JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S10

Optimization of Academic Competitiveness Through Advanced Knowledge Management Models with A Systemic Approach

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ABSTRACT

In a context of rapid advances in educational methodologies and their socioeconomic impact, this research highlights the crucial role of Knowledge Management (KM) in optimizing academic competitiveness in university research. The study, carried out at the National University of Cajamarca, demonstrates that effective knowledge management, based on innovative practices and technological tools, contributes significantly to the strengthening of scientific production and academic visibility.

The proposed model addresses critical deficiencies in current KM practices, promoting the transfer, storage, and use of knowledge in an environment that fosters innovation and research quality. Through a mixed approach, qualitative and quantitative, the impacts of this model were evaluated, showing a notable increase in the quantity and quality of publications in indexed journals, as well as in the scientific productivity of the institution.

In addition to contributing to the theoretical framework of KM in higher education, the study offers a practical and replicable model for other institutions seeking to improve their academic competitiveness. This approach highlights the importance of structured KM practices to meet global educational standards and effectively contribute to the advancement of the knowledge economy.

KEYWORDS: Knowledge Management, Academic Competitiveness, University Research, Indexed Publications.

1. Introduction

Within the framework of the fourth industrial revolution, scientific and technological development is positioned as a central element for global socioeconomic growth. This transformation, which significantly affects higher education, poses unprecedented challenges for academic institutions in terms of competitiveness and innovation. According to Bikse et al. (2022) and Cruz (2021), universities play a key role as knowledge catalysts and value drivers in the creation of a knowledge-based society. However, in Peru, Knowledge Management (KM) practices in universities

have not yet reached the level required to respond to these global demands. Previous studies, such as those by Morgan Rozas and Llinàs (2017), show a low production of scientific research and a limited presence in publications of international impact, which calls into question the national academic competitiveness.

Against this backdrop, a critical question arises: How can the implementation of an effective KM model improve competitiveness in university research in Peru? This study seeks to answer this question by developing and implementing an innovative KM model designed to strengthen research capacity and scientific production in a university school. This model considers key elements such as strategic planning, the use of emerging technologies and the creation of collaborative environments that facilitate the transfer and application of knowledge.

The research is based on the recognition that, despite the current limitations, Peruvian universities have significant potential to contribute to the advancement of the knowledge economy. Mirata et al. (2020) highlight that systematic approaches in KM not only improve research quality, but also have a positive impact on educational policies and institutional management. In this context, the proposed model combines a systemic approach with innovative technologies, aligning with global trends to optimize the knowledge cycle and foster interdisciplinary collaboration.

The justification for this study lies in its ability to generate significant improvements in the quality of university research and its impact on academic visibility. Although the analysis focuses on a specific institution, its findings and recommendations offer an adaptable model for other universities in similar contexts. In addition, this approach encourages the integration of emerging technologies such as system dynamics, which, according to Suryani et al. (2024) and García et al. (2024), is essential for creating innovative academic environments.

Finally, the hypothesis suggests that the implementation of an efficient KM model can significantly transform academic competitiveness, increasing the production and quality of research and strengthening its social impact. This study not only seeks to contribute to the development of knowledge in Peru, but also to position national universities as key actors in the global research scenario.

2. General objective

To develop a Knowledge Management (KM) model to strengthen academic competitiveness and optimize scientific production in a university school in Peru.

3. Methodology

The methodology implemented in this thesis is characterized by being rigorous, structured and adapted to the objective of designing and implementing a Knowledge Management (KM) model to improve academic competitiveness in a university school. Here's a detailed breakdown:

3.1 Methodological approach

- Mixed Approach: Combines qualitative and quantitative methods to gain a comprehensive understanding of the problem. This approach allows analyzing both the experiences and perceptions of the participants and measuring the impact of the study variables objectively.

  - Qualitative method: Used to explore experiences, perceptions and needs related to knowledge management, through interviews and documentary analysis.

  - Quantitative method: It allows measuring and evaluating variables related to academic competitiveness through surveys and statistical analysis.

3.2 Research Type and Design

- Type of research:

  - Applied: It seeks to offer practical solutions through the design of a KM model.

  - Descriptive and explanatory: Describes the current state of KM in the institution, identifies shortcomings and proposes a model that explains how to improve academic competitiveness.

- Research Design:

  - Case study: Focused on the Professional Academic School of Systems Engineering of the National University of Cajamarca.

3.3 Variables

- Independent variable: Knowledge Management (KM), which includes the identification, creation, storage, transfer and application of knowledge.

- Dependent variable: Academic competitiveness, measured through indicators such as quantity, quality and impact of publications in indexed journals.

3.4 Population and Sample

- Population: Teachers from the selected university school, involved in research and academic development activities.

- Sample: 14 teachers selected through an intentional sampling, based on their experience in research and their active participation in academic projects.

3.5 Data Collection Techniques and Instruments

- Semi-structured interviews: To explore in depth the perceptions and experiences of teachers about KM.

- Surveys: To collect quantitative data on the use of KM practices and their impact on academic competitiveness.

- Documentary analysis: To identify policies, practices, and institutional guidelines related to KM.

- Worksheets: Used to diagnose the current state of research in the institution.

3.6 Procedures

1. Initial diagnosis:

○ Evaluation of the current state of KM and research in the institution through surveys and interviews.

○ Identification of shortcomings and needs in research and knowledge management processes.

2. Selection of indicators:

○ Use of the modified Lawshe model to identify and validate key KM indicators.

○ Validation of indicators through experts and content validity index calculations.

3. GC Model Design:

○ Based on the dynamics of systems, a model was structured that integrates strategic, operational and innovative dimensions of KM.

4. Model simulation:

○ Simulations were used to project the impact of the model on academic competitiveness under different scenarios.

5. Pilot implementation:

○ Application of the model in a controlled environment, evaluating its effectiveness and adjusting it according to the results obtained.

3.7 Data Analysis

- Thematic coding: To analyze qualitative interviews and extract meaningful patterns.
- Descriptive statistics and regression analysis: To evaluate surveys and measure the relationships between variables.
- Dynamic simulation: To project scenarios and evaluate the impact of different KM practices on academic competitiveness.

3.8 Ethical considerations

- Informed consent: Participants were informed about the objectives of the study and consented to participate.
- Confidentiality: The identity and data of the participants were protected.
- Regulatory compliance: The research complied with the ethical principles of beneficence, non-maleficence, justice and respect for autonomy.

4. Results and discussion

4.1 Results

The case study to achieve competitiveness in a university school in research was carried out at the Professional Academic School of Systems Engineering of the National University of Cajamarca (EAPIS), the scientific research process that is carried out in universities must conclude in a publication of scientific articles in quantity, quality and innovation, methodological criteria used in university competitiveness rankings (Scimago, 2020) with this will achieve visibility of the university school and the university as a whole.

Intellectual production involves a process, in which new knowledge is generated, where research is carried out, contributing to innovation in various aspects of life such as social, technological, scientific and academic. For this reason, it is important that knowledge is disseminated (Milla et al., 2018), SINEACE establishes publication in journals indexed in databases.

A KM model must promote each of the phases in the process of research production and its subsequent publication, therefore, we will identify the scientific research process at the National University of Cajamarca, which extends to all academic-professional schools and is established in the research regulations. In Figure 1, 2 phases have been added to the process, these that are generated by researchers in schools: generation of ideas and elaboration of projects, the whole process concludes in the research report.

Figure 1. Research process at the National University of Cajamarca. In original language Spanish

It should be noted that according to Article 11 of the research regulations, projects are called annually (VIR UNC, 2018). There are two sources of financing: the FEDU funds, with low budgets ranging from S/. 500.00 and S/.1000.00 and the competitive funds of the mining canon, with a base budget of S/ 350.0,000.00. Research projects are regularly developed at EAPIS, mainly with FEDU funds, generating 88 research projects (Vice-Rectorate, 2020) in different research groups.

Diagnostic results in EAPIS, on research, publication and empirical criteria for a KM model

A survey is applied to diagnose the state of research, its publication in indexed journals and to know relevant criteria in the research process at EAPIS that help to formulate knowledge management indicators for the competitiveness of the university school.

The following results were obtained.

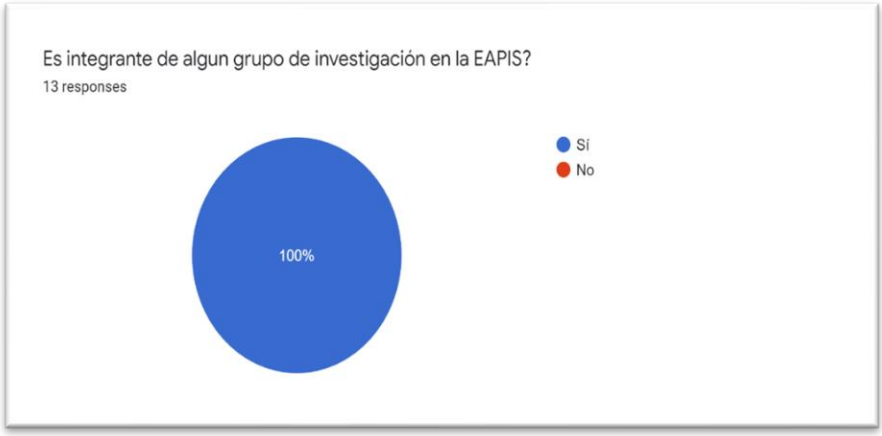


Figure 2. Member of the research group

Source: SPSS 22. In original language Spanish

It represents the level of participation of the professors of the Professional Academic School of Systems Engineering (EAPIS) in formally constituted research groups. This figure is essential to evaluate academic collaboration, since integration in these groups fosters scientific production, the exchange of ideas and the development of interdisciplinary projects. It reflects the commitment of teachers to research as an essential activity of their academic work.

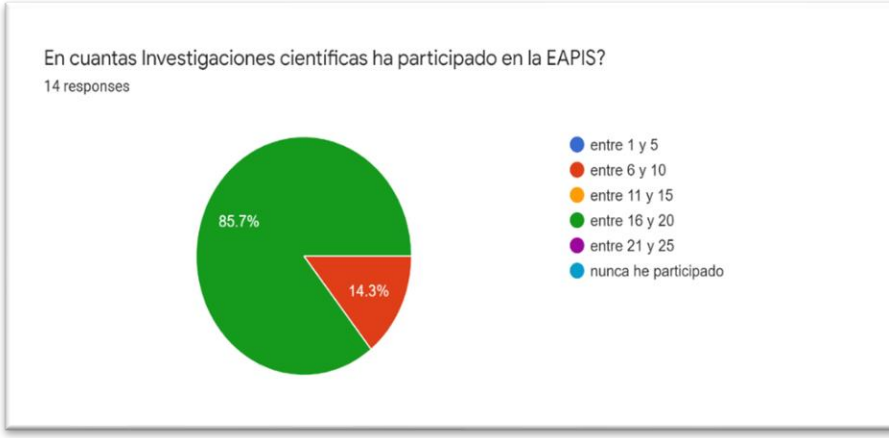


Figure 3. Participation in scientific research

Source: SPSS 22. In original language Spanish

It shows the degree of involvement of teachers in scientific research projects, both individual and collective. This data is important to identify trends in the frequency of research activities and to determine what percentage of teachers actively participate in the production of new knowledge. The figure helps to analyse possible areas for improvement in teachers' motivation and commitment to research.

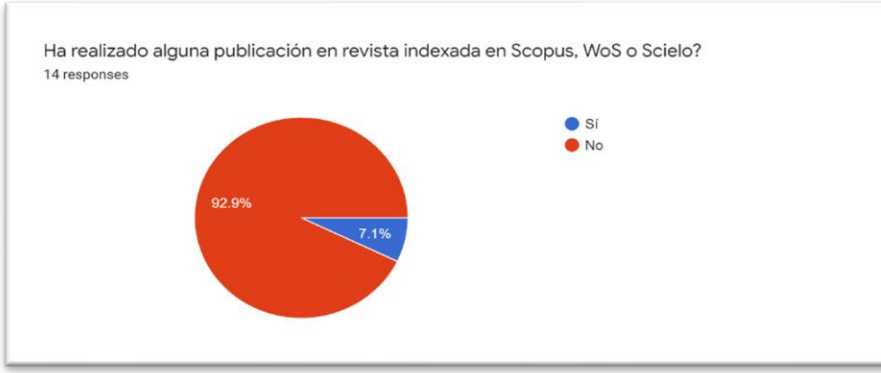


Figure 4. Publication of research carried out in indexed scientific journals.

Source: SPSS 22. In original language Spanish

It illustrates the amount of research completed by faculty that has been published in indexed scientific journals, a key indicator of academic competitiveness. It reflects not only the quality of research, but also access to internationally recognized scientific dissemination platforms. This analysis allows us to identify barriers in the publication process and areas where efforts should be focused to improve the academic visibility of the institution.

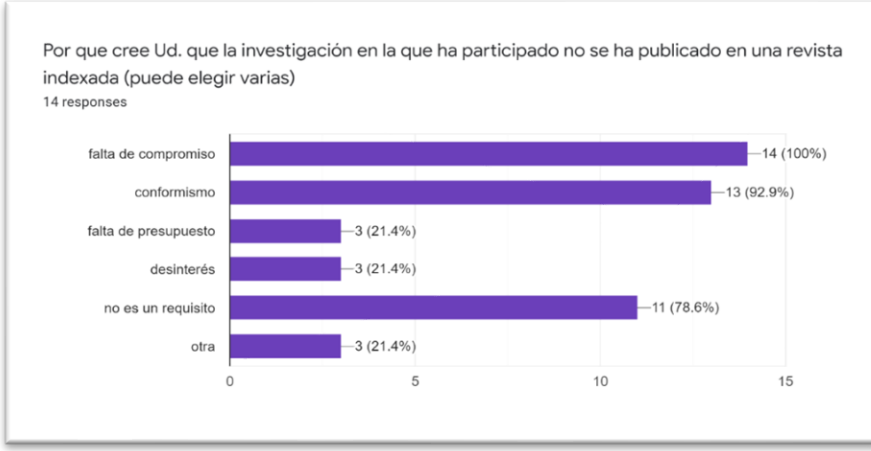


Figure 5. Possible causes why research was not published

Source: SPSS 22. In original language Spanish

It lists and prioritizes the factors that hinder the publication of research in indexed journals. Among the most prominent causes are the lack of commitment on the part of teachers, conformism in the face of the lack of publications, and the perception that it is not a mandatory institutional requirement. These results underscore the need to establish clear incentives and a research culture that values publication as an essential objective.

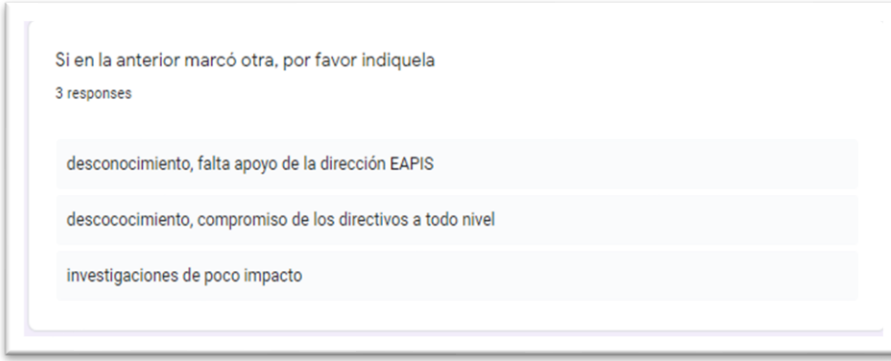


Figure 6. Other causes of non-publication of research in indexed journals.

Source: SPSS 22. In original language Spanish

It presents additional, although less frequent, factors that affect the publication of research. These include a lack of knowledge about publication processes, lack of interest on the part of teachers, and limited institutional support to facilitate access to necessary resources. This figure highlights areas where it is possible to intervene through training, mentoring, and strengthening institutional policies.

Figure 7. All research in the EAPIS must be required to be published in an indexed journal.

Source: SPSS 22. In original language Spanish

It shows the level of consensus among professors on the need for all research in the institution to be oriented towards publication in indexed journals. This criterion is perceived as essential to promote the quality and relevance of research. The figure reflects a generalized stance of support for the implementation of institutional policies that prioritize publication as an integral part of the research process.

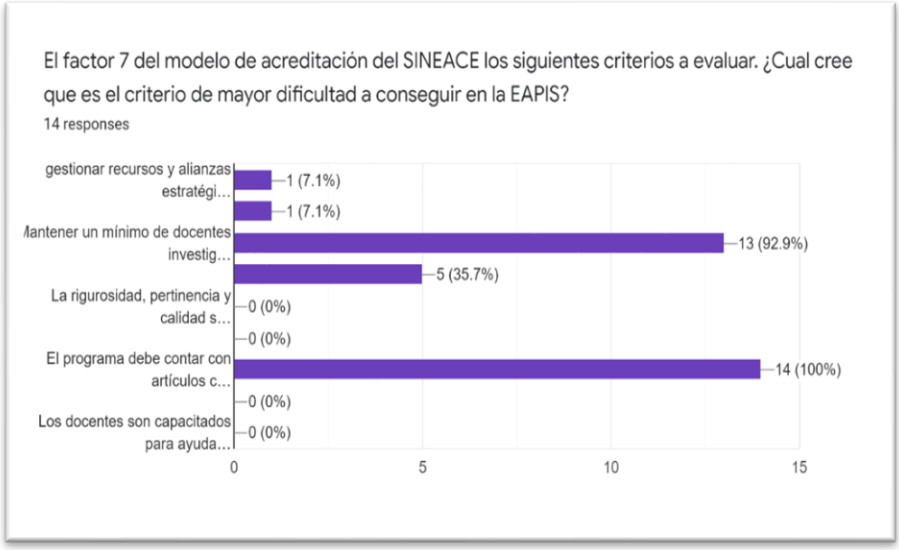
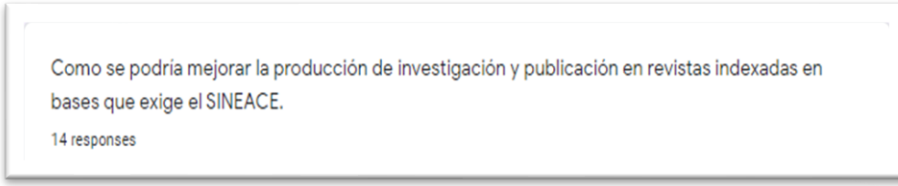


Figure 8. This is the most difficult criterion to be achieved in the accreditation process.

Source: SPSS 22. In original language Spanish

It identifies the main challenges in meeting the accreditation criteria for professional schools. According to the professors, the greatest difficulty lies in the need to have publications in indexed journals, a requirement that requires a strategic approach in scientific production. Other challenges include the enrollment of research professors in RENACYT and the use of technology surveillance tools, underscoring the importance of strengthening institutional capacities and infrastructure to support quality research.

The following question, open to teachers who participate in research in the EAPIS, was established to know empirically (experience and observation of the reality of the EAPIS) criteria that will serve as a basis for the identification of indicators in KM models.



Teacher1: Greater support and openness from the Office of the Vice-Rector for Research, Equipment and Laboratories, annual training plans in the lines of research for teachers, implementation of results-based management.
Teacher2: improving research with the development of competencies, adequate selection of teachers when entering teaching with research and publications, greater commitment.
Teacher3: commitment and support of managers, continuous training plans in the areas of interest of researchers, increased budgets for research.
Teacher4: With a training plan, improve budgets, adequate teacher selection mechanisms.
Teacher5: With training, support from the vice-rector's office, with impact research.
Teacher6: training, processes for selecting teachers with researcher profiles, relevant research or with high impact.
Teacher7: training, adequate budgets, implementation of knowledge management, laboratories.
Teacher8: Permanent training, larger budgets, application of knowledge management to research, laboratory
Teacher9: continuous training plan in the specialty of the research professor, permanent support from managers, budgets, impact research
Teacher10: Develop competence in teachers, permanent support from the vice-rectorate, knowledge management plans.
Teacher11: impact research, budget, commitment of managers. implement a knowledge management model, recognitions
Teacher12: Implement knowledge management model, training, permanent support from managers, budget.
Teacher13: relevant research, admission to the school of teachers with proven research capacity.
Teacher14: training for researchers, relevance of research, training to publish scientific articles, support from UNC directors

Table 1. Criteria for improving research and its publication in the EAPIS

Source: Diagnostic questionnaire for teachers participating in EAPIS research.

It is observed that all teachers participate in research groups and that 85.7% have carried out between 16 and 20 research projects and 14.3% have carried out between 5 and 10 research projects, however, only 7.1% have published their research in a journal indexed in Scopus, WoS or Scielo. Among the criteria that have had the greatest influence on the fact that research has not been published in an indexed journal, 100% of teachers express a lack of commitment, 92.9% of teachers express

conformism, 78.6% of teachers indicate that it is not a requirement to carry out research and 21.4% of teachers indicate a lack of budget. and disinterest, due to lack of knowledge, lack of support from managers at all levels and research with little impact in a smaller proportion.

On the other hand, 85.7% of EAPIS professors agreed that publication in an indexed journal should be established as a requirement for all research. In the case of the criteria established in factor 7 of the SINEACE accreditation model for professional schools, 100% of teachers indicate that the most difficult criterion to achieve in the EAPIS is that "the program must have scientific articles published in indexed journals", 92.9% of teachers state "maintain a minimum of research teachers registered in REGINA (Renacyt)", followed by 35.7% who indicate that the greatest difficulty is in "using technological surveillance tools" and to a lesser extent "strategic alliances and establishment of guidelines to ensure the quality of R+D+i"

To find out how research and publication of scientific articles could be improved, the question was asked openly to the teachers of the EAPIS, which can be deduced that it is not part of guidelines or permanent policies and we consolidate them in the following table.

Criteria for research publication in indexed journals	Results
Training and skills development	12
Support from UNC Directors	7
KM model and results-based management	7
Impact of research	5
Budget	5
Selection of teachers who have research	4
Equipment and Laboratories	3
Commitment	3
Recognitions	2

Table 2. Empirical criteria ordered according to the frequency of responses from EAPIS teachers

Source: Authors' elaboration, extracted from the diagnostic questionnaire in the EAPIS

These criteria will serve as a basis for the search and identification of KM indicators. We then identified two hundred and three indicators of KM models that contain the criteria in Table 1, organized into three dimensions and nine subdimensions (Arguello, 2017; Martínez et al., 2011): strategic knowledge management (KM strategies and KM objectives), innovative environment (culture of innovation and innovative leadership) and knowledge cycle or functional KM management (origin, storage, transfer, application and protection). To give them reliability, validity and objectivity (R. Hernández et al., 2014) care has been taken that their selection belongs to KM models published in indexed journals, periodical research publication that denotes high quality and has been listed in a worldwide database/index/repertoire such as Scopus, Academic Search Premier, Fuente Academica Plus, DOAJ, DIALNET, Aerospace Database, Civil Engineering Abtracts, Metadex, Communication Abstracts, zbMATH, Social Sciences Citation Index, IBZ Online, Periodicals Index Online, Library, Information Science & Technology Abstracts (LISTA), Library and Information Science Abstracts, Library

Literature and Information Science, DOAJ, DIALNET, or LATINDEX. The two hundred and five indicators grouped into nine subdimensions have been selected using Lawshe's model for the subdimensions GC strategy, origin, storage, transfer, application and protection, and the indicators of the remaining three subdimensions have been selected empirically, here it is necessary to remember that all the indicators have been extracted from research models and published in indexed journals.

To select KM indicators in the research process carried out by a competitive school, three KM experts and members of the EAPIS accreditation committee were surveyed and the quantitative index for content validity was determined (Galicia Alarcón et al., 2017), using the modified model of Lawshe, that based on the evaluation carried out with respect to each CG indicator, the number of coincidences in the category was determined (more than 50% agreement must occur among the judges, for the item to be considered with a certain degree of content validity) (Tristan, cited by Puerta & Marín, 2015). Lawshe proposes the Content Validity Ratio (CVR), defined by the following expression:

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

Where: ne = number of panelists who agree in the "a lot" category

N = total number of panelists

According to Tristán (2008) for an indicator to be valid, the CVR must be greater than 0.58. In Table 1, we can see 32 indicators that meet this condition, with validity indices of 0.667 and 0.833. The most relevant KM index (I. GC > validity) is 0.833 for 15 indicators.

Indicator	CVR	I. GC	I. GC > validity
Productivity	0.833	1	1
No. of Research Professors with a PhD degree [1]	0.667	2	
No. of Articles in Indexed Journals (Publication of scientific articles in Scopus)	0.833	3	2
Improve product quality	0.667	4	
Knowledge Management Systems	0.667	5	
Investment in research	0.667	6	
Commitment	0.833	7	3
Communication processes	0.833	8	4
Directing Style	0.667	9	
Decision-making	0.667	10	
Training in new technologies	0.667	11	
Financial incentives	0.667	12	
Recognitions	0.833	13	5
Research budget	0.833	14	6
Research policies	0.667	15	
New projects	0.667	16	
Uses of ICT	0.667	17	
Personnel selection mechanisms	0.667	18	

Emphasis on innovation and production of new knowledge applied in the organization	0.667	19	
Publication of research results	0.667	20	
Through communication (transfer and storage)	0.667	21	
Commitment to learning, shared vision and openness mentality.	0.833	22	7
Contributions of Human Talent	0.833	23	8
Use of research results	0.667	24	
Exploitation of knowledge	0.833	25	9
Existence of an innovative group.	0.833	26	10
Innovation leadership	0.667	27	
Owners and managers and supervisors stimulate innovation with their leadership	0.833	28	11
Collaborative tools	0.833	29	12
Appropriate equipment and technology	0.833	30	13
Skills development	0.833	31	14
Innovation	0.833	32	15

Table 3. Indicators selected using Lawshe's modified model (Tristan, 2008).

Source: Own elaboration

To make the KM model practical and to be able to model it dynamically, it has been considered to work with the indicators with the highest validity index and they have been ordered in table 2 according to their dimension and subdimension.

Dimension	Subdimension	Indicator
Strategic knowledge management	Objectives of KM	Productivity (1)
		Publication of scientific articles (2)
	KM Strategies	Commitment (3)
		Communication Processes (4)
		Recognition (5)
		Research Budget (6)
Cycle of knowledge	Knowledge creation	Commitment to learning, shared vision and openness mentality (7)
		Contributions of Human Talent (8)
		Knowledge Exploitation (9)
Innovative environment	Innovative leadership	Owners and managers and supervisors stimulate innovation with their leadership (10)
		Existence of an innovative group (11)
	Culture of innovation	Development of competencies. (12)
		Collaborative Tools (13)
		Suitable equipment and technology (14)
		Innovation (15)

Table 4. Selected KM indicators with higher validity indices, sorted by dimension and subdimension

Source: Own elaboration

Indicators with a CVR of 0.667, although they meet the validity requirements (Lawshe, modified by Tristán, cited by Puerta & Marín, 2015), are not listed in the table above, but can be selected to adjust the model to be used.

To determine reliability, once we have the selection of the indicators for their validity, we conducted a survey of the teachers of the EAPIS, Cronbach's Alpha is obtained using the following formula:

$$\alpha = \frac{K}{K-1}\left[1 - \frac{\sum S_i^{\,2}}{S_T^{\,2}}\right]$$

Where:

K:	The number of items
∑Si2 :	Sum of Variances of Items
ST2 :	Variance of the sum of the items
to:	Cronbach's Alpha Coefficient

By applying the formula one obtains,

a = 0.78

This value manifests the internal consistency, that is, it shows the correlation between each of the questions, a value higher than 0.7 reveals a strong relationship between the questions, in our case the value is 0.78. The problem to examine is the establishment of a KM model in a university school that makes it competitive, with the visibility that can be given by research and the publication of articles in indexed journals that are made from there. We already have the input indicators and the output indicator that also corresponds to the objective of the KM formulated by Inche Mitma, (2007), we obtain the matrix of operationalization of variables, as shown in the following table.

We will evaluate, through a simulation model, the effect of the independent variable knowledge management, through its indicators, on the dependent variable, competitiveness of a university school, through its indicator publication of articles in indexed journals, as we had previously mentioned. This indicator is used for positioning in the rankings, in the classification as a researcher in Renacyt and as a factor in the accreditation of the academic programs of the university schools.

Characterization of the model

Formato de caracterización de indicadores de Gestión del Conocimiento (GC)

Con el objetivo de caracterizar (definir) los indicadores de GC, seleccionados y validados con las respuestas a la encuesta que Ud. respondió, se le solicita a los expertos seleccionados, responder cada uno de los items.
Con relación al proceso de investigación en una escuela universitaria para competitividad, defina o caracterize los siguientes indicadores:

Productividad

La cantidad de publicaciones en revistas indexadas van a generar competitividad tal como lo miden los principales rankings como Scimago, utilizados en los procesos de licenciamiento y acreditación.

Publicación de articulos científicos

Si bien es un indicador de la GC en la investigación, también vemos que es el indicador de competitividad que muestra en la matriz. Es importante observar aquí el procedimiento de la revista indexada en su tabla de revisión, normas de presentación de artículos

Compromiso

Recoge la disposición de los investigadores a ofrecer su esfuerzo a generar o presentar ideas sin necesidad de un reconocimiento o un incentivo. Este compromiso es institucional

Proceso de comunicación

Los procesos de comunicación son importantes entre los miembros de los grupos de investigación, fomentar canales informales proporciona una gran ventaja en este proceso.

Dueños y directivos y supervisores estimulan con su liderazgo la innovación

Este indicador es muy importante y su selección muestra la dependencia vital en el proceso de investigación, asignando recursos principalmente equipamiento y tecnología adecuada. Deben dividirse en, el apoyo del vicerrectorado de investigación y el apoyo de la dirección de escuela, ya que tienen diferentes niveles de estímulo.

Grupo innovador

La capacidad investigadora de sus recursos humanos y que no solo es producto de un trabajo individual, sino de las relaciones que se logren entre los investigadores.

Herramientas colaborativas

Estas herramientas iniciales de apoyo a la investigación y de poco presupuesto podria estar basada en software bibliografico como Zotero, Mendeley, La GSiute y todas sus herramientas como el Meet, Forms, Classroom entre otros.

Equipamiento y tecnología adecuada

Apoyo recibido directamente del vicerrectorado de investigación quien con capacidad ejecutiva y presupuestal es la instancia que equipa tecnológicamente las investigaciones desde su etapa inicial. Como: las redes de telecomunicaciones, computadores de altas prestaciones, equipamiento especializado para robotica, inteligencia artificial, Iot, etc.

Innovación

Aplica nuevas ideas, productos, conceptos, servicios y prácticas en un sistema de gestión transparente y eficiente basado en los principios de libertad académica y autonomía universitaria

Reconocimiento

Es el reconocimiento por las publicaciones de sus investigaciones, ya sea a través de la política de incentivos o bien del apoyo de los directivos.

Presupuesto para la investigación

Las investigaciones innovadoras, de impacto y la productividad de ellas, dependen principalmente de las oportunidades de disponer de adecuados presupuestos.

Compromiso con el aprendizaje, visión compartida y mentalidad aperturista

Debe ser una visión conjunta de toda la escuela en los procesos de investigación, inclusive tambien como una politica insitucional, sin estos criterios existiría el riesgo de caer en el conformismo.

Talento

Se define como la capacidad de abordar problemas complejos con rapidez y profundidad. Se considera que si se utilizan adecuados mecanismos de selección de personal, una escuela es capaz de atraer al mejor talento.

Explotación del conocimiento

La repercusión clave de este proceso es generar mayor importancia en la investigación hacia la parte interna y como uso de sus resultados hacia la parte interna (empresas, instituciones, organizaciones, etc). Esto podría inclusive generar divisas.

In original language Spanish

From the GC indicators in Table 3, we are going to separate them into first, second, third and fourth order indicators. The former influence the latter, the latter the third, and the latter the fourth.

First-order indicators:

Talent, innovation, commitment to learning, shared vision and openness mentality, commitment, collaborative tools, communication processes, existence of an innovative group, budgets for research and development of skills. It should be noted here that collaborative tools are easily accessible by researchers such as bibliographic tools (Zotero, Mendeley, etc.), anti-plagiarism tools, repositories for searching for information in journals indexed in databases, all university schools and in this case EAPIS has them. In the case of research budgets , these have to be well established at the time of the presentation of projects, the development of competencies has been placed here to minimize dependence on indicators, although this indicator must be part of an annual plan in schools, the EAPIS does not have it. however, with easy access to virtual and distance education through the Internet, to platforms such as Coursera Free Courses, edX Free on Line Courses and an infinity of complete courses on Youtube, we can make this indicator independent.

Second-order indicators:

Owners and managers and supervisors stimulate innovation with their leadership, this indicator can be separated into 2 levels of indicators: support from the school management, followed by the support of the vice-rectorate for research, productivity that depends on published articles that is equal to scientific production. Scientific articles fulfill two functions: one as an indicator of KM, in the strategic knowledge management dimension, subdimension objectives of KM and also in this case as an output of the system to give way to scientific production.

Third-order indicators:

The indicator of equipment and adequate technology would be made up of

telecommunications networks, high-performance computer equipment, specialized laboratories, and expensive equipment that depends mainly on senior management. Here we also have the exploitation of knowledge, which can be achieved by highlighting the value of the published articles.

Fourth-order indicators:

We have left recognition here , as an indicator that will leverage the motivation to develop projects and is dependent on all the feedback of the process.

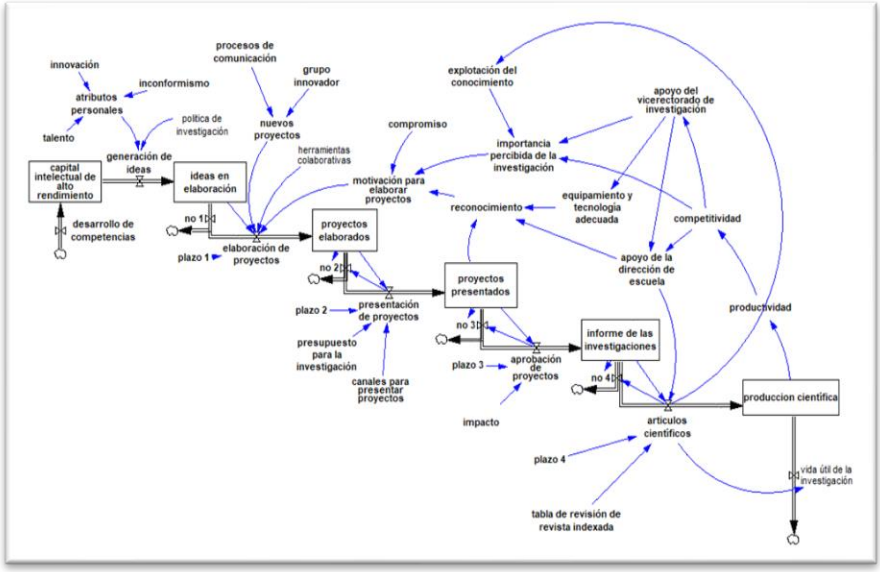


Figure 9. Causal diagram of Knowledge Management for competitiveness in research in a university school. In original language Spanish

Simulation and validation of the KM model for competitiveness in research at a university school

The method consists of introducing changes in the model, to select the option that provides the best results. For the simulation we analyzed 4 scenarios over a 36-month horizon:

Scenario 1: No KM Practices

In this scenario, making both the communication processes and the innovative group non-existent (value 0), while talent and innovation, being personal attributes of a maximum of 1, we have placed them at 0.2, the projection in the number of scientific articles in null, so competitiveness would be 0, as can be seen in the figure.

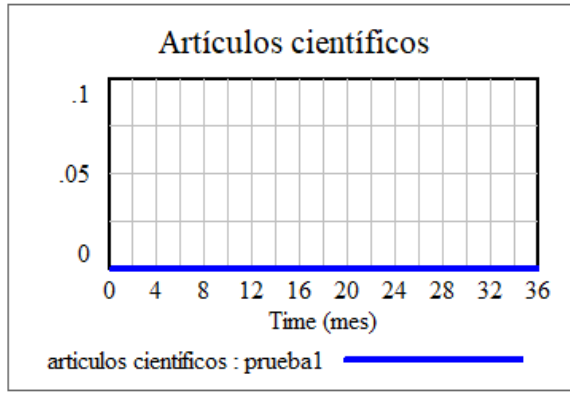


Figure 10. Scientific articles without personal attributes. In original language Spanish

Scenario 2: With minimal KM practices, but no innovative group

It is indicated that the teacher selection mechanisms establish values in innovation and talent, at 0.5 out of a maximum of 1, we observe that quantities of scientific articles are already beginning to be projected, however, it is not sustainable over time, observing a decrease over time, it is necessary to improve other indicators for this.

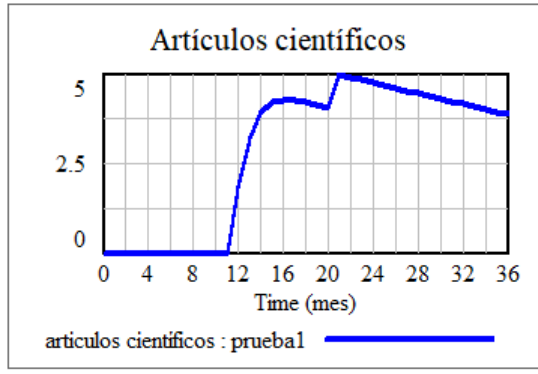


Figure 11. innovation and talent, at 0.5 out of a maximum of 1. In original language Spanish

In this same scenario, by improving the talent of researchers (this can only be done in the selection mechanisms), we will be able to correct the curve and sustain it over time, that is, scientific articles can be maintained.

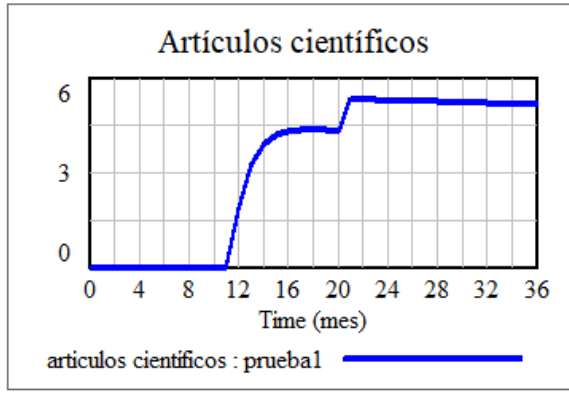


Figure 12. Improving talent. In original language Spanish

Scenario 3: Giving initial values to first-order indicators

We establish as a premise, an adequate mechanism for the selection of teachers, who will become researchers, with values to talent and innovation of 1. In this scenario we establish commitment values at 0.01, this can go to a maximum commitment of 0.1, communication processes at 0.5 (maximum value of 1, q would indicate excellent communication processes), a research budget of 1, this indicator can reach very large values, a commitment to learning, shared vision and openness mentality (renamed as the nonconformity), a value of 0 would indicate absence of commitment to learning, shared vision and openness mentality, in addition to innovative group of 0.5, collaborative tools 0.5.

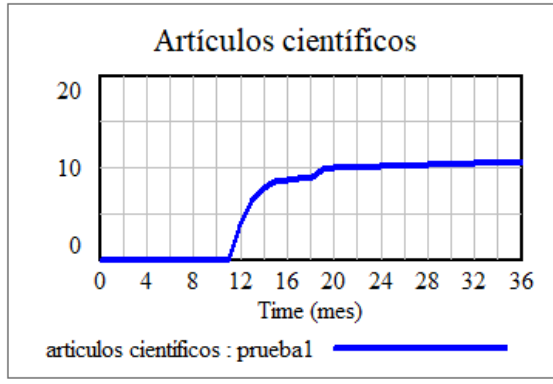


Figure 13. Commitment in 0.01, communication processes in 0.5 budget for research of 1, innovative group of 0.5, collaborative tools 0.5.. In original language Spanish

Scenario 4: Moving First-Order Indicators

These are the indicators over which we would have direct control and their different values generate various projections in scientific articles, as shown in the following figures.

From here we can move some indicators, raising communication processes from 0.5 to 0.75, scientific articles can improve from a projection of 14 to month 20 and leverage in month 32 to 22, due to the feedback that competitiveness generates in the importance received from research and this in the motivation to develop projects.

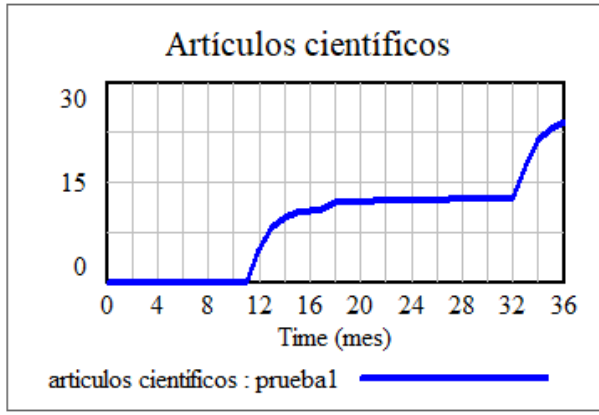


Figure 15. Varying from 0.5 to 0.75 the communication processes. In original language Spanish

To project how a decrease in communication processes has an impact, we reduce them from 0.5 to 0.25 and obtain a low projection, in the horizon of 36 months towards 4 of scientific articles. In month 24, a small leverage is seen as a result of feedback.

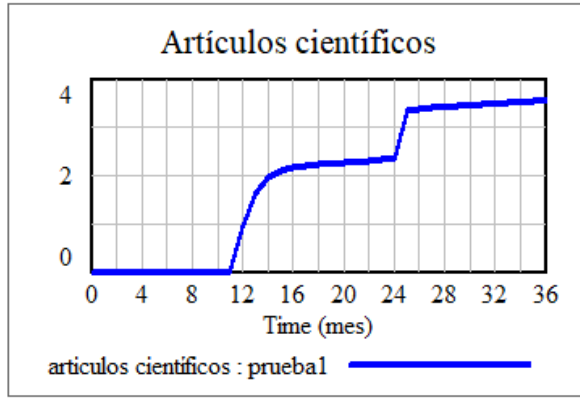


Figure 16. We reduce communication processes from 0.5 to 0.25. In original language Spanish

Nonconformity has been represented in a negative way so that a value of 0 is ideal (no commitment to learning, shared vision and openness mentality) if we reduce from 0.7 to 0.2, it tends to a positive projection from month 24 with respect to the initial values, reaching a projection of 15 in month 33 and from there as a result of the feedback of the system to 25 in the 36th month.

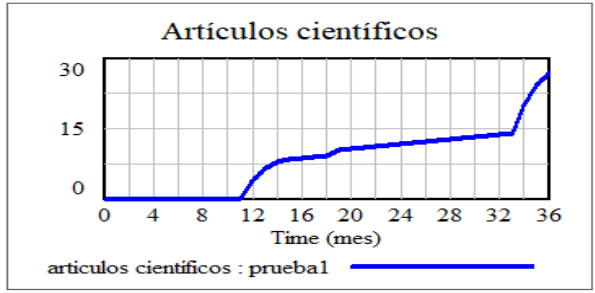


Figure 17. We range from 0.7 to 0.2 commitment to learning, shared vision and openness mentality. In original language Spanish

Improving the engagement to 0.02 from its initial value at 0.01 sees a rapid improvement in the same month 18 towards a projection of 20 publications and a leverage to 30 in month 3.

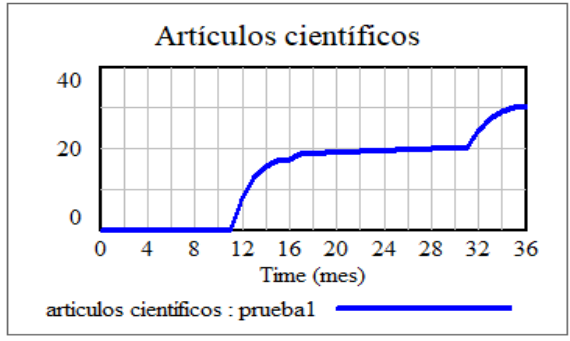


Figure 18. Improving the commitment to 0.02 from its initial value at 0.01. In original language Spanish

If further improving engagement to 0.03, the item projection continues to improve until reaching a projection of 38 in month 36. Commitment is a fundamental indicator for scientific production and competitiveness.

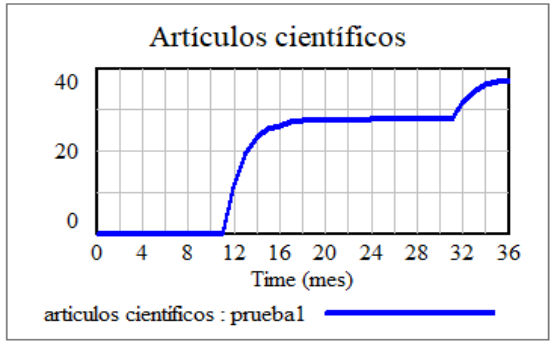


Figure 19. Further improving the commitment to 0.03. In original language Spanish

4.2 Discussion

This research addresses in a clear and well-founded way the problem of low academic competitiveness in Peruvian universities, specifically in the context of Knowledge Management (KM). The central problem lies in the absence of structured and effective KM practices, which negatively impacts scientific production, the quality of research and its visibility in indexed publications.

The research question, "How can the implementation of an effective KM model improve the research competitiveness of a university school in Peru?", guided the development of this work. To answer this question, a practical KM model was designed and evaluated, applying a mixed methodological approach that combined qualitative and quantitative techniques. This approach allowed both the exploration of experiences and perceptions and the measurement of the impact of the proposed model on key indicators of academic competitiveness.

Semi-structured interviews provided valuable information on teachers' perceptions of KM practices and their needs. At the same time, the surveys made it possible to obtain statistical data on the frequency of use and the perceived effectiveness of these practices. This comprehensive approach made it possible to identify critical areas, such as lack of commitment, insufficient resources, and the need to improve communication and collaboration processes.

The results showed significant advances in academic production after the implementation of the model. An increase in the number of publications in indexed journals, an improvement in the quality of scientific articles and an increase in the commitment of teachers to research were observed. Likewise, the quantitative data reflected a positive correlation between the frequency of use of KM practices and the levels of academic productivity, validating the hypothesis that an effective KM model has a direct impact on research competitiveness.

The methodology used stood out for its rigor and relevance. The combination of documentary analysis, interviews, surveys and simulations allowed a comprehensive evaluation of the proposed model. The selection of key indicators using the modified Lawshe model was an essential component, ensuring the validity and relevance of the elements considered in the design of the model.

Regarding the evaluation of the model, the results of the simulations revealed that improvements in first-order indicators, such as engagement, communication processes and the use of collaborative tools, generate a significant impact on scientific production. These findings are consistent with previous studies that highlight the importance of KM as a driver for innovation and academic productivity.

In addition, the results underscore the importance of establishing an institutional culture that values research and scientific publishing. Although a lack of financial and technological resources remains a major barrier, the model demonstrates that strategic changes in KM practices can overcome many of these limitations.

In conclusion, this study not only confirms the hypothesis raised, but also provides a practical roadmap for other academic institutions facing similar challenges. The

proposed model not only improves academic competitiveness, but also contributes to the development of a solid and sustainable research culture, positioning the institution as a benchmark in the field of higher education.

5. Conclusions

This study demonstrates that the implementation of a Knowledge Management (KM) model is a key strategy to improve academic competitiveness in higher education institutions. In the case of the Professional Academic School of Systems Engineering (EAPIS) of the National University of Cajamarca, critical deficiencies were identified in the current research processes, such as the lack of standardized structures, limited institutional commitment, and insufficient infrastructure for the generation and transfer of knowledge. These shortcomings restrict the ability of researchers to collaborate effectively and diminish the quality and visibility of scientific production.

The identification and selection of key KM indicators made it possible to design a practical and applicable model that covers strategic, operational and innovative dimensions. These indicators include organizational commitment, effective communication processes, technological infrastructure, and mechanisms to support scientific production. Its implementation not only facilitates the continuous monitoring and evaluation of KM practices, but also fosters an environment conducive to collaboration and innovation.

The proposed model, based on the dynamics of systems, integrates tools and strategies that optimize the generation, storage, transfer and application of knowledge. The results obtained show a positive impact on academic competitiveness, reflected in a significant increase in the quantity and quality of publications in indexed journals, as well as in a greater academic visibility of the institution. These advances consolidate the hypothesis that an effective KM model contributes directly to the strengthening of research competitiveness.

In addition, the model provides a replicable framework that can be adapted to similar institutional contexts, positioning KM as a strategic pillar for universities seeking to improve their research performance and their contribution to the knowledge economy.

In conclusion, this study not only validates the importance of KM as a tool to enhance academic competitiveness, but also offers a practical solution to overcome the current limitations in higher education institutions. The adoption of this approach will allow universities not only to increase their scientific productivity, but also to consolidate their relevance in the global field of research.

6. Recommendations

Implementation of clear institutional policies:

- Develop specific policies that promote Knowledge Management (KM) as a strategic axis in the institution. These should include clear guidelines on scientific output, incentives for publication in indexed journals, and research-related performance evaluation criteria.

Strengthening the technological and collaborative infrastructure:

- Invest in advanced technology tools that facilitate collaboration, storage, and knowledge transfer. This includes the implementation of digital platforms for teamwork, open access repositories and specialized software for research management.

Continuous training for teachers and researchers:

- Design continuous training programs in research methodologies, scientific writing and use of technological tools for KM. These programs must be adapted to the specific needs of teachers, strengthening their competencies and fostering their commitment to academic production.

Fostering a culture of innovation and collaboration:

- Promote an organizational culture that values innovation and collaborative work, encouraging the creation of multidisciplinary research groups. This includes recognizing and rewarding individual and collective efforts that contribute to the strengthening of scientific production.

Evaluation and continuous monitoring of the KM model:

- Establish a permanent evaluation system to monitor the effectiveness of KM practices implemented. This system should include key indicators to measure the impact of the strategies implemented and make adjustments as necessary to maximize their effectiveness.

Establishment of strategic alliances:

- Foster collaborations with other universities, research centers and international organizations to share good practices, access additional resources and enrich research and publication opportunities.

Allocation of adequate budgets for research:

- Guarantee an allocation of financial resources that supports the implementation of the KM model and allows the development of high-impact projects. This includes the creation of specific funds to finance publications in indexed journals and participation in academic conferences.

Incorporation of KM criteria in accreditation processes:

- Align KM strategies with the requirements established by national and international accreditation models. This will strengthen the institution's position in academic rankings and contribute to the sustainability of research practices in the long term.

References

Acosta Mellado, E. I., Murillo Félix, C. A., Galván Corral, A., & Quiroz Campas, C. Y. (2019). Use of competitive advantage in the agricultural sector. Academia Journals International Research Congress, 11(4), 12.

Adhikari, D. R., & Shrestha, P. (2022). Knowledge management initiatives for achieving sustainable development goal 4.7: Higher education institutions' stakeholder perspectives. Journal of Knowledge Management, 27(4), 1109-1139. https://doi.org/10.1108/JKM-03-2022-0172

Alarcón, J., Cohan, A., Cabello, M., & Barra, M. (2018). Design management and innovation for business competitiveness. ResearchGate. https://www.researchgate.net/publication/323932569_Gestion_del_diseno_e_Innovacion_para_la_competitividad_empresarial

Amini, A., & Mohammadi, M. (2022). Modeling the Dynamics of Knowledge Management in Educational Institutes: A System Dynamics Approach | Education and Self Development. https://eandsdjournal.kpfu.ru/en/journal-article/modeling-the-dynamics-of-knowledge-management-in-educational-institutes-a-system-dynamics-approach/

Andersen, A. (1999). Knowledge Management Assessment Tool. KMAT.

Andreu, J., López, M., Belzebe, & Rossano, E. (2005). The relationship between learning orientation and market orientation. XV Annual Congress of ACEDE.

Arguello, C. (2017). Development of a knowledge management model for SMEs in the textile sector in the city of Riobamba. Industrial Data, 20(2). https://industrial.unmsm.edu.pe/upg/archivos/TESIS2018/DOCTORADO/tesis17.pdf

Aryani, R. & Istaryatiningtias. (2020). Model of Learning Management: Improving the Quality of Education. Talent Development & Excellence, 226-233.

Betz, U. A. K., Arora, L., Assal, R. A., Azevedo, H., Baldwin, J., Becker, M. S., Bostock, S., Cheng, V., Egle, T., Ferrari, N., Schneider-Futschik, E. K., Gerhardy, S., Hammes, A., Harzheim, A., Herget, T., Jauset, C., Kretschmer, S., Lammie, C., Kloss, N., ... Zhao, G. (2023). Game changers in science and technology—Now and beyond. Technological Forecasting and Social Change, 193, 122588. https://doi.org/10.1016/j.techfore.2023.122588

Bikse, V., Grinevica, L., Rivza, B., & Rivza, P. (2022). Consequences and Challenges of the Fourth Industrial Revolution and the Impact on the Development of Employability Skills. Sustainability, 14(12), Article 12. https://doi.org/10.3390/su14126970

Blas, E. Z. R., Contreras, N. R., Blas, R. R., Escobedo, A. R., & Contreras, J. R. (2023). EDUCATIONAL SOFTWARE FOR STRENGTHENING THE LEARNING OF ARITHMETIC OPERATIONS IN BASIC EDUCATION STUDENTS. IPSUMTEC Journal, 6(4), Article 4.

Bojórquez, J., López, L., Hernández, M., & Jiménez, E. (2013). Use of Cronbach's alpha to validate the reliability of a student satisfaction measurement instrument in the use of Minitab software. Eleventh LACCEI Latin American and Caribbean Conference for Engineering and Technology. 11th Latin American and Caribbean Conference for Engineering and Technology, Cancun, Mexico. http://laccei.org/LACCEI2013-Cancun/RefereedPapers/RP065.pdf

Brown, C., White, R., & Kelly, A. (2021). Teachers as educational change agents: What do we currently know? Findings from a systematic review. Emerald Open Research, 1(3). https://doi.org/10.1108/EOR-03-2023-0012

Bygstad, B., Øvrelid, E., Ludvigsen, S., & Dæhlen, M. (2022). From dual digitalization to digital learning space: Exploring the digital transformation of higher education. Computers & Education, 182, 104463. https://doi.org/10.1016/j.compedu.2022.104463

Calisaya-Mamani, J., Yana-Salluca, M., Pineda-Serruto, J., Adco-Valeriano, H., Yana-Salluca, N., Huanca-Arohuanca, J. W., Calisaya-Mamani, J., Yana-Salluca, M., Pineda-Serruto, J., Adco-Valeriano, H., Yana-Salluca, N., & Huanca-Arohuanca, J. W. (2022). Multiple intelligences and basic competencies in university education. Horizontes Journal of Research in Education Sciences, 6(24), 1010-1022. https://doi.org/10.33996/revistahorizontes.v6i24.393

Christer, J.-O., & Acevedo, J. (2015). The development of capacities and the management of knowledge in the potentials of change and university competitiveness. Anagramas Rumbos y Sentidos de la Comunicación, 14(27).

Cochrane, & Ryan, T. (2023). Chatgpt and academic integrity: Options for adapting assessment in semester 1, 2023 A/Prof, Thomas, Cochrane & Dr Tracii, Ryan.

Cooren, F., Mallette, S., Balay, M., Brummans, B. H. J. M., & Germain, O. (2024). Entrepreneuring as communicative practice: Analyzing vectors, tracing trajectories, unfolding relational fields. Scandinavian Journal of Management, 101341. https://doi.org/10.1016/j.scaman.2024.101341

Creswell, J. W., & Creswell, J. D. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). Sage Publications.

Cruz, H. (2021, November 8). The Fourth Industrial Revolution and the Sustainable Development Goals. Accent. https://acento.com.do/opinion/la-cuarta-revolucion-industrial-y-los-objetivos-de-desarrollo-sostenible-9003592.html

Drucker, P. (2014). Innovation and Enterpreneurship: Practice and Principles. Routledge Classics.

Eakin, M. (2016). Tropical Capitalism: The Industrialization of Belo Horizonte, Brazil, 1897-1997. Springer International Publishing. https://books.google.es/books?hl=es&lr=&id=2W4YDAAAQBAJ&oi=fnd&pg=PP1&ots=A3BrGrmzgI&sig=BvM0v-c5onL1c5Wec_Pqw99xMbM#v=onepage&q&f=false

Encyclopedia Britannica. (2024, May 18). Adam Smith—Economics, Wealth, Capitalism | Britannica. https://www.britannica.com/biography/Adam-Smith/Economic-growth

Enríquez, Á. (2019). Knowledge management and university, prospective vision based on its experts. CS Journal, 273-297. https://doi.org/10.18046/recs.i29.2687

Flores - Urbaez, M., & Espósito de Diaz, C. (2014). Basic fundamentals of technology management.

Forrester, J. (2019). Principles of Systems. Pegasus Communications.

Fullan, M. (2011). Change Leader: Learning to Do What Matters Most. John Wiley & Sons.

Galicia Alarcón, L. A., Balderrama Trápaga, J. A., Edel Navarro, R., Galicia Alarcón, L. A., Balderrama Trápaga, J. A., & Edel Navarro, R. (2017). Validity of content by expert judgment: Proposal of a virtual tool. Apertura (Guadalajara, Jal.), 9(2), 42-53. https://doi.org/10.32870/ap.v9n2.993

García, A., & Antonio, A. (2020). Yellow pages model of experts in public institutions based on knowledge management approaches. Federico Villarreal National University. http://repositorio.unfv.edu.pe/handle/UNFV/4152

Garcia, J. S., Cárdenas, L. M., Morcillo, J. D., & Franco, C. J. (2024). Policy Assessment for Energy Transition to Zero- and Low-Emission Technologies in Pickup Trucks: Evidence from Mexico. Energies, 17(10), Article 10. https://doi.org/10.3390/en17102386

García, M., & Gómez, M. (2015). Knowledge management practices in research groups: a case study. Inter-American Journal of Bibliotechnology, 38(1), 13-25.

Gascoigne, N., & Thornton, T. (2014). Tacit Knowledge. Routledge.

Gutierrez, W. (2023). Qualitative Approach in Research: Implications and Perspectives.

REFLECTIONS FOR UNIVERSITY EDUCATION, Santiago de Chile.

Halushka, Z., & Sobolev, V. (2016). Factors of competitiveness of universities under globalization of education. USV Annals of Economics & Public Administration, 16, 106-110.

Hazelkorn, E. (2009). Impact of global rankings on higher education research and the production of knowledge. https://unesdoc.unesco.org/ark:/48223/pf0000181653

Hernández, R., Fernández Collado, C., & Baptista Lucio, P. (2014). Research methodology. McGraw-Hill Education.

Hernández Sampieri, R., Fernández Collado, C., & Baptista Lucio, P. (2014). Research methodology. Case studies. Chapter IV. https://es.slideshare.net/conyas16/sampieri-estudio-de-casos?from_action=save

Hogan, S., & Coote, L. (2014). Organizational culture, innovation, and performance: A test of Schein's model. Journal of Business Research, 67(8), 1609-1621.

Huanca, J. C., Portal Gallardo, J. A., Huanca Guanca, J. C., & Portal Gallardo, J. A. (2023). Quantitative Content Analysis on Knowledge Management in Latin American Higher Education Institutions. Actualidad Investigativas en Educación, 23(1), 312-343. https://doi.org/10.15517/aie.v23i1.51513

Huerta-Riveros, P., Gaete-Feres, H., Yáñez-Alvarado, M., Pedraja-Rejas, L., Leyton-Pavez, C., Huerta-Riveros, P., Gaete-Feres, H., Yáñez-Alvarado, M., Pedraja-Rejas, L., & Leyton-Pavez, C. (2022). Experience in the implementation of a strategic management model in higher education. Journal of Studies and Experiences in Education, 21(46), 261-276. https://doi.org/10.21703/0718-5162.v21.n46.2022.014

Huhtelin, M., & Nenonen, S. (2015). A Co-Creation Centre for university-industry collaboration—A framework for concept development. 21, 137-145.

Hult, G. T. M. (2003). An integration of thoughts on knowledge management. Decision Sciences, 4(2).

Hunt, S., & Lambe, C. (2000). Marketing's contribution to business strategy: Market orientation, relationship marketing and resource-advantage theory. International Journal of Management Reviews, 2(1), 17-43.

Inche Mitma, J. (2007). KNOWLEDGE MANAGEMENT INDICATORS. Science on your PC, 2. https://www.redalyc.org/articulo.oa?id=1813/181320217003

Jansa, S. (2010). Summary of the Oslo Handbook on Innovation. http://portal.uned.es/portal/page?_pageid=93,23280929&_dad=portal

Kumar, M., Mamgain, P., Pasumarti, S. S., & Singh, P. K. (2022). Organizational IT support and knowledge sharing behaviour affecting service innovation performance: Empirical evidence from the hospitality industry. VINE Journal of Information and Knowledge Management Systems, 54(2), 256-279. https://doi.org/10.1108/VJIKMS-07-2021-0124

Lawshe, C. (1975). A Quantitative Approach to Content Validity. Personnel Psychology, 28(4), 563-575.

Mamani Ramos, Á. A., Damian Nuñez, E. F., Inga Arias, M. G., Quisocala Ramos, J. A., Torres Cruz, F., Dextre Mendoza, C. W., Yabar Geldres, I. A., Mamani Cari, Y. A., Botton Estrada, L. M., Quispe Cruz, H., Paucar Pancca, A., Luna Ramos, S. Y., Zavala Bustios, R., & Vivar Cueva, J. A. (2024). Physical Activity Questionnaire for Schoolchildren (CAFE): Reliability and validity of a new proposal according to WHO guidelines. Challenges: New Trends in Physical Education, Sports and Recreation, 51, 626-636.

Martinez, M. (2011). Development of a Knowledge Management Model in the Supply Chain of the Agri-Food Industry [Doctoral Thesis]. Polytechnic University of Madrid.

Martínez, M., Rodriguez, C., Morris, A., & Gil, M. (2011). A Computer Simulation Model of

Knowledge Management in Small and Medium Agri-Food Enterprises. ResearchGate. https://www.researchgate.net/publication/260228082_A_Computer_Simulation_Model_of_Knowledge_Management_in_Small_and_Medium_Agri-Food_Enterprises

Marulanda, E., López, M., & Giraldo, J. (2012). Knowledge Management Models. Ventana Informática, 26.

Massaro, M., Handley, K., Bagnoli, C., & Dumay, J. (2016). Knowledge management in small and medium enterprises: A structured literature review. Journal of Knowledge Management, 20(2), 258-291. https://doi.org/10.1108/JKM-08-2015-0320

Meadows, D. (2020). Thinking in Systems: A Primer. (Chelsea Green Publishing.).

Mena, M., & Isaias, P. (2019). Gathering researchers' requirements to develop a learning technologies dashboard. 59-61.

Milla, L., Martelo, R., & Peña, M. (2018). Knowledge management for the dissemination of intellectual production in university education. Knowledge, Science and Freedom, 13(1), 290-303.

Mirata, V., Hirt, F., Bergamin, P., & van der Westhuizen, C. (2020). Challenges and contexts in establishing adaptive learning in higher education: Findings from a Delphi study. International Journal of Educational Technology in Higher Education, 17(1), 32. https://doi.org/10.1186/s41239-020-00209-y

Montenegro-Rueda, M., & Fernández-Batanero, J. M. (2024). Adaptation and validation of an instrument for assessing the digital competence of special education teachers. European Journal of Special Needs Education, 39(3), 367-382. https://doi.org/10.1080/08856257.2023.2216573

Morgan Rozas, M., & Llinàs, X. (2017). An academic knowledge management model: Multiple case studies in Peruvian Universities. Peruvian University of Applied Sciences (UPC). https://repositorioacademico.upc.edu.pe/handle/10757/622491

Moya, B., Eaton, S., Pethrick, H., Hayden, A., Brennan, R., Wiens, J., & McDermott, B. (2024). Academic Integrity and Artificial Intelligence in Higher Education (HE) Contexts: A Rapid Scoping Review. Canadian Perspectives on Academic Integrity, 7(3), Article 3. https://doi.org/10.55016/ojs/cpai.v7i3.78123

Murray, P. (2002). MANAGEMENT – INFORMATION – KNOWLEDGE. Biblios, 14, 12.

Nguyen, D. P., Phan, L. T., Ho, H. X., & Le, A. N.-H. (2022). Human resource management practices in higher education: A literature review using co-word analysis. International Journal of Management in Education, 16(1), 40-61. https://doi.org/10.1504/IJMIE.2022.119682

Nonaka, I., & Takeuchi, H. (1995). The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press.

OECD, & EUROSTAT. (2006). UNED | Oslo Handbook on Innovation. http://portal.uned.es/portal/page?_pageid=93,23280929&_dad=portal

Ochoa, Parada, & Verdugo. (2012). Knowledge management as a factor of competitiveness in small and medium-sized enterprises. Inceptum, 7(12).

Osorio, C. (2008). Competitiveness and Innovation. pp. 202-221.

Osorio, F., Hernández, M., & Rodriguez, A. (2019). Nonlinear and complementary effects of responsive and proactive market orientation on firms' competitive advantage. Asia Pacific Journal of Marketing and Logistics.

Parakhina, V., Godina, O., Boris, O., & Ushvitsky, L. (2017). Strategic management in universities as a factor of their global competitiveness. International journal of educational management, 31, 62-75. https://doi.org/10.1108/IJEM-03-2016-0053

Pari, M., & Valero, M. (2023). Research, Technological Development and Innovation in the

accreditation model of Peruvian university higher education. https://doi.org/10.53595/eip.007.2023.ch.3

Pereira, Z. (2011). Mixed-method designs in education research: A concrete experience. Revista Electrónica Educare, 15. https://doi.org/10.15359/ree.15-1.2

Pérez, V. A., & Urbáez, M. F. (2016). Theoretical models of knowledge management: Descriptors, conceptualizations and approaches. Entreciencias: Diálogos en la Sociedad del Conocimiento, 4(10), 201-227.

Peris-Ortiz, M., García-Hurtado, D., & Prado Román, A. (2023). Measuring knowledge exploration and exploitation in universities and the relationship with global ranking indicators. European Research on Management and Business Economics, 29(2), 100212. https://doi.org/10.1016/j.iedeen.2022.100212

Prozesky, H., & van Schalkwyk, F. (2024). The profile of postdoctoral research fellows in South Africa: Trends over the past two decades. South African Journal of Science, 120(1-2), 1-8. https://doi.org/10.17159/sajs.2024/15898

Pucciarelli, F., & Kaplan, A. (2016). Competition and strategy in higher education: Managing complexity and uncertainty. Business Horizons, 59(3), 311-320. https://doi.org/10.1016/j.bushor.2016.01.003

Puerta, L., & Marín, E. (2015). Content validity analysis of a university-industry technology transfer instrument in Baja California, Mexico. XX International Congress of Accounting, Administration and Informatics, Mexico City.

Qualitative Research. (2023, March 21). How To Justify Sample Size. https://interq-research.com/how-to-justify-sample-size-in-qualitative-research/

Quezadas, A., Baeza, E., Ovando, J., Gómez, C., & Bracqbien, C. (2023). Education for resilience, an analysis from the perspective of children and teachers. https://www.scielo.org.mx/scielo.php?pid=S2448-878X2023000100155&script=sci_arttext

Rahman, M., & Salim, J. (2014). The Importance of Knowledge Sharing in IT Organizations: An Empirical Study in Malaysia. Procedia Technology, 11, 1146-1153. https://doi.org/10.1016/j.protcy.2013.12.311.

Ricardo, D. (1817). The principles: Political economy. John Murray, Albemarle-Street.

Santos, J. (2024). On the Second Mission of Higher Education Institutions: The Case of'Polytechnics' in Europe. Journal of Higher Education Theory & Practice, 24(1).

Scimago, L. (2020). Ranking of Scimago Institutions. https://www.scimagoir.com/rankings.php?country=Latin%20America&sector=Higher%20educ.

Senge, P. M. (2014). The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization. Crown.

Soto, J. (2023). Understanding International Exchange: A Call for Economic Coherence in Trade Policy in Latin America. Laissez-Faire, (58-59), 48-61.

Sterman, J. (2000). Business Dynamics: Systems Thinking and Modeling for a Complex World. (McGraw-Hill Education.).

Suryani, E., Hendrawan, R. A., Muhandhis, I., Syafa'at, F., Mudjahidin, M., Handayani, F., Az-Zahra, A., Chou, S.-Y., Dewabharata, A., & Karijadi, I. (2024). Modeling of Wind Power Plants and Their Impact on Economic and Environmental Development. Journal of Energy Resources Technology, 146(081301). https://doi.org/10.1115/1.4065425

Tejedor, B., & Aguirre, A. (1998). Logos Project: Research on the learning capacity of Spanish companies. Bulletin of Economic Studies, LIII(164): 231-249. Bulletin of Economic Studies, LIII(164), 231-249.

Tristán, A. (2008). Modification to the lawshe model for the quantitative opinion of the validity of the content of an objective instrument. Advances in measurement 6.

UNCTAD. (2021). Technology and Innovation Report 2021 | UNCTAD. https://unctad.org/page/technology-and-innovation-report-2021

Vasiliev, A. (2020). Entrepreneurial Education Quality Management to Improve University Competitiveness. Journal of Entrepreneurship Education, 1.

Vice-Rectorate. (2020). FEDU - VRI - UNC Projects.

VIR UNC. (2018). Regulations for the financing of the execution of research projects with competitive funds from the mining canon, surcharge and mining royalties. http://investigacion.unc.edu.pe/investigacion/wp-content/uploads/2018/05/REGLAMENTO-COSEMOEV.pdf

VNair, B., & Munusami, C. (2020). Knowledge management practices: An exploratory study at the Malaysian higher education institutions. Journal of Research in Innovative Teaching & Learning, 13(2), 174-190. https://doi.org/10.1108/JRIT-01-2019-0008

Wang, M.-H., & Yang, T.-Y. (2016). Investigating the success of knowledge management: An empirical study of small- and medium-sized enterprises. Asia Pacific Management Review, 21(2), 79-91. https://doi.org/10.1016/j.apmrv.2015.12.003

Wong, K., & Aspinwall, E. (2005). An empirical study of the important factors for knowledge-management adoption in the SME sector. Journal of Knowledge Management, 9(3), 64-82.

Zambrano, C. Y., Campuzano, M. P., & Laz, E. S. A. (2020). Information and knowledge management based on innovative training strategies. ReHuSo: Journal of Humanistic and Social Sciences, 4(1), Article 1. https://doi.org/10.33936/rehuso.v4i1.2245

Zamir, :., & Esmaeili, A. (2024). Methods and Technologies for Supporting Knowledge Sharing within Learning Communities: A Systematic Literature Review. Administrative Sciences, 14(1), 17. https://doi.org/10.3390/admsci14010017.