29. Kianto, A.; Ritala, P.; Spender, J.; Vanhala, M. The interaction of intellectual capital assets and knowledge management practices in organizational value creation. *J. Intellect. Cap.* **2014**, *15*, 362–375. [CrossRef]
30. Zack, M.; McKeen, J.; Singh, S. Knowledge management and organizational performance: An exploratory analysis. *J. Knowl. Manag.* **2009**, *13*, 392–409. [CrossRef]
31. Lopes, C.M.; Scavarda, A.; Hofmeister, L.F.; Thomé, A.M.T.; Vaccaro, G.L.R. An analysis of the interplay between organizational sustainability, knowledge management, and open innovation. *J. Clean. Prod.* **2017**, *142*, 476–488. [CrossRef]
32. Dayan, R.; Heisig, P.; Matos, F. Knowledge management as a factor for the formulation and implementation of organization strategy. *J. Knowl. Manag.* **2017**, *21*, 308–329. [CrossRef]
33. North, K.; Kumta, G. *Knowledge Management: Value Creation through Organizational Learning*; Springer: Berlin/Heidelberg, Germany, 2018.
34. Becerra-Fernandez, I.; Leidner, D.E.; Leidner, D. On knowledge, knowledge management, and knowledge management systems: An introduction. In *Knowledge Management*; Routledge: New York, NY, USA, 2014; pp. 17–24.
35. Scarbrough, H.; Robertson, M.; Swan, J. Diffusion in the face of failure: The evolution of a management innovation. *Br. J. Manag.* **2015**, *26*, 365–387. [CrossRef]
36. Fidel, P.; Cervera, A.; Schlesinger, W. Customer's role in knowledge management and in the innovation process: Effects on innovation capacity and marketing results. *Knowl. Manag. Res. Pract.* **2016**, *14*, 195–203. [CrossRef]
37. Valmohammadi, C.; Ahmadi, M. The impact of knowledge management practices on organizational performance: A balanced scorecard approach. *J. Enterp. Inf. Manag.* **2015**, *28*, 131–159. [CrossRef]
38. Biemans, W. *Managing Innovation within Networks*; Routledge: London, UK, 2018.
39. Dougherty, D. *Taking Advantage of Emergence: Productively Innovating in Complex Innovation Systems*; Oxford University Press: Oxford, UK, 2016.
40. Koch, A.H. Authority and managing innovation: A typology of product development teams and communities. *Creat. Innov. Manag.* **2012**, *21*, 376–387. [CrossRef]
41. Inauen, M.; Schenker-Wicki, A. The impact of outside-in open innovation on innovation performance. *Eur. J. Innov. Manag.* **2011**, *14*, 496–520. [CrossRef]

42. Un, C.A.; Asakawa, K. Types of R&D collaborations and process innovation: The benefit of collaborating upstream in the knowledge chain. *J. Prod. Innov. Manag.* **2015**, *32*, 138–153.
43. Dougherty, D. Organizing for innovation in complex innovation systems. *Innovation* **2017**, *19*, 11–15. [CrossRef]
44. Hussinger, K.; Pacher, S. Information ambiguity, patents and the market value of innovative assets. *Res. Policy* **2019**, *48*, 665–675. [CrossRef]
45. Lee, H.F.; Miozzo, M. Which Knowledge-Intensive Business Services Firms Collaborate for Innovation with Universities? In *Academy of Management Proceedings*; Academy of Management: Briarcliff Manor, NY, USA, 2017; Volume 2017, p. 12965.
46. Ankrah, S.; Omar, A.T. Universities–industry collaboration: A systematic review. *Scand. J. Manag.* **2015**, *31*, 387–408. [CrossRef]
47. Valmohammadi, C. Customer relationship management: Innovation and performance. *Int. J. Innov. Sci.* **2017**, *9*, 374–395. [CrossRef]
48. Kaplan, R.S.; Norton, D.P. Linking the balanced scorecard to strategy. *Calif. Manag. Rev.* **1996**, *39*, 53–79. [CrossRef]
49. Kaplan, R.S.; Robert, N.P.D.K.S.; Davenport, T.H.; Kaplan, R.S.; Norton, D.P. *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*; Harvard Business Press: Oxford, UK, 2011.
50. Hansen, E.G.; Schaltegger, S. The sustainability balanced scorecard: A systematic review of architectures. *J. Bus. Ethics* **2016**, *133*, 193–221. [CrossRef]
51. Sofiyabadi, J.; Nasab, S. A dynamic balanced scorecard for identification internal process factor. *Manag. Sci. Lett.* **2012**, *2*, 1721–1730. [CrossRef]
52. Sofiyabadi, J.; Kolahi, B.; Valmohammadi, C.; Movahedi, M.M. application of fuzzy cognitive map in determining the organization's success path. *Product. Manag. J.* **2015**, *9*, 201–223. (In Persian)
53. Nikolaou, I.E.; Tsalis, T.A. Development of a sustainable balanced scorecard framework. *Ecol. Indic.* **2013**, *34*, 76–86. [CrossRef]
54. Cochran, W.G. *Sampling Techniques*; John Wiley & Sons: Hoboken, NJ, USA, 2007.
55. Chong, A.Y.; Chan, F.T.; Ooi, K.B.; Sim, J.J. Can Malaysian firms improve organizational/innovation performance via SCM? *Ind. Manag. Data Syst.* **2011**, *111*, 410–431. [CrossRef]
56. Baruch, Y.; Holtom, B.C. Survey response rate levels and trends in organizational research. *Hum. Relat.* **2008**, *61*, 1139–1160. [CrossRef]
57. Prajogo, D.I.; McDermott, C.M. The relationship between multidimensional organizational culture and performance. *Int. J. Oper. Prod. Manag.* **2011**, *31*, 712–735. [CrossRef]
58. Kock, N.; Lynn, G. Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *J. Assoc. Inf. Syst.* **2012**, *13*. [CrossRef]
59. Kock, N.; Gaskins, L. The mediating role of voice and accountability in the relationship between Internet diffusion and government corruption in Latin America and Sub-Saharan Africa. *Inf. Technol. Dev.* **2014**, *20*, 23–43. [CrossRef]
60. Kock, N. Common method bias in PLS-SEM: A full collinearity assessment approach. *Int. J. e-Collab. (IJeC)* **2015**, *11*, 1–10. [CrossRef]
61. Brace, N.; Snelgar, R.; Kemp, R. *SPSS for Psychologists*; Macmillan International Higher Education: London, UK, 2012.
62. Kline, R.B. *Principles and Practice of Structural Equation Modeling*; Guilford Publications: New York, NY, USA, 2015.
63. Esposito Vinzi, V.; Chin, W.W.; Henseler, J.; Wang, H. *Handbook of Partial Least Squares: Concepts, Methods and Applications*; Springer: Heidelberg, Germany; Dordrecht, The Netherlands; London, UK; New York, NY, USA, 2010.
64. Vinzi, V.E.; Trinchera, L.; Amato, S. PLS path modeling: From foundations to recent developments and open issues for model assessment and improvement. In *Handbook of Partial Least Squares*; Springer: Berlin/Heidelberg, Germany, 2010; pp. 47–82.
65. Henseler, J.; Fassott, G. Testing moderating effects in PLS path models: An illustration of available procedures. In *Handbook of Partial Least Squares*; Springer: Berlin/Heidelberg, Germany, 2010; pp. 713–735.

66. Henseler, J.; Ringle, C.M.; Sarstedt, M. Using partial least squares path modeling in advertising research: Basic concepts and recent issues. In *Handbook of Research on International Advertising*; Edward Elgar publication: Massachusetts, USA, 2012; p. 252.
67. Chin, W.W. How to write up and report PLS analyses. In *Handbook of Partial Least Squares*; Springer: Berlin/Heidelberg, Germany, 2010; pp. 655–690.
68. Kline, P. *An Easy Guide to Factor Analysis*; Routledge: London, UK, 2014.
69. Henseler, J.; Ringle, C.M.; Sarstedt, M. Testing measurement invariance of composites using partial least squares. *Int. Mark. Rev.* **2016**, *33*, 405–431. [CrossRef]
70. Sarstedt, M.; Ringle, C.M.; Hair, J.F. Partial least squares structural equation modeling. In *Handbook of Market Research*; Springer: Homburg, Germany, 2017; pp. 1–40.
71. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: Thousand Oaks, CA, USA, 2016.
72. Latan, H.; Noonan, R. (Eds.) *Partial Least Squares Path Modeling: Basic Concepts, Methodological Issues and Applications*; Springer: Berlin/Heidelberg, Germany, 2017.
73. Chin, W.W. The partial least squares approach to structural equation modeling. *Mod. Methods Bus. Res.* **1998**, *295*, 295–336.
74. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
75. Henseler, J.; Ringle, C.M.; Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* **2015**, *43*, 115–135. [CrossRef]
76. Zhao, X.; Lynch, J.G.; Chen, Q. Reconsidering Baron and Kenny: Myths and Truths About Mediation Analysis. *J. Consum. Res.* **2010**, *37*, 197–206. [CrossRef]
77. Khalili, A.; Ismail, M.Y.; Karim, A.N.M.; Daud, M.R.C. Quality management practices and sustainable performance: Examining the role of soft TQM as mediator. *Int. J. Ind. Syst. Eng.* **2019**, *31*, 250–277.
78. Poltronieri, C.F.; Ganga, G.M.D.; Gerolamo, M.C. Maturity in management system integration and its relationship with sustainable performance. *J. Clean. Prod.* **2019**, *207*, 236–247. [CrossRef]
79. Acquaye, A.; Ibn-Mohammed, T.; Genovese, A.; Afrifa, G.A.; Yamoah, F.A.; Oppon, E. A quantitative model for environmentally sustainable supply chain performance measurement. *Eur. J. Oper. Res.* **2018**, *269*, 188–205. [CrossRef]
80. Atapattu, A.; Jayakody, J. The interaction effect of organizational practices and employee values on knowledge management (KM) success. *J. Knowl. Manag.* **2014**, *18*, 307–328. [CrossRef]
81. Ferraris, A.; Santoro, G.; Dezi, L. How MNC's subsidiaries may improve their innovative performance? The role of external sources and knowledge management capabilities. *J. Knowl. Manag.* **2017**, *21*, 540–552. [CrossRef]
82. Martinez-Conesa, I.; Soto-Acosta, P.; Carayannis, E.G. On the path towards open innovation: Assessing the role of knowledge management capability and environmental dynamism in SMEs. *J. Knowl. Manag.* **2017**, *21*, 553–570. [CrossRef]
83. Honarpour, A.; Jusoh, A.; Md Nor, K. Total quality management, knowledge management, and innovation: An empirical study in R&D units. *Total Qual. Manag. Bus. Excell.* **2018**, *29*, 798–816.
84. Obeidat, B.Y.; Al-Suradi, M.M.; Masa'deh, R.E.; Tarhini, A. The impact of knowledge management on innovation: An empirical study on Jordanian consultancy firms. *Manag. Res. Rev.* **2016**, *39*, 1214–1238. [CrossRef]
85. Papa, A.; Dezi, L.; Gregori, G.L.; Mueller, J.; Miglietta, N. Improving innovation performance through knowledge acquisition: The moderating role of employee retention and human resource management practices. *J. Knowl. Manag.* **2018**. [CrossRef]
86. Bustinza, O.F.; Gomes, E.; Vendrell-Herrero, F.; Baines, T. Product–service innovation and performance: The role of collaborative partnerships and R&D intensity. *R D Manag.* **2019**, *49*, 33–45.
87. West, J.; Bogers, M. Leveraging external sources of innovation: A review of research on open innovation. *J. Prod. Innov. Manag.* **2014**, *31*, 814–831. [CrossRef]
88. Tsinopoulos, C.; Sousa, C.; Yan, J. Process Innovation: Open Innovation and the Moderating Role of the Motivation to Achieve Legitimacy. *J. Prod. Innov. Manag.* **2018**, *35*, 27–48. [CrossRef]
89. Meira, J.V.D.S.; Dos Anjos, S.J.G.; Falaster, C.D. Innovation and performance in the hotel industry. *J. Qual. Assur. Hosp. Tour.* **2019**, *20*, 185–205. [CrossRef]

90. Meroño-Cerdán, A.L.; López-Nicolás, C.; Molina-Castillo, F.J. Risk aversion, innovation and performance in family firms. *Econ. Innov. New Technol.* **2018**, *27*, 189–203. [CrossRef]
91. Naranjo-Valencia, J.C.; Jiménez-Jiménez, D.; Sanz-Valle, R. Studying the links between organizational culture, innovation, and performance in Spanish companies. *Revista Latinoamericana de Psicología* **2016**, *48*, 30–41. [CrossRef]
92. Roach, D.C.; Ryman, J.A.; Makani, J. Effectuation, innovation and performance in SMEs: An empirical study. *Eur. J. Innov. Manag.* **2016**, *19*, 214–238. [CrossRef]
93. Donate, M.J.; de Pablo, J.D.S. The role of knowledge-oriented leadership in knowledge management practices and innovation. *J. Bus. Res.* **2015**, *68*, 360–370. [CrossRef]
94. Santoro, G.; Vrontis, D.; Thrassou, A.; Dezi, L. The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity. *Technol. Forecast. Soc. Chang.* **2018**, *136*, 347–354. [CrossRef]
95. Del Giudice, M.; Della Peruta, M.R. The impact of IT-based knowledge management systems on internal venturing and innovation: A structural equation modeling approach to corporate performance. *J. Knowl. Manag.* **2016**, *20*, 484–498. [CrossRef]
96. Nowacki, R.; Bachnik, K. Innovations within knowledge management. *J. Bus. Res.* **2016**, *69*, 1577–1581. [CrossRef]
97. Martín-de Castro, G. Knowledge management and innovation in knowledge-based and high-tech industrial markets: The role of openness and absorptive capacity. *Ind. Mark. Manag.* **2015**, *47*, 143–146. [CrossRef]
98. Inkinen, H.T.; Kianto, A.; Vanhala, M. Knowledge management practices and innovation performance in Finland. *Balt. J. Manag.* **2015**, *10*, 432–455. [CrossRef]
99. Donate, M.J.; Guadamillas, F. An empirical study on the relationships between knowledge management, knowledge-oriented human resource practices and innovation. *Knowl. Manag. Res. Pract.* **2015**, *13*, 134–148. [CrossRef]
100. Abualoush, S.H.; Obeidat, A.M.; Tarhini, A.; Masa'deh, R.E.; Al-Badi, A. The role of employees' empowerment as an intermediary variable between knowledge management and information systems on employees' performance. *VINE J. Inf. Knowl. Manag. Syst.* **2018**, *48*, 217–237. [CrossRef]
101. Joshi, H.; Chawla, D. Knowledge management and performance improvement in Indian organisations. *International J. Knowl. Manag. Stud.* **2018**, *9*, 164–180. [CrossRef]
102. Mills, A.M.; Smith, T.A. Knowledge management and organizational performance: A decomposed view. *J. Knowl. Manag.* **2011**, *15*, 156–171. [CrossRef]
103. Mardani, A.; Nikoosokhan, S.; Moradi, M.; Doustar, M. The relationship between knowledge management and innovation performance. *J. High Technol. Manag. Res.* **2018**, *29*, 12–26. [CrossRef]
104. Rousseau, M.B.; Mathias, B.D.; Madden, L.T.; Crook, T.R. Innovation, firm performance, and appropriation: A meta-analysis. *Int. J. Innov. Manag.* **2016**, *20*, 1650033. [CrossRef]
105. Hilman, H.; Kaliappen, N. Innovation strategies and performance: Are they truly linked? *World J. Entrep. Manag. Sustain. Dev.* **2015**, *11*, 48–63. [CrossRef]
106. Ndubisi, N.O.; Capel, C.M.; Ndubisi, G.C. Innovation strategy and performance of international technology services ventures: The moderating effect of structural autonomy. *J. Serv. Manag.* **2015**, *26*, 548–564. [CrossRef]