



TESIS DOCTORAL

*Relación entre la coordinación relacional y
la satisfacción en educación superior.
Análisis comparado.*

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Resumen

Antecedentes

Como clave para la creación de valor, la educación superior se considera fundamental en la sociedad actual. En instituciones de educación superior se desarrollan los más altos niveles de enseñanza y de creación del conocimiento. Los responsables políticos han mostrado un interés creciente en las últimas décadas por la innovación procedente de estas instituciones, creándose un ecosistema formado por empresa-gobierno-universidad. Por otra parte, la educación superior es un servicio impartido por instituciones tanto públicas como privadas. Como organizaciones, estos centros operan en el mercado educativo aplicando estrategias que permitan obtener ventajas competitivas, además de buscar la mejora de la calidad del servicio que ofrecen.

En lo que respecta a la mejora de los resultados, el aprendizaje organizativo se presenta como un elemento esencial. El modelo de coordinación relacional (en adelante CR) permite la mejora de los resultados de la organización desde dos dimensiones principales: comunicación y relación entre los sujetos que componen la institución. El modelo se basa en incentivar lazos relacionales, basados en compartir objetivos, fomentar el respeto mutuo y compartir información, donde la comunicación debe ser precisa, oportuna y orientada a la resolución de problemas. Estudios previos han analizado el impacto del modelo de CR en distintos sectores —como el bancario, textil, aerolíneas o el sanitario, entre otros— y han confirmado que mayores niveles de CR se asociaron a la mejora de los resultados organizativos.

En esta tesis doctoral se ha estudiado el modelo de CR en relación con la mejora de la calidad en la educación superior. Sin embargo, la calidad es un concepto subjetivo y ampliamente analizado desde múltiples perspectivas. Puede observarse desde cada una de las ópticas de los distintos agentes que intervienen en la educación superior, atendiendo a múltiples resultados de diferente índole y aplicándose a distintos niveles de funcionamiento. Sin embargo, para el desarrollo de este estudio, se consideró la calidad de la universidad desde la perspectiva de la satisfacción del estudiante, entendido como cliente del servicio de educación superior, respecto a los elementos que componen el ecosistema universitario.

La literatura científica previa relativa al modelo de CR en la educación superior es escasa, centrándose exclusivamente en la mejora de la calidad de la educación en línea y la aplicación de las nuevas tecnologías en la docencia universitaria. Además, estos trabajos estudiaron los procesos relacionales principalmente entre estudiante-profesor, sin considerar el resto de perfiles que interactúan en la institución. En esta investigación se estudió el modelo de CR para la mejora de la calidad universitaria de una forma más amplia, estudiando distintos entornos y considerando la totalidad de perfiles, con la intención de lograr los objetivos que se presentan a continuación.

Objetivos

La finalidad de esta tesis es estudiar el efecto que las dimensiones de la CR tienen sobre la calidad de las instituciones universitarias y verificar si mayores niveles de CR se asocian a mayores niveles de satisfacción del estudiante. Para ello, la investigación se abordó considerando tres entornos diferentes, cuya visión en conjunto permita obtener una perspectiva global de la CR en la educación universitaria. Cada artículo de investigación se ha asociado a un objetivo concreto, siendo estos los siguientes:

- El primer objetivo fue determinar si existen diferencias organizativas y de satisfacción entre universidades de distintos contextos socioeconómicos. Es importante conocer si el modelo de CR puede verse afectado por factores socioeconómicos a la hora de observar mejoras en la calidad en diferentes estructuras organizativas, diferenciadas por contexto cultural y nivel económico, como son los contextos de Finlandia, España y Ecuador. Se buscó determinar si las universidades ubicadas en países más desarrollados presentaron un mayor nivel de CR, si los alumnos más satisfechos presentaron un mayor nivel de CR y si la metodología utilizada permite construir un modelo organizativo que diferencie a las tres instituciones para proponer medidas concretas que mejoren la calidad.
- El segundo objetivo de esta tesis fue determinar si existen diferencias organizativas y de satisfacción entre distintos estilos educativos —presencial tradicional y presencial intensivo—. Para implementar estrategias organizativas que doten de competitividad a las universidades, existe una responsabilidad social de estas instituciones de ofrecer estilos de formación de calidad adecuados a cada perfil de estudiante y de promover métodos educativos más eficientes e

innovadores. Así, este trabajo se orientó a determinar si una mayor asistencia presencial se asoció a una mayor coordinación, si una mayor satisfacción de los estudiantes se asoció con una mayor coordinación y si es posible construir un modelo organizativo a través de variables CR para el diseño de nuevos estilos educativos combinados.

- El tercer objetivo de esta investigación se asocia a la aparición de la crisis sanitaria provocada por el COVID-19 durante el desarrollo de la tesis. La pandemia supuso un cambio de paradigma en los sistemas educativos ya que, durante el confinamiento, la educación universitaria fue impartida digitalmente de forma sobrevenida. Esto provocó un cambio en la comunicación dentro del ecosistema educativo. Este trabajo buscó determinar si existieron diferencias organizativas y de satisfacción en la educación superior pre y durante la pandemia. Se consideró relevante profundizar en cambios organizativos que se experimentaron en la educación superior a raíz de la pandemia, comprobar si existieron diferencias entre la satisfacción del aprendizaje presencial y en el en línea en dicho periodo, así como estudiar la posibilidad de extender las mejores prácticas organizativas del modelo a otras universidades.
- Por último, y como aspecto transversal a los trabajos realizados, comprobar si la CR es un elemento fundamental para la satisfacción en la educación superior fue el cuarto objetivo de esta investigación. Si bien es cierto que el modelo de CR se asocia a mejoras en los resultados organizativos en distintos sectores, con esta investigación se pretende comprobar si del mismo modo la calidad de la universidad puede mejorar con la aplicación de medidas organizativas basadas en el modelo.

Metodología

Para la consecución de los objetivos de la investigación se realizaron comparativas entre: i) los modelos organizativos de tres contextos socioeconómicos; ii) los modelos de dos estilos educativos —tradicional e intensivo—; iii) los modelos organizativos del aprendizaje prepandemia y durante pandemia, respectivamente. La recogida de datos se llevó a cabo mediante un cuestionario entregado a los alumnos de las distintas universidades analizadas. Para la construcción de cada modelo organizativo se utilizaron

técnicas estadísticas de análisis multivariante, de las cuales el análisis discriminante constituyó el punto central en los dos primeros trabajos. El análisis de componentes principales combinado con análisis de conglomerados configuró la metodología del tercero. Además, se desarrolló una variable sintética en cada trabajo, a partir de la satisfacción del estudiante, para determinar los dos niveles de calidad —alta y baja— de cada muestra.

Resultados

Los resultados obtenidos se presentan a través de un compendio de tres artículos publicados en revista científica de impacto:

- En el primer artículo de investigación se estudiaron universidades de tres países distintos —Finlandia, España y Ecuador—. Según los resultados de esta investigación, el contexto de cada universidad no afecta a la eficacia del modelo, al observarse que una mejora en las prácticas organizativas condujo a una mejora en los resultados en las tres universidades. De este modo se puede afirmar que un mayor nivel de CR conduce a una mejora en los resultados independientemente del contexto socioeconómico. En cuanto a la satisfacción de los alumnos, mayores niveles de CR se asociaron a una mayor satisfacción de los estudiantes en las tres universidades. Las prácticas organizativas basadas en la comunicación precisa y orientada a la resolución de problemas, el respeto mutuo y el conocimiento y los objetivos compartidos explicaron estos mayores niveles de satisfacción. Por último, se mostró que la metodología utilizada puede ser de utilidad para construir modelos organizativos más apreciados.
- En el segundo trabajo de investigación se estudian las diferencias organizativas entre el estilo de enseñanza presencial en sus formas tradicional e intensiva. En la educación presencial tradicional el alumno asiste a clase durante los cinco días lectivos de la semana en un horario extendido, mientras que la educación intensiva concentra las horas de enseñanza en períodos de tiempo comprimidos, generalmente en fines de semana. La comparación de estos estilos educativos puede contribuir a mejorar el rendimiento y la satisfacción de la modalidad educativa presencial y suponer un primer paso en la construcción de sistemas educativos híbridos eficientes. Así, se realizó una comparativa entre ambos estilos educativos para conocer si una mayor presencialidad del alumno se asocia a

mayores niveles de coordinación y satisfacción. Sin embargo, los estudiantes del estilo intensivo mostraron mayores niveles en ambos factores. En lo relativo a la coordinación, la resolución de problemas relacionada con los representantes de estudiantes fue estratégica en el estilo intensivo, donde los estudiantes asisten a la universidad en un horario reducido y tratan de optimizar su tiempo presencial. Por su parte, la alta satisfacción de estilo educativo se asocia al respeto mutuo profesor-alumno.

- El tercer trabajo de investigación se centra en conocer cómo el cambio en el estilo educativo provocado por la pandemia de COVID-19 afecta a la estructura organizativa de la universidad y la satisfacción de los estudiantes. Igualmente, se consideró relevante profundizar en el conocimiento del aprendizaje en línea que se adoptó en el confinamiento, para comprobar si puede mejorar los resultados de las universidades y ser extendido a otras universidades para mejorar la estructura organizativa en futuros sistemas educativos. Los resultados de esta investigación confirman que existen diferencias organizativas entre el aprendizaje presencial pre-pandemia y el en línea durante pandemia. La comunicación para la resolución de problemas es el elemento que explica tales diferencias. En cuanto a la satisfacción de los estudiantes, los resultados mostraron un hallazgo relevante, pues ésta no mostró diferencias entre los períodos pre y durante pandemia. Esto podría deberse a que los profesores contribuyeron a reducir la asimetría de la información. Se observó que la comunicación entre administrativos y estudiantes es un elemento de satisfacción en los sistemas educativos con asistencia reducida. Además, en cuanto al planteamiento de extensión de las mejoras prácticas organizativas del modelo a otras universidades, según los resultados de este estudio, el modelo en línea no contribuyó a mejorar la satisfacción de los estudiantes, sino a mantenerla en una situación de emergencia. Por lo tanto, se debe proponer una estrategia diferente para mejorar la satisfacción de los estudiantes.
- Por último, como punto común en los tres artículos mencionados, se pretende demostrar que el modelo de CR es una herramienta válida para el diseño de estrategias organizativas basadas en la satisfacción en las instituciones universitarias y aplicable a cualquier entorno y estilo de enseñanza. Los resultados

muestran que un mayor nivel de CR se asocia a mayor satisfacción de los estudiantes en los dos primeros trabajos. En el tercero, las variables organizativas de CR contribuyeron a mantener la satisfacción en un entorno de emergencia. Así, se puede afirmar que la metodología utilizada puede ser reproducible en diferentes contextos para ofrecer medidas concretas orientadas a la mejora de la calidad universitaria de forma global. Estos resultados pueden ser de utilidad para los órganos de gestión de las universidades en la determinación de medidas organizativas que sirvan para obtener mejores resultados.

Además, los resultados de esta tesis doctoral se han presentado en diferentes congresos nacionales e internacionales, tanto de ámbito organizativo como de innovación educativa, tales como INTED2019¹, EDULEARN2019², INTED2020³ y ACEDE2022⁴, con el principal objetivo de presentar los avances de la investigación y obtener retroalimentación de otros investigadores.

Conclusiones

Los resultados de esta tesis ofrecen distintas conclusiones, tanto académicas como para la práctica organizativa. En cuanto a las primeras, se puede afirmar que los resultados de esta tesis confirman la bibliografía previa, asociando un mayor nivel de CR a mejoras en los resultados de la universidad, en términos de satisfacción del estudiante en este caso, además de añadir un enfoque global al estudio del modelo organizativo aplicado en la educación superior. Además, en esta investigación se ha llevado a cabo la identificación de prácticas organizativas para la mejora de cada entorno estudiado.

En el desarrollo de esta tesis ha sido posible observar que el nivel socioeconómico del territorio no determina necesariamente la mejora de la calidad universitaria basada en la CR. De este modo, es posible inferir que aquellas universidades que implementen un programa de buenas prácticas de CR lograrán mayores niveles de calidad en términos de satisfacción del alumnado, independientemente del contexto y los medios económicos.

Por otra parte, se concluyó que la CR puede ser de utilidad para mejorar la educación presencial. Se estudiaron dos formas de impartir la educación presencial —

¹ INTED2019, the 13th International Technology, Education and Development Conference.

² EDULEARN19, the 11th International Conference on Education and New Learning Technologies.

³ INTED2020, the 14th International Technology, Education and Development Conference.

⁴ ACEDE (Asociación Científica de Economía y Dirección de la Empresa) 2022, XXXI Congreso internacional.

estilo tradicional e intensivo—dentro de un mismo centro, contribuyendo a la escasa literatura científica sobre casos de estas características. Los hallazgos de esta investigación pueden ser útiles para determinar la duración adecuada de la educación presencial que mejore la satisfacción del estudiante.

Asimismo, se ha mostrado que la aplicación de medidas basadas en la CR permite mantener la calidad educativa en situaciones de emergencia, como la provocada por el COVID-19. La organización de la universidad sufrió un brusco cambio, implementando la educación en línea de forma drástica. Sin embargo, el nivel de satisfacción de los estudiantes no se vio modificado. El papel de los profesores explicó este hecho, ya que asumieron funciones administrativas fuera de su competencia, compensando la falta de comunicación entre los estudiantes y el personal de administración. A partir de estos hallazgos, podría estudiarse la forma de optimizar la actividad del docente universitario, como perfil clave en el proceso educativo. Además, dado que el aprendizaje en línea no se ha asociado con una mejora en la satisfacción, este estudio podría aportar una base para construcción de un tercer modelo educativo que combine las mejores prácticas del aprendizaje en línea y presencial en un sistema híbrido.

Por último, en el desarrollo de las tres investigaciones citadas ha quedado constancia de que, efectivamente, el modelo de CR puede aplicarse a la educación superior para la mejora de la calidad en términos de satisfacción. Este modelo puede ser de utilidad para lograr excelentes resultados en la educación superior, donde se observan altos niveles de interdependencia de tareas.

En lo relativo a las conclusiones sobre la práctica organizativa, se verificó que el análisis discriminante es útil para diseñar estrategias para la mejora de la calidad de la universidad. Esta metodología, junto con aquella relativa al desarrollo de una métrica de calidad ad hoc, es reproducible para estudios futuros. Por último, se puede afirmar que el modelo de CR es una herramienta útil para construir modelos organizativos en los tres entornos estudiados. Este aspecto puede ser de utilidad para diseñar medidas organizativas susceptibles de aplicación en cualquier institución universitaria. Además, permite considerar al modelo de CR como una herramienta fácil de implementar, asequible y eficiente para el establecimiento de estrategias competitivas.

Abstract

Background

As a key to value creation, higher education is considered a fundamental element in the current society. In institutions of higher education, the highest levels of teaching and creation of knowledge are developed. In recent decades, policy makers have shown a growing interest for innovation from these institutions, creating an ecosystem made up of company-government-university. On the other hand, higher education is a service provided by both public and private institutions. As organizations, these institutions operate in the educational industry by applying strategies that allow them to obtain competitive advantages, in addition to seeking to improve the quality of the service they offer.

Regarding the improvement of results, organizational learning is presented as an essential element. The relational coordination model (RC) allows the improvement of the results of the organization from two main dimensions: communication and relationship between the stakeholders that make up the institution. The model is based on relational processes where communication is accurate, timely and problem-solving oriented. Along with shared goals and knowledge, and mutual respect, these elements foster communication ties that allow information to be processed as it becomes available. Previous studies have worked on the RC model in different sectors —such as banking, textiles, airlines or healthcare, among others— and confirmed that higher levels of RC were associated with improved organizational results.

In this doctoral thesis, the RC model for quality improvement in higher education was studied. However, quality is a subjective concept and widely studied from multiple perspectives. It can be observed from each of the perspectives of the different agents involved in higher education, attending to multiple results of different kinds and applying to different levels of operation. However, for the development of this study, the quality of the university was considered from the perspective of student satisfaction, understood as a client of the higher education service, regarding the elements that make up the university ecosystem.

Previous scientific literature on the RC model in higher education is scarce, focusing exclusively on improving the quality of online education and the application of

new technologies in university teaching. In addition, these works studied the relational processes mainly between student-teacher, without considering the rest of the profiles that interact in the institution. In this research, the RC model for improving university quality was studied in a broader way, studying different environments and considering all profiles, with the intention of achieving the objectives presented below.

Objectives

The purpose of this thesis was to study the effect that RC dimensions play on the quality of university institutions and to verify if higher levels of RC are associated to higher levels of student satisfaction. For this, the research was approached by studying three different environments, whose joint vision would allow obtaining a global perspective of RC in university education. Each research article was associated with a specific objective, these being the following:

- The first objective was to determine if there are organizational and satisfaction differences between RC from different socioeconomic contexts. It is important to know if the RC model can be affected by socioeconomic factors when observing improvements in quality in different organizational structures, differentiated by cultural context and economic level, such as the contexts of Finland, Spain and Ecuador. We sought to determine if the universities located in more developed countries presented a higher level of RC, if the most satisfied students presented a higher level of RC and if the methodology used allows the construction of an organizational model that differentiates the three institutions to propose concrete measures that improve quality.
- The second objective of this thesis was to determine if there are organizational and satisfaction differences between different educational styles —traditional face-to-face and intensive face-to-face—. To implement organizational strategies that provide universities with competitiveness, there is a social responsibility of these institutions to offer quality training styles appropriate to each student profile and to promote more efficient and innovative educational methods. Therefore, this work was aimed at determining whether greater face-to-face attendance was associated to greater coordination, if greater student satisfaction was associated to greater coordination, and whether it is possible to build an organizational model through RC variables for the design of new combined educational styles.

- The third objective of this research is associated with the appearance of the health crisis caused by COVID-19 during the development of this thesis. The pandemic meant a paradigm shift in educational systems since, during confinement, university education was delivered digitally in an unexpected way. This caused a change in communication within the educational ecosystem. This work sought to determine if there were organizational and satisfaction differences in higher education before and during the pandemic. It was considered relevant to delve into the organizational changes that were experienced in higher education as a result of the pandemic, to verify if there were differences between the satisfaction of face-to-face and online learning in said period, as well as to study the possibility of extending the best organizational practices. of the model to other universities.
- Finally, and as a transversal aspect of the work carried out, verifying whether RC is a fundamental element for satisfaction in higher education was the fourth objective of this research. Although it is true that the RC model is associated with improvements in organizational results in different sectors, this research aims to verify whether the quality of the university can improve with the application of organizational measures based on the model.

Methodology

In order to achieve the objectives of the research, comparisons were made between: i) the organizational models of three socioeconomic contexts; ii) the models of two educational styles —traditional and intensive—; iii) the organizational models of learning before the pandemic and during the pandemic, respectively. The data collection was carried out through a RC survey given to the students of the different universities studied. For the construction of each organizational model, statistical techniques of multivariate analysis were used, of which the discriminant analysis was the central point in the first two works. Principal component analysis combined with cluster analysis configured the methodology of the third party. In addition, a synthetic variable was developed in each work, based on student satisfaction, to determine the two levels of quality —high and low— of each sample.

Results

The results obtained are presented through a compendium of three articles published in an impact scientific journal:

- In the first research article, universities from three different countries were studied—Finland, Spain, and Ecuador—. According to the results of this research, the context of each university did not affect the effectiveness of the model, as it was observed that an improvement in organizational practices led to an improvement in the results in the three universities. In this way, it was possible to affirm that a higher level of RC led to an improvement in the results regardless of the socioeconomic context. Regarding student satisfaction, higher levels of RC were associated with higher student satisfaction in the three universities. Organizational practices based on accurate and problem-solving communication, mutual respect, and shared knowledge and goals explained these higher levels of satisfaction. Finally, it was shown that the methodology used can be useful for building organizational models.
- In the second research work, the organizational differences between the face-to-face teaching style in its traditional and intensive forms were studied. In traditional face-to-face education, the student attends class during the five school days of the week in an extended schedule, while intensive education concentrates teaching hours in compressed periods of time, generally on weekends. The comparison of these educational styles can contribute to improving the performance and satisfaction of the face-to-face educational modality and suppose a first step in the construction of efficient hybrid educational systems. Thus, a comparison was made between both educational styles to find out if a greater presence of the student was associated with higher levels of coordination and satisfaction. However, students in the intensive style showed higher values in both factors. Regarding coordination, on the one hand, problem solving related to student representatives was strategic in the intensive style, where students attend the university on a reduced schedule and try to optimize their face-to-face available time. On the other hand, high satisfaction with the educational style was associated to mutual teacher-student respect.

- The third research work focused on knowing how the change in education caused by the COVID-19 pandemic affected the organizational structure of the university and student satisfaction. Likewise, it was considered relevant to deepen the knowledge of online learning that was adopted in confinement, to check if it can improve the results of universities and be extended to other universities to improve the organizational structure in future educational systems. The results of this research confirmed that there were organizational differences between pre-pandemic face-to-face learning and online learning during the pandemic. Problem solving communication was the element that explained such differences. Regarding student satisfaction, the results showed a relevant finding, since it did not show differences between the periods before and during the pandemic. This could be because teachers contributed to reducing information asymmetry. It was observed that communication between administrators and students is an element of satisfaction in educational systems with reduced attendance. In addition, regarding the approach of extending the best organizational practices of the model to other universities, according to the results of this study, the online model did not contribute to improving student satisfaction, but rather to maintaining it in an emergency situation. Therefore, a different strategy should be proposed to improve student satisfaction.
- Finally, as a common point in the three articles mentioned, it is intended to demonstrate that the RC model is a valid tool for the design of organizational strategies based on satisfaction in university institutions and applicable to any environment and teaching style. The results showed that a higher level of RC was associated to greater student satisfaction in the first two jobs. In the third article, RC organizational variables contributed to maintaining satisfaction in an emergency setting. As a result, it can be affirmed that the methodology used can be reproduced in different contexts to offer concrete measures aimed at improving university quality globally. These results can be useful for the management bodies of the universities in determining organizational measures that serve as a competitive strategy.

In addition, the results of this doctoral thesis have been presented at different national and international conferences, both in the field of organization and educational

innovation, such as INTED2019⁵, EDULEARN2019⁶, INTED2020⁷ and ACEDE2022⁸, with the main objective of presenting the advances in research and obtaining feedback from other researchers.

Conclusions

The results of this thesis offer different conclusions, both academically and for organizational practice. Regarding the first ones, it can be affirmed that the results of this thesis confirm the previous bibliography, associating a higher level of RC to improvements in the results of the university, in terms of student satisfaction in this case, in addition to adding a focus study of the organizational model applied in higher education. In addition, this research has carried out the identification of organizational practices for the improvement of each environment studied.

In the development of this thesis, it has been possible to observe that the socioeconomic level of the territory does not necessarily determine the improvement of university quality based on RC. In this way, it is possible to infer that those universities that implement a program of good RC practices will achieve higher levels of quality in terms of student satisfaction, regardless of the context and economic means.

On the other hand, it was concluded that RC can be useful to improve face-to-face education. Two ways of providing face-to-face education were studied —traditional and intensive style— within the same center, contributing to the scarce scientific literature on cases of these characteristics. The findings of this research may be useful in determining the appropriate duration of face-to-face education that improves student satisfaction.

Likewise, it was shown that the application of measures based on RC made it possible to maintain educational quality in emergency situations, such as that caused by COVID-19. The organization of the university underwent a sudden change, drastically implementing online education. However, the level of student satisfaction did not change. The role of the professors explained this fact, since they assumed administrative functions outside their competence, compensating for the lack of communication between the students and the administrative staff. Based on these findings, the way to optimize the

⁵ INTED2019, the 13th International Technology, Education and Development Conference.

⁶ EDULEARN19, the 11th International Conference on Education and New Learning Technologies.

⁷ INTED2020, the 14th International Technology, Education and Development Conference.

⁸ ACEDE (Asociación Científica de Economía y Dirección de la Empresa) 2022, 31st International Conference.

activity of the university lecturers could be studied, as a key profile in the educational process. In addition, since online learning was not associated with an improvement in satisfaction, this study could provide a basis for the construction of a third educational model that combines the best practices of online and face-to-face learning in a hybrid system.

Finally, in the development of the three studies cited, it has been confirmed that, indeed, the RC model can be applied to higher education to improve quality in terms of satisfaction. This model can be useful to achieve excellent results in higher education, where high levels of task interdependence are observed.

Regarding the conclusions on the organizational practice, it was verified that the discriminant analysis is useful to design organizational practices for the improvement of the quality of the university. This methodology, together with the one related to the development of an ad hoc quality metric, is reproducible for future studies. Finally, it can be stated that the RC model is a useful tool for building organizational models in the three environments studied. This aspect can be useful to design organizational measures that can be applied in any university institution. In addition, it allows the RC model to be considered as an easy-to-implement, affordable and efficient tool for establishing competitive strategies.

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CAPÍTULO 1. INTRODUCCIÓN

1.1 Presentación y organización del documento

El presente documento recoge el trabajo realizado y los resultados obtenidos en el marco de la tesis doctoral titulada “Relación entre la coordinación relacional y la satisfacción en educación superior. Análisis comparado”, inscrita en el Programa de Doctorado en Ciencias Sociales y Jurídicas (línea empresa) de la Escuela Internacional de Doctorado de la Universidad Rey Juan Carlos. Dado que los resultados obtenidos ya han sido publicados en revistas científicas de impacto, esta tesis se presenta bajo la modalidad de compendio de artículos y se estructura en 6 capítulos.

- El Capítulo 1 presenta la investigación llevada a cabo y justifica su relevancia en relación con trabajos previos.
- En el Capítulo 2 se definen los objetivos que se pretenden alcanzar en esta tesis y se explica la metodología empleada en cada trabajo, justificando igualmente la coherencia de los artículos que se presentan en el capítulo 3.
- El Capítulo 3 recoge los tres artículos de investigación publicados como resultado de esta tesis.
- En el Capítulo 4 se discuten los resultados de los artículos en relación con los objetivos planteados al comienzo de la tesis.
- El Capítulo 5 presenta las conclusiones más relevantes de esta tesis y se identifican futuras líneas de investigación.
- Por último, el Capítulo 6 referencia las citas empleadas en el trabajo de investigación.

1.2 Justificación e importancia de la tesis

Como clave para la creación de valor en las sociedades modernas, la mejora de la educación superior (ES) ha recibido una atención considerable por parte de los responsables políticos (Bartimote-Aufflick et al., 2016). Las instituciones de ES enfrentan importantes desafíos que requieren repensar y renovar la gestión tradicional, las políticas

y prácticas organizativas (Aboramadan et al., 2021). En general, la transformación de los enfoques convencionales de la gestión educativa necesita fomentar la colaboración y la integración de tareas, con el fin de lograr resultados positivos relacionados con la coordinación entre todos los perfiles que componen el ecosistema universitario. Estas demandas requieren adaptarse a la diversidad académica y garantizar la calidad y eficacia institucional.

Por otra parte, para hacer frente a los rápidos cambios que se están produciendo a nivel global, especialmente tras la pandemia provocada por el COVID-19, el sector educativo debe tener una estrategia competitiva para sobrevivir a la competencia en su campo. La ES es un servicio ofertado tanto por administraciones públicas como privadas, y la aparición repentina de la pandemia provocó un aumento exponencial en la oferta educativa en diversas modalidades (Sá & Serpa, 2020; Tejedor et al., 2020). Por lo tanto, es necesario que los cursos ofertados por las universidades mejoren su calidad para crear una ventaja competitiva en su programa de estudio frente a otros (Firman et al., 2019).

A través del aprendizaje organizativo, la institución tiene la capacidad de mejorar su desempeño de manera continua, promoviendo el compromiso de sus miembros mediante el respeto mutuo y el compartimiento de objetivos y conocimientos. Mediante una comunicación oportuna y frecuente se facilita la resolución de problemas, lo que afecta directamente a la eficiencia organizativa. Así, la forma en que las instituciones de ES ponen en práctica el aprendizaje organizativo se considera un elemento fundamental en la calidad (Gast et al., 2017). Es un elemento interpersonal y relacional, y a menudo ha implicado aprender a coordinar el trabajo de nuevas formas (Santos & Horta, 2018). De este modo, esta tesis doctoral propone la aplicación del modelo de coordinación relacional (CR) en diferentes entornos e instituciones de ES para la mejora de sus resultados.

1.2.1 El sistema de educación superior

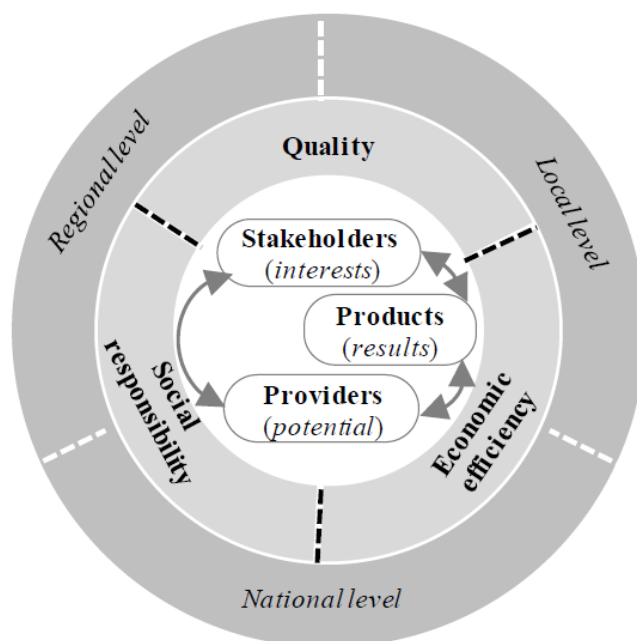
La ES es la última fase del proceso educativo, donde confluyen estudios de grado y postgrado, así como gran parte de la investigación científica a nivel global. Hrynkevych et al. (2020) considera la ES como un sistema de instituciones informales (valores, tradiciones, etc.) y formales (leyes, estándares, instituciones de ES, partes interesadas, etc.) que permiten obtener una comprensión de la importancia del conocimiento en la superación personal, acumulación, transmisión y generación de nuevos conocimientos

con fines de desarrollo personal y social. Por otra parte, Tambovtsev y Rozhdestvenskaya (2020) desglosan el concepto en tres acepciones: ES como resultado, referido a los conocimientos adquiridos por un sujeto tras su paso por la institución universitaria; ES como proceso intencional de educación en interés del individuo, la sociedad y el estado, acompañado de una declaración del logro del estudiante de un nivel educativo definido por el estado (calificación); y ES como sistema educativo, entendido como institución social y un subsistema en el sistema de educación continua.

La calidad del sistema de ES se ve directamente afectada por la actividad de los perfiles que la componen (Hrynkevych et al., 2020). Desde la óptica de Freeman (2010), pueden observarse las partes interesadas que este autor define para gestión estratégica del sector: internas (propietarios, consumidores, empleados y proveedores) y externas (gobiernos, competidores, defensores del consumidor, ecologistas, grupos de interés especial y medios). Por otra parte, según Welzant et al. (2015), existen cuatro partes interesadas en el sistema de ES que deben tenerse en cuenta: los proveedores (organismos de financiación, comunidad, contribuyentes); usuarios del producto (estudiantes); usuarios del output (empleadores) y empleados del sector (académicos y administradores).

Otro aspecto relevante del sistema de ES es la forma de medir sus resultados. El concepto más extendido para ello es la calidad. Sin embargo, este es un concepto ambiguo, ya que puede medirse en función de distintos criterios. Para Welzant et al. (2015), la calidad es un concepto multidimensional y se podría considerar desde la perspectiva de cada agente señalado anteriormente. Por otra parte, Hrynkevych et al. (2020) equilibran la calidad del sistema de ES con los conceptos de responsabilidad social y eficiencia económica del territorio como base para la competitividad, implicando a los agentes previamente mencionados. Para este autor, los componentes del sistema de ES (proveedores, productos y stakeholders), así como los criterios para su evaluación (calidad, responsabilidad social y eficiencia económica) forman la base para el análisis de competitividad. El siguiente nivel considera la viabilidad de su implementación en varios niveles del funcionamiento del sistema de ES: local/institucional, regional, nacional (Figura 1).

Figura 1. Modelo conceptual para el análisis de la competitividad del sistema de educación superior



Fuente: Hrynkevych et al. (2020)

En los últimos años, ha habido un aumento significativo en el número de estudios relacionados con el sistema de ES (Kuznetsova et al., 2017; Bilevičiūtė et al., 2019; Hrynkevych et al., 2020; Sitanggang et al., 2021). Al analizar la gestión de las instituciones universitarias, el criterio de calidad es un punto fundamental para el análisis de la competitividad de los sistemas de ES en todos sus niveles de funcionamiento (Turkulets et al., 2018; Bilevičiūtė et al., 2019; Firman et al., 2019; Hrynkevych et al., 2020).

A este respecto, es importante señalar la teoría de la triple hélice desarrollada por Etzkowitz y Leydesdorff, que considera las relaciones existentes de cooperación entre la Universidad-Empresa-Gobierno. La vinculación entre estos agentes promueve la creación de conocimiento y la innovación como parte del desarrollo de un país (Etzkowitz & Leydesdorff, 1997). Este modelo otorga especial relevancia a las instituciones universitarias como creadoras del conocimiento que posteriormente aportarán innovación en el sector empresarial, mientras que el gobierno regula las relaciones entre ambos agentes. Así, en condiciones de globalización, la principal prioridad de la política educativa estatal en muchos países del mundo es garantizar la ES de calidad (Kuznetsova

et al., 2017; Lysenko et al., 2020; Sitanggang et al., 2021), considerándola uno de los factores estratégicos más importantes del desarrollo económico. Particularmente importante es la solución al problema de mejorar la calidad de la ES que se plantea en el contexto del desarrollo de la sociedad de la información, donde el componente intelectual de la población es clave. Las tendencias actuales indican la necesidad de una estrecha interacción entre las estructuras de innovación, las universidades y la comunidad científica (Bilevičiūtė et al., 2019; Lysenko et al., 2020).

Como respuesta a las tendencias mundiales actuales en el campo de la ES, se requieren reformas importantes para ayudar al sector a competir con éxito bajo las condiciones de la globalización y una economía basada en el conocimiento (Kuznetsova et al., 2017; Bilevičiūtė et al., 2019). La gestión universitaria debe basarse en el espíritu de comunidad, la autonomía de las instituciones académicas, así como en un enfoque orientado a resultados que conduzca a una mayor eficiencia y mejora de sus resultados en términos de calidad (Gast et al., 2017; Bilevičiūtė et al., 2019; Sitanggang et al., 2021).

Se prevé que antes de 2025 la mitad de todos los puestos de trabajo deberán ser ocupados por trabajadores altamente cualificados (Bilevičiūtė et al., 2019). Las instituciones de ES y sus conexiones con la investigación científica y la innovación ayudan a promover y mantener el crecimiento económico (Kuznetsova et al., 2017; Bilevičiūtė et al., 2019). Ahora, todas las universidades se ven obligadas a modernizar sus operaciones e implementar métodos de gestión avanzados en su organización interna para cumplir con las exigencias de la globalización (Turkulets et al., 2018; Bilevičiūtė et al., 2019).

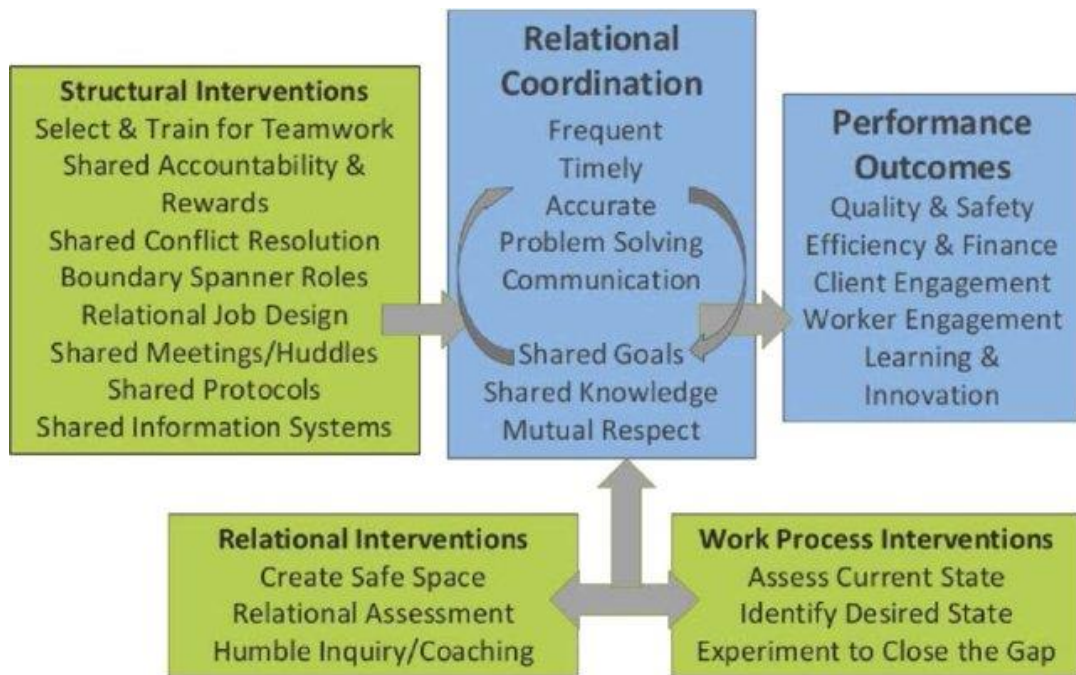
1.2.2 La coordinación relacional y su relación con la calidad

La coordinación ha sido explicada por teóricos del diseño organizativo y de la contingencia como Kundu et al. (2020), como un problema de procesamiento de información. Algunos autores como Faraj y Sproull (2000) y Margalina et al. (2017) han percibido la coordinación como el conocimiento compartido del trabajo y, el contexto en el que se desarrolla la actividad, como un proceso relacional. Según Fu et al. (2019), la coordinación es una estrategia de gestión importante que ayuda a las organizaciones a mejorar la eficiencia y la eficacia.

El modelo de CR fue desarrollado por J. H. Gittell a comienzos de los años 2000 (Gittell, 2002). La autora define el modelo como un proceso de comunicación y relación

conjunto de factores centrados en las rutinas organizativas de los equipos de trabajo y su aplicación influye en los resultados organizativos, mejorándolos significativamente (De-Pablos-Heredero et al., 2019, 2020; Gallego-Sánchez et al., 2015, 2021; Gittell et al., 2018; Havens et al., 2018; Margalina et al., 2017; Sulmonte et al., 2022). La figura 2 muestra el esquema del modelo de CR.

Figura 2. Modelo de coordinación relacional



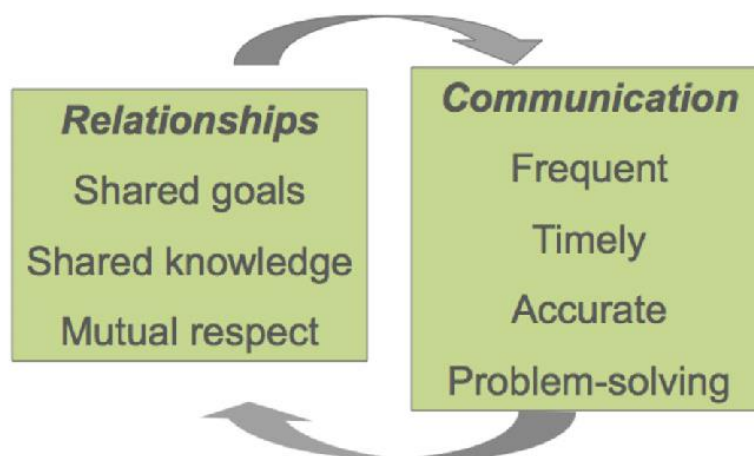
Fuente: Perloff et al. (2017)

La CR es un mecanismo basado en factores humanos. Si bien la excelencia se mide por los resultados, se genera en procesos intangibles, personales y humanos (Asadullah et al., 2016). El modelo CR, basado en las relaciones entre seres emocionales podría convertirse en una herramienta útil para medir y fomentar una coordinación eficaz (Gittell et al., 2018). Por ello, trata de agrupar todas las conexiones entre ellas, no sólo como tareas, herramientas o necesidades técnicas, sino como formas reales de hacer posible que las personas trabajen de forma eficiente. La CR se ha construido en torno a la coordinación del trabajo, considerando todos los aspectos de las relaciones del equipo. Reconoce, por lo tanto, la necesidad del lado relacional de la coordinación para lograr la efectividad organizativa (Haider et al., 2017, 2020) .

Gittell et al. (2010) estructuró el modelo CR en torno a dos dimensiones: comunicación y relaciones (Figura 3). Las variables de la dimensión de comunicación

son: (i) comunicación frecuente, que ayuda a establecer relaciones a través de la proximidad generada por la interacción repetida; (ii) comunicación oportuna, o comunicación proporcionada a tiempo; (iii) comunicación precisa, entendida como información relevante, lo que juega un papel crítico en la efectividad del desempeño de las tareas de un grupo; (iv) comunicación para la resolución de problemas, referida a la coordinación efectiva para resolver problemas. Por otra parte, las variables de relación son: (i) objetivos compartidos, que juegan un papel clave en la coordinación de tareas altamente interdependientes; (ii) conocimiento compartido, entendido como la comunicación entre los involucrados en las diversas tareas que constituyen un proceso, que no siempre es efectiva debido a diferentes orígenes sociales, formación y experiencia; (iii) respeto mutuo, que genera una coordinación eficaz, porque los perfiles de los participantes en un mismo proceso valoran la contribución de los demás y consideran el impacto de sus propias acciones en los demás también.

Figura 3. Dimensiones del modelo de CR.

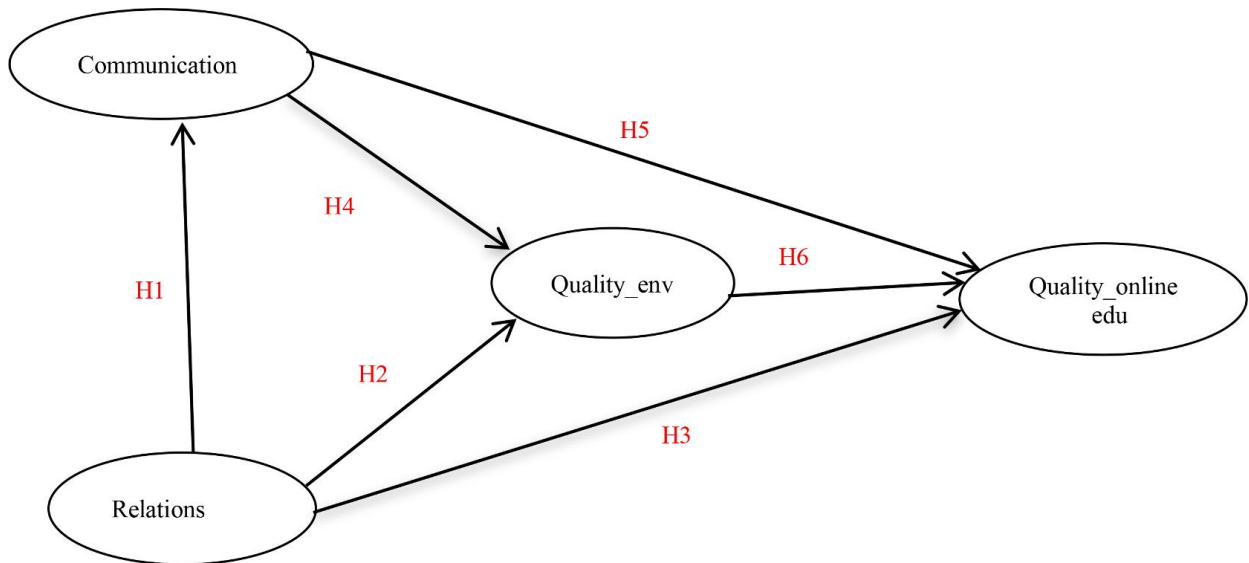


Fuente: De-Pablos-Heredero y Margalina (2015).

Comprender las relaciones de los factores de CR ayuda a saber cómo se pueden organizar mejor los recursos para maximizar el desempeño de una institución (Asadullah et al., 2016; Gittell et al., 2010). La investigación existente muestra que la CR se relaciona positivamente con el desempeño organizativo en varios sectores. Gittell et al. (2018) lo aplicaron a diferentes unidades médicas dentro de hospitales y observaron que las unidades con niveles más altos de CR producían un mejor desempeño. Havens et al. (2018) explicaron niveles más altos de satisfacción laboral, compromiso laboral y disminución del agotamiento desde la perspectiva de CR. Haider et al. (2020) aplicaron

la CR al sector bancario para explicar la relación entre los sistemas de trabajo de alto rendimiento y la satisfacción laboral. Gallego-Sánchez et al. (2015, 2021) y Margalina et al. (2017) aplicaron el modelo de CR para explicar los mejores resultados en los sistemas en línea en la ES (Figura 4).

Figura 4. Resultados del modelo estructural de aprendizaje en línea propuesto por Gallego-Sánchez et al. (2021)



Fuente: Gallego-Sánchez et al. (2021).

1.2.3 La satisfacción del estudiante como métrica de calidad

En el mercado educativo, las universidades compiten por la financiación y por el número de estudiantes en un ámbito global (Carvalhoes et al., 2022; Martínez et al., 2018). Por lo tanto, se espera que las instituciones de ES se adapten a los requerimientos de dicho mercado. El desafío para sus líderes es identificar las necesidades de sus estudiantes y ofrecer un servicio de calidad que las satisfaga (Camilleri, 2021).

La calidad es un indicador de desempeño importante para la educación, y es uno de los principales temas examinados por los académicos y profesionales del mercado educativo internacional (Caffarel-Serra et al., 2017). El principal problema radica en la subjetividad del concepto de calidad, lo que dificulta su medición (Zee & Koomen, 2016). Son numerosos los criterios que la comunidad científica ha utilizado para establecer un criterio de calidad educativa. Sin embargo, la satisfacción de los estudiantes ha sido ampliamente considerada como un indicador efectivo para tal fin (Gallego-Sánchez et al.,

2015). La educación es un tipo de servicio y, por lo tanto, las instituciones educativas que lo ofertan deben tratar de satisfacer las necesidades de sus usuarios. De este modo, será oportuno definir la calidad de la ES desde la perspectiva del estudiante entendido como cliente (Ortega-Mohedano & Rodríguez-Conde, 2018). Además, Kilgo et al. (2017) proponen una serie de buenas prácticas (Tabla 1), basadas en la comunicación y coordinación, asociados a una mayor satisfacción del estudiante, independientemente del área de conocimiento.

Tabla 1. Buenas prácticas asociadas a mejoras de la satisfacción del estudiante

Buenas prácticas
Fomentar el contacto estudiante-profesor
Fomentar la colaboración entre estudiantes
Alentar el aprendizaje activo
Retroalimentación rápida a los estudiantes
Enfatizar el tiempo en la tarea
Comunicar altas expectativas
Respetar diversos talentos y formas de aprender

Fuente: Elaboración propia a partir de (Kilgo et al., 2017).

1.2.4 Estudios previos

Se ha observado la literatura científica relativa a la CR. La tabla 2 muestra un recuento de los artículos científicos publicados en revistas de impacto en los diez últimos años —de 2013 a septiembre de 2022— e indexados en la *Web of Science*. Como se observa, es escasa la literatura científica relativa a la CR. La mayoría de las publicaciones aplican este modelo en estudios de ámbito no educativo. Solo el 4,7% de los artículos mencionados recogen estudios del modelo aplicado a la organización de las instituciones educativas. Además, los estudios sobre CR en el ámbito educativo previos a esta tesis —anteriores a 2019— se ciñen al campo de la educación en línea.

Tabla 2. Artículos sobre CR publicados en revistas de impacto

Año	Ámbito		Total
	Educativo	No educativo	
2013	0	10	10
2014	0	25	25
2015	3	22	25
	(De-Pablos-Heredero et al., 2015; Gallego-Sánchez et al., 2015; Maria Margalina et al., 2015)		
2016	0	19	19
2017	1	26	27
	(Margalina et al., 2017)		
2018	0	20	20
2019	0	39	39
2020	2	41	43
	(Checa et al., 2020; Hallen et al., 2020)		
2021	5	29	34
	(Checa-Morales, De-Pablos-Heredero, Carreño, et al., 2021; Checa-Morales, De-Pablos-Heredero, Torres, et al., 2021; Estriegana et al., 2021; Gallego-Sánchez et al., 2021; Gallego-Gómez et al., 2021)		
2022	3	32	35
	(Checa-Morales et al., 2022; Tørring & Jensen, 2022; Willgerodt & Blakeney, 2022)		
Total	14	263	277

Fuente: Elaboración propia

Como se indicó anteriormente, el modelo de CR ha sido aplicado en la ES. Sin embargo, tales investigaciones se ciñeron a entornos específicos, como la educación en línea. En el trabajo de De-Pablos-Heredero et al. (2015) se estudió la implementación de rutinas organizativas para mejorar los resultados en los sistemas educativos en línea, mostrando que el modelo de CR puede ser utilizado para abordar la calidad del trabajo en equipo, aunque ciñéndose a la coordinación profesor-alumno. Del mismo modo y relativo a los mismos perfiles, se abordó la CR en los trabajos de Margalina et al. (2015, 2017), mediante la metodología de ecuaciones estructurales (SEM). Se concluyó que mayores niveles de CR entre docentes en e-learning explicaron mayores grados de satisfacción y se planteó como un mecanismo para la mejora del desempeño de esta modalidad educativa.

Por otra parte, Gallego-Sánchez et al. (2015) estudiaron la aplicación de las tecnologías de la información y la comunicación (TIC) en los sistemas de ES y mostraron

cómo un mayor grado de coordinación e integración de los procesos mejoran la competitividad y capacidad de investigación de las instituciones. Otros autores como Estriegana et al. (2021), Gallego-Gómez et al. (2021) y Gallego-Sánchez et al. (2021) observaron igualmente la aplicación de las TIC en entornos de educación universitaria en línea aunque, en estos casos, considerando el efecto de la pandemia provocada por el COVID-19.

Por último, es importante señalar que gran parte de la literatura científica relativa al modelo de CR se centra en el trabajo en equipo en el ámbito de la salud. Centrándonos en el aspecto educativo de este sector, Willgerodt y Blakeney (2022) estudiaron los efectos de la coordinación en centros de educación primaria sobre estudiantes con enfermedades crónicas, de forma preliminar. Los estudios de Hallen et al. (2020) y Tørring y Jensen (2022) observaron la CR en estudiantes de medicina y enfermería, respectivamente. Se concluyó que la colaboración y la creación de relaciones sólidas tuvieron un gran impacto en el aprendizaje para la capacitación clínica.

De este modo, dada la escasa investigación sobre la aplicación global de la CR en la ES, esta tesis doctoral busca aportar en este ámbito y contribuir al crecimiento teórico y práctico del modelo, así como proponer nuevas líneas de investigación. Por una parte, se buscó comprobar si el modelo de CR puede mejorar la satisfacción en la ES. Se trata de valorar de forma general, si este modelo puede aportar una herramienta para la mejora de la calidad en el sector. En este estudio se aborda la mejora organizativa considerando la totalidad de perfiles que forman el ecosistema universitario. Por otra parte, conocer la existencia de diferencias organizativas y de satisfacción en distintos entornos y modalidades educativas puede ser de interés para las instituciones universitarias a la hora de decidir sobre la puesta en marcha de diferentes metodologías de enseñanza y aprendizaje. Con esta tesis se ofrece un marco más amplio, donde la CR se aplica a distintos entornos de la ES, mostrando los elementos de calidad en cada uno y ofreciendo una metodología reproducible en cualquier contexto.

CAPÍTULO 2. OBJETIVOS, METODOLOGÍA E INTEGRIDAD Y COHERENCIA DE LA INVESTIGACIÓN

2.1 Objetivos de la investigación

En el desarrollo de esta tesis se estudió el efecto que las dimensiones de CR tienen sobre la calidad de las instituciones universitarias, desde la perspectiva de la satisfacción del estudiante. Dado que el modelo de CR es un modelo genérico, fue necesario comprobar si sus variables permitían la construcción de modelos organizativos específicos en distintos entornos para, posteriormente, realizar un análisis comparativo en cada uno. El estudio de cada entorno se asoció a cada uno de los tres primeros objetivos de la investigación, mientras que el cuarto objetivo constituyó un punto en común entre los anteriores. Así, los objetivos a alcanzar en esta tesis doctoral fueron los siguientes:

- Determinar si existen diferencias organizativas y de satisfacción entre universidades de distintos contextos socioeconómicos fue el primer objetivo, correspondiente al primer artículo. El conocimiento de la cultura local y la situación socioeconómica son esenciales para establecer estrategias de liderazgo y gestión educativa. Sin embargo, es importante conocer si el modelo de CR puede verse afectado por estos factores a la hora de observar mejoras en la calidad. En la investigación correspondiente al primer trabajo publicado se seleccionaron tres universidades como instrumentos representativos de tres contextos socioeconómicos internacionales —Finlandia, España y Ecuador—, con diferentes estructuras organizativas. En este trabajo se buscó determinar si las universidades ubicadas en países desarrollados presentaron un mayor nivel de CR, si los alumnos más satisfechos presentaron un mayor nivel de CR y si la metodología utilizada permite construir un modelo organizativo que diferencie a las tres instituciones para proponer medidas concretas que mejoren la calidad.
- El segundo objetivo de esta tesis fue determinar si existen diferencias organizativas y de satisfacción entre distintos estilos educativos —presencial tradicional y presencial intensivo— y corresponde al segundo artículo de investigación. Si hablamos de implementar estrategias organizativas que doten de competitividad a las universidades, es innegable que existe una responsabilidad social de estas instituciones de ofrecer estilos de formación de calidad adecuados

a cada perfil de estudiante y de promover métodos educativos más eficientes e innovadores. Dado que la investigación cuantitativa que compara la educación presencial (tradicional e intensiva) en una misma institución e identifica sus elementos organizativos y colaborativos es escasa, éste se consideró un punto de interés para la propuesta de medidas organizativas que permitan la mejora de ambos estilos educativos. Así, este trabajo se orientó a determinar si una mayor asistencia presencial se asoció a una mayor coordinación, si una mayor satisfacción de los estudiantes se asoció con una mayor coordinación y si es posible construir un modelo organizativo a través de variables de CR para el diseño de nuevos estilos educativos combinados.

- El tercer objetivo de esta investigación se asocia a la aparición de la crisis sanitaria provocada por el COVID-19 durante el desarrollo de la tesis. De entre las escasas ventajas que podrían desprenderse de la misma, cabe señalar que tal circunstancia nos ofreció un tercer entorno para estudiar la capacidad organizativa de las universidades. La pandemia supuso un cambio de paradigma en los sistemas educativos ya que, durante el confinamiento, la ES fue impartida digitalmente de forma sobrevenida. Esto provocó un cambio en la comunicación dentro del ecosistema educativo. Dado que la CR es un modelo de comunicación y relación asociado a la mejora de los resultados organizativos, el tercer objetivo de esta investigación fue determinar si existieron diferencias organizativas y de satisfacción en la ES pre y durante la pandemia. En este tercer trabajo se consideró relevante profundizar en cambios organizativos que se experimentaron en la ES a raíz de la pandemia, comprobar si existieron diferencias entre la satisfacción del aprendizaje presencial y en el en línea en dicho periodo, así como estudiar la posibilidad de extender las mejores prácticas organizativas del modelo a otras universidades.
- Por último, y como aspecto transversal a los trabajos realizados, comprobar si la CR es un elemento fundamental para la satisfacción en la ES fue el cuarto objetivo de esta investigación. Si bien es cierto que, como se indicó en el capítulo anterior, el modelo de CR se asocia a mejoras en los resultados organizativos en distintos sectores, con esta investigación se pretende comprobar si del mismo modo la calidad de la universidad puede mejorar con la aplicación de medidas

organizativas basadas en el modelo. Observar esta premisa en estudios realizados en los tres entornos mencionados podría suponer una evidencia sólida para este ámbito de conocimiento.

2.2 Metodología

Para la consecución de los objetivos de la investigación se realizaron comparativas entre: i) los modelos organizativos de tres contextos socioeconómicos; ii) los modelos de dos estilos educativos —tradicional e intensivo—; iii) los modelos organizativos del aprendizaje prepandemia y durante pandemia, respectivamente. Para la construcción de cada modelo organizativo se utilizaron técnicas estadísticas de análisis multivariante, de las cuales el análisis discriminante constituyó el punto central en los dos primeros trabajos, y el análisis de componentes principales (ACP) combinado con análisis de conglomerados configuró la metodología del tercero. Además, se desarrolló una variable sintética en cada trabajo, a partir de la satisfacción del estudiante, para determinar los dos niveles de calidad —alta y baja— de cada muestra. Por último, cabe destacar que la técnica comparativa fue seleccionada para el desarrollo de cada estudio, dado que permite contrastar diferentes contextos estudiados mediante una misma metodología y explicar diferencias y semejanzas entre ellos.

En primer lugar, y como punto en común en los tres artículos de investigación, la recogida de datos se llevó a cabo a partir de la encuesta de CR (Gittell, 2001; Gittell et al., 2018), adaptada al contexto de ES por De-Pablos-Heredero et al. (2019, 2020) entregada a los estudiantes. Este cuestionario estuvo compuesto por 4 preguntas sobre datos sociodemográficos (edad, sexo, curso y campo de conocimiento). Además, contenía 23 ítems de CR (11 comunicación y 12 relación) y 6 ítems sobre satisfacción, que fueron respondidos mediante una escala Likert de 1 a 5. La tabla 3 muestra los ítems correspondientes a cada pregunta.

Tabla 3. Desglose del cuestionario de CR

Dimensión	Código	Pregunta/Variable
<i>COMUNICACIÓN</i>	<i>COMUNICACIÓN OPORTUNA (¿En qué medida las personas que pertenecen a estas áreas tienen la necesidad de ofrecerle información en determinados momentos?)</i>	
	1.ACCU _{Admin}	personal de administración
	2.ACCU _{Lect}	profesores
	3.ACCU _{Class}	compañeros
	<i>COMUNICACIÓN FRECUENTE (¿Con qué frecuencia las personas que pertenecen a las siguientes áreas de trabajo se comunican con usted?)</i>	
	4.FREQ _{Admin}	personal de administración
	5.FREQ _{Lect}	profesores
	6.FREQ _{Class}	compañeros
	<i>COMUNICACIÓN PARA LA RESOLUCIÓN DE PROBLEMAS (Cuando aparece cualquier tipo de problema (estudio, logística, documentación...), ¿cuánto te ayudaron los siguientes perfiles a solucionar tu problema?)</i>	
	7.SOLPRO _{Myself}	yo mismo
	8.SOLPRO _{Lect}	profesores
9.SOLPRO _{Repres}	representantes de estudiantes	
10.SOLPRO _{Admin}	personal de administración	
11.SOLPRO _{Class}	compañeros	
<i>RELACIÓN</i>	<i>CONOCIMIENTOS COMPARTIDOS (¿En qué medida los siguientes perfiles conocen sobre su rol en la universidad y los problemas que se presentan?)</i>	
	12.SKNO _{Lect}	profesores
	13.SKNO _{Repres}	representantes de estudiantes
	14.SKNO _{Admin}	personal de administración
	15.SKNO _{Class}	compañeros
	<i>RESPE TO MUTUO (¿Cuánto respetan los siguientes perfiles su rol en la universidad?)</i>	
	16.RESPE _{Lect}	profesores
	17.RESPE _{Repres}	representantes de estudiantes
	18.RESPE _{Admin}	personal de administración
	19.RESPE _{Class}	compañeros
	<i>OBJETIVOS COMPARTIDOS (¿En qué medida los siguientes perfiles comparten sus objetivos en la universidad?)</i>	
20.SHARGOAL _{Lect}	profesores	
21.SHARGOAL _{Repres}	representantes de estudiantes	
22.SHARGOAL _{Admin}	personal de administración	
23.SHARGOAL _{Class}	compañeros	
<i>SATISFACCIÓN</i>	<i>SATISFACCIÓN DEL ESTUDIANTE (Indique su grado de satisfacción con los siguientes perfiles)</i>	
	24.SATIS _{Lect}	profesores
	25.SATIS _{Represent}	representantes de estudiantes
	26.SATIS _{Admin}	personal de administración
	27.SATIS _{Materials}	materiales
	28.SATIS _{Communic}	canales de comunicación
29.SATIS _{Contents}	contenidos formativos	

Fuente: Elaboración propia a partir de Gittell, (2001), Gittell et al. (2018) y De-Pablos-Heredero et al. (2019, 2020).

En la tabla 4 se recogen las poblaciones y muestras de cada trabajo. En el primero, se obtuvo una población de 3000 estudiantes pertenecientes a las tres universidades estudiadas —Universidad de Ciencias Aplicadas de Arcada (ARCADA), en Finlandia; Universidad de Córdoba (UCO), en España y la Escuela Superior Politécnica Agropecuaria de Manabí (ESPAM), en Ecuador— y se seleccionó una muestra aleatoria estratificada de 300 estudiantes, 100 por cada universidad. En el segundo trabajo, 4000 estudiantes de la institución —Universidad Técnica Estatal de Quevedo (UTEQ), en Ecuador— con una experiencia mínima de tres años en la institución formaron la población. Del total obtenido, se seleccionó una muestra aleatoria de 370 alumnos, 170 pertenecientes a la educación presencial tradicional y 200 a la educación presencial intensiva. Por último, el tercer trabajo tuvo una población de 3000 alumnos. Una vez se eliminaron las encuestas incompletas y aquellas que mostraron inconsistencias lógicas, se seleccionó una muestra de 2774 estudiantes, 1147 pertenecientes a la UTEQ para la construcción del modelo organizativo principal y 1627 de la Universidad Estatal de Bolívar (UEB), para la validación subsiguiente.

Tabla 4. Población y muestra

	Población	Muestra	Distribución
Artículo 1	3000	300	ARCADA:100 UCO: 100 ESPAM: 100
Artículo 2	4000	370	TFE: 170 IFE: 200
Artículo 3	3000	2774	UTEQ:1147 UEB: 1627

Fuente: Elaboración propia.

Para el desarrollo de primer trabajo se llevó a cabo, en primer lugar, una observación del contexto socioeconómico de cada país estudiado: Finlandia, España y Ecuador. Se utilizaron principalmente datos del Banco Mundial para extraer los datos sociodemográficos, y datos de los informes PISA —para Finlandia y España— y PISA para el Desarrollo (o PISA-D) —en el caso de Ecuador—, con el fin de estudiar los datos del ámbito educativo. Igualmente, se consideraron las posiciones que cada universidad estudiada —ARCADA, UCO y ESPAM— ocupó en diversos rankings internacionales (Checa-Morales, De-Pablos-Heredero, Carreño, et al., 2021) (Tabla 5).

Tabla 5. Contextos socioeconómicos pre-COVID-19 (datos de 2020)

Características del país			Resultados de los informes PISA y PISA-D							Ranking ⁴			
País	Población	PIB ¹	Sistema político	Puntuación media en matemáticas y ciencias ²	Estudiantes de alto rendimiento (%) ²	Impacto socioeconómico (%) ³	Tendencia de los resultados de los estudiantes	Calidad del personal y de los recursos	Docentes altamente calificados por tipo de centro (%) ³	Casos de bullying (%) ³	Satisfacción respecto al estilo de vida (%) ³	Mentalidad de crecimiento de los estudiantes (%) ³	Posición en el ranking mundial de universidades
Finlandia	5.515.525	48.280	República parlamentaria	Matem. 520 Ciencias 552	12	11	Decrece	Mantiene	Favorecidos: 94 Desfavorecidos: 91	18	78	67	ARCADA = 4589
España	46.797.754	29.350	Monarquía parlamentaria	Matem. 481 Ciencias 483	4	10	Estable	Escasa	Favorecidos: 94 Desfavorecidos: 98	17	74	62	UCCO = 679
Ecuador	17.084.359	6.090	República constitucional presidencial	Matem. 377 Ciencias 399	1,4	25	Decrece	Escasa	No hay información	No hay información	87	No hay información	ESPAM = 15,330

¹ Producto Interior Bruto: \$/persona/año; ² Media de la OCDE; Matemáticas= 489, Ciencias= 489; ³ Influencia del estado socioeconómico del país sobre los resultados de los estudiantes; ⁴ Ranking web universites.

Fuente: Elaboración propia a partir de Checa-Morales, De-Pablos-Herdedero, Carreño, et al. (2021).

Posteriormente, en cuanto a técnicas estadísticas, se utilizaron modelos lineales generalizados (MLG) para encontrar diferencias significativas en las variables de CR, utilizando las variables de satisfacción y universidad como factores fijos. Este análisis permite determinar qué pares de medias difieren significativamente y estudiar datos con varianzas no constantes y cuyo error no se ajusta a la distribución normal (Gutiérrez-Cordero et al., 2017). Los MLG resumen un grupo homogéneo de métodos de regresión (logística, Poisson, gamma, etc.), considerados previamente de forma independiente. Posteriormente, se realizó un análisis discriminante lineal (ADL) para construir el modelo organizativo de cada universidad. El ADL permite estudiar las relaciones concretas que existen entre los grupos discriminados (determinados por los factores fijos) y su grado de asociación (Legendre & Legendre, 2012; Noël et al., 2016; Rivas et al., 2019). El ADL se incluye dentro de las técnicas de dependencia, analizando la relación entre una única variable dependiente y varias independientes. La variable dependiente define los grupos que previamente se han constituido, por ejemplo, satisfacción —alta y baja— y universidad —ARCADA, UCO y ESPAM—. De este modo, el ADL fue utilizado para agrupar las variables de CR. Los coeficientes del modelo discriminante muestran la contribución relativa de cada variable al modelo. Además, para medir la distancia entre pares de grupos más próximos, se utilizó la distancia de Mahalanobis. Esta medida, también utilizada en el análisis de conglomerados, supone una generalización de la distancia euclídea que considera la matriz de covarianzas intragrupo y se basa en la cercanía entre los centroides de cada grupo (Cea D’Ancona, 2016).

Posteriormente, para encontrar las diferencias organizativas entre estilos educativos, se realizó un segundo trabajo. En el mismo se comparó el estilo educativo presencial tradicional, generalmente preferido por los alumnos, con un estilo educativo intensivo, que suele asociarse a estudiantes que compaginan cargas familiares o vida laboral con su formación universitaria. Para encontrar las características principales de cada estilo educativo, se realizó una revisión de la literatura. La peculiaridad de este estudio reside en el uso de datos de misma universidad —UTEQ—, referidos a los mismos programas y contenidos formativos y mismo profesorado impartiendo las clases. La diferencia práctica entre ambos estilos fue la duración y frecuencia de asistencia a clase: 30 horas semanales de lunes a viernes en el estilo tradicional frente a 16 horas en el intensivo, impartidas en fin de semana. En cuanto a la metodología estadística, la

construcción de ambos modelos organizativos se realizó de forma similar al trabajo anterior —combinando GLM y ADL—.

Finalmente, en un tercer trabajo, se compararon los modelos organizativos de los aprendizajes presencial prepandemia (2018) y en línea durante la pandemia (periodo de confinamiento de mayo a septiembre de 2020), en una misma institución universitaria —la UTEQ de Ecuador—. En este caso, se construyó el modelo organizativo del aprendizaje en línea y se comparó con un modelo de aprendizaje presencial construido en un artículo de investigación publicado previamente. En este caso, la construcción del modelo de aprendizaje en línea durante pandemia se desarrolló con una metodología diferente a los dos trabajos señalados anteriormente, para adecuarlo a la utilizada en la construcción del modelo de aprendizaje tradicional de 2018. Esta metodología estadística se aplicó en tres etapas. En primer lugar, se utilizó análisis de componentes principales (ACP) combinado con análisis de conglomerados para construir el modelo. El ACP se utiliza para sustituir el número original de variables por un número menor de componentes principales con una pérdida mínima de información. En este trabajo se seleccionaron variables con un coeficiente de variación superior al 60%. Se redujo el número de variables, resumiendo la mayor variabilidad de los ítems. Una vez seleccionados los componentes, se aplicó la rotación ortogonal varimax para relacionar las variables seleccionadas con los componentes extraídos. A continuación, se realizó un análisis de conglomerados jerárquicos con las dimensiones que presentaban la mayor varianza generada por el PCA. Este análisis agrupó los casos que eran similares entre sí y diferentes de los demás (considerando la varianza intra e intergrupo). Los agrupamientos se realizaron de acuerdo con el método de Ward, utilizando distancias euclidianas, euclidianas cuadradas y de Manhattan. Los grupos resultantes fueron estudiados por ANOVA utilizando una prueba SNK post hoc. Este procedimiento maximizó la homogeneidad dentro de los grupos y la heterogeneidad entre ellos. En una segunda etapa, se aplicaron los MLG para verificar los niveles de satisfacción del modelo obtenido. Y, por último, en una tercera etapa, el modelo obtenido para el aprendizaje durante pandemia en UTEQ se validó con la construcción de un modelo similar en una universidad distinta, perteneciente al mismo contexto —la UEB, de Ecuador— durante el mismo periodo.

Además, como punto en común de los trabajos realizados, se debe añadir la metodología utilizada para la obtención de la variable sintética de calidad. Para crear esta variable sintética, se realizó un contraste de heterogeneidad mediante la prueba CHI^2 . La

ausencia de heterogeneidad entre universidades favoreció el procesamiento acumulado de datos. A partir de propuestas metodológicas referidas a la calidad percibida por los estudiantes, se desarrolló esta herramienta de investigación. La calidad fue evaluada a partir de la percepción de satisfacción de los estudiantes en los siguientes aspectos: clases/profesores, representantes de estudiantes, personal de administración, materiales, medios de comunicación y contenidos formativos. En la recogida de datos se usó una escala Likert con valores de 1 (no satisfecho) a 5 (muy satisfecho). Posteriormente se estimó un valor de satisfacción total ($SATIS_{Total}$) con el valor acumulado de variables anteriores para este alumno. A partir de prescriptores estadísticos de tendencia, se calculó dispersión y asimetrías de la variable $SATIS_{Total}$. Se establecieron dos niveles de calidad considerando como referencia principal el punto central X , considerando $<X$ puntos como “baja calidad” y $>X$ puntos como “alta calidad”, en cada muestra.

Cada estudio y análisis comparativo realizado fue asociado a los tres primeros objetivos de la investigación planteados previamente, mientras que el cuarto, —relativo a la consideración de la CR como elemento fundamental para la satisfacción en ES—, fue abordado en cada trabajo de forma transversal. Además, en cada trabajo se propusieron nuevas líneas de investigación para profundizar en la utilidad de la CR en la planificación organizativa de las instituciones universitarias.

2.3 Integridad y coherencia de la investigación

El apartado de resultados de esta tesis está compuesto por tres artículos publicados en revistas de impacto indexadas en *Scopus*. Cada uno de estos artículos ha ido reflejando los resultados de investigación alcanzados y, analizados en conjunto como se hará en el capítulo de discusión de los resultados, permiten comprender mejor el modelo de CR en la educación superior, así como su relación con la satisfacción del estudiante como indicador de calidad.

CAPÍTULO 3. RESULTADOS DE LA INVESTIGACIÓN

Los artículos de este compendio han sido publicados en la revista *Education Sciences* que, según el *CiteScores* de 2021 (Elsevier) publicado en junio de 2022, recibió un CiteScore aumentado de 2,9, ubicándose en el puesto 395/1406 (Q2) en la categoría "Educación" (Ciencias sociales). Esta revista presenta un factor SJR de 0,518.

3.1 Artículo 1: (Checa-Morales, De-Pablos-Heredero, Carreño, et al., 2021)

Organizational Differences among Universities in Three Socioeconomic Contexts: Finland, Spain and Ecuador. Relational Coordination Approach

Checa-Morales, C., De-Pablos-Heredero, C., Carreño, A. L., Haider, S., & García, A. (2021). Organizational differences among universities in three socioeconomic contexts: Finland, Spain and Ecuador. relational coordination approach. *Education Sciences*, 11(8), 445; <https://doi.org/10.3390/educsci11080445>

Article

Organizational Differences among Universities in Three Socioeconomic Contexts: Finland, Spain and Ecuador. Relational Coordination Approach

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Abstract: The knowledge of local culture is essential to establish competitive strategies in higher education. The objective of this research was to identify the organizational differences among three universities with different international contexts and satisfaction level. An approach was made regarding Relational Coordination (RC) attributes: accurate, frequent and problem-solving communication, shared knowledge, mutual respect and shared goals, by discriminant analysis method. A random sample of 300 students, 100 belonging to each university, was surveyed on the 23 RC variables in 2017–2018. First, the RC variables were evaluated by general linear model (GLM). The three universities—Arcada University of Applied Science (ARCADA) in Finland, University of Cordoba (UCO) in Spain and Agricultural Polytechnic of Manabi “MFL” (ESPAM) in Ecuador—and the two levels of student satisfaction—Low and High—were used as fixed factors. Second, a discriminant model was built with RC variables. A higher level of RC practices concerning to accurate, frequent and problem-solving communication achieved higher levels of satisfaction, regardless of the universities’ socioeconomic context. RC differentiation among three universities showed that shared goals with lecturers and administrative officers and problem-solving communication among classmates were the variables with the highest discriminant power. Two clusters were obtained, where UCO was the most differentiated university. In conclusion, organizational practices made a difference among the three universities. Discriminant analysis can be adapted and extended to different universities to improve quality.

Keywords: relational coordination; student satisfaction; higher education; communication; discriminant analysis

1. Introduction

As a key to value creation in modern societies, improvement in higher education has received considerable attention from policy makers [1,2]. The way Higher Education Institutions have put into practice organizational learning is considered a key element [3]. Organizational learning is interpersonal and relational, and it has often involved learning to coordinate work in new ways [4]. Coordination has been explained by organization design and contingency theorists such as Kundu et al. [5], as an information-processing problem. Some authors such as Faraj and Sproull [6] and Margalina et al. [7] have perceived

coordination as shared understanding of work, and the context in which the activity is carried out has been defined as a relational process. According to Fu et al. [8], coordination is an important management strategy which helps organizations to improve efficiency and effectiveness.

Gittell [9] defined relational coordination (RC) as a mutually reinforcing process of communicating and relating for the purpose of task integration. RC is a mechanism based on human factors. Even though excellence is measured by results, it is generated in intangible, personal and human processes [10]. The RC model could become a helpful tool to measure and encourage effective coordination. RC is based on human relationships among emotional beings [11]. For this reason, it attempts to group together all the connections between them, not merely as tasks, tools or technical needs, but rather in real ways to make it possible for people to work efficiently. RC has been built around work coordination, by considering all aspects of team's relationships. It recognizes, therefore, the need for the relational side of coordination to achieve organizational effectiveness [12,13].

Gittell et al. [14] structured the RC model around two dimensions: communication and relationships. The communication dimensions are: (i) frequent communication helps to establish relationships via roles through the proximity generated because of repeated interaction; (ii) timely communication, communication provided on time; (iii) accurate communication, in the context of relevant information, this plays a critical role in the effectiveness of a group's tasks performance; (iv) problem-solving communication, referred to effective coordination to solve problems. The relationship dimensions are: (i) shared goals: these play a key role in the coordination of highly interdependent tasks; (ii) shared knowledge: communication among those involved in the various tasks that constitute a process is not always effective because of different social backgrounds, training and experience; (iii) mutual respect, that generates an effective coordination, because participant's profiles in the same process value the contribution of others and consider the impact of their own actions in others too.

Understanding the RC factor relationships helped to know how resources can be organized best in order to maximize an institution's performance [10,11]. Existing research showed that RC was positively linked to organizational performance in several sectors. Gittell et al. [11] applied it to different medical units inside hospitals and observed that units with higher levels of RC produced best performance. Havens et al. [15] explained higher levels of job satisfaction, work engagement and decrease of burnout from the RC perspective. Haider et al. [13] applied the RC to the banking industry to explain the relationship between high performance work systems and job satisfaction. Gallego et al. [16,17] and Margalina et al. [7] applied the RC model to explain best results in online systems in higher education. The model was also applied to face-to-face learning. At Quevedo State Technical University (Ecuador), a typology of organizational models was built [18]. In addition, the level of quality in education of Agricultural Polytechnic of Manabi "MFL" and Quevedo State Technical University [19] was estimated. Furthermore, Checa et al. [20] located RC factors oriented towards sustainability in higher education.

Quality is an important performance indicator for education, and it is one of the main issues examined by modern scholars and practitioners from the international education market [21]. The main problem lies in the subjectivity of the concept of quality, which makes it difficult to measure [22]. According to Gallego et al. [16], an indicator to measure the quality was the degree of students' satisfaction. Satisfaction showed a customer orientation, linking what it is expected from one student with the obtained result [23]. Student's perceived satisfaction showed the efficiency of organizations at different areas of activity: Academic services, administrative services, teaching staff, training programs, etc. [24]. However, there is still a lack of empirical research that examines the relationship between RC and students' satisfaction to solve some questions such as: How deep is that relationship? Does an improvement in RC increase student satisfaction? Furthermore, in the current literature, the findings are based on cases that can hardly be extended to other universities. Addi-Racah and Gavish [25], Lee and Yu [26] and Noël et al. [27] identified

organizational differences through discriminant analysis. A comparison among universities allows identifying the key organizational factors that differentiate them. This can enable the design of strategic measures oriented to improve the quality of performances.

We pose the following research questions: (RQ1) Do universities located in developed countries showed a higher level of RC? (RQ2) Do the most satisfied students have a higher level of RC? (RQ3) Is it possible to build an organizational model that differentiates the three institutions?

Therefore, the objective of this study was to identify the organizational differences among three universities with different socioeconomic contexts and two levels of student satisfaction, from the RC perspective. The cases of Arcada University of Applied Science (ARCADA) in Finland, University of Cordoba (UCO) in Spain and Agricultural Polytechnic of Manabi "MFL" (ESPAM) in Ecuador with different satisfaction levels and socioeconomic contexts were selected. The analysis was developed in two stages. In the first stage, considering the 23 organizational variables proposed, those variables with significant differences among the three universities and between the two levels of satisfaction by general linear model (GLM) were identified. In the second stage, the organizational differences among the three universities were explained by discriminant analysis.

Socioeconomic Contexts

The knowledge of local culture and the socioeconomic situation are essential to establish competitive educational leadership and management strategies [28]. In this research, three universities were selected as representative instruments of three international socioeconomic contexts with different organizational structures. ARCADA represented Finland, which has a high Gross Domestic Product (GDP) (Table 1). This university is in the position 18 out of 35 in the ranking of Finnish Universities [29]. UCO represented Spain, which has a medium GDP (Table 1). UCO is a non-private university and appears in position 53 out of 120 in the ranking of Spanish universities [30]. Ecuador presented the lowest GDP (Table 1) and was represented by ESPAM. This university is in the position 41 out of 61 universities in Ecuador [31]. In Table 1, the main differences between the three socioeconomic contexts and the positions in the higher education rankings of the three universities were shown.

The three countries were compared using the Program for International Student Assessment (PISA) report. This study carried out by the countries belonging to the Organization for Economic Cooperation and Development (OECD), measures the academic performance of students according to subjects such as mathematics, science and reading. Finland and Spain showed their data in the regular PISA report [32,33], while Ecuador presented their data in the "PISA for development" or PISA-D report [34], an OECD initiative for low-and middle-income countries. Ranking Web of Universities showed the position of each university worldwide [35].

Table 1. Socioeconomic contexts (pre-COVID 19).

Characteristics of the Country						PISA Report [32,33]/PISA-D Report [34]									Ranking ³
Country	Population	GDP ¹	Public univ.	Non-public univ.	Political System	Mathematics and science average (pts.)	High performance students (%)	Socioeconomic impact (%) ²	Student performance trend	Staff and resources quality	Qualified teaching by type of centre (%)	Bullying cases (%)	Lifestyle satisfaction (%)	Student growth mindset (%)	
Finland	5,515,525	48,280	13	22	Parliamentary republic	Mathem. 520 Science 552	12	11	Decrease	Remain	Favoured: 94 Disadvantaged: 91	18	78	67	ARCADA = 4589
Spain	46,797,754	29,350	64	56	Parliamentary monarchy	Mathem. 481 Science 483	4	10	Stable	Shortage	Favoured: 94 Disadvantaged: 98	17	74	62	UCO = 679
Ecuador	17,084,359	6090	30	31	Presidential constitutional republic	Mathem. 377 Science 399	1.4	25	Decrease	Shortage	No data	No data	87	No data	ESPAM = 15,330

¹ Gross Domestic Product: \$/person/year. ² Status students over performance. ³ Ranking web universities [35].

Arcada University of Applied Science (ARCADA) is a private university located in Finland, in Northern Europe. It is composed of 2443 students, 165 employees, 4 educational departments, 17 grade programs and 10 Master programs. U-Multirank ranking evaluates five dimensions of higher education centers (teaching and learning, research, knowledge transfer, international orientation and regional engagement). ARCADA overall profile showed higher performance on several indicators, with “A” scores (very good) overall. According to U-Multirank [36], ARCADA was strongest in Regional Engagement. ARCADA was in position 4589 out of 30,585 in the Ranking Web of Universities [35]. Within the three world rankings that classify the top 1000 universities, University of Cordoba (UCO) was ranked at position 800 in The Higher Education World Universities Ranking [37], position 700–800 in the Shanghai Ranking [38] and position 101–150 in QS World Universities Ranking [39]. It presented a medium size dimension with 21,000 students, 1200 lecturers, 700 workers, 47 undergraduate studies and more than 50 postgraduate studies. Finally, it was classified in the position 686 out of 30,585 in the Ranking Web of Universities [35]. Moreover, Agricultural Polytechnic of Manabi, ESPAM, is a public institution located in Ecuador. It was graded with “C” category by the Council of Evaluation, Accreditation and Quality Assurance of Upper Education (CEAACES) [40]. This is a ranking applicable to Ecuadorian universities exclusively. This classification is distributed in a decreasing way from category “A” to “D”. In this case, 2811 students and 176 employees compose ESPAM, and it offers 8 grade programs. In addition, it was ranked 15,330 out of 30,585 in the Ranking Web of Universities [35].

2. Materials and Methods

2.1. Data Collection and Survey

A stratified random sample composed of 300 surveyed students, 100 from each university, was collected during the period 2017–2018. The initial data started from a database for each university, made up of 200–1000 data each one. Incomplete surveys and those that showed logical inconsistencies were deleted. Finally, a group of 100 surveys from each university was randomly selected with the random function of the spreadsheet software, making up the complete database with 300 surveys. The survey included 33 items: 4 socio-economic (age, gender, character public/private, size), 6 of students’ perceived satisfaction and 23 related to RC. The survey’s reliability was verified by means of Cronbach’s alpha, with values greater than 0.7, acceptable to confirm internal consistency: communication dimension (0.703), relationship dimension (0.831) and satisfaction (0.793) (Table 2). The complete survey showed a Cronbach’s alpha of 0.87 [20,41].

The 23 items of the RC model focused on the mechanisms involved in organizational practices are shown in Table 2. 11 variables of the communication dimension, 12 of relationship dimension and 6 related to the level of student satisfaction were used. The students answered each question of the survey (Table S1) as many times as profiles were observed at the university. Then, each relational coordination variable was disaggregated into the following profiles: lecturers, administrative officers, classmates, student representatives and me (myself), as a control variable. A Likert scale metric was used, from 1 (infrequent) to 5 (very frequent). In this case, the intervals between the points on the scale corresponded to empirical observations in the metric sense [42]. A visual analog scale was displayed on each survey question presented to the students.

Table 2. Relational coordination and satisfaction variables.

Dimension	α Cronbach	Code	Question/Variable
COMMUNICATION	0.703	ACCURATE COMMUNICATION: Do the people who belong to these areas have the need to offer you information at certain times?	
		1. ACCU _{Admin}	Accurate communication with administrative officers
		2. ACCU _{Lect}	Accurate communication with lecturers
		3. ACCU _{Class}	Accurate communication with classmates
		FREQUENT COMMUNICATION: Do people who belong to the following work areas communicate with you frequently?	
		4. FREQ _{Admin}	Frequent communication with administrative officers
		5. FREQ _{Lect}	Frequent communication with lecturers
		6. FREQ _{Class}	Frequent communication with classmates
		SOLVING PROBLEM COMMUNICATION: When any type of problem appears (study, logistics, documentation . . .), how much did the following profiles help you to solve your problem?	
		7. SOLPRO _{Myself}	Problem-solving communication with myself
		8. SOLPRO _{Lect}	Problem-solving communication with lecturers
RELATIONSHIP	0.831	SHARED KNOWLEDGE: How well do the following profiles know about your role in the university and the problems that arise?	
		12. SKNOW _{Lect}	Shared knowledge with lecturers
		13. SKNOW _{Repres}	Shared knowledge with students' representatives
		14. SKNOW _{Admin}	Shared knowledge with administrative officers
		15. SKNOW _{Class}	Shared knowledge with classmates
		MUTUAL RESPECT: How much do the following profiles respect your role at the university?	
		16. RESPE _{Lect}	Mutual respect with lectures
		17. RESPE _{Repres}	Mutual respect with students' representatives
		18. RESPE _{Admin}	Mutual respect with administrative officers
		19. RESPE _{Class}	Mutual respect with classmates
		SHARED GOALS: How well do the following profiles share your goals at the university?	
20. SHARGOAL _{Lect}	Shared goals with lecturers		
21. SHARGOAL _{Repres}	Shared goals with students' representatives		
22. SHARGOAL _{Admin}	Shared goals with administrative officers		
23. SHARGOAL _{Class}	Shared goals with classmates		
SATISFACTION	0.793	STUDENT SATISFACTION: Indicate your degree of satisfaction with the following profiles.	
		24. SATIS _{Lect}	Satisfaction with lectures
		25. SATIS _{Represent}	Satisfaction with students' representatives
		26. SATIS _{Admin}	Satisfaction with administrative officers
		27. SATIS _{Materials}	Satisfaction with materials
		28. SATIS _{Communic}	Satisfaction with communication channels
		29. SATIS _{Contents}	Satisfaction with training contents

The proposed indicator of satisfaction was based on the student's satisfaction level [7,16,43]. This indicator was obtained from variables 24–29, related to profiles of conferences, student representatives, administrative officers, materials, communication channels, training con-

tent. The descriptive statistics of trend, dispersion and position of the satisfaction variable were calculated (Figure S1). In each university the median ranges between 18–20 points and for the total sample of 19 points. Therefore, two levels were determined: 19 points was used as border: less than 19, “Low satisfaction” and more than 19, “High satisfaction” [19,20]. Later, satisfaction level was understood as fixed or independent variable.

2.2. Statistical Analysis

The normality of the data distribution was evaluated using the Kolmogorov-Smirnov test (with the Lilliefords correction) and a Levene test was used to evaluate the homogeneity of variance. For those variables that did not show a normal distribution, the Bartlett test was applied to assess if the data had equal variances.

In the first stage, to answer RQ1 and RQ2, the RC variables influenced by the university (socioeconomic context) and the level of satisfaction were identified. 23 variables of RC were compared using the general linear model (GLM). The three universities (ARCADA, ESPAM and UCO) and two satisfaction levels (Low and High) were used as fixed factors. The interactions between both factors were also considered [43]. Three levels: * p -value < 0.05; ** p -value < 0.01 and *** p -value < 0.001 were considered. The test allowed determining which pairs of means differed significantly and to study data whose error did not conform to the normal distribution and non-constant variances. The test allowed determining which pairs of means differed significantly and to study data whose error did not conform to the normal distribution and non-constant variances [43].

Secondly, an organizational model was built using a canonical discriminant analysis to answer to RQ3. This analysis allows studying the concrete relationships that exist among discriminated groups (universities) and their degree of association [44]. The coefficients of the discriminant model show the relative contribution of the variables to the model. The higher the value of the F-remove coefficient, the greater the contribution to group discrimination [45,46]. Therefore, variables with a p -value < 0.05 were accepted and a model with highest percentage of correctly classified cases was selected. The most discriminant variables were calculated applying the F of Snedecor, Wilks' Lambda and the 1-Tolerance. High values of F for each variable indicated that the means of each group were widely separated. Small Lambda values showed that the variable discriminates well among groups. Variables with a high percentage of tolerance (1-Toler) were selected [26]. Statistical analyses were performed using the STATISTICA 12.

3. Results

The three universities showed an average age of students less than 25 years in 86% of the sample (p -value < 0.05). Regarding gender, the distribution was uniform in ARCADA. However, in UCO most of the students were women (p -value < 0.001) and in ESPAM most of the students were men (p -value < 0.05). Regarding the field of knowledge, significant differences were found among the three universities. In ARCADA 100% of the data corresponded to the Social Sciences (p -value < 0.001), in UCO the Health Sciences predominated (90%; p -value < 0.001) and in ESPAM the Engineering Areas obtained the highest percentage (72%; p -value < 0.05). The sociodemographic indicators of the sample are shown in Table 3.

Table 3. Sociodemographic distribution of the sample (%).

	Age			Gender			Field of Knowledge			
	<25	≥25	<i>p</i> -Value	Male	Female	<i>p</i> -Value	Social sciences	Engineering	Health sciences	<i>p</i> -Value
ARCADA	86	14	ns	54	46	ns	100	-	-	***
UCO	88	12	ns	30	70	***	-	10	90	***
ESPAM	83	17	ns	56	44	*	15	72	13	*
TOTAL	86	14	ns	46	54	***	38	27	35	***

* *p*-value < 0.05; ** *p*-value < 0.01; *** *p*-value < 0.001; ns = not significantly different.

The three universities reached relational coordination values close to the average (69.87 ± 0.78 ; $CV = 0.19$). Regarding satisfaction, UCO obtained the lowest level (18.25 ± 0.44 ; $CV = 0.24$) and ARCADA (19.44 ± 0.53 ; $CV = 0.27$), the highest one. The dispersion coefficient was low in the three universities (data not presented).

3.1. Identification of Organizational Differences

GLM results are shown in Table 4. Significant differences were found in most of the variables of RC by university and satisfaction (*p*-value < 0.05). 82.61% of the RC variables showed significant differences by university. The highest RC values were observed at ESPAM and UCO, while ARCADA showed lower values. ARCADA showed significant differences in the variables related to solving problem communication and shared knowledge with the administrative officers. In UCO significant differences were found, highlighting the frequent communication, shared knowledge and mutual respect related to classmates. Lastly, ESPAM showed significant differences in accurate and frequent communication variables, and shared knowledge and goals were the variables that stood out, relating to lectures.

Table 4. Relational coordination by university and satisfaction level (Mean \pm SE).

Variable	University (A)			Satisfaction Level (B)		<i>p</i> -Value		
	ARCADA	UCO	ESPAM	Low	High	University (A)	Satisfaction level (B)	Interactions (A \times B)
1. ACCU _{Admin}	2.75 ^a \pm 0.10	2.60 ^a \pm 0.10	3.38 ^b \pm 0.10	2.67 \pm 0.09	3.15 \pm 0.08	***	***	ns
2. ACCU _{Lect}	3.57 ^a \pm 0.09	3.77 ^{ab} \pm 0.09	3.95 ^b \pm 0.09	3.60 \pm 0.07	3.92 \pm 0.07	**	**	**
3. ACCU _{Class}	3.67 ^a \pm 0.10	3.76 ^a \pm 0.10	3.84 ^a \pm 0.10	3.67 \pm 0.08	3.84 \pm 0.08	ns	ns	ns
4. FREQ _{Admin}	2.54 ^b \pm 0.09	1.99 ^a \pm 0.09	2.81 ^c \pm 0.10	2.16 \pm 0.08	2.74 \pm 0.07	***	***	**
5. FREQ _{Lect}	3.44 ^a \pm 0.09	3.54 ^a \pm 0.09	3.83 ^b \pm 0.09	3.36 \pm 0.08	3.84 \pm 0.07	**	***	ns
6. FREQ _{Class}	4.08 ^{ab} \pm 0.09	4.30 ^b \pm 0.09	4.00 ^a \pm 0.09	4.08 \pm 0.08	4.17 \pm 0.07	ns	ns	ns
7. SOLPRO _{Myself}	4.20 ^{ab} \pm 0.08	4.43 ^b \pm 0.08	4.18 ^a \pm 0.08	4.29 \pm 0.07	4.25 \pm 0.07	ns	ns	ns
8. SOLPRO _{Lect}	3.04 ^a \pm 0.08	3.04 ^a \pm 0.08	3.11 ^a \pm 0.08	2.87 \pm 0.07	3.26 \pm 0.07	ns	***	ns
9. SOLPRO _{Repres}	2.13 ^a \pm 0.11	2.51 ^b \pm 0.11	2.47 ^b \pm 0.11	2.18 \pm 0.09	2.56 \pm 0.09	*	**	ns
10. SOLPRO _{Admin}	2.50 ^b \pm 0.09	2.05 ^a \pm 0.09	2.46 ^b \pm 0.09	2.09 \pm 0.08	2.59 \pm 0.07	***	***	ns
11. SOLPRO _{Class}	3.43 ^b \pm 0.10	3.78 ^c \pm 0.10	2.95 ^a \pm 0.10	3.37 \pm 0.08	3.40 \pm 0.08	***	ns	ns
12. SKNOW _{Lect}	3.04 ^{ab} \pm 0.11	2.85 ^a \pm 0.10	3.16 ^b \pm 0.10	2.81 \pm 0.09	3.23 \pm 0.08	ns	**	ns
13. SKNOW _{Repres}	2.36 ^a \pm 0.12	2.21 ^a \pm 0.11	2.51 ^a \pm 0.11	2.23 \pm 0.10	2.48 \pm 0.09	ns	ns	**
14. SKNOW _{Admin}	2.40 ^b \pm 0.10	1.73 ^a \pm 0.10	2.47 ^b \pm 0.10	1.96 \pm 0.09	2.44 \pm 0.08	***	***	***
15. SKNOW _{Class}	3.35 ^a \pm 0.11	4.02 ^b \pm 0.10	3.21 ^a \pm 0.10	3.47 \pm 0.09	3.59 \pm 0.08	***	ns	ns
16. RESPE _{Lect}	3.30 \pm 0.11	3.62 \pm 0.10	3.58 \pm 0.10	3.27 \pm 0.09	3.73 \pm 0.08	ns	***	**
17. RESPE _{Repres}	2.52 ^a \pm 0.12	2.96 ^b \pm 0.12	3.06 ^b \pm 0.12	2.60 \pm 0.10	3.09 \pm 0.09	**	***	**
18. RESPE _{Admin}	2.65 ^b \pm 0.12	2.33 ^a \pm 0.11	3.00 ^c \pm 0.11	2.33 \pm 0.10	2.99 \pm 0.09	***	***	**
19. RESPE _{Class}	3.42 ^a \pm 0.10	4.15 ^b \pm 0.09	3.53 ^a \pm 0.09	3.62 \pm 0.08	3.78 \pm 0.07	***	ns	ns
20. SHARGOAL _{Lect}	2.84 ^a \pm 0.10	3.09 ^a \pm 0.10	3.43 ^b \pm 0.10	2.83 \pm 0.08	3.41 \pm 0.08	***	***	ns
21. SHARGOAL _{Repres}	2.46 ^a \pm 0.12	2.65 ^{ab} \pm 0.12	2.85 ^b \pm 0.12	2.33 \pm 0.10	2.97 \pm 0.09	ns	***	*
22. SHARGOAL _{Admin}	2.55 ^b \pm 0.10	1.77 ^a \pm 0.10	2.85 ^c \pm 0.10	2.09 \pm 0.08	2.68 \pm 0.08	***	***	*
23. SHARGOAL _{Class}	3.46 ^a \pm 0.10	4.03 ^b \pm 0.10	3.46 ^a \pm 0.10	3.59 \pm 0.08	3.71 \pm 0.08	***	ns	**

* *p*-value < 0.05; ** *p*-value < 0.01; *** *p*-value < 0.001; ns = not significantly different. ^a, ^b Within row, averages with different superscript differ significantly.

Significant differences by level of student satisfaction were found in 65.21% of the organizational variables. 26.09% of the variables showed differences according to both criteria (Table 4). The non-significant variables were those related to the classmates and representatives of the students in the two dimensions of RC. The interactions between university and satisfaction were found in six RC variables. Most of the variables were

related to the profile of administrative officers. The interactions found between both factors in these six significant variables are shown in Figure 1.

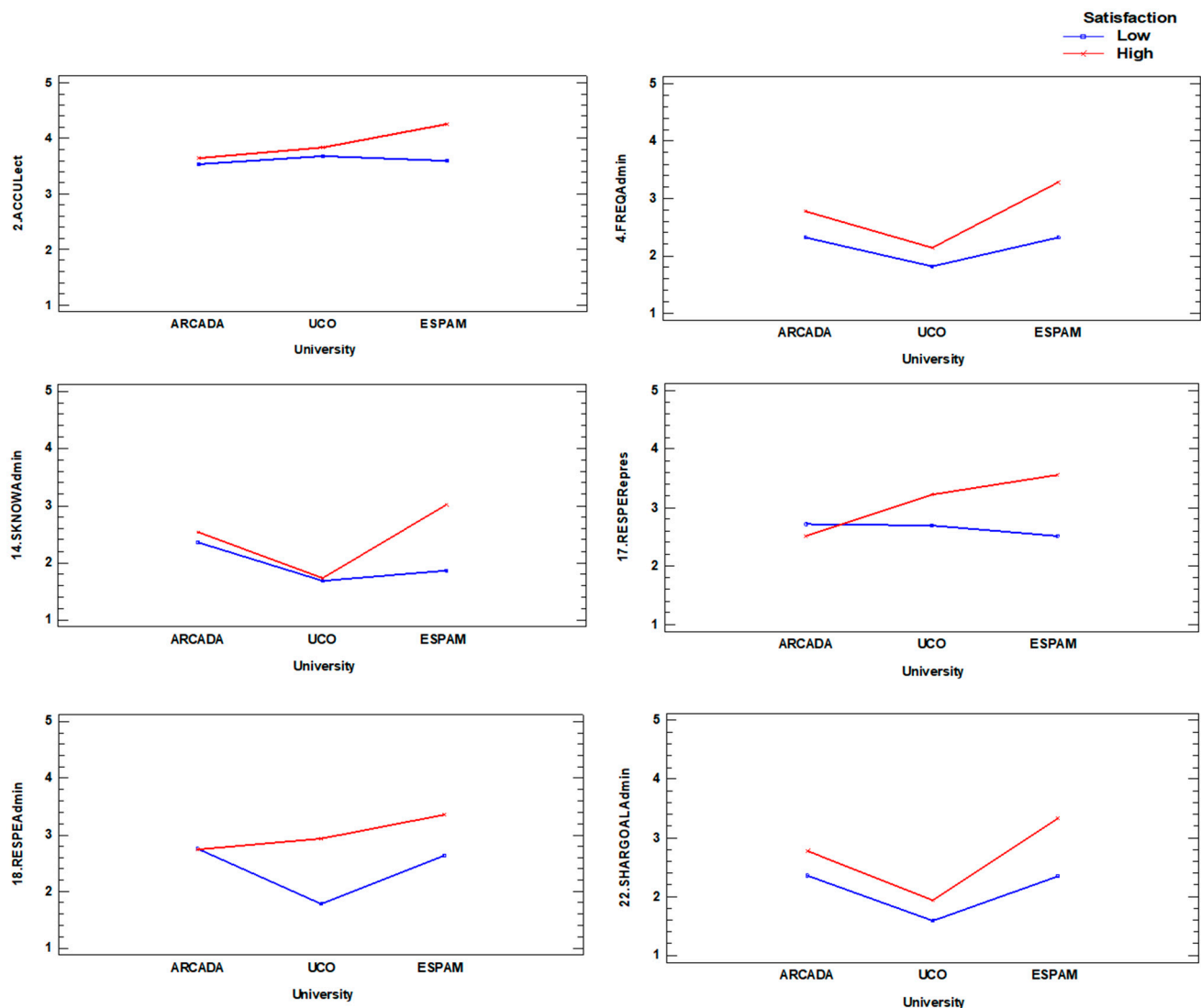


Figure 1. Interactions between university and level of satisfaction.

3.2. Discriminant Model Building

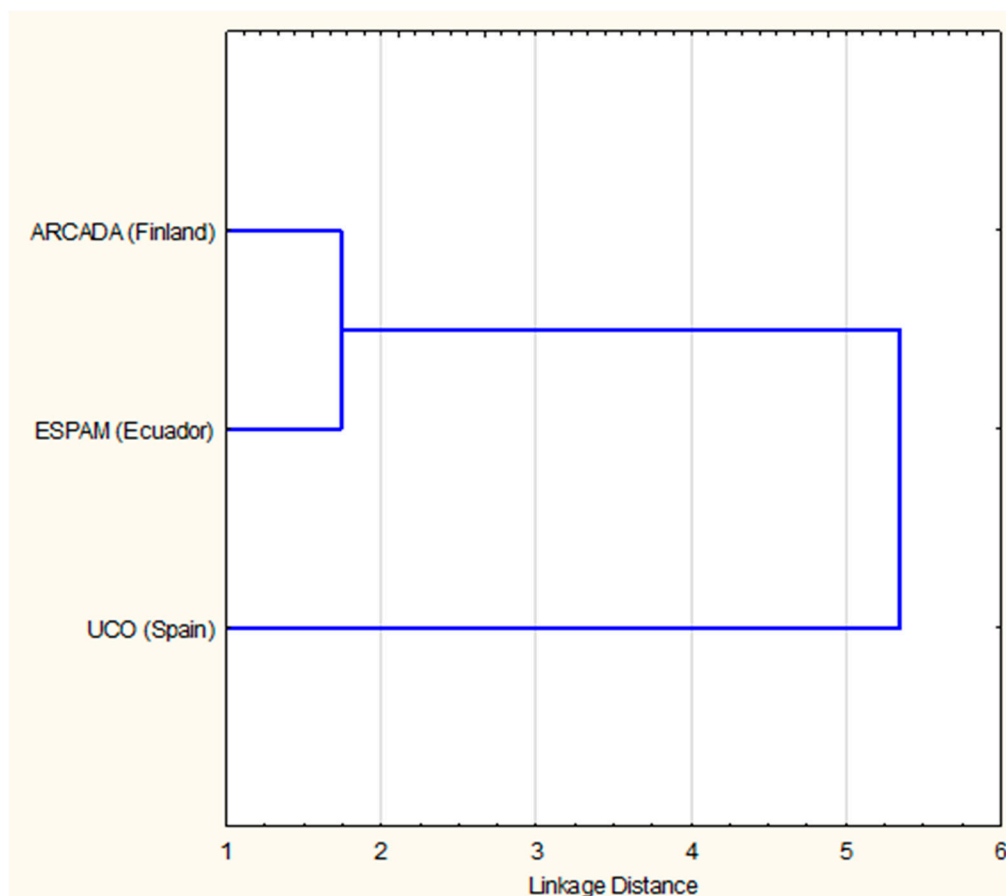
Discriminant analysis model among universities was carried out. As predictors, 23 RC variables were used. The eight significant variables, which showed a p -value < 0.05 , were selected for the construction of the discriminant model: Three related to the communication and five to the relationship dimension (Table 5). Accurate communication with administrative officers and lecturers, shared knowledge and mutual respect with classmates; and shared objectives with the representatives of the students belonged to the discriminant model. Additionally, shared goals with lectures and administrative officers, and the communication for solving problems among classmates were the variables with the three highest discriminant powers, showing a higher F-remove coefficient.

Table 5. Discriminant function for the organizational variables of three universities (ARCADA, UCO and ESPAM).

Variable	Wilks'	Partial	F-Remove	<i>p</i> -Value	Toler	1-Toler
2. ACCU _{Lect}	0.491	0.974	3.088	*	0.603	0.397
3. ACCU _{Class}	0.494	0.967	4.029	*	0.681	0.319
11. SOLPRO _{Class}	0.516	0.927	9.279	***	0.737	0.263
15. SKNOW _{Class}	0.493	0.971	3.568	*	0.549	0.451
19. RESPE _{Class}	0.494	0.967	3.960	*	0.643	0.357
20. SHARGOAL _{Lect}	0.518	0.924	9.726	***	0.558	0.442
21. SHARGOAL _{Repres}	0.491	0.973	3.290	*	0.457	0.543
22. SHARGOAL _{Admin}	0.550	0.869	17.672	***	0.480	0.520

* *p*-value < 0.05; *** *p*-value < 0.001.

The classification matrix offered a correct ascription percentage of 69.32, obtaining assignment errors only in ESPAM (data not presented). The organizational differences of the three analyzed universities are shown in Figures 2 and 3. In the first one, in which the Mahalanobis distances obtained from the relational coordination indicators were graphically represented, a first cluster grouped ARCADA and ESPAM University and second cluster made up UCO. The students from UCO showed greater separation, and, therefore, greater relational coordination differentiation, due to its lower RC rating. The existence of different relational models for each university were observed in Figure 3, which showed a spatial distribution of each university with overlap of some individuals of ARCADA and ESPAM, but strong distance from UCO showed a clear differentiation.

**Figure 2.** Cluster from Mahalanobis distances for three universities.

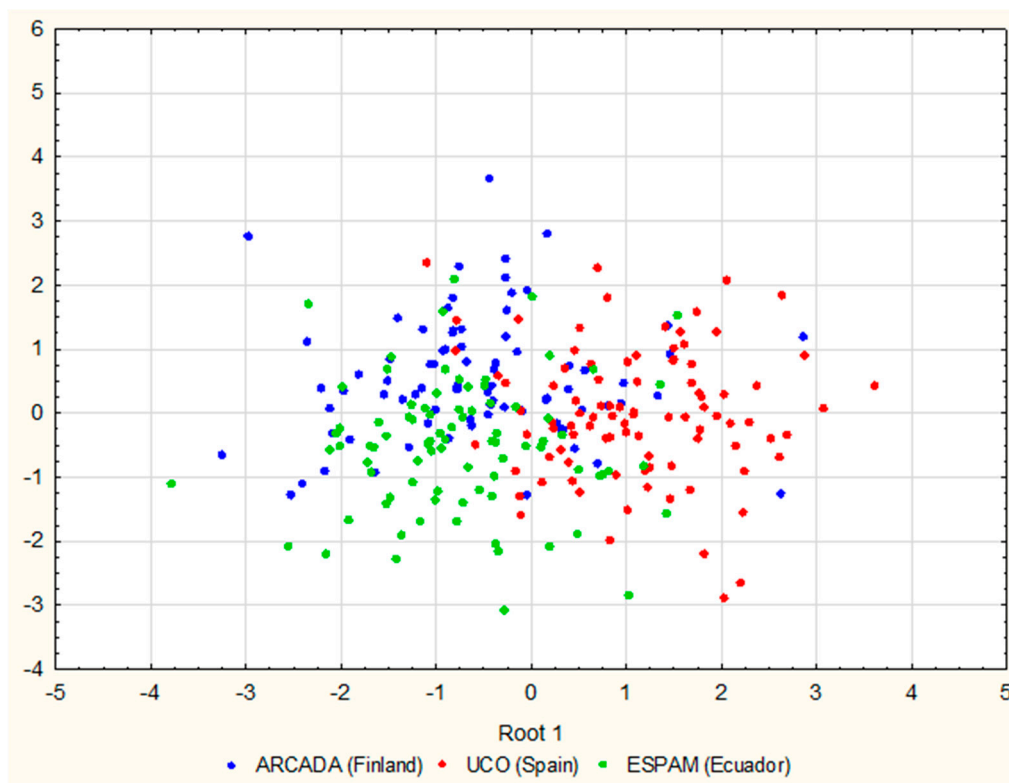


Figure 3. Plot of the individual observation discriminant scores obtained with the canonical discriminant function for three universities.

4. Discussion

The relational coordination framework provides an excellent basis for investigating the types of organizational models at universities [7,16,17,47]. According to [47], higher levels of relational coordination improve results. RC model can be useful to achieve excellent results in higher education where high levels of task interdependence, uncertainty, time restrictions and tacit knowledge are required [7]. In the case of higher education, it is important to identify best organizational practices to apply at universities, as well as the differences among universities, which contribute to the global knowledge of the importance of RC on the results of the organization [16,20]. The methodology developed in this research has allowed, in a first step, identifying the relational coordination variables that promote differences among universities and satisfaction levels. In a second stage, according to Addi-Raccah and Gavish [25], Lee and Yu [26] and Noël et al. [27], a canonical discriminant function for the ARCADA, UCO and ESPAM universities, in three countries and very different socioeconomic contexts has been built.

RQ1 was not validated in this study. According to De-Pablos-Heredero et al. [19], an improvement in organizational practices leads to an improvement in results regardless of the socioeconomic context.

RQ2 was validated, finding a positive relationship between RC and student satisfaction level. In the three universities there is a positive effect between RC and satisfaction. This link is more prominent in the case of ESPAM (Figure 1). In ESPAM, with high levels of RC, the highest values of satisfaction have been obtained. In ESPAM, which is a small size public university in a developing country with low economic growth, the level of satisfaction is very sensitive to the modifications in RC in the administrative officers profile [7]. According to the Pisa-D report [34] Ecuador requires an improvement in digital literacy, so there is a greater dependence on administrative officers [7]. Therefore, the different social contexts could explain part of the differences in organizational patterns [28].

Accurate and solving problem communication, mutual respect and shared knowledge and goals are strategic factors to improve de RC. The results obtained show that the personalized service to the student is positively valued by considering individual circumstances. Gallego et al. [16,17] and Margalina et al. [7] proofed how in universities with high quality levels, the institutional coordination with students was stronger. Havens et al. [15] and Haider et al. [13] paid attention to the similarities between teamwork quality and RC. Lacayo-Mendoza and De-Pablos-Heredero [48] indicated that the majority of students highly value the facilities provided by educational staff. Finally, results show that other outstanding attributes are shared goals with students' representatives and with administrative officers. Gallego et al. [16,17] and Margalina et al. [7] concluded how in universities exhibiting high quality levels, the institutional coordination with students is strong.

The construction of a discriminant model verified RQ3. Knowing the variables with the greatest discriminant power, it is possible to propose concrete, simple and economic measures to improve educational quality. The results of this research allow establishing the organizational differentiation among three Universities though discriminant analysis. Shared goals, with lectures and administrative officers, and the communication for solving problems among classmates were the variables with the highest discriminant power. UCO was the most differentiated university according to RC (Figures 2 and 3). This differentiation explains the fact that it is the highest ranked university in the world ranking of universities (Table 1).

Three different universities could be discriminated by the organizational model generated. Shared goals are a key piece for university excellence [17], therefore measures that allow sharing the objectives of the students with lectures and administrative officers are crucial. In order to enhance this, improvements are proposed in digital literacy for communication with administrative officers [7] and changes in the teaching guides, where the lectures establish specific objectives for the students in each subject, are welcomed. Solving problem communication shows that the students use the educational ecosystem in moments of lack of information [16,17]. This way, the creation of direct communication mechanisms among students and other profiles is proposed to solve the problems of university life.

Apart from this, it would be of great interest to develop prediction models for each set of organizational variables over satisfaction. This issue could be developed in future research lines by applying structural equation models. This approach could be extended to different universities and contexts.

5. Conclusions

This research contributes to a novel approach since it allows identifying the organizational differences among three universities with different socioeconomic contexts.

In each university, as the relational coordination dimensions are improved, the level of satisfaction increases. However, an association among universities located in countries with a higher level of economic resources and a higher level of relational coordination, has not been verified. Those universities that implement a program of best practices in relational coordination will achieve higher levels of quality in terms of student satisfaction, regardless the socioeconomic context.

The canonical discriminant model built according to the relational coordination dimensions showed that three organizational variables were enough to explain differences among universities. These variables were shared goals, with lectures and administrative officers, and the communication oriented to solve problems among classmates. Therefore, the discriminant analysis is useful for designing the improvement of the relational practices in each university.

The proposed model can easily be adapted and applied to different contexts and, therefore, they can be of great interest for the improvement of quality at universities. The results were validated but are conditioned in each university by its standard of satisfaction values.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/educsci11080445/s1>, Figure S1: Statistical parameters of the student satisfaction value, Table S1: Relational coordination survey.

Author Contributions: Conceptualization and methodology, all authors. Formal analysis, software, data curation, data processing, A.L.C.; statistical analysis, C.C.-M. and S.H.; validation and investigation, C.D.-P.-H. and A.G.; supervision, A.G., C.D.-P.-H. and C.C.-M.; project administration, C.D.-P.-H. and A.G.; data acquisition, A.L.C. and A.G. All authors have been involved in developing, writing, commenting, editing and reviewing the manuscript. All authors have read and agreed to the published version of the manuscript.

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3.2 Artículo 2: (Checa-Morales, De-Pablos-Heredero, Torres, et al., 2021)

Quantitative Comparison between Traditional and Intensive Face-to-Face Education through an Organizational Model

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Article

Quantitative Comparison between Traditional and Intensive Face-to-Face Education through an Organizational Model

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Abstract: Face-to-face education continues to present benefits in terms of student motivation, even though in COVID-19 scenario, online education has been the model of choice. In addition to the traditional face-to-face style, the intensive face-to-face style remains, which allows greater flexibility for the student. The objective of this study was to compare both educational styles and build an organizational model to improve student satisfaction. Two-way general linear model (GLM) with educational styles and satisfaction as fixed factors and discriminant analysis was applied. The selection of the most discriminant variables was made applying the F of Snedecor, Wilks'-Lambda, and the 1-Tolerance. A discriminant model was built. The four variables with the highest discriminant power were problem-solving communication with students' representatives and shared knowledge and goals with lectures in the intensive style and frequent communication with administrative officers in the traditional style. In addition, it was found that greater face-to-face attendance did not imply greater coordination and that intensive style students show greater satisfaction. The appropriate duration of face-to-face education can contribute to the design of an innovative hybrid system in the future.

Keywords: relational coordination model; higher education; discriminant analysis; improvement of the education system



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1. Introduction

The COVID-19 crisis caused a paradigm shift in education [1], with a necessary establishment of online education during the confinement period. Nowadays, there is a tendency to establish hybrid learning systems permanently [2]. However, face-to-face education is the most successful model [2,3]. This modality has been coexisting with others that try to satisfy a demand whose profile did not meet the demands of face-to-face education (blended education, online, etc.) [3–6]. In addition, to satisfy part of that demand, different styles of attendance were observed.

Traditional face-to-face education (TFE) was defined by Gherheş et al. [7] as “an instructional method where course content and learning material are taught in person to a group of students”. It has been the preferred educational strategy for students [7,8] and the most common educational method, where the student shares physical space with the professor and there is a continuous interaction between both profiles [5]. The duration of teaching is regulated in the EU by ECTS credits. One credit corresponds to 25 teaching

hours, where 30–40% are face-to-face and 70–60% are non-face-to-face and correspond to the personal and group work of the student. Student–teacher interaction in the classroom allows immediate feedback [3,9]. It has been reported that face-to-face education has a lower dropout rate than other educational modalities [10]. In other types of education (distance, online, etc.), the lack of direct and accurate interaction with teachers causes a lack of motivation in students, in addition to higher rates of stress and anxiety [11]. TFE encourages participation in student interpersonal relationships and didactic communication [12]. As indicated by Cho et al. [13] and Gherheş et al. [7], motivation is directly linked to the degree of achievement of learning objectives.

TFE presents a lack of flexibility in class schedule for students who need to reconcile their academic and professional life [3,5,14]. This can generate anxiety patterns in students [15] and especially affects students with a job [16] or family responsibilities [17,18]. According to Sprung and Rogerts [15], the balance between personal and professional-educational life is an important antecedent of mental health of university students, and educational institutions should facilitate this balance to improve the university experience. An organizational improvement in the management of work-study reconciliation by the institution is reflected in an improvement in academic results [14].

Intensive education is a variant of traditional face-to-face education. This style concentrates the teaching hours in compressed periods of time [17–20]. The credit has the same duration as in the TFE (25 h), although the percentage of face-to-face attendance of the students is lower, with a variable term between 10–30% of the time. [21]. Given the growing demand of students for a model of these characteristics, some universities offer intensive face-to-face education programs (IFE) to allow non-conventional students to opt for face-to-face education [13,16–18,20,22,23]. The intensive academic day generally covers 8 h a day [18,23] and includes all the training contents of the subject [17,18,23]. Therefore, the component of student attendance decreases, but without being eliminated, considering it a modality or educational style within face-to-face education [19,24,25]. The IFE student profile is different from that of the TFE. In the traditional style, there are mostly young students who have just finished secondary education and do not have family responsibilities [26]. On the contrary, in the intensive style, the students that make their education compatible with their job predominate [7,16,27]. They are generally older people who financially support their family [17]. According to Cho et al. [13], granting a greater degree of autonomy to students allows higher levels of motivation. While in the TFE the student dedicates most of the total amount of learning hours to attending master classes, the IFE is characterized by the dedication to independent work of the student outside the institution most of the time. In other words, the self-activity of the student predominates in the intensive learning process, dedicating only a part to attending classes or mentorship where the professor solves specific doubts [24].

Therefore, in the IFE the self-regulated learning of the students becomes important [28–30]. According to Romero et al. [28], this educational style is associated with higher levels of student resilience and better academic results. The compressed schedule enhances the self-discipline [8] and the assimilation of knowledge [30]. Furthermore, according to Hsu et al. [29], greater autonomy in the learning process contributes directly to the employability later.

The implementation of a learning style such as the IFE must take into account organizational coordination, since the same training contents as in the TFE must be taught in less time [5]. Relational coordination (RC) plays a crucial role in the educational strategy [1]. RC is an organizational model for the integration of tasks, based on the dimensions of communication and relationship among the stakeholders of the organization [4,5,31–33]. Accurate, frequent, and problem-solving communication defines the first dimension of the model [31,32]. These characteristics allow the establishment of strong links in contexts with high levels of tasks' interdependence [32,33]. Shared goals and knowledge and mutual respect constitute the second dimension [31,32,34]. These elements allow the sharing of relevant information for the decision making process [32,33].

The RC model has been studied in sectors such as banking [35], airlines [34], health [4,31], and entrepreneurship [33], showing that a higher level of RC significantly increases the quality of the organization's results, regardless of the sector. Furthermore, RC has been applied to higher education. In the online mode, Gallego et al. [4] and Margalina et al. [36] highlighted the importance of communication and its relationship with quality, by studying two Spanish universities. In the face-to-face mode, De-Pablos-Heredero et al. [37] showed the relationship between RC and educational quality, through the construction of an organizational model by means of a transnational comparison, proving how an increase in RC allows students to achieve a higher level of student satisfaction.

The objective of this work was to compare the traditional face-to-face (TFE) and intensive (IFE) styles through a quantitative model. The effect of coordination on educational style and student satisfaction was studied. A two-stage study was conducted. In a first stage, organizational and satisfaction differences were determined individually using general linear models (GLM). In a second stage, a discriminant model that differentiated both styles of face-to-face education was built, combining educational style and satisfaction. The comparison of the traditional and intensive style contributes to improving the satisfaction performance of the face-to-face educational modality. This would be a first step in building efficient hybrid educational systems through the implementation of coordination variables. The evaluation of this effect requires an environment where both styles coexist, as is the case of the Quevedo State Technical University (UTEQ).

There is a social responsibility of the institutions to offer quality training styles appropriate to each student profile [16–18] and to promote more efficient and innovative educational methods [1,38]. There is a lack of quantitative research that compares face-to-face education [7] and identifies its organizational and collaborative elements [12]. Therefore, the following research questions were raised: RQ1) Is greater face-to-face assistance associated with greater coordination? RQ2) Is greater student satisfaction associated with greater coordination? RQ3) Is it possible to build an organizational model through RC variables?

After this introduction, the second section presents the sample and the statistical methods used; the third section collects the research results; the fourth, the discussion of them; the fifth, the limitations of the study; and, finally, the sixth section shows the main conclusions of this research.

2. Materials and Methods

2.1. Quevedo State Technical University (UTEQ)

Quevedo State Technical University (UTEQ) is an Ecuadorian public university located in the city of Quevedo, Los Ríos province [39]. It has been accredited as “B” category by the Council for the Evaluation, Accreditation, and Quality Assurance of Higher Education of Ecuador (CEACEES), on a scale from A to D, according to decreasing quality criteria, and it has been studied as an organizationally sustainable higher education institution [40]. According to CEAACES, Ecuadorian legislation determines its academic offer according to “relevance”, that is, according to local, regional, and national development needs [41].

The UTEQ offers its degrees in both traditional face-to-face (TFE) and intensive (IFE) educational styles, with the same professors and training content. TFE is taught from Monday to Friday, with a duration of 6 teaching hours per day (30 h per week), while the IFE concentrates the same training content on two days, Saturday and Sunday, where students attend the educational centre 8 h a day (16 h a week).

2.2. Data Collection and Survey

The data came from a database composed of more than 4000 pieces of information with students from first to fifth year, belonging to different degrees of animal sciences. Incomplete surveys and those that showed logical inconsistencies were eliminated by using the random function of the spreadsheet software [42]. To make up the complete database for this study, a random sample of 370 students from third to fifth year (170 from TFE and

200 IFE) was taken, in the academic year 2018–2019 [43]. Degrees with an agri-food profile were selected due to the rural nature of growing economy of Ecuador [44]. To ensure objective answers about the evolution of the university, a minimum of three years of tenure in the educational centre was established. The students were asked through a survey. In conducting the survey, they were guided by a professor to avoid misinterpretation.

Regarding the structure of the survey, for the sociodemographic data, two variables were used: age and gender. In total, 29 items were used for the variables of the relational coordination model and for satisfaction [4,5,31,37]: 11 variables from the communication dimension, 12 from the relationship dimension, and 6 related to the level of student satisfaction. In the survey, students were asked for their degree of coordination with the rest of the university profiles and for their degree of satisfaction with each one (Table S1). Later on, each relational coordination variable was disaggregated into the following profiles: lecturers (Lect), administrative officers (Admin), classmates (Class), student representatives (Repres), and “myself” (Myself) as a control variable, that indicates the student’s problem solving without the help of other profiles. The reliability of the survey was verified using Cronbach’s alpha, with values greater than 0.7, acceptable to confirm internal consistency: communication dimension (0.785), relationship dimension (0.889), and satisfaction (0.825). The complete survey showed a Cronbach’s alpha of 0.906 [40,45]. The variables and the reliability values are shown in Table 1. An ascending visual scale was used for the responses of the students, applying a Likert scale from 1 to 5, from “infrequent” to “very frequent” [46]. The satisfaction metric was obtained from the cumulative level of student satisfaction, according to previous research [37,40]. A level of 21 points differentiated between two levels of satisfaction: low satisfaction (LS) with less than 21 points and high satisfaction (HS) with a score of 21 or higher (Figure 1).

Table 1. Relational coordination and satisfaction variables.

Dimension	α Cronbach	Code	Question/Variable
COMMUNICATION	0.785	ACCURATE COMMUNICATION: Do the people who belong to these areas have the need to offer you information at certain times?	
		1.ACCU _{Admin}	Accurate communication with administrative officers
		2.ACCU _{Lect}	Accurate communication with lecturers
		3.ACCU _{Class}	Accurate communication with classmates
		FREQUENT COMMUNICATION: Do people who belong to the following work areas communicate with you frequently?	
		4.FREQ _{Admin}	Frequent communication with administrative officers
		5.FREQ _{Lect}	Frequent communication with lecturers
		6.FREQ _{Class}	Frequent communication with classmates
		SOLVING PROBLEM COMMUNICATION: When any type of problem appears (study, logistics, documentation, . . .), how much did the following profiles help you to solve your problem?	
		7.SOLPRO _{Myself}	Problem-solving communication with myself
		8.SOLPRO _{Lect}	Problem-solving communication with lecturers
9.SOLPRO _{Repres}	Problem-solving communication with students’ representatives		
10.SOLPRO _{Admin}	Problem-solving communication with administrative officers		
11.SOLPRO _{Class}	Problem-solving communication with classmates		

Table 1. Cont.

Dimension	α Cronbach	Code	Question/Variable
RELATIONSHIP	0.889	SHARED KNOWLEDGE: How well do the following profiles know your role in the university and the problems that arise?	
		12.SKNO _{Lect}	Shared knowledge with lecturers
		13.SKNO _{Repres}	Shared knowledge with students' representatives
		14.SKNO _{Admin}	Shared knowledge with administrative officers
		15.SKNO _{Class}	Shared knowledge with classmates
		MUTUAL RESPECT: How much do the following profiles respect your role at the university?	
		16.RESPE _{Lect}	Mutual respect with lectures
		17.RESPE _{Repres}	Mutual respect with students' representatives
		18.RESPE _{Admin}	Mutual respect with administrative officers
		19.RESPE _{Class}	Mutual respect with classmates
		SHARED GOALS: How well do the following profiles share your goals at the university?	
		20.SHARGOAL _{Lect}	Shared goals with lecturers
		21.SHARGOAL _{Repres}	Shared goals with students' representatives
		22.SHARGOAL _{Admin}	Shared goals with administrative officers
23.SHARGOAL _{Class}	Shared goals with classmates		
SATISFACTION	0.825	STUDENT SATISFACTION: Indicate your degree of satisfaction with the following profiles.	
		24.SATIS _{Lect}	Satisfaction with lectures
		25.SATIS _{Represent}	Satisfaction with students' representatives
		26.SATIS _{Admin}	Satisfaction with administrative officers
		27.SATIS _{Materials}	Satisfaction with materials
		28.SATIS _{Communic}	Satisfaction with communication channels
		29.SATIS _{Contents}	Satisfaction with training contents

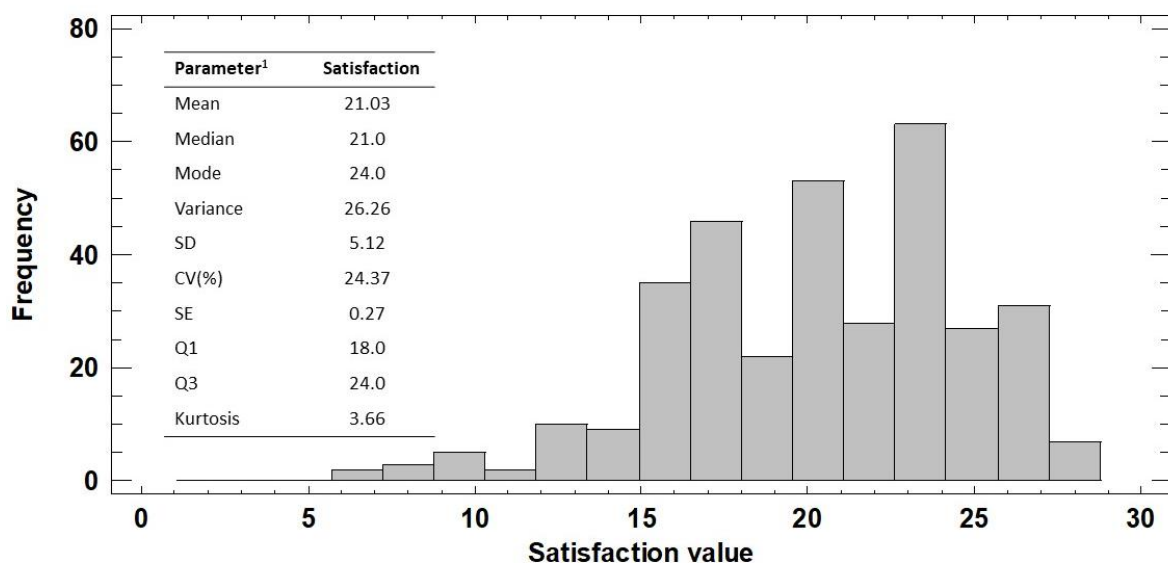


Figure 1. Statistical parameters of the student satisfaction value.

2.3. Statistical Analysis

The normality of the data distribution was evaluated using the Kolmogorov-Smirnov test (with the Lilliefors correction) and a Levene test was used to evaluate the homogeneity of the variance. For those variables that did not show a normal distribution, the Bartlett test was applied to assess whether the data had equal variances.

In a first stage, to answer RQ1 and RQ2, the RC variables were compared using the general linear model (GLM). For this, two educational styles were used: traditional face-to-face (TFE) and intensive face-to-face (IFE); and two levels of satisfaction: low satisfaction (LS) and high satisfaction (HS), as fixed factors. Three levels of significance were considered: * p -value < 0.05; ** p -value < 0.01, and *** p -value < 0.001. This test allows the identification of significantly different means in the individual observation of the variables [47].

In a second stage, to answer RQ3, a discriminant analysis was performed [48]. To obtain the indicator of success in the classification, the proportional causality criterion described by Cea D'Ancona [49] was used, which accepts classification percentages that exceed by 25% the sum of the squares of the proportions of each group [49].

From the combination of the two fixed factors, four groups were obtained: TFE/LS, TFE/HS, IFE/LS, and IFE/HS. The most discriminating variables (p -value < 0.05) were calculated by applying Snedecor's F, Wilks's Lambda, and 1-Tolerance. The high values of F for each variable indicate that the means of each group are widely separated. The small Lambda values showed that the variable discriminates well between groups. Variables with a high percentage of tolerance (1-Toler) were selected [50]. Finally, the score of each discriminant variable in each group was determined. Statistical analyses were performed with STATISTICA 12 software.

3. Results

The average age of UTEQ students under 25 years of age was 49.46% of the sample. In TFE, students under 25 years of age predominated and in IFE, those over 25 (p -value < 0.05). Regarding gender, most of the students were men in both educational styles (p -value < 0.05). The sociodemographic indicators of the sample are shown in Table 2.

Table 2. Sociodemographic distribution of the sample (%).

	Age			Gender		
	<25 (<i>n</i> = 183)	≥25 (<i>n</i> = 187)	<i>p</i> -Value	Male (<i>n</i> = 261)	Female (<i>n</i> = 109)	<i>p</i> -Value
Traditional	39.19	10.27	***	28.11	17.84	**
Intensive	6.76	43.78	***	42.43	11.62	**

** p -value < 0.01; *** p -value < 0.001; *n* = sample size.

The TFE style (72.98 ± 1.13 ; 0.2) showed lower than average RC levels than average (76.44 ± 0.83 ; 0.21), while the IFE style showed higher levels (79.36 ± 1.65 ; 0.21). Regarding satisfaction, the intensive style (22.17 ± 0.37 ; 0.24) obtained higher RC values than the mean (21.03 ± 0.27 ; 0.24), while the traditional style showed a lower level of RC (19.68 ± 0.35 ; 0.23).

The GLM results are shown in Table 3. Significant differences were found by educational style and level of satisfaction (p -value < 0.05). The two fixed factors showed no interactions (p -value < 0.05). Furthermore, 65.22% of the RC variables showed significant differences according to the educational style. The greatest differences were found in variables of problem-solving communication, mutual respect, and shared knowledge and goals, related to the profiles of lectures and student representatives. These variables showed higher levels of RC in IFE. Frequent communication with administrative officers showed higher levels of RC in TFE (Table 3).

Table 3. Relational coordination by mode and satisfaction level.

Variable	Educational Style		Satisfaction Level		p-Value		
	Traditional Face-to-Face	Intensive Face-to-Face	Low	High	Educational Style (A)	Satisfaction Level (B)	Interactions
1.ACCU _{Admin}	3.25 ± 0.10	2.87 ± 0.09	2.72 ± 0.11	3.39 ± 0.08	**	***	ns
2.ACCU _{Lect}	3.82 ± 0.06	4.07 ± 0.06	3.70 ± 0.07	4.19 ± 0.06	*	***	ns
3.ACCU _{Class}	3.83 ± 0.07	4.03 ± 0.07	3.75 ± 0.08	4.11 ± 0.06	*	***	ns
4.FREQ _{Admin}	2.62 ± 0.10	1.96 ± 0.09	1.91 ± 0.11	2.68 ± 0.08	***	***	ns
5.FREQ _{Lect}	3.54 ± 0.08	3.77 ± 0.07	3.37 ± 0.09	3.95 ± 0.07	*	***	ns
6.FREQ _{Class}	3.85 ± 0.07	3.98 ± 0.07	3.72 ± 0.08	4.11 ± 0.06	ns	**	ns
7.SOLPRO _{Myself}	4.31 ± 0.06	4.53 ± 0.06	4.36 ± 0.07	4.48 ± 0.05	**	ns	ns
8.SOLPRO _{Lect}	3.01 ± 0.08	3.40 ± 0.08	2.80 ± 0.09	3.61 ± 0.07	***	***	ns
9.SOLPRO _{Repres}	2.40 ± 0.09	3.26 ± 0.08	2.39 ± 0.10	3.27 ± 0.08	***	***	ns
10.SOLPRO _{Admin}	2.41 ± 0.09	2.46 ± 0.09	1.99 ± 0.10	2.88 ± 0.08	ns	***	ns
11.SOLPRO _{Class}	3.24 ± 0.09	3.27 ± 0.09	2.90 ± 0.10	3.61 ± 0.08	ns	***	ns
12.SKNOw _{Lect}	3.00 ± 0.08	3.64 ± 0.08	2.95 ± 0.09	3.69 ± 0.09	***	***	ns
13.SKNOw _{Repres}	2.54 ± 0.09	3.09 ± 0.09	2.87 ± 0.10	3.25 ± 0.08	***	***	ns
14.SKNOw _{Admin}	2.47 ± 0.09	2.33 ± 0.09	2.03 ± 0.10	2.77 ± 0.08	ns	***	ns
15.SKNOw _{Class}	3.45 ± 0.09	3.60 ± 0.08	3.37 ± 0.10	3.68 ± 0.07	ns	**	ns
16.RESPE _{Lect}	3.42 ± 0.07	3.85 ± 0.07	3.31 ± 0.08	3.96 ± 0.06	***	***	ns
17.RESPE _{Repres}	2.75 ± 0.09	3.26 ± 0.09	2.52 ± 0.10	3.50 ± 0.08	***	***	ns
18.RESPE _{Admin}	2.74 ± 0.09	2.55 ± 0.09	2.13 ± 0.10	3.16 ± 0.08	ns	***	ns
19.RESPE _{Class}	3.50 ± 0.08	3.68 ± 0.07	3.33 ± 0.09	3.85 ± 0.07	ns	***	ns
20.SHARGOAL _{Lect}	3.17 ± 0.07	3.76 ± 0.07	3.05 ± 0.08	3.88 ± 0.06	***	***	ns
21.SHARGOAL _{Repres}	2.76 ± 0.09	3.24 ± 0.08	2.53 ± 0.10	3.47 ± 0.07	***	***	ns
22.SHARGOAL _{Admin}	2.56 ± 0.09	2.49 ± 0.09	2.02 ± 0.10	3.03 ± 0.08	ns	***	ns
23.SHARGOAL _{Class}	3.50 ± 0.07	3.73 ± 0.07	3.34 ± 0.08	3.88 ± 0.06	*	***	ns

* p -value < 0.05; ** p -value < 0.01; *** p -value < 0.001; ns = not significant.

In total, 95.65% of the variables showed significant differences according to satisfaction. The problem-solving communication related to the “myself” profile did not show differences. The rest of the RC variables exhibited higher levels of satisfaction (Table 3).

In order to identify the differences between educational styles, a discriminant analysis model was carried out. Four groups were built combining the two fixed factors: educational style and satisfaction. The groups were: traditional face-to-face education with low satisfaction (TFE/LS), traditional face-to-face education with high satisfaction (TFE/HS), intensive face-to-face education with low satisfaction (IFE/LS), and intensive face-to-face education with high satisfaction (IFE/HS). Furthermore, 59.89% of the cases were correctly classified, so the validity of the model was verified, and 23 RC variables were used as predictors. Six variables made up the discriminant model (p -value < 0.05). Among the six variables, those four with the greatest discriminating power ($F > 5$) were selected: two related to the communication dimension and two to the relationship dimension (Table 4). Frequent communication with administrative officers, problem-solving communication with students’ representatives, and shared goals and knowledge with lectures were the variables with the highest discriminating power (Table 4).

Table 4. Discriminant function for the organizational variables of two educational styles (traditional face-to-face and intensive face-to-face).

Variable	Wilks’	Partial	F-Remove	p-Value	Toler.	1-Toler.
4.FREQ _{Admin}	0.484	0.941	7.341	***	0.710	0.290
9.SOLPRO _{Repres}	0.478	0.953	5.823	**	0.632	0.368
11.SOLPRO _{Class}	0.466	0.977	2.738	*	0.720	0.280
12.SKNOw _{Lect}	0.475	0.958	5.148	**	0.685	0.315
18.RESPE _{Admin}	0.470	0.968	3.301	**	0.605	0.395
20.SHARGOAL _{Lect}	0.480	0.948	6.478	***	0.686	0.314

* p -value < 0.05; ** p -value < 0.01; *** p -value < 0.001.

The organizational differences among the four analysed groups are shown in Figure 2. The Mahalanobis distances obtained from the relational coordination indicators are graphically represented. A first cluster grouped TFE/LS and IFE/LS, a second cluster linked TFE/HS, and a third cluster was observed with IFE/HS.

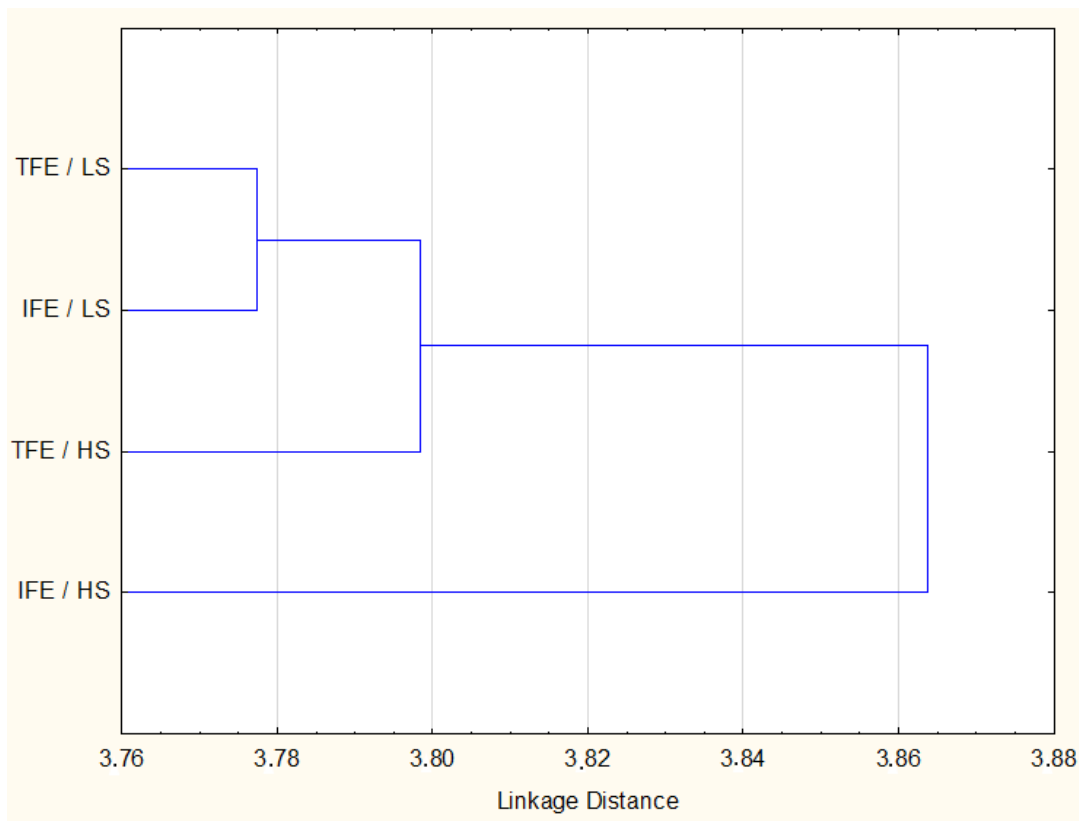


Figure 2. Cluster from Mahalanobis distances among the four groups.

Table 5 shows the scores of the discriminant variables for each group (p -value < 0.001). The two low-quality groups showed the lowest values in all variables. Frequent communication with the administration officers was the variable that stood out in the TFE/HS group. Finally, problem-solving communication with students’ representatives and shared goals and knowledge with lectures were the variables that predominated in the IFE/HS group.

Table 5. Discriminant variables for each group.

	4.FREQ _{Admin}	9.SOLPRO _{Repres}	12.SKNO _{Lect}	20.SHARGOAL _{Lect}
TFE/LS	2.17 ± 0.11	1.97 ± 0.12	2.67 ± 0.14	2.75 ± 0.11
TFE/HS	3.06 ± 0.12	2.83 ± 0.13	3.34 ± 0.11	3.59 ± 0.09
IFE/LS	1.67 ± 0.15	2.81 ± 0.17	3.22 ± 0.16	3.36 ± 0.14
IFE/LS	2.31 ± 0.12	3.70 ± 0.09	4.02 ± 0.08	4.17 ± 0.07

4. Discussion

Results of this research are in line with those obtained by Gutiérrez-Cordero et al. [47] and Sá and Serpa [1], who evaluated the influence of organizational culture on educational styles and its effect on the level of satisfaction. RQ1 was not verified in this study. The students in the intensive style showed higher levels of relational coordination and, apart from this, the higher the level of relational coordination, the greater the satisfaction was found. Significant differences were observed in 65% of the organizational variables according to the educational style.

The problem-solving variable related to student representatives is strategic in the intensive style, where students attend university on a reduced schedule and try to optimize their face-to-face time [36]. Likewise, when there is a problem, the student representatives are the first to be asked, since they are the link between the students and the rest of the profiles. Thus, De-Pablos-Heredero et al. [37] and Gallego et al. [5] indicate that a greater resolution of communication problems implies the improvement of educational quality.

Frequent communication with administrative officers obtained higher levels in the traditional style due to the coincidence of the work hours of the administrative officers and the attendance schedule of the students at the centre. According to Margalina et al. [36], poor communication on administrative processes generates uncertainty in the student and decreases satisfaction. An improvement in this variable in the intensive style could lead to an improvement in its quality.

RQ2 was verified in this study. Intensive education showed a higher level of satisfaction in 95% of the organizational variables. The maturity of the intensive style student allows greater commitment to their educational process [15]. Having greater autonomy and control over time and rhythm leads to a higher levels of satisfaction [13,17,24,25]. The intensive style impacts the same traditional training contents in a shorter period [18,20,22,23], making it more efficient for the student in need of flexibility and conciliation [14–17].

Mutual respect with lecturers was a strategic element for the improvement of RC and predominated in the intensive style. Respect between teacher and student is associated with better results based on more satisfactory relationships [4,5].

The intensive educational style presents a greater degree of collaboration between the student and their classmates. Those students with less time availability are more aware of their limitations and interact in shared learning [20]. The link of the student with the educational ecosystem is positively related to satisfaction [3,6,12]. Mutual respect between peers suggests better results in this educational style [5,36].

RQ3 was verified in this study. An organizational model was built through RC variables. Four groups were formed combining the educational styles and the two levels of satisfaction. The four groups show a positive relationship between RC and satisfaction. The groups with low satisfaction showed similar RC levels. The intensive style group with high satisfaction was the most differentiated. There is a greater flow of communication and relationship of the student with lectures and student representatives. The fact of attending class two days a week predisposes the student to greater communication with the teacher [3], solving specific doubts about the training content already studied by the student previously.

The RC model offers a basis for the study of higher education models, where there are diverse communication flows and a high degree of dependency on tasks [4,5,36,37]. Greater coordination with the organizational environment allows optimizing resources and provides greater satisfaction [1]. Higher levels of RC were associated with a higher level of student satisfaction [37].

The application of intensive face-to-face education allows this modality to achieve higher levels of student satisfaction by making a more efficient use of the time [1,2,20,38]. In this way, the implementation of organizational measures that improve communication between the student and the administration is proposed to the universities. Measures that enhance the knowledge and objectives shared between student and lectures and communication to solve problems with student representatives can lead to an improvement in educational quality.

This study has shown that students can take the same training contents in less face-to-face time without affecting their satisfaction, as long as there are adequate levels of coordination and communication. The scientific literature defends that, as more contingent factors demand a need for organizational action, the more important the application of relational coordination principles becomes [5,31,34,35]. Therefore, the application of relational coordination as an innovative organizational model for higher education could be transferable to other universities. This may be of interest for the configuration of future

learning models in which the physical presence of the student in the educational centre must be considerably reduced.

5. Limitations

The methodology used makes it possible to compare two educational styles, which enables us to define face-to-face. Nevertheless, this work has some limitations. On the one hand, this study was carried out in a specific intensive program at a university considering students enrolled in agri-food profiles. In future research, the study could be extended to a sample of students belonging to different branches of knowledge to obtain a cross-sectional approach. On the other hand, quality was studied in terms of student satisfaction with the organisational model. Subsequent studies could associate quality with students' academic results, since their exploration was outside the scope of this study. Finally, given that this study focuses only on student satisfaction, the study from the perspective of the satisfaction of the rest of the university profiles (lecturers and administrative officers, among others) could be the object of study in future research.

6. Conclusions

In this research, differences between both educational styles were found, the intensive face-to-face style being the one that obtained the highest levels of RC and student satisfaction.

A discriminant model with reduced number of variables was built and allowed for the identification of differences between face-to-face educational styles (traditional versus intensive). The obtained RC model was linked to the improvement of results. Problem-solving communication with students' representatives and shared knowledge and goals with lectures were the elements of success in this educational style. Frequent communication with administrative officers should be improved in the intensive style to increase performance. The proposed measures can be useful for the academic and administrative staff of the university that is committed to face-to-face education for adult students.

Face-to-face modality is an educational form that must be maintained to satisfy the educational demand of a specific profile of student with flexibility needs. Traditional face-to-face education has been considered the most accepted and demanded model. However, it is possible to adjust this modality to achieve efficient intensive models that do not renounce the benefits provided by the contact of the student with the educational ecosystem. The findings of this research are useful to determine the appropriate duration of face-to-face education that improves satisfaction.

Future research could combine this high satisfaction face-to-face education model with the online modality to form a hybrid model, as an effective alternative smart education adjusted to the current situation.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/educsci11120820/s1>, Table S1: Relational coordination survey.

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3.3 Artículo 3: (Checa-Morales et al., 2022)

An Organizational Model of Online Learning in the Pandemic Period: Comparison with Traditional Face-to-Face Learning

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Article

An Organizational Model of Online Learning in the Pandemic Period: Comparison with Traditional Face-to-Face Learning

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Abstract: The COVID-19 pandemic has led to a paradigm shift in educational systems. During the lockdown, higher education became digital. This caused a change in communication within the educational ecosystem. Relational coordination (RC) is a communication and relationship model associated with the improvement of organizational results. Therefore, the objective of this research is to build an organizational model of online learning applied during the pandemic period and compare it with the previous face-to-face learning. A sample of 2774 students from two Ecuadorian universities was selected. A two-stage methodology was applied: First, an organizational model of online learning was built using multivariate methods. The RC model was linked to student satisfaction using generalized linear models (GLM). In the second stage, the organizational differences between the 2018 face-to-face and the 2020 online learning were identified. Finally, the online learning model was validated with external data. The components associated with a higher level of RC were institutional cooperation, institutional problem-solving, and administrative communication. Administrative communication lost importance in the online model. Significant differences between the satisfaction of the two models were not found. Nevertheless, since online learning was not associated with an improvement in satisfaction, the creation of a third educational model that combines the best practices of online and face-to-face learning in a hybrid system could be an alternative that improves the satisfaction of students.



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Keywords: relational coordination; satisfaction; organizational model; higher education; online learning; COVID-19

1. Introduction

The COVID-19 pandemic forced a sudden change in teaching modalities [1]. Online methods were established to respect the imposed confinement and avoid contagion [2]. The change from traditional face-to-face learning to online classes involved a technological change and accelerated the use of digital technologies in students [3]. The roles of the administration and services staff, and of the teaching staff, were modified in an attempt to adapt to the reality of the pandemic. Besides, it affected the elements of student satisfaction [4]. However, before this change took place, there were already online and mixed systems implemented in universities worldwide [3]. Before the COVID-19 pandemic, online learning offered training options to specific student profiles, such as those that combined their training with work or family responsibilities [3]. During the pandemic period,

online learning was established immediately regardless of the technological capacity of universities and their staff [5,6]. The pandemic has led to a change in the relationships between the different actors in the higher education (HE) system. Therefore, this caused changes in the organizational model that could affect the quality of HE [1,5]. Numerous authors have studied this topic, offering different approaches to communication in HE in a context of confinement [1,5,7]. It is important to know how the change in education caused by the pandemic affected the organizational structure of the university and student satisfaction. It is also relevant to delve into the knowledge of the online learning that was adopted in confinement and check if it can improve the results of the universities and if it could be consolidated. It may be useful to extend it to other universities and improve the organizational structure in future educational systems.

1.1. Communication in HE in the Pandemic Period: Literature Review

During the confinement period, communication at the university was affected [1,5]. Given the need to limit physical contact, information and communication technologies (ICTs) have become a crucial element; so, digital literacy has been an essential element in online learning during the pandemic period [7,8]. According to Tejedor et al. [9] and Simon et al. [10], the learning scenario established by the pandemic highlighted the need to improve the digital skills of university staff. In this context, communication was the key element to provide students with personalized information and encourage their participation [11]. Sosa Díaz et al. [4] and Van-Der-Velde et al. [12] studied student satisfaction in the online classroom, concluding that communication skills through ICTs are necessary in the learning process both for accessing training content and to ensure optimal communication between the student and the other university worker's profiles—mainly lecturers and administrative staff. This opinion is shared by Harati et al. [13] and Schwanenberger et al. [14], who observed it both in students and in university administrative officers in online teaching. Obtaining timely feedback from lecturers in the evaluation process was crucial for students during online education in the pandemic period [15–17]. Furthermore, Flores et al. [5] and Prieto-Ballester et al. [18], showed that the level of digital literacy for online communication during confinement directly and positively affected students' well-being in online classes. In other words, HE requires quality organizational measures in the face of the change caused by COVID-19 [15,19,20].

1.2. RC and Improvement of Results

RC is an organizational model for task integration, where communication and relationship constitute the two main dimensions [21,22]. The communication dimension includes elements such as accurate and frequent communication aimed at solving problems [3,22–25]. The relationship dimension focuses on shared goals, knowledge, and mutual respect among all profiles of an organization [3,22–25]. The RC model has been applied in different sectors such as healthcare [22], banking [26], or airlines [21]. In addition, it has been studied in HE, showing that an increase in RC leads to an improvement in the results [3,23,24,27–29].

In the context of COVID-19, Sulmonte et al. [30] showed how the Quality and Safety team was able to harness skills in relational coordination and process improvement to respond to rapidly changing needs in a flexible and effective manner. In the field of HE, it is interesting to see if the drastic change in the educational paradigm (from face-to-face to online learning) has had an effect on student satisfaction [31,32]. Due to the unpredictability of the change in the global situation [1,2], there is a lack of studies comparing organizational models of communication in HE before the pandemic and in COVID-19 pandemic periods.

Therefore, the objective of this research was to build an organizational model of online learning applied at Quevedo State Technical University (UTEQ) during the pandemic period (2020) and compare it with the face-to-face (2018) learning at the same university.

Firstly, an organizational model of online learning was built in the period of the COVID-19 pandemic (May to September of 2020) UTEQ in Ecuador. The organizational model was linked to student satisfaction. Secondly, the organizational model obtained was

compared with the face-to-face model prior to the pandemic developed during 2018 at UTEQ. Finally, the organizational model was validated with external data from the State University of Bolivar (UEB) in Ecuador, during the period from May to September 2020.

To achieve the objective of this work, three research questions were established: (RQ1) What organizational changes have been experienced in learning as a result of the pandemic?; (RQ2) were differences observed between the satisfaction of face-to-face and online in pandemic period learning?; (RQ3) Can the best organizational practices of the model be extended to other universities?

This research will help to determine whether there were organizational differences between the online learning established during the pandemic and the previous face-to-face learning. In addition, it will allow knowing if there were changes in student satisfaction and will enable the proposal of specific organizational practices for future educational systems.

After this introduction, the second section presents the case of UTEQ; the third describes the materials and applied methods; the fourth shows the results; the fifth section exposes the discussion; the sixth, the limitations of the work; and, finally, the seventh section contains the conclusions.

2. The case of UTEQ in Ecuador

According to The World Bank [33], the COVID-19 health crisis triggered a recession, meaning that Ecuador needed to make its public practices more efficient and improve the quality of its educational system. These efforts require evidence-based decision-making and better management of public resources. To this end, The World Bank approved the Country Partnership Framework (CPF) 2019–2023 with Ecuador. Among its main objectives, the development of human capital and improving institutional sustainability are being promoted.

The ranking of the Council for Evaluation, Accreditation, and Quality Assurance of Higher Education (CEACEES) was considered to observe the category of the university. This is the entity in charge of accrediting the position of each university in the internal ranking of universities in Ecuador; the categories go from “A” to “D” on a decreasing scale and are determined for a period of five years [34].

Data from Quevedo State Technical University (UTEQ) were studied in this work. UTEQ is a university located in the coast zone of Ecuador, in Quevedo. It corresponds to category “B” in the CEACEES ranking [34]. This university offers 33 undergraduate and 15 postgraduate degrees [35]. The UTEQ online learning data collected in 2020 (UTEQ_2020) were used to perform the main analyses of this study and were compared with the UTEQ results of face-to-face learning in 2018 (UTEQ_2018) [23].

2.1. HE Prepandemic Context: Face-to-Face Learning at UTEQ_2018

In Checa et al. [23] the organizational model in face-to-face higher learning at UTEQ (2018), by using the RC, was widely described. It was linked to student satisfaction as a metric of university quality. The most relevant components were administrative communication, student leadership, lecturer cooperation, classmates’ coordination, classroom communication, and “autonomy”. Altogether, these explained 66.23% of the variance.

The most influential element in satisfaction was administrative communication. The students considered administrative officers as a reliable source of information. It was recommended to simplify administrative processes and improve the quality of information through accurate and frequent communication, and the reduction of response times aimed at problem-solving. Student leadership showed that student representatives were associated with a higher level of satisfaction. They were presented as a method to reduce the asymmetry of information between the student and the rest of the university profiles, and a way to increase the value of the human capital of the students. In addition, lecturer cooperation and classmates’ coordination were also elements associated with student satisfaction, although to a lesser extent. Finally, the least relevant element was “autonomy”, which showed the lack of willingness of the students to solve problems on their own. The

research reported that an improvement in the two RC dimensions between students and the rest of the university profiles, the level of satisfaction, and the sustainability of the organization improve.

2.2. HE in Pandemic Period: Online Learning at UTEQ_2020 and UEB_2020

The COVID-19 pandemic caused the closure of higher education institutions unexpectedly. The move from face-to-face to online learning was forced to mitigate the spread of the virus. At UTEQ, this readjustment affected all degrees and subjects, both theoretical and practical. The university used the Microsoft Teams tool and Moodle as the digital platforms selected by the government for public institutions to deliver online teaching. For communication with administrative officers, the students used e-mail. However, difficulties related to digital skills and access to the internet or computing devices, as well as delays in response time, were observed [36]. This caused changes in the communication between the student and the rest of the university profiles.

UEB is a university located in Guaranda, a zone in the highlands of Ecuador, 140 km away from UTEQ. According to the CEACEES ranking, it corresponds to category “C” [34]. The UEB offers 20 undergraduate and 9 postgraduate degrees [37]. UEB was made up of 5000 students, compared to the 10,000 students of UTEQ. In the pandemic period, an online learning process similar to that of the UTEQ was developed, given the state nature of educational practices in the face of the COVID-19 crisis. The study of UEB data made external validation possible of the model obtained in online learning (UTEQ_2020) [38].

3. Materials and Methods

In the first stage, an organizational model was built for online learning (UTEQ_2020), through the development of an organizational typology. Principal component analysis (PCA) and cluster analysis were performed. Subsequently, the model obtained was related to student satisfaction through the use of generalized linear models (GLM). In a second stage, to deepen the organizational differences between face-to-face learning (UTEQ_2018) and online learning (UTEQ_2020), both models were compared. In a third stage, online organizational learning (UTEQ_2020) was validated with data from the online learning model of the State University of Bolivar (UEB_2020). The methodological stages are shown in Figure 1.

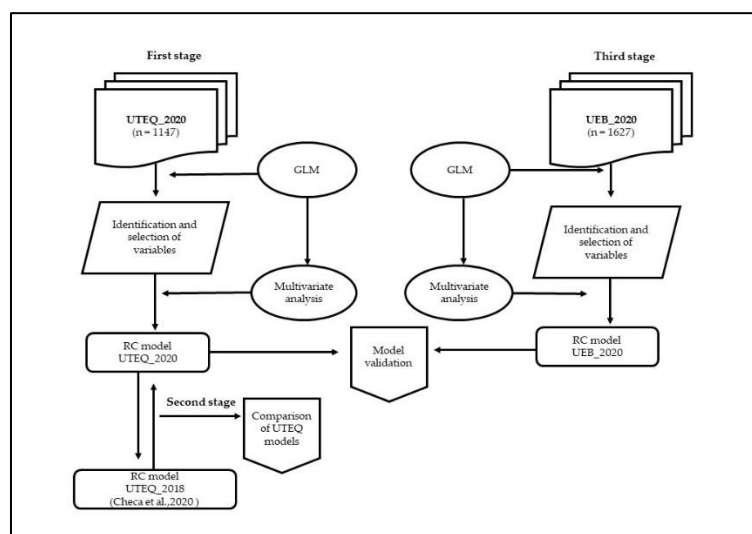


Figure 1. Methodology stages [23].

3.1. HE in Pandemic Period: Online Learning at UTEQ_2020 and UEB_2020

The participants were students enrolled in undergraduate and postgraduate degrees in the following fields of knowledge: social sciences, humanities, engineering, and health sci-

ences. More than 3,000 surveys were collected between the months of May and September in 2020 at UTEQ and UEB. The surveys were distributed online through the Google Forms application. The answers of the students that were incomplete and those in which logical inconsistencies were observed were eliminated in the database cleaning process [39]. A stratified random sample composed of 1,147 participants from online learning (UTEQ_2020) was used to determine the main model. Finally, another stratified random sample composed of 1,627 participants from online learning (UEB_2020) was used to validate the model of online learning (UTEQ_2020).

3.2. Relational Coordination Survey

The students were asked through an online questionnaire composed of 4 questions on sociodemographic data (age, gender, course, and field of knowledge), 23 relational coordination items (11 communication and 12 relationship), and 6 items on satisfaction [21–23,25]. The original survey questions were asked in Spanish; these are shown with their English translations in Table 1. The questions in the survey were referred to all university profiles: lecturers, administrative officers, classmates, student representatives. The “myself” index was considered as a control variable [23]. In order to answer the survey questions obtaining metric variables, a Likert scale from 1 to 5 was used. Each equidistant point on the visual scale was associated with a level of student response [40]. The reliability of the questionnaire was verified using Cronbach’s alpha, with values greater than 0.7 considered acceptable to confirm internal consistency: communication dimension (0.851), relationship dimension (0.938), and satisfaction (0.936) (Table 1). The complete survey (available as supplementary material) showed a Cronbach’s alpha of 0.957 [41].

To measure satisfaction, variables 14 to 29 of the survey were used and a satisfaction indicator (SATISTotal) was built. The validity of the indicator was verified from the measures of central tendency (mean, median, and mode), dispersion (standard deviation and coefficient of variation), and asymmetry (kurtosis). Once SATISTotal was obtained, its main statistical descriptors (trend, dispersion, and asymmetry) were observed and a dichotomous satisfaction variable was determined for each university with two possible values: low satisfaction (LS) and high satisfaction (HS). A level of 19 points differentiated the two levels of satisfaction in UTEQ and a level of 20 points in UEB (Figure S1) [3,23–25].

Subsequently, a hierarchical cluster analysis was performed from the variables with higher variance values in the PCA. The grouping was carried out considering the intra and intergroup variance, joining the most akin cases to each other and different from the others, applying the Ward method. Besides, the Euclidean distance was used to check the degree of dissimilarity between the cases [47]. Once the groups were obtained, the analysis of variance (ANOVA) and the Student–Newman–Keuls method were applied to find significant differences between the sample means [48].

To answer RQ2 and verify the satisfaction levels of the obtained model, generalized linear models (GLM) were used. This analysis allowed determining which pairs of means show significant differences and analyzing variables with nonconstant variances and non-normal error [49]. GLM summarizes a similar group of regression methods, which were previously applied individually. A value of $p < 0.001$ was used as the level of significance. All statistical analyses were performed with Statgraphics Centurion XVI.I software.

In a second stage, the organizational typologies of face-to-face learning (UTEQ_2018) and online learning (UTEQ_2020) were compared; thereby, the differences in the resulting components were highlighted as well as the positions of the components in each model. In order to validate the resulting model and verify RQ3, the organizational model of online learning at UTEQ (UTEQ_2020) was compared with that of online learning at UEB (UEB_2020). Both were obtained in the period of the COVID-19 pandemic. This comparison allowed us to extend the model to other institutions [50].

Table 1. Relational coordination and satisfaction variables.

Dimension	α Cronbach	Code	Question/Variable
COMMUNICATION	0.851	ACCURATE COMMUNICATION (Do the people who belong to these areas have the need to offer you information at certain times?) with	
		1.ACCU _{Admin}	administrative officers
		2.ACCU _{Lect}	lecturers
		3.ACCU _{Class}	classmates
		FREQUENT COMMUNICATION (Do people who belong to the following work areas communicate with you frequently?) with	
		4.FREQ _{Admin}	administrative officers
		5.FREQ _{Lect}	lecturers
		6.FREQ _{Class}	classmates
		SOLVING PROBLEM COMMUNICATION (When any type of problem appears (study, logistics, documentation . . .), how much did the following profiles help you to solve your problem?) with	
		7.SOLPRO _{Myself}	myself
		8.SOLPRO _{Lect}	lecturers
RELATIONSHIP	0.938	SHARED KNOWLEDGE (How well do the following profiles know about your role in the university and the problems that arise?) with	
		12.SKNO _{Lect}	lecturers
		13.SKNO _{Repres}	students' representatives
		14.SKNO _{Admin}	administrative officers
		15.SKNO _{Class}	classmates
		MUTUAL RESPECT (How much do the following profiles respect your role at the university?) with	
		16.RESPE _{Lect}	lectures
		17.RESPE _{Repres}	students' representatives
		18.RESPE _{Admin}	administrative officers
		19.RESPE _{Class}	classmates
		SHARED GOALS (How well do the following profiles share your goals at the university?) with	
20.SHARGOAL _{Lect}	lecturers		
21.SHARGOAL _{Repres}	students' representatives		
22.SHARGOAL _{Admin}	administrative officers		
23.SHARGOAL _{Class}	classmates		
SATISFACTION	0.936	STUDENT SATISFACTION (Indicate your degree of satisfaction with the following profiles) with	
		24.SATIS _{Lect}	lectures
		25.SATIS _{Represent}	students' representatives
		26.SATIS _{Admin}	administrative officers
		27.SATIS _{Materials}	materials
		28.SATIS _{Communic}	communication channels
		29.SATIS _{Contents}	training contents

4. Results

The main sociodemographic data of each sample are shown in Table 2. The majority of students surveyed in 2020 were female and younger than 25 years old. First- and second-year students and postgraduate students predominated in UTEQ_2020 and UEB_2020. In the 2020 samples, students from all university courses were considered, since the online modality during confinement affected all students. Most of the online learning (UTEQ_2020) students belonged to the engineering field of knowledge, due to the predominantly agrarian nature of the university. The distribution of the sample by field of knowledge in face-to-face learning (UTEQ_2018) confirmed this point. In UEB_2020, most of the students belonged to the social sciences, engineering, and health sciences for the most part, which confirmed

the heterogeneity of the sample. The description of the UTEQ_2018 sample is derived from the work of Checa et al. [23].

Table 2. Sociodemographic distribution of the samples (%).

		Age		Gender		Academic Year							Field of Knowledge			
		<25	>25	Male	Female	1st	2nd	3rd	4th	5th	6th	7th	Social sciences	Humanities	Engineering	Health sciences
UTEQ_2018	3200	43.36	56.64	38.71	61.29	–	–	45.94	42.98	11.08	–	–	37.25	–	55.36	7.39
UTEQ_2020	1147	88.40	11.60	40.71	59.29	19.70	13.51	10.46	12.29	13.86	7.67	22.49	–	–	100	–
UEB_2020	1627	83.90	16.10	40.69	59.31	1.60	18.87	17.95	17.15	16.04	9.04	19.36	37.19	5.84	29.19	27.78

4.1. Organizational Model in Online Learning (UTEQ_2020)

4.1.1. Organizational Typology of Online Learning (UTEQ_2020)

The components obtained in the online learning model (UTEQ_2020) are shown in Table 3. Five factors explained 70.51% of the variance. The first component explained more than 44% of the variance (Table 3). It displayed the highest values in variables such as mutual respect and shared goals related to all university profiles. “Institutional cooperation” was the name of the component. The second one justified 8.42% of the variance. The predominant variables were communication for problem solving and shared knowledge. The related profiles were lecturers, student representatives and administrative officers. This component was “institutional problem solving”. The third component was “administrative communication”. It explained 7.50% of the variance and was composed of the variables of accurate and frequent communication, related to lecturers and administrative officers. The fourth factor represented 5.27% of the variance. The variables of accurate and frequent communication prevailed, referring to the classmates profile. This factor constituted “classmates communication”. Finally, the fifth factor explained the 4.65% of variance and was linked to problem-solving communication with “myself” profile. This component was called “autonomy”.

Table 3. Principal components (PC) of online education (UTEQ_2020).

Items	Loading	Eigenvalues	Explained Variance (%)	α Cronbach	PC
16.RESPE _{Lect}	0.755	10.34	44.96	0.950	1
17.RESPE _{Repres}	0.791				
18.RESPE _{Admin}	0.816				
19.RESPE _{Class}	0.796				
20.SHARAGOAL _{Lect}	0.809	1.94	8.42	0.819	2
21.SHARAGOAL _{Repres}	0.811				
22.SHARAGOAL _{Admin}	0.791				
23.SHARAGOAL _{Class}	0.790				
8.SOLPRO _{Lect}	0.660	1.73	7.50	0.760	3
9.SOLPRO _{Repres}	0.763				
10.SOLPRO _{Admin}	0.715				
14.SKNO _{Admin}	0.689				
1.ACCU _{Admin}	0.730	1.21	5.27	0.819	4
2.ACCU _{Lect}	0.744				
5.FREQ _{Lect}	0.653				
3.ACCU _{Class}	0.748				
6.FREQ _{Class}	0.815	1.00	4.65	-	5
7.SOLPRO _{Myself}	0.897				

Figure 2 represents the results of the cluster analysis of online learning (UTEQ_2020) with Ward’s method, based on Euclidean distances. The centroids of each type of organization are shown in Table 4. The second group, with the highest levels of RC, grouped 45.51% of students and presented high figures in the five components (p -value < 0.05). The first

group, with medium RC, justified 39.49% of students and central figures in the centroids (p -value < 0.05). The third group, with lower RC levels, bunched 15.00% of students and showed negative figures in all components (p -value < 0.05).

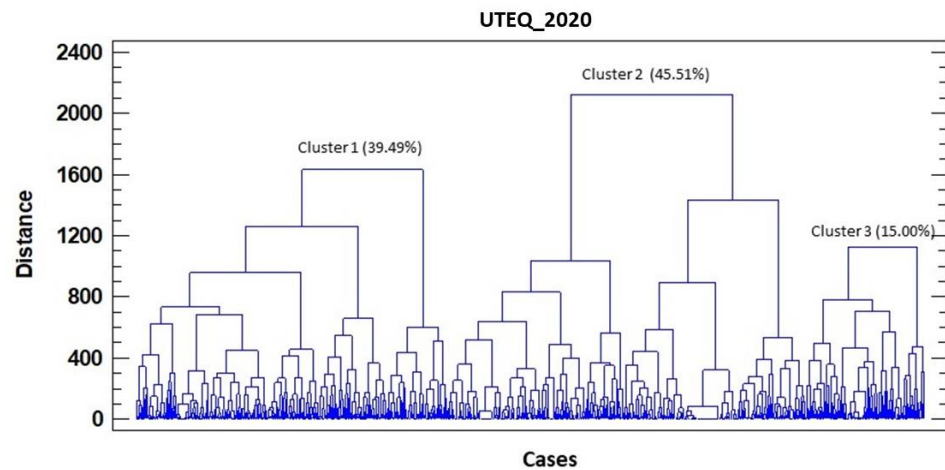


Figure 2. Relational coordination clusters of online education (UTEQ_2020).

Table 4. Centroids for each cluster of online education (UTEQ_2020).

Components	PC ¹	Cluster 1	Cluster 2	Cluster 3
Institutional cooperation	1	−3.907 ^b	6.512 ^c	−9.476 ^a
Institutional problem-solving	2	−2.621 ^b	4.537 ^c	−6.865 ^a
Administrative communication	3	−1.590 ^b	3.553 ^c	−6.596 ^a
Classmates' communication	4	−1.037 ^b	2.984 ^c	−6.325 ^a
Autonomy	5	−0.003 ^b	0.504 ^c	−1.522 ^a

¹ Principal component. ^{a,b,c} Within row, averages with different superscripts differ significantly, p -value < 0.001.

4.1.2. Satisfaction Level of Online Learning (UTEQ_2020)

The satisfaction rating in online learning (UTEQ_2020) was 21.27 ± 0.15 , with a coefficient of variation of 24.43%. The data from this university showed positive Fisher asymmetry values and did not fit the normal distribution (Figure S1). The behavior of the satisfaction variable is represented in Figure 3. An increase in RC in the first two components managed to reach greater rates of satisfaction (p -value < 0.001).

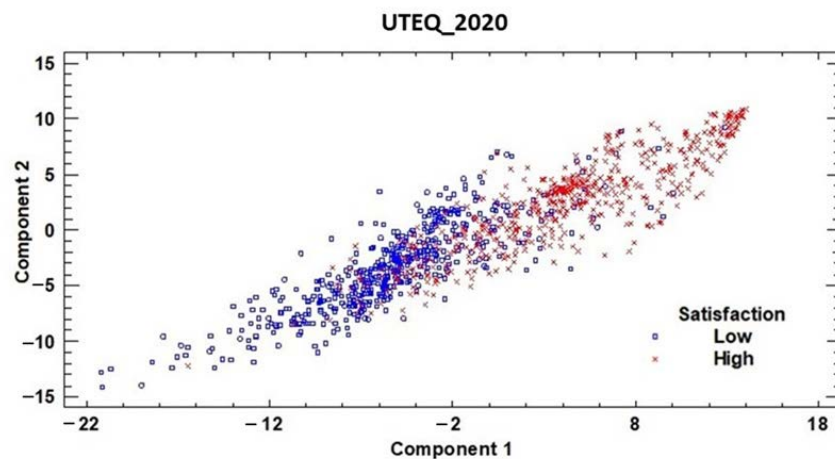


Figure 3. Dispersion of the satisfaction variable in online education (UTEQ_2020).

The relationship between RC and satisfaction (SASTISTotal) is shown in Figure 4. GLM results showed a significant linkage amidst satisfaction and cluster, with a confidence rate of 99%. Likewise, Duncan test for comparison of mean showed the existence of significant differences among clusters. In online learning (UTEQ_2020), the second cluster obtained the highest satisfaction values (p -value < 0.001). As for the lowest levels of satisfaction, these were observed in the third cluster. The satisfaction indicator showed differences between each group regarding its density function. This is shown in Figure S1 as supplementary material.

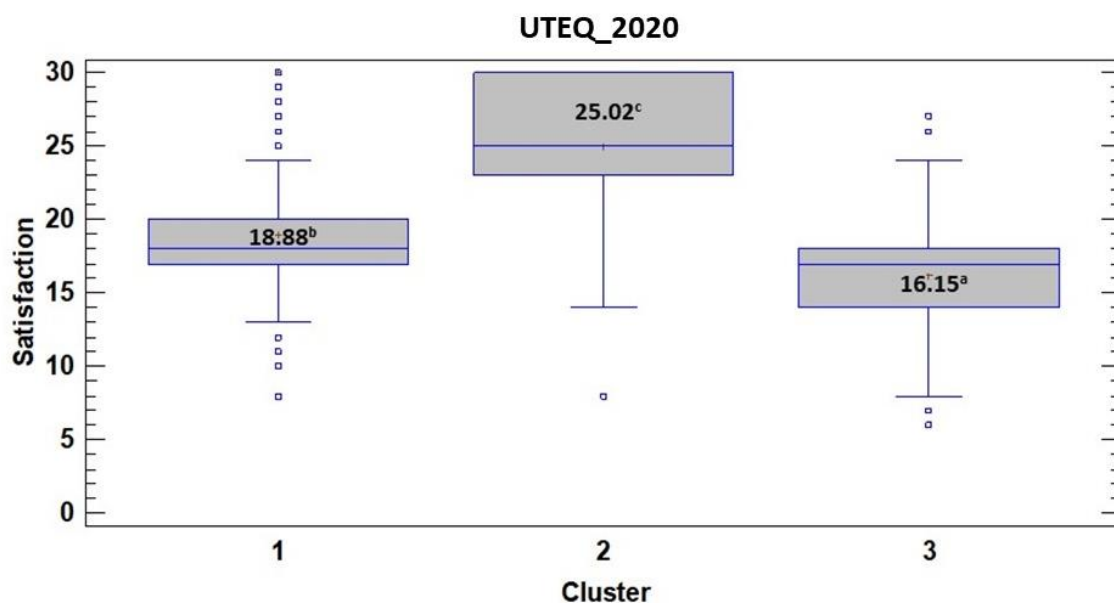


Figure 4. Total satisfaction in each relational coordination model of online education (UTEQ_2020). Means ^{a,b,c} with different superscripts differ significantly, p -value < 0.001.

4.2. Comparison between Face-to-Face (UTEQ_2018) and Online (UTEQ_2020) Learning

The main components in the typologies built for face-to-face (UTEQ_2018) [23] and online learning (UTEQ_2020) are shown in Table 5. Among the components with the highest explained variance (>60%), administrative communication and institutional cooperation were found in both models. Significant differences in satisfaction between face-to-face and online learning were not found (Table 6).

Table 5. Comparison of the components between face-to-face (UTEQ_2018) and online (UTEQ_2020) education.

Face-to-Face Education			Online Education		
Component Name	PC	Explained Variance (%)	Component Name	PC	Explained Variance (%)
Administrative communication	1	36.13	Institutional cooperation	1	44.96
Student’s leadership	2	8.58	Institutional problem-solving	2	8.42
Lecturer cooperation	3	7.25	Administrative communication	3	7.50
Classmates’ coordination	4	5.26	Classmates’ communication	4	5.27
Classroom communication	5	4.59	Autonomy	5	4.56
Autonomy	6	4.42	—	—	—

Administrative communication was the most relevant component in face-to-face learning. The variables’ accurate, frequent, and problem-solving communication and shared knowledge with administrative officers made up this component. In online learning, the

predominant component was institutional communication. Mutual respect and shared goals with all profiles (classmates, lecturers, administrative officers, and student representatives) were the included variables.

Table 6. Satisfaction in face-to-face UTEQ_2018 and online UTEQ_2020 education.

Face-to-Face Education	Online Education	<i>p</i> -Value
23.35 ± 0.08	21.27 ± 0.15	ns

ns = not significantly different.

The components were rotated. The administrative communication component went from being the first in face-to-face learning to the third in online learning. The institutional cooperation component in online learning was similar to the lecturer cooperation in face-to-face learning. It collected the mutual respect and shared goals variables related to lecturers. In the rest of the components, the relationships between classmates in face-to-face learning (components 4 and 5) were combined in classmates communication (component 4) in online learning. Finally, the autonomy of the student formed by the problem-solving communication was not reliable in either of the two models.

4.3. Model Validation

The online model between both universities (UTQ_2020 and UEB_2020) is compared in Table 7. The components with the highest factor loading were similar in both cases. The factorial composition of the variance explained in the rest of the components was similar in both universities, except for the fifth component, “autonomy”, in UTEQ_2020. This component was removed as it was not reliable according to Cronbach’s alpha. The typologies built for UTEQ_2020 and UEB_2020 showed a similar factorial structure and grouping in cluster analyses. Significant differences between the satisfaction of UTEQ_2020 and UEB_2020 were not found (Table 8). Online learning UEB_2020 data analyses are shown in the supplementary material.

Table 7. Comparison between the components of online education in UTEQ_2020 and UEB_2020.

UTEQ_2020			UEB_2020		
Component Name	PC	Explained Variance (%)	Component Name	PC	Explained Variance (%)
Institutional cooperation	1	44.96	Institutional cooperation	1	44.72
Institutional problem-solving	2	8.42	Institutional problem-solving	2	7.49
Administrative communication	3	7.50	Administrative communication	3	6.97
Classmates’ communication	4	5.27	Classmates’ communication	4	4.95

ns = not significantly different.

Table 8. Satisfaction in online education in UTEQ_2020 and UEB_2020.

UTEQ_2020	UEB_2020	<i>p</i> -Value
21.27 ± 0.15	19.76 ± 0.13	ns

ns = not significantly different.

5. Discussion

An organizational model for online learning at UTEQ in 2020 was built. The organizational models in face-to-face and online learning were different. In face-to-face learning before the pandemic, students mainly solved their administrative problems in person with administrative officers, since the response rate was higher than in telematic inquiries [51]. With the appearance of the pandemic, confinement forced people to work from home [20]. The administration staff did not have precision technological means in their homes, nor did

they have sufficient organization to provide student attention synchronously [36]. This, together with the increased influx of student queries on administrative procedures affected by the pandemic, caused delays in responses. Regarding the resolution of academic problems, before the pandemic, students turned to student representatives in face-to-face learning to solve academic and organizational problems [3,22–25]. In online learning, this profile had the same problem as the administrative officers: lack of adequate technological means in their homes and a higher rate of inquiries than was usual in face-to-face learning [6].

Therefore, the main organizational change was observed: while in face-to-face learning, the students solved the administrative and academic problems with the profiles responsible, respectively, in the online learning the students asked the lecturers directly. This was because the only synchronous contact in education was between student and lecturer, due to online classes. The lecturers made a great effort and reacted to the pandemic by implementing online classes with public and own equipment to respond to the pandemic and keep their communication channels (Microsoft Teams and Moodle) open. Consequently, in online learning, lecturers assumed the role of solving problems through synchronous and asynchronous communication during the class period.

In the comparison between the online and face-to-face model, students showed the same level of satisfaction in face-to-face and online learning. This could be because the lecturers contributed to reducing the information asymmetry [4]. Although communication between administrative officers and students is an element of satisfaction in educational systems with reduced attendance [3], the role of lecturers compensated for this lack of communication. Lecturers were a key element in the process of adapting to the educational system imposed during the pandemic [5,18]. McKenzie et al. [52] found that establishing direct communication channels between lecturers and students helped maintain their trust. According to Schwanenberger et al. [14], lecturers serve as organizational and technological support during the learning process in online learning. These facts contributed to the maintenance of student satisfaction during the pandemic. These results are contrary to other studies on student satisfaction in online learning during the pandemic: Gallego-Gómez et al. [8] and Yang and Huang [20]—although nonorganizational variables were supported—found higher levels of student satisfaction in online learning.

The organizational models of online learning at UTEQ and UEB in 2020 were similar. The online model built was the same at each university analyzed; so, it can be extended to other universities [25]. However, according to the results of this study, the online model did not contribute to improving student satisfaction, but rather to maintaining it in an emergency situation. Therefore, a different strategy should be proposed to improve student satisfaction.

The RC model allows establishing strategies to improve communication [22] and increase satisfaction [3,23–25,27–29,50]. The combination of the best RC practices of face-to-face and online learning models in a hybrid model is proposed. As a concrete measure, the adaptation of the ICTs of the administrative officers is proposed. First of all, establishing a remote online appointment procedure can assure students that they will receive care within reasonable time frames. On the other hand, a technological improvement that allows multiple lines to be linked on the same device could optimize communication when administrative officers work from home. These measures could help improve communication flows and increase student satisfaction. These results agree with those of Schwanenberger et al. [14] and Harati et al. [13], who demonstrated that administrative officers need to improve their technological support to offer optimal communication to the student [19]. Furthermore, this could help free teachers from administrative functions and allow them to focus on their teaching tasks [1,3,12]. With more time available, lecturers could develop pedagogical skills that combine face-to-face learning and digital tools [19], such as gamification, which increases student motivation [4,12]. Synchronous and asynchronous methods could also be combined, such as video recording of face-to-face classes. Consequently, students could avoid the passive learning of online learning [32] and, at the same time, acquire a deeper understanding of the content through subsequent visualizations [19].

6. Limitations

The methodology used makes it possible to compare the two organizational models of HE: face-to-face and online. The creation of a hybrid system that integrates the best practices of both models is proposed. However, future research could validate the combination of specific practices and verify if the new system is associated with higher levels of satisfaction, since its exploration has not been contemplated in this research.

7. Conclusions

The relational coordination model was a useful tool to build an organizational model of online learning during the pandemic period. The organizational model of online learning at UTEQ changed, compared to face-to-face learning, even though the level of satisfaction was similar in both. The main changes observed were related to the cooperation and resolution of problems by the lecturers and administrative officers.

The role of lecturers gained importance beyond teaching tasks in times of confinement, also assuming administrative functions. However, the level of satisfaction was similar in both models since the lecturers compensated for the lack of communication between the students and the administrative officers to solve administrative problems. This organizational model is applicable to other universities in similar contexts. Nevertheless, since online learning was not associated with an improvement in satisfaction, different structural changes are necessary to improve it. The construction of a third educational model that combines the best practices of online and face-to-face learning in a hybrid system could be an alternative that improves student satisfaction.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/educsci12070448/s1>, Relational coordination in higher education: Student survey; Table S1: Principal components (PC) loading matrix of rotated of UEB_2020; Table S2: Centroids for each cluster of UEB_2020; Figure S1: Statistical parameters of the satisfaction value for each university; Figure S2: Relational coordination clusters of UEB_2020; Figure S3: Satisfaction according to the first two components of UEB_2020; Figure S4: Total satisfaction in each relational coordination model of UEB_2020.

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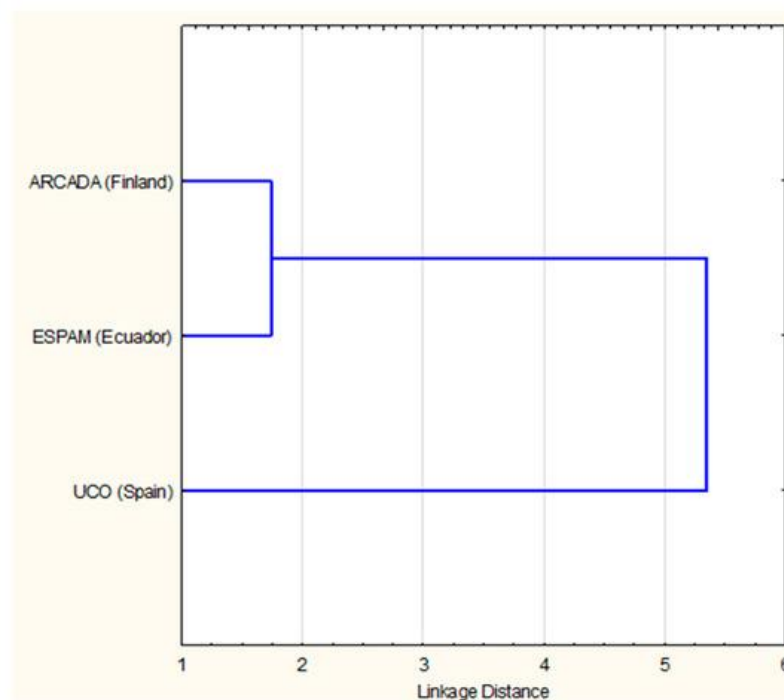
CAPÍTULO 4. DISCUSIÓN DE RESULTADOS

En este apartado se discutirán los resultados de los artículos publicados en el marco de esta tesis doctoral, explicando cómo contribuye cada uno al avance del campo de investigación de la CR en cada uno de los entornos analizados. En primer lugar, se observará si el contexto socioeconómico de la institución universitaria es un factor determinante para la aplicación del modelo de CR, y si esta aplicación afecta a la satisfacción del estudiante. Igualmente, se discutirá si la metodología utilizada puede considerarse una herramienta válida para la construcción de modelos organizativos en otros entornos. En segundo lugar, se comentarán los resultados de realizar una comparativa entre el estilo educativo tradicional e intensivo dentro de la educación presencial, tanto desde la perspectiva organizativa como de satisfacción, y se planteará si puede servir de base para la construcción de sistemas híbridos en el futuro. En tercer lugar, se discutirá si existieron cambios organizativos y de satisfacción a raíz de la pandemia en la ES, mediante la construcción de un modelo organizativo de aprendizaje en línea y su comparativa con el modelo organizativo prepandemia, además de observar si las mejores prácticas organizativas del modelo en línea pueden ser extendidas a otras universidades.

4.1 Coordinación relacional y contexto socioeconómico

En el caso de la ES, es importante identificar las mejores prácticas organizativas para aplicar en las universidades, así como las diferencias entre las mismas, que contribuyan al conocimiento global de la importancia de la CR en los resultados de la organización (Gallego-Sánchez et al., 2015). Además, es igualmente importante conocer si la cultura local y la situación socioeconómica pueden afectar a la aplicación del modelo (Bush, 2018). En el primer artículo de investigación se estudiaron universidades de tres países distintos —Finlandia, España y Ecuador—. Según los resultados de esta investigación, el contexto de cada universidad no afectó a la eficacia del modelo, al observarse que una mejora en las prácticas organizativas condujo a una mejora en los resultados en las tres universidades. De este modo se puede afirmar que un mayor nivel de CR conduce a una mejora en los resultados (De-Pablos-Heredero et al., 2020), independientemente del contexto socioeconómico (Figura 5).

Figura 5. Distancias de Mahalanobis entre las tres universidades



Fuente: Checa-Morales, De-Pablos-Heredero, Carreño, et al. (2021).

En cuanto a la satisfacción de los alumnos, mayores niveles de CR se asociaron a mayor satisfacción de los estudiantes en las tres universidades. Las prácticas organizativas basadas en la comunicación precisa y orientada a la resolución de problemas, el respeto mutuo y el conocimiento y los objetivos compartidos explicaron estos mayores niveles de satisfacción. Margalina et al. (2017) y Gallego-Sánchez et al. (2021) estudiaron la CR en el entorno de la educación en línea, relacionándola con la calidad organizativa. Ambos trabajos utilizaron análisis de ecuaciones estructurales en su metodología, para encontrar dinámicas de interdependencia entre las dimensiones del modelo de CR y la calidad. Margalina et al. (2017) estudiaron la educación en línea previa a la pandemia, utilizando datos de dos universidades españolas para medir la calidad de alumnos y docentes. Por otra parte, Gallego-Sánchez et al. (2021) observaron la educación en línea durante la pandemia, asociando el modelo de CR con la calidad de las TIC. Ambos trabajos comprobaron cómo, en universidades con altos niveles de calidad, la coordinación institucional con los estudiantes era más fuerte. Havens et al. (2018) y Haider et al. (2020) mostraron las similitudes entre la calidad del trabajo en equipo y la CR. Lacayo-Mendoza y De-Pablos-Heredero (2016) indicaron que la mayoría de los estudiantes valoran mucho las facilidades que brinda el personal docente. Finalmente, se

observó que otros atributos destacados son las metas compartidas con los representantes de los estudiantes y con los funcionarios administrativos.

Por último, se mostró que la metodología utilizada puede ser de utilidad para construir modelos organizativos. Conociendo las variables con mayor poder discriminante, es posible proponer medidas concretas, sencillas y económicas para mejorar la calidad educativa. Los resultados de esta investigación permiten establecer la diferenciación organizativa entre las tres universidades a través del análisis discriminante y mostraron cómo la UCO fue la universidad más diferenciada según la CR (Figura 5). Esta diferenciación explicó que, de las tres universidades estudiadas, ésta se encontrase mejor posicionada en el ranking mundial de universidades aún sin encontrarse en el país más favorecido en cuanto a situación socioeconómica.

4.2 Coordinación relacional y estilo educativo

En lo relativo al establecimiento de estrategias competitivas en la ES, existe una responsabilidad social de las instituciones de ofrecer estilos de formación de calidad adecuados a cada perfil de estudiante (Balandya et al., 2021; Loton et al., 2020) y de promover métodos educativos más eficientes e innovadores (McAuliffe, 2019; Sá & Serpa, 2020).

En el segundo trabajo de investigación se estudiaron las diferencias organizativas entre el estilo de enseñanza presencial en sus formas tradicional e intensiva. La educación presencial tradicional ha sido la modalidad educativa preferida por los estudiantes (Gherheş et al., 2021; Tratnik et al., 2019) y el método educativo más común, donde el estudiante comparte espacio físico con el profesor y existe una interacción continua entre ambos perfiles (Gallego-Sánchez et al., 2015). Se asocia a una menor tasa de deserción que otras modalidades educativas (Escanés, 2014), fomenta la participación del alumno en el ecosistema educativo (Lowenthal & Snelson, 2017) y presenta mayores niveles de motivación en el alumnado, lo que se relaciona positivamente con la consecución de los objetivos de aprendizaje (Cho et al., 2021; Harwood et al., 2018). Sin embargo, este estilo educativo adolece de cierta falta de flexibilidad para los estudiantes que necesitan conciliar su vida académica y profesional o personal (Amato & de Jesús Novales-Castro, 2014; Gallego-Sánchez et al., 2021; McNallh & Michel, 2017). Esto puede generar patrones de ansiedad en los estudiantes (Sprung & Rogers, 2020) y afecta especialmente

a los estudiantes con responsabilidades laborales (Balandya et al., 2021) o familiares (Harwood et al., 2018; Loton et al., 2020). Según Sprung y Rogers, (2020), el equilibrio entre la vida educativa personal y profesional es un antecedente importante de la salud mental de los estudiantes universitarios, y las instituciones educativas deben facilitar este equilibrio para mejorar la experiencia universitaria. Una mejora organizativa en la gestión de la conciliación estudio-trabajo por parte de la institución se refleja en una mejora de los resultados académicos (McNall & Michel, 2017).

Por otra parte, la educación intensiva es una variante de la educación presencial tradicional. Este estilo concentra las horas de enseñanza en períodos de tiempo comprimidos (Harwood et al., 2018; Loton et al., 2020; McLinden, 2017; Samarawickrema & Cleary, 2021). Dada la creciente demanda de los estudiantes por un modelo de estas características, algunas universidades ofrecen programas intensivos de educación presencial para permitir que los estudiantes no convencionales opten por la educación presencial (Balandya et al., 2021; Cho et al., 2021; Harwood et al., 2018; Huynh et al., 2020; Kim, 2018; Loton et al., 2020; Samarawickrema & Cleary, 2021). La presencialidad del alumnado se reduce prácticamente a la mitad de duración (Arranz et al., 2018) e incluye todos los contenidos formativos de la asignatura (Harwood et al., 2018; Huynh et al., 2020; Loton et al., 2020). La implementación de un estilo de aprendizaje como el intensivo debe tener en cuenta la coordinación organizativa, ya que se deben impartir los mismos contenidos formativos que en el estilo tradicional, en menor tiempo (Gallego-Sánchez et al., 2021). De este modo, la CR juega un papel crucial en la estrategia educativa (Sá & Serpa, 2020).

La comparación de los estilos tradicional e intensivo puede contribuir a mejorar el rendimiento y la satisfacción de la modalidad educativa presencial. Además, podría ser un primer paso en la construcción de sistemas educativos híbridos eficientes a través de la implementación de variables de coordinación. De este modo, se realizó una comparativa entre ambos estilos educativos para conocer si una mayor presencialidad del alumno se asoció a una mayor coordinación. La respuesta a esta pregunta fue negativa según los resultados de esta investigación. Los estudiantes del estilo intensivo mostraron mayores niveles de CR. La resolución de problemas relacionada con los representantes estudiantiles fue estratégica en el estilo intensivo, donde los estudiantes asisten a la universidad en un horario reducido y tratan de optimizar su tiempo presencial. Cuando surge algún problema, los representantes de los alumnos son los primeros en ser

consultados, ya que son el nexo entre los alumnos y el resto de los perfiles. De-Pablos-Heredero et al. (2019) y Gallego-Sánchez et al. (2021) indican que una mayor resolución de los problemas de comunicación implica la mejora de la calidad educativa. Además, la comunicación frecuente con los administrativos obtuvo niveles superiores en el estilo tradicional debido a la coincidencia del horario de trabajo de los administrativos y el horario de asistencia de los alumnos al centro. Según Margalina et al. (2017), la mala comunicación sobre los procesos administrativos genera incertidumbre en el estudiante y disminuye la satisfacción. Una mejora en esta variable en el estilo intensivo podría conducir a una mejora en su calidad.

En cuanto a la satisfacción del estudiante, el estilo intensivo mostró mayores niveles. La madurez del estudiante de estilo intensivo permite un mayor compromiso con su proceso educativo (Sprung & Rogers, 2020). Tener una mayor autonomía y control sobre el tiempo y el ritmo conduce a mayores niveles de satisfacción (Cho et al., 2021; Harwood et al., 2018; Pozdnyakova & Pozdnyakov, 2017; Sheail, 2018). El estilo intensivo incide en los mismos contenidos formativos tradicionales en un periodo más corto (Huynh et al., 2020; Kim, 2018; Loton et al., 2020; Samarawickrema & Cleary, 2021), haciéndolo más eficiente para el alumno necesitado de flexibilidad y conciliación (Balandya et al., 2021; Harwood et al., 2018; McNall & Michel, 2017; Sprung & Rogers, 2020). Además, el respeto mutuo con los profesores fue un elemento estratégico para la mejora de CR y predominó en el estilo intensivo. El respeto entre profesor y alumno se asocia a mejores resultados basados en relaciones más satisfactorias (Gallego-Sánchez et al., 2015, 2021). Por último, este estilo presenta un mayor grado de colaboración entre el alumno y sus compañeros. Aquellos estudiantes con menor disponibilidad de tiempo son más conscientes de sus limitaciones e interactúan en el aprendizaje compartido (Samarawickrema & Cleary, 2021), hecho que se relaciona positivamente con la satisfacción en el ecosistema educativo (Amato & de Jesús Novales-Castro, 2014; Gallego-Sánchez et al., 2021; Lowenthal & Snelson, 2017; Margalina et al., 2017; Paudel, 2021).

Finalmente, este estudio mostró que los alumnos pueden cursar los mismos contenidos formativos en menos tiempo presencial sin que ello afecte a su satisfacción, siempre que existan niveles adecuados de coordinación y comunicación. La literatura científica defiende que, cuantos más factores contingentes exigen una necesidad de acción organizativa, más importante se vuelve la aplicación de los principios de CR (Gallego-

Sánchez et al., 2021; Gittel, 2001; Gittel et al., 2018; Haider et al., 2020). Por tanto, la aplicación de la CR como modelo organizativo innovador para la educación superior podría ser transferible a otras universidades. Esto puede ser de interés para la configuración de futuros modelos de aprendizaje en los que se deberá reducir considerablemente la presencia física del alumno en el centro educativo.

4.3 Coordinación relacional y COVID-19

Por último, y como se indicó anteriormente, para hacer frente a los rápidos cambios que se están produciendo a nivel mundial, especialmente tras la crisis del COVID-19, el sector educativo debe tener una estrategia clara para ofertar programas de calidad en las distintas modalidades de aprendizaje.

La pandemia de COVID-19 obligó a un cambio repentino en las modalidades de enseñanza (Yosef et al., 2021). Se establecieron métodos en línea para respetar el confinamiento impuesto y evitar el contagio (Khan et al., 2021). Aunque con anterioridad a este hecho ya existían programas de educación en línea, la pandemia obligó a implantar esta metodología de forma repentina a nivel global, independientemente del nivel tecnológico y los medios de cada centro educativo (Flores et al., 2021; Van-Schalkwyk, 2021). Este abrupto cambio de la enseñanza presencial tradicional a las clases en línea implicó un cambio tecnológico y aceleró el uso de las tecnologías digitales en los estudiantes (Sá & Serpa, 2020). Esto provocó cambios en las relaciones entre los distintos perfiles de la ES y, como consecuencia, cambios organizativos que podrían afectar a la calidad (Flores et al., 2021; Yosef et al., 2021). De este modo, el tercer trabajo de investigación se centró en conocer cómo el cambio en la educación provocado por la pandemia afectó la estructura organizativa de la universidad y la satisfacción de los estudiantes. Igualmente, se consideró relevante profundizar en el conocimiento del aprendizaje en línea que se adoptó en el confinamiento, para comprobar si puede mejorar los resultados de las universidades y ser extendido a otras universidades para mejorar la estructura organizativa en futuros sistemas educativos.

Los resultados de esta investigación confirmaron que existieron diferencias organizativas entre el aprendizaje presencial prepandemia y el en línea durante pandemia. La comunicación para la resolución de problemas fue el elemento que explicó tales diferencias. Por una parte, respecto a los problemas administrativos, los estudiantes los resolvían presencialmente acudiendo al personal de administración antes de la pandemia,

y de forma telemática durante la misma. La tasa de respuesta fue mayor durante el aprendizaje presencial (Steppacher et al., 2021) ya que durante la crisis sanitaria el personal universitario trabajó desde casa (Yang & Huang, 2021) y no se contó con medios tecnológicos adecuados ni organización suficiente para hacer frente a la mayor afluencia de consultas por parte de los estudiantes (Urquiza et al., 2021). Por otra parte, en cuanto a los problemas académicos, se observó un problema similar con los representantes de estudiantes. Mientras que en el entorno prepandemia los estudiantes acudían a sus representantes para resolver problemas académicos y organizativos (De-Pablos-Heredero et al., 2019; Gittell et al., 2018), durante la pandemia este perfil presentó de nuevo falta de medios tecnológicos adecuados en sus hogares y un índice de consultas superior al habitual (Van-Schalkwyk, 2021).

En cuanto a la satisfacción de los estudiantes, los resultados mostraron un hallazgo relevante, pues ésta no mostró diferencias entre los períodos pre y durante pandemia. Esto podría deberse a que los profesores contribuyeron a reducir la asimetría de la información (Sosa-Díaz et al., 2021). Se observó que la comunicación entre administrativos y estudiantes es un elemento de satisfacción en los sistemas educativos con asistencia reducida. El papel de los profesores compensó esta falta de comunicación, ya que fueron un elemento clave en el proceso de adaptación al sistema educativo impuesto durante la pandemia (Flores et al., 2021; Prieto-Ballester et al., 2021). Los aspectos que contribuyeron a este mantenimiento de la satisfacción fueron, en primer lugar, el mantenimiento de la confianza de los alumnos al disponer de comunicación directa con los profesores durante el confinamiento (McKenzie et al., 2020) y, en segundo lugar, el papel de éstos como soporte organizativo y tecnológico en el citado periodo (Schwanenberger et al., 2021).

Por último, en cuanto al planteamiento de extensión de las mejoras prácticas organizativas del modelo a otras universidades, según los resultados de este estudio, el modelo en línea no contribuyó a mejorar la satisfacción de los estudiantes, sino a mantenerla en una situación de emergencia. Por lo tanto, se debe proponer una estrategia diferente para mejorar la satisfacción de los estudiantes. Así, se propone la combinación de las mejores prácticas CR de los modelos de aprendizaje presencial y en línea en un modelo híbrido. Una adecuación de las TIC de los administrativos debería ser considerada como un elemento principal en futuros modelos, coincidiendo con Schwanenberger et al. (2021) y Harati et al. (2021), quienes demostraron que los funcionarios administrativos

necesitan mejorar su soporte tecnológico para ofrecer una comunicación óptima al estudiante (Bebbington, 2021). Además, esto podría ayudar a liberar a los profesores de funciones administrativas y permitirles concentrarse en sus tareas docentes (Van-Der-Velde et al., 2021; Yosef et al., 2021). Con más tiempo disponible, los profesores podrían desarrollar habilidades pedagógicas que combinen el aprendizaje presencial y las herramientas digitales (Bebbington, 2021) que aumenten la motivación de los estudiantes (Sosa Díaz et al., 2021; Van-Der-Velde et al., 2021). Igualmente se podrían combinar métodos síncronos y asíncronos, como la grabación en vídeo de clases presenciales, donde los estudiantes puedan evitar el aprendizaje pasivo del aprendizaje en línea (Sitthiworachart et al., 2021) y, al mismo tiempo, adquirir una comprensión más profunda del contenido a través de visualizaciones posteriores (Bebbington, 2021).

4.4 Coordinación relacional como elemento de satisfacción en la educación superior

Como se ha mencionado a lo largo del desarrollo de esta tesis, existe un objetivo común a los tres artículos de investigación que componen el compendio. Aunque, como ya indicamos, el modelo de CR ha mostrado su eficacia en distintos sectores en cuanto a la mejora de los resultados (Gittell, 2001; Gittell et al., 2018; Haider et al., 2020), este objetivo pretende demostrar que el modelo de CR es una herramienta válida para el diseño de estrategias organizativas en las instituciones universitarias y aplicable a cualquier entorno y estilo de enseñanza.

De este modo, el primer artículo mostró que el marco de CR proporciona una base para investigar los tipos de modelos organizativos en las universidades (Gallego-Sánchez et al., 2015, 2021; Lacayo-Mendoza & De-Pablos-Heredero, 2016; Margalina et al., 2017) independientemente de su contexto social y cultural. Se observó que mayores niveles de CR mejoraron los resultados (Lacayo-Mendoza & De-Pablos-Heredero, 2016) en las tres universidades estudiadas en términos de satisfacción. Es importante identificar las mejores prácticas organizativas para aplicar a cada universidad de forma individual, así como las diferencias entre las mismas, que contribuyan al conocimiento global de la importancia de la CR en los resultados de calidad de la ES (Gallego-Sánchez et al., 2015).

El segundo artículo evidenció que el modelo CR ofrece una base para el estudio de modelos de ES con distinto grado de presencialidad del estudiante, donde existen diversos flujos de comunicación (De-Pablos-Heredero et al., 2019; Gallego-Sánchez et

al., 2015, 2021; Margalina et al., 2017). Se mostró cómo una mayor coordinación con el entorno organizativo permite optimizar recursos y brinda mayor satisfacción (Sá & Serpa, 2020). Los niveles más altos de CR, que se encontraron en el estilo presencial intensivo, se asociaron con un mayor nivel de satisfacción de los estudiantes (De-Pablos-Heredero et al., 2019).

Por último, el tercer artículo mostró que el modelo CR permite establecer estrategias para mejorar la comunicación en entornos de inestabilidad como el sufrido durante la pandemia (Gittell et al., 2018) y contribuir al mantenimiento de la satisfacción del alumnado (De-Pablos-Heredero et al., 2019, 2020; Gallego-Sánchez et al., 2015, 2021; Margalina et al., 2017). En este caso, se observó cómo con las variables de CR se consiguió evitar un descenso brusco de la satisfacción del estudiante en una situación de total incertidumbre.

Así, en el desarrollo de esta tesis, se ha evidenciado cómo el modelo de CR puede ser de utilidad para la mejora de la satisfacción en las instituciones de ES de forma general, cubriendo una laguna hasta ahora existente en la investigación científica en este ámbito. Estos resultados pueden ser de utilidad para los órganos de gestión de las universidades en la determinación de medidas organizativas que sirvan para mejorar el desempeño en su sector. Se muestra cómo el aprendizaje organizativo es un elemento estratégico en este tipo de instituciones.

CAPÍTULO 5. CONCLUSIONES E INVESTIGACIONES FUTURAS

5.1 Conclusiones

Las principales conclusiones de esta tesis doctoral se asocian directamente a los objetivos previamente planteados. De esta manera, se ha comprobado que, efectivamente, el modelo de CR tiene un gran potencial de contribución a la calidad de la ES, tal y como sugiere la literatura previa.

5.1.1 Contribuciones académicas

- *Coordinación relacional y contexto socioeconómico*

El primer artículo de investigación ofrece un enfoque novedoso ya que permite identificar las diferencias organizativas entre tres universidades con diferentes contextos socioeconómicos. En cada universidad, a medida que se mejoran las dimensiones de la CR, aumenta el nivel de satisfacción. Además, como hallazgo relevante, no se verificó una asociación entre universidades ubicadas en países con mayor nivel de recursos económicos y mayor nivel de CR. Por lo tanto, aquellas universidades que implementen un programa de buenas prácticas en CR lograrán mayores niveles de calidad en términos de satisfacción del alumnado, independientemente del contexto y los medios económicos.

El modelo discriminante canónico construido según las dimensiones de CR mostró que tres variables organizativas fueron suficientes para explicar las diferencias entre universidades. Estas variables fueron objetivos compartidos, con profesores y personal de administración, y la comunicación orientada a la solución de problemas entre compañeros. Por tanto, el análisis discriminante es útil para diseñar la mejora de las prácticas relacionales en cada universidad. El modelo propuesto puede adaptarse y aplicarse fácilmente a diferentes contextos y, por tanto, puede ser de gran interés para la mejora de la calidad en las universidades.

- *Coordinación relacional y estilo educativo*

El segundo artículo de investigación estudió dos formas de impartir la educación presencial dentro de un mismo centro, contribuyendo a la escasa literatura científica sobre casos de estas características. Se encontraron diferencias entre ambos estilos educativos, siendo el estilo presencial intensivo el que obtuvo mayores niveles de CR y satisfacción del alumnado. Se construyó nuevamente un modelo discriminante con un número reducido de variables que permitió identificar diferencias entre los estilos educativos

presenciales (tradicional e intensivo), que se asoció a una mejora de resultados. La comunicación para la resolución de problemas con los representantes de los estudiantes y el conocimiento y objetivos compartidos con profesores fueron los elementos del éxito en este estilo educativo. Se propone la mejora de la comunicación frecuente con el personal de administración en el estilo intensivo para aumentar el rendimiento. Las medidas propuestas pueden ser de utilidad para el personal académico y administrativo de la universidad que apuesta por la educación presencial para estudiantes adultos.

Según lo observado en este estudio, la educación presencial intensiva es una modalidad educativa que debe mantenerse para satisfacer la demanda educativa de un perfil específico de alumno con necesidades de flexibilidad. Aunque la educación tradicional presencial ha sido usualmente considerada como el modelo más aceptado y demandado, es posible ajustarla para lograr modelos intensivos eficientes que no renuncien a los beneficios que proporciona el contacto del alumno con el ecosistema educativo. Los hallazgos de esta investigación son útiles para determinar la duración adecuada de la educación presencial que mejora la satisfacción.

- *Coordinación relacional y COVID-19*

El tercer artículo de investigación estudió las diferencias entre la educación presencial prepandemia y la presencial en línea establecida durante el confinamiento, contribuyendo a la literatura en lógica tendencia por ser una situación mundial sin precedentes. Se concluyó que el modelo de CR fue una herramienta útil para construir un modelo organizativo de aprendizaje en línea durante el período de pandemia. El modelo organizativo de la formación en línea cambió, en comparación con la formación presencial prepandemia, aunque el nivel de satisfacción fue similar en ambos. Los principales cambios observados estuvieron relacionados con la cooperación y resolución de problemas por parte de los profesores y administrativos.

El papel de los profesores cobró importancia más allá de las tareas docentes en tiempos de confinamiento, asumiendo también funciones administrativas. Sin embargo, el nivel de satisfacción fue similar en ambos modelos ya que los profesores compensaron la falta de comunicación entre los estudiantes y los administrativos para solucionar problemas administrativos. Este modelo organizativo es aplicable a otras universidades en contextos similares. No obstante, dado que el aprendizaje en línea no se asoció con una mejora en la satisfacción, son necesarios diferentes cambios estructurales para

mejorarla. La construcción de un tercer modelo educativo que combine las mejores prácticas del aprendizaje en línea y presencial en un sistema híbrido podría ser una alternativa que mejore la satisfacción de los estudiantes.

- *Coordinación relacional como elemento de satisfacción en la educación superior*

Por último, a través del análisis de la CR en la ES, ha sido posible corroborar lo establecido previamente por la literatura, al mismo tiempo que se han ampliado los resultados obtenidos por otros investigadores. En el desarrollo de las tres investigaciones citadas ha quedado constancia de que, efectivamente, el modelo de CR puede aplicarse a la ES para la mejora de la calidad en términos de satisfacción. Este modelo puede ser de utilidad para lograr excelentes resultados en la ES, donde se observan altos niveles de interdependencia de tareas, incertidumbre, restricciones de tiempo y conocimiento tácito. Además, los tres trabajos muestran un punto en común: la necesidad de mejorar la actividad del personal de administración y descargar al docente de carga administrativa, para permitir la mejora de la enseñanza y establecer nuevos métodos más eficientes. Se recomiendan prácticas que fomenten la coordinación alumno-profesor y el papel de los representantes de estudiantes para resolver problemas académicos menores. Esto podría tender a nuevos modelos de enseñanza híbridos o formas de enseñanza personalizadas para el estudiante, donde se maximice su potencial de aprendizaje en sesiones lectivas eficientes. Igualmente, se recomiendan medidas sobre el personal de administración: en primer lugar, mejorar su soporte tecnológico para dar respuestas más rápidas y efectivas; en segundo lugar, su evaluación periódica de forma similar a las evaluaciones anuales del personal docente por parte del alumnado.

5.1.2 Contribuciones a la práctica organizativa

La investigación desarrollada en el contexto de esta tesis doctoral contribuye a la teoría de la CR. Concretamente en el marco de la ES, como forma de obtener mejoras en los resultados en términos de calidad, así como de obtener ventajas competitivas basadas en estrategias organizativas. Además, ha quedado patente que el modelo de coordinación relacional se aplica en cualquier entorno universitario, independientemente de contexto socioeconómico, estilo educativo o formas de aprendizaje en situaciones de emergencia.

Por otra parte, se contribuye a la literatura científica en lo relativo a la determinación de la calidad de las instituciones educativas. Aunque es extensa la

bibliografía existente que basa la calidad educativa en la satisfacción del estudiante, en esta investigación se presenta el desarrollo de una métrica de calidad concreta y reproducible en cualquier entorno, siempre que se cuente con información suficiente sobre los parámetros de satisfacción indicados.

Por último, es importante señalar que en esta investigación se presenta una metodología estadística fácilmente reproducible para la construcción de modelos organizativos en universidades. Esto puede permitir a los órganos de gobierno de las instituciones universitarias evaluar la situación organizativa de sus centros y diseñar políticas organizativas concretas para la mejora de los resultados. En la tabla 6 se sintetizan las contribuciones que ofrecen en esta tesis.

Tabla 6. Contribuciones académicas y prácticas

Académicas	Prácticas
Confirma la bibliografía previa: un mayor nivel de CR se asocia a mejoras en los resultados	Estrategias susceptibles de aplicación en cualquier entorno universitario
Amplía la bibliografía sobre CR en ES con el estudio de distintos entornos	Métrica de calidad reproducible
Identificación de prácticas organizativas para la mejora de cada entorno estudiado	Herramienta metodológica para desarrollar medidas individualizadas
El nivel socioeconómico del territorio no determina la mejora de la calidad basada en la CR	
La CR puede ser de utilidad para mejorar la educación presencial	
La aplicación de medidas basadas en la CR permite mantener la calidad educativa en situaciones de emergencia	

Fuente: Elaboración propia.

5.2 Limitaciones y líneas de investigación futuras

En el desarrollo de los diferentes artículos de investigación se han ido planteando una serie de limitaciones que deberían ser solventadas en investigaciones futuras, de cara a reforzar los hallazgos obtenidos en el marco de la CR y calidad en la ES.

En primer lugar, aunque los resultados del primer trabajo fueron validados, podrían estar condicionados en cada universidad por su estándar de valores de satisfacción, por lo que sería de gran interés desarrollar modelos de predicción para cada

conjunto de variables organizativas sobre la satisfacción y extenderlo a diferentes universidades y contextos. Este tema podría desarrollarse en futuras líneas de investigación mediante la aplicación de modelos de ecuaciones estructurales y encontrar relaciones de interdependencia entre variables.

En cuanto al segundo artículo, la metodología utilizada compara dos estilos educativos, lo que nos permite definir el presencial. Sin embargo, este trabajo tiene algunas limitaciones. Por un lado, este estudio se ha realizado en un programa intensivo específico de una universidad considerando alumnos matriculados en perfiles agroalimentarios. En futuras investigaciones se podría ampliar el estudio a una muestra de estudiantes pertenecientes a diferentes ramas del conocimiento para obtener un enfoque transversal.

Por otra parte, la metodología utilizada en el tercer trabajo permite comparar los dos modelos organizativos de la ES —presencial y en línea— durante la pandemia provocada por el COVID-19. Dado que en este artículo se propone la creación de un sistema híbrido que integre las mejores prácticas de ambos modelos, investigaciones futuras podrían validar la combinación de prácticas específicas y verificar si el nuevo sistema está asociado a mayores niveles de satisfacción, ya que su exploración no ha sido contemplada en esta investigación. Además, podría estudiarse esta misma combinación de prácticas considerando modelos organizativos postpandemia, para eliminar el efecto de establecimiento repentino de la educación en línea durante confinamiento.

Finalmente, un punto en común en esta investigación es el hecho de estudiar la calidad en función de la satisfacción de los alumnos respecto al modelo organizativo. Estudios posteriores podrían asociar la calidad con los resultados académicos de los estudiantes, ya que su exploración estaba fuera del alcance de este estudio. Finalmente, dado que este estudio se centra únicamente en la satisfacción de los estudiantes, el estudio desde la perspectiva de la satisfacción del resto de perfiles universitarios (docentes y personal de administración, entre otros) podría ser objeto de estudio en futuras investigaciones.

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