

KNOWLEDGE MANAGEMENT IN THE COVID-19 ERA: EXPLORATORY FACTOR MODEL

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ABSTRACT

The pandemic impacted knowledge management through anti-COVID-19 policies of social distancing and confinement. The educational systems moved from the face-to-face classroom to the virtual classroom through self-management of content according to technology, devices and platforms. The aim of this paper was to explore the dimensions of knowledge management in the context of the health crisis. A psychometric, exploratory, correlational and cross-sectional work was carried out with a sample of 100 students selected based on their computer skills, informational entrepreneurship and academic innovation at a university in central Mexico. The results indicate the non-rejection of the null hypothesis regarding the differences between the theoretical structure of three dimensions with respect to the observed empirical structure. In relation to anti-pandemic policies, risk prevention and the promotion of self-management of knowledge are recommended as an extensive factor of the proposed model.

Keywords: Agenda, Self-management of Knowledge, COVID-19, Factorial Model.

INTRODUCTION

Starting from the epidemiological traffic light, anti-COVID-19 policies defined the degree of confinement, social distancing and use of anti-pandemic devices such as face masks. The educational repercussions defined the transition from the face-to-face classroom to the virtual classroom (García Lirios et al., 2019). In this sense, the health crisis and shock policies established a knowledge management scenario different from that before the pandemic.

Before the health crisis, knowledge management consisted of the translation of findings and dissemination in the face-to-face classroom (Sánchez-Sánchez et al., 2022). The didactic sequences included knowledge management as a transfer rather than as a production of content. The in-person classroom highlighted traditional leadership of one-way teaching and learning. In this way, the COVID-19 crisis disrupts the established structure and chain of knowledge to move it towards a self-management scenario (Anguiano-Salazar et al., 2018).

If in the face-to-face classroom the learners are reproducers of knowledge, then in the virtual classroom the self-production and management of content meant a degree of learning focused on the student's skills (García Lirios et al., 2019). In the virtual classroom, unlike the face-to-face classroom, the relationship between teachers and students was asynchronous and multi-directional. In other words, traditional management only consisted of search, translation and playback. In contrast, virtual self-management consisted of the production, dissemination and empowerment of content (Aguayo et al., 2021).

The transition to the virtual classroom from the face-to-face classroom involves a process of creation, management and transfer of knowledge where entrepreneurship and innovation are central axes in the face of the health crisis. In the face-to-face classroom in the face of a risk event such as the pandemic, opportunism emerges as a central topic on the agenda, but in the virtual classroom, entrepreneurship and innovation prevail as damage control and risk prevention (Lirios et al., 2022).

As the pandemic intensifies, knowledge management becomes personalized and prevails over the production and transfer of knowledge. Through the entrepreneurship of content for self-consumption and the innovation of content for individual satisfaction, knowledge self-reproduces. This is the case of immersive learning such as augmented reality, gamification and interactivity (Bustos-Aguayo et al., 2022).

Augmented reality allows you to visualize scenarios of risks, threats and contingencies where the learning theme stands out. Gamification is a synthetic mode of learning in the face of decisions to maximize profits and reduce bias. Both educational tools allow learning content in exceptional situations. More reliable is the interactivity that allows the simulation of a topic in the event of uncertainty (Guillén et al., 2015).

In this way, immersive learning reduces traditional management and increases entrepreneurship and innovation. Knowledge self-management in the COVID-19 era was consolidated via technology, immersive devices and software (Lirios et al., 2017).

However, the structure of knowledge self-management assumes immersive learning in the making. Although the pandemic has continued, self-management and immersive learning have not been consolidated in the virtual classroom. Rather, the in-person classroom was extended to the virtual classroom. That is, teachers and students use virtual platforms as a content projector, they review the content in a traditional way and the exams are administered as in the face-to-face classroom through the supervision of the teacher (Espinoza et al., 2022).

The paradigms of immersive learning, namely: digital culture, information economy and competency-based education, suggest that immersive learning can replace face-to-face learning as long as stakeholders reach a cycle of university governance. This is the case of knowledge management as a cultural habitus where the emancipation of the learner consists of the self-management of their skills and knowledge (Garcia-Lirios et al., 2018).

Within the framework of the information economy, immersive learning is part of the formation of intellectual capital in specialized and updated software for data processing. In this process, computational skills are competitive advantages in the professional and work field. In this way, the Internet habitus is transformed into computational skills in order to be competitive in a data processing market (Campas et al., 2020).

Knowledge management, according to the three paradigms of immersive learning, consists of the formation of intellectual capital through technologies, devices and information networks. The process begins with the information habitus or need for access to data, and continues with computer skills as essential requirements for entry into the labor market and the subsequent professional development. In other words, the formation of intellectual capital is aimed at converting it into an intangible asset in the classroom, profession and work.

Therefore, the objective of the present work was to explore the dimensions of knowledge management in the COVID-19 era, comparing the theoretical structure reported in the literature from 2019 to 2023 with respect to the observations in the present work (Campas et al., 2022).

Are there significant differences between the theoretical structure reported in the reviewed knowledge management literature with respect to the empirical structure observable in immersive learning or in the extension of traditional learning?

The premises that guide this work suggest that anti-COVID-19 policies diversified the risks more than mitigated them. Consequently, immersive learning should have exacerbated the virtual classroom, but incompetence forced the importation of traditional teaching and learning resources such as PowerPoint presentations. In this scenario of risk of contagion, illness and death from COVID-19, anxiety in teachers and students limits immersive learning and amplifies traditional learning. Therefore, significant differences are expected between the structure reported in the literature with respect to the observations of the present study.

METHOD

A documentary, cross-sectional, exploratory and psychometric study was carried out with a sample of 100 students ($M = 21.3$ $SD = 3.2$ age and $M = 9'987.00$ $SD = 765.34$ pesos of monthly income), considering the participation of the students in technologies, platforms and virtual software (Lilies, 2022).

Carreon's Knowledge Management Scale (2020) was used. It includes three dimensions of immersive learning: augmented reality ("*COVID-19 will intensify the use of augmented reality for banknote verification*"), gamification ("*COVID-19 will increase learning content through emoticons*"), interactivity ("*COVID-19 will enhance collaborative learning on the wiki. All items include five response options ranging from 0 = 'not at all likely' to 5 = 'fairly likely.'*" The reliability reported in the literature ranges between 0.764 and 0.785, although in the present work the general scale reached an alpha value of 0.774 and the augmented reality, gamification and interactivity learning subscales obtained values of 0.754; 0.769 and 0.770 respectively. Validity was reported with factor weights ranging from 0.354 to 0.657, but in the present study the values range between 0.446 to 0.948 (Hycinth et al., 2022).

The standards of the American Psychological Association (APA) were followed in its sections on studies with people. Respondents were contacted by institutional email. The invitation letter and confidentiality contract were sent. Respondents were emphasized that their answers did not correspond to any remuneration and that the results would not affect their academic status. The homogenization of the concepts was established through focus groups and the Delphi technique (Sanchez-Sanchez et al., 2017).

The data were captured in Excel and processed in JASP version 16. They were estimated. The coefficients of reliability, adequacy, sphericity, validity, adjustment and residual were estimated in order to be able to contrast the hypothesis of significant differences between the theoretical structure with respect to the empirical observations of knowledge management. Values close to unity were assumed as evidence of linearity, co-linearity and multicollinearity. Values close to zero as evidence of spurious relationship.

RESULTS

Figure 1 shows the eigenvalues essential for the analysis of the relationships between factors and indicators. A maximum of two eigenvalues are appreciated to establish the equation

that explains the dimensions of knowledge management. The 24 observations or indicators are concentrated around two factors. The result contrasts with the structure reported in the literature where three dimensions related to augmented reality, gamification and interactivity are proposed. From the paradigm of digital culture, knowledge management is an immersive learning of skills and knowledge aimed at the representation of processes and products. Consequently, the computational competencies approach warns that such representation of information is a requirement for its processing into data. Once the culture of information processing is achieved, the information market can be reproduced in the classroom through the dimensions of immersive learning in order to complete the cycle of academic, professional and work training.

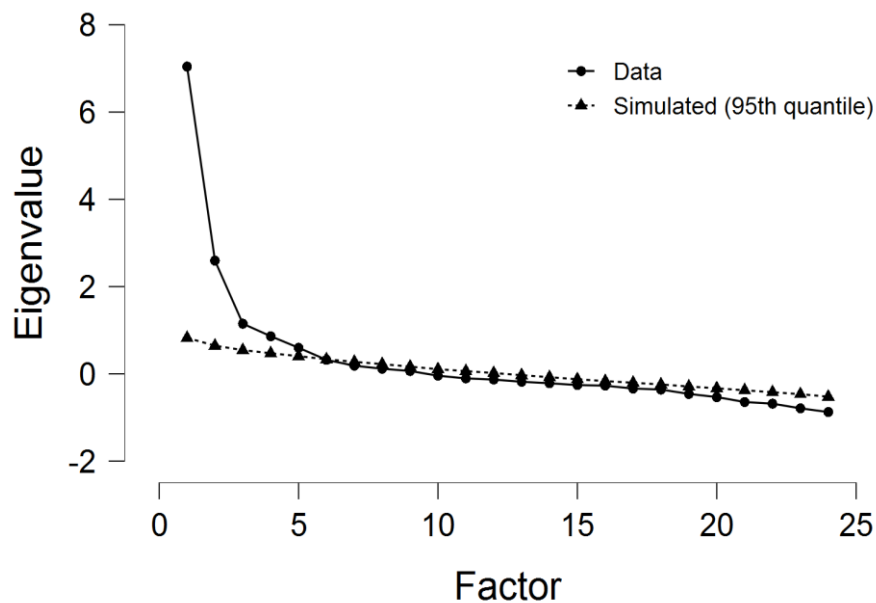


FIGURE 1
VALUES OF KNOWLEDGE MANAGEMENT IN THE COVID-19 ERA

Source: Prepared with study data. Adequacy: KMO (0.522 to 0.947). Sphericity [$\chi^2 = 2939.802$ (276) $p < 0.001$]

Figure 2 shows the positive (green lines) and negative (red lines), as well as significant (thick lines) and spurious (thin lines) relationships. The prevalence of the first factor is appreciated, but since it is not associated with the other two factors, it is considered a dual structure. Knowledge management in the COVID-19 era includes learning through augmented reality, although it is not linked to learning through gamification and interactivity. Such a finding explains why augmented reality is more used in risk exposure in order to promote a digital culture of deterrence of risky behaviors such as the reuse of face masks. In the case of gamification and interactivity, it is more used in the dissemination of preventive strategies such as isolation or distancing of people (Rincón et al., 2022).

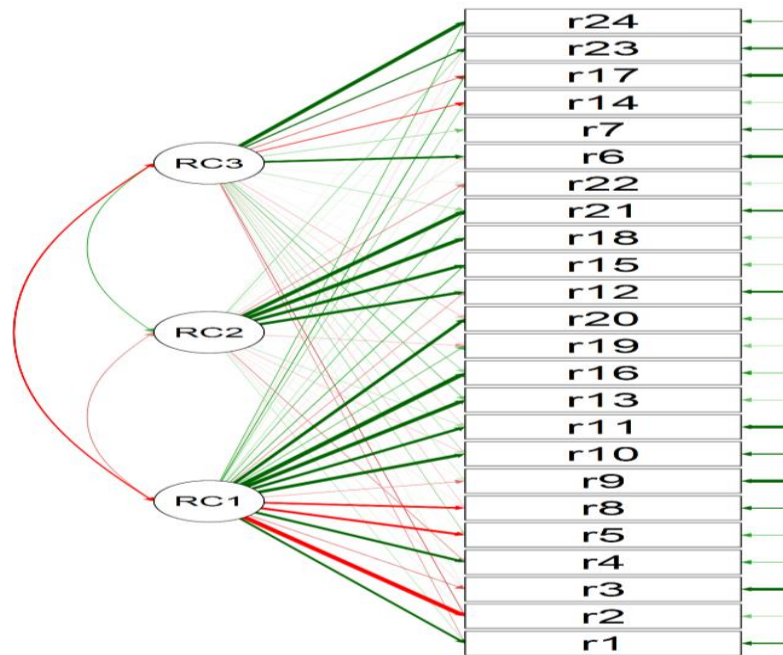


FIGURE 2
EXPLORATORY FACTOR MODEL OF KNOWLEDGE MANAGEMENT IN THE COVID-19 ERA

Source: Prepared with study data. Fit [$\chi^2 = 825.913$ (207) $p > 0.001$; $RMSEA = 0.135$; $TLI = 0.683$; $BIC = -247.876$].

The adjustment and residual values indicate the non-rejection of the null hypothesis related to the significant differences between the theoretical structure with respect to the observed structure. In other words, the knowledge management dimensions reported in the literature were observed in the present study as an exploratory three-factor model where augmented reality learning prevails, but dissociated from gamified and interactive learning. From the computational skills approach, augmented reality reveals representations of objects and relationship skills between spaces. Therefore, the literature published from 2019 to 2023 and the observations of the present study seem to reflect the impact of anti-COVID-19 policies consisting of distancing and confinement strategies. That is, the sample surveyed reflects the representations and skills that are required for the prevention of COVID-19 and that can be learned through augmented reality.

DISCUSSION

The contribution of this work to the state of knowledge lies in the exploration of the dimensions of knowledge management in the context of the pandemic and with a sample of students from a public university in central Mexico. The results show a three-factor structure where learning through augmented reality prevails, but unrelated to learning through gamification and interactivity. In this sense, the findings contravene the reported structure where

the perceptions of benefits, risks and intentions allude to knowledge management oriented by the exceptional situation.

Knowledge management is an undertaking oriented towards knowledge innovation, both observable in the habitus or community responses towards contingencies for local development. If habitus is an entrepreneurial and innovative factor that emerges in the face of risk events, threats or contingencies, then knowledge management and immersive learning are indicators of habitus that communities or localities develop in the face of crises such as the pandemic. Knowledge management guides entrepreneurship and innovation through learning capabilities, capitals and representations associated with habitus. The factors that determine a collective response to the pandemic and influence knowledge management explain a process of civil influence known as Bottom up. In contrast, the impact of anti-COVID-19 policies consisting of distancing and confinement explain a process known as Top Down.

Both perspectives, Bottom Up and Top Down, are essential to explain the effect of anti-COVID-19 policies on knowledge management. Consequently, lines of research related to habitus will clarify the relationship between the two approaches. The observation of the theoretical dimensions for the empirical contrast will allow us to anticipate learning scenarios in the face of health crises.

However, the results of this study indicate that augmented reality prevails over gamification and interactivity. This is because gamification involves representations and skills that refer to identification in spaces. If the anti-COVID-19 strategies were distancing and confinement, then it is possible that not only the curriculum topics were disseminated in the virtual classroom. Furthermore, learning about spaces and objects complements deterrent strategies for exposure and risk behaviors such as contagion, illness, and death from COVID-19. In other words, the formation of human capital in the pandemic reproduced educational content and anti-COVID-19 policies that guided immersive risk prevention learning.

If gamification and interactivity were hegemonic in the structure of immersive learning and knowledge management, then it could be deduced that anti-pandemic policies and strategies would have been reduced to preventive messages, but it is in the prevalence of augmented reality where the surveyed sample seems to reflect a risk aversion. In this way, future research on the impact of containment and mitigation policies in the virtual classroom will allow us to notice the immersive learning that would guide risk communication. The prevention of COVID-19 can be spread through the diffusion of symptoms on objects where its magnitude and growth can be appreciated.

However, immersive learning offers increasing alternatives for knowledge management. Augmented reality will soon be replaced by another style or mode of learning. In the face of a risk event such as the pandemic, immersive learning can be a prevention instrument, but its effects on the formation of intellectual capital are unknown. It is possible that any mode or method of immersive learning is only a complement to other learning such as collaborative learning or critical thinking. Therefore, models explaining the impact of a containment strategy will need to be comprehensive.

CONCLUSION

The objective of the study was to explore the dimensions of knowledge management through immersive learning as a reflection of the impact of anti-COVID-19 policies in the virtual

classroom. The results corroborate the three-factor structure of learning through augmented reality, gamification and interactivity. In relation to the state of the art where community habitus stands out as responses to contingencies or risks, the extension of the model is recommended in order to predict hybrid learning of entrepreneurship and innovation through immersive technology.

Knowledge management as risk prevention involves the development of skills such as opportunism, optimization or innovation, but its translation into immersive learning is preferably guided by augmented reality. In this sense, confinement and distancing strategies were adopted because they allude to spaces and risks of contagion that were soon assimilated by users. On the other hand, strategies for using anti-COVID-19 devices such as face masks, gloves, odometer, thermo meter or alcohol gel were not fully adopted due to their cost. In this sense, immersive learning of risk prevention through augmented reality opens the discussion on the magnitude and avoidance of infections, diseases and deaths.

However, greater dissemination of risk prevention learning through augmented reality means a reduction in opportunism, optimization and innovation skills. In fact, if augmented reality precedes exposure and risk behaviors, then immersive learning and knowledge management would not be aimed at preventing infections, diseases and deaths from COVID-19.

Because immersive learning coexists with other learning such as collaborative work and critical thinking, knowledge management in the COVID-19 era would be carried out through gamification, interactivity and augmented reality as long as they are perceived as useful and easy to use.

In the case of risk prevention in the face of the pandemic, knowledge management finds in immersive learning and augmented reality instruments for translating skills and knowledge. The formative structure of intellectual capital, when impacted by confinement and distancing strategies, revealed the inclusion of other learning styles collateral to the immersive teaching of content in the virtual classroom.

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Received: 18-Aug-2023, Manuscript No. JMIDS-23-13877; **Editor assigned:** 21-Aug-2023, Pre QC No. JMIDS-23-13877(PQ); **Reviewed:** 22-Sep-2023, QC No. JMIDS-23-13877; **Published:** 29-Sep-2023