

Original Paper

Integrating Strategic Change, Evolutionary Ecology, and Neoinstitutionalism: Transformations in Community Higher Education amidst the Covid-19 Pandemic

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Abstract

This study examines how the Covid-19 pandemic reshaped technological, pedagogical, and institutional practices in community universities in Santa Catarina, drawing on organizational change, evolutionary ecology, and neoinstitutional theory. Using a qualitative, multi-case design, the research is based on interviews with six Pro-Rectors (senior executive officers responsible for teaching, administration, research and graduate studies, and outreach) from four institutions. The findings indicate that the pandemic acted as a catalyst for both incremental and transformational adjustments, reflected in the adoption of active learning methodologies, flexible assessment practices, and the consolidation of hybrid teaching models. From an evolutionary ecology perspective, the crisis activated a selective process through which effective pedagogical routines, digital infrastructures, and collaborative networks were retained and institutionalized. Neoinstitutional analysis shows that universities strengthened their legitimacy by aligning with societal expectations of innovation, inclusion, and social responsibility, reinforcing their community-oriented identity.

Keywords

technological change, pedagogical change, organizational adaptation; pandemic, SARS-CoV-2, coronavirus

1. Introduction

Organizational changes are inherent to the dynamic environment in which institutions operate, resulting from both internal initiatives and external pressures (DiMaggio & Powell, 1983). Theoretically, the study is anchored in the theory of change (Mintzberg & Waters, 1985), organizational adaptation (Aldrich, 1979; Nelson & Winter, 1982), and neoinstitutional theory (DiMaggio & Powell, 1983; Scott, 2008).

The Covid-19 pandemic represented an external shock that caused unexpected disruptions and demanded rapid responses, reconfiguring organizational practices across various sectors (Ghaleb, 2024), including global higher education (Aristovnik et al., 2021; Leal Filho et al., 2022), irrespective of the institutions' administrative category (Carnegie et al., 2022; Guerrero & Pugh, 2022). In Brazil, this process was also evident across the different categories of Higher Education Institutions (HEIs) (Gimenez & Bonaelli, 2021; Moura et al., 2023; Rolins & Ferreira, 2025), accelerating the adoption of digital methodologies and requiring strategic reconfigurations within a compressed timeframe.

The pandemic necessitated a reformulation of methodologies and the incorporation of digital technologies to maintain engagement with communities and regions. Research indicates that digital outreach, when guided by pedagogical intentionality and active listening, can broaden citizen participation and strengthen the collaborative production of knowledge (Byiringiro et al., 2022; Cristofolletti & Pinheiro, 2023; Reyna, 2020; R. D. F. e Silva & Rodrigues, 2023).

Although numerous studies have investigated the context of the Covid-19 pandemic, several gaps persist. This is because researchers emphasize the occurrence of changes but fail to analyze them through integrative theoretical perspectives in an interdisciplinary manner. Specifically, this study seeks to evaluate the educational landscape, affected by the SARS-CoV-2 externality, as it is permeated by economic, pedagogical, management, and administrative transformations (Rivera, 2020).

The investigation is framed by the following research questions: How were the strategic technological and pedagogical changes and innovations implemented in the community HEIs of Santa Catarina – Brazil in response to Covid-19?

How did these HEIs respond to and integrate new practices in the post-crisis period?

What institutional factors explain the similar and distinct patterns of change among the community HEIs of Santa Catarina (SC)?

This study analyzes the technological, pedagogical, and institutional innovations that occurred in the community HEIs of Santa Catarina during the Covid-19 pandemic, with the aim of understanding how these institutions adapted to the crisis context. Based on this analysis, the following specific objectives are established: (a) to identify the nature of the changes; (b) to understand the processes of response and adaptation; and (c) to analyze institutional pressures and legitimation.

The Covid-19 pandemic, which emerged in late 2019, precipitated a significant transformation in pedagogical practices across global higher education. The urgent need for physical distancing and the suspension of in-person classes prompted educational institutions to adopt Emergency Remote Teaching (ERT) to ensure educational continuity (Rivera, 2020).

In Brazil, a federal law enacted in 2020 established an exceptional educational regime in response to the Covid-19 public calamity, relaxing essential provisions of the Law of Directives and Bases of National Education (LDB) to preserve the right to education despite the suspension of in-person activities.

The legislation authorized remote pedagogical activities at all levels of education, provided that the full annual workload was met and the national guidelines established by the National Education Council were respected. In higher education, the possibility of early graduation in strategic healthcare fields was guaranteed, while in technical education, early completion of courses related to pandemic response was allowed, subject to the fulfillment of minimum requirements. Concurrently, the law mandated that education systems ensure equitable access to technological means and consider age-specific needs among public school students.

Ease of use, perceived usefulness, and technical support influenced the acceptance of e-learning platforms (Fauzi et al., 2021). Furthermore, the pandemic underscored the role of social media in education and highlighted the need for policies that ensure sustainable and high-quality online teaching. This context accelerated the integration of digital technologies and the adoption of novel pedagogical approaches in higher education (Alam & Asimiran, 2021; Gao et al., 2022; Papademetriou et al., 2022; Piyatamrong et al., 2021; Rosli & Saleh, 2023; S. Wang et al., 2021).

The pedagogical shift to online teaching necessitated technological training for both faculty and students, underscoring the need for clear guidelines and structured capacity-building programs (Rivera, 2020). Regarding institutional management, maintaining essential services and adapting to remote work were crucial for ensuring operational continuity (Rivera, 2020). The challenges included balancing technology and pedagogy, enhancing educators' technological competencies, and fostering digital literacy among students and faculty (Akram et al., 2021; Rapanta et al., 2021; Sánchez Ruiz et al., 2021).

HEIs in Latin America emphasize the need for continuous training and digital inclusion strategies (Sánchez Ruiz et al., 2021). The pandemic caused unprecedented disruptions to the global scientific production ecosystem, particularly affecting higher education (Hedding et al., 2020). Laboratories closed, projects were postponed, and researchers rapidly adapted to health and mobility restrictions (Sohrabi et al., 2021). This emergency context redefined scientific practice, requiring technological and methodological innovations to sustain research continuity (Mudzi & Mudzi, 2022).

Brazil presented a similar scenario. Universities simultaneously faced the impacts of the health crisis and enduring structural challenges, such as budgetary constraints. Despite these difficulties, they played a prominent role in combating the pandemic and generating knowledge related to Covid-19 (J. G. da Silva et al., 2024).

The pandemic reshaped university outreach, requiring technological and pedagogical adaptations to sustain essential activities. Digital technologies, including videoconferencing platforms and social networks, enabled ongoing interaction between universities and communities and expanded the geographical reach of initiatives (Byiringiro et al., 2022; Cristofolletti & Pinheiro, 2023). Yet digitalization also exposed disparities in internet access and digital literacy, limiting the participation of vulnerable communities (Reyna, 2020). In Brazil, public universities showed the greatest capacity to adapt to remote conditions, whereas private institutions were less engaged in outreach during the most critical phase of the pandemic (Mêlo et al., 2021). Importantly, new forms of service delivery, such as remote health and psychological support, demonstrated that technology can strengthen university–society interaction even in adverse contexts (Amancio et al., 2020).

To analyze strategic changes in community HEIs, this study adopts an integrative perspective that draws on three complementary theoretical lenses. Emergent strategic change is examined through Mintzberg and Waters (1985), who view strategy as a process shaped by the interaction between intention and learning. The theory of organizational evolution (adaptation) is based on Aldrich (1979) and Nelson & Winter (1982), which explains organizational and environmental adaptation through variation, selection, and retention. Finally, neoinstitutional theory, as articulated by DiMaggio and Powell (1983) and Scott (2008), emphasizes regulatory, normative, and cultural-cognitive pillars that shape organizational action and confer legitimacy. Together, these perspectives enable an understanding of HEI transformations as emergent, evolutionary, and institutionally conditioned strategic processes shaped by the pressures of the Covid-19 pandemic.

2. Materials and Methods

The research methodology employed a comprehensive set of resources, tools, and procedures to achieve the study's objectives. This applied study adopted an inductive method and a qualitative approach, guided by exploratory and descriptive objectives. Data collection comprised documentary, bibliographic, and survey strategies, supported by semi-structured interviews (Bardin, 1977; Gil, 2017). The qualitative and applied design is justified by the need to understand managerial perceptions and to explore contextual nuances that cannot be captured through quantitative data alone.

The study population consists of higher education institutions affiliated with a regional association of educational foundations in southern Brazil. This system currently includes fourteen member institutions, comprising thirteen community-based HEIs and one state university.

From this population, the sample comprised four community universities that jointly offer a *stricto sensu* graduate program. The selection of these institutions is further justified by their strategic relevance within the regional higher education system and their distribution across different regions of the state, enabling the analysis of regional diversity and differentiated institutional strategies adopted in response to the pandemic.

The research targeted all Pro-Rectors from the four institutions who held their positions during the Covid-19 pandemic (2020-2021) and agreed to participate in the study. In total, ten senior administrators occupying these positions during the study period were contacted.

The empirical investigation was conducted through semi-structured interviews with managers from community HEIs in Santa Catarina, Brazil. The interviews gathered qualitative data on the strategic technological and pedagogical changes adopted in response to the Covid-19 pandemic. The perceptions of Pro-Rectors regarding the challenges encountered, the solutions implemented, and the impacts of these changes on institutional operations and teaching quality were examined. All interviews were transcribed using the Tactiq tool.

Data analysis followed Bardin's (1977) content analysis technique and was conducted in three stages: pre-analysis, material exploration with coding and categorization (technological changes, pedagogical changes, and innovations), and the treatment and interpretation of results according to their dimensions (teaching, research, and outreach).

Subsequently, the analytical framework (Figure 1) is presented, grounded in theoretical contributions on Covid-19 and higher education, as well as theories of change, evolutionary ecology, and neoinstitutionalism. This framework enables an understanding of how HEIs responded to the health crisis, highlighting processes of adaptation, transformation, and innovation in teaching, research, and outreach.

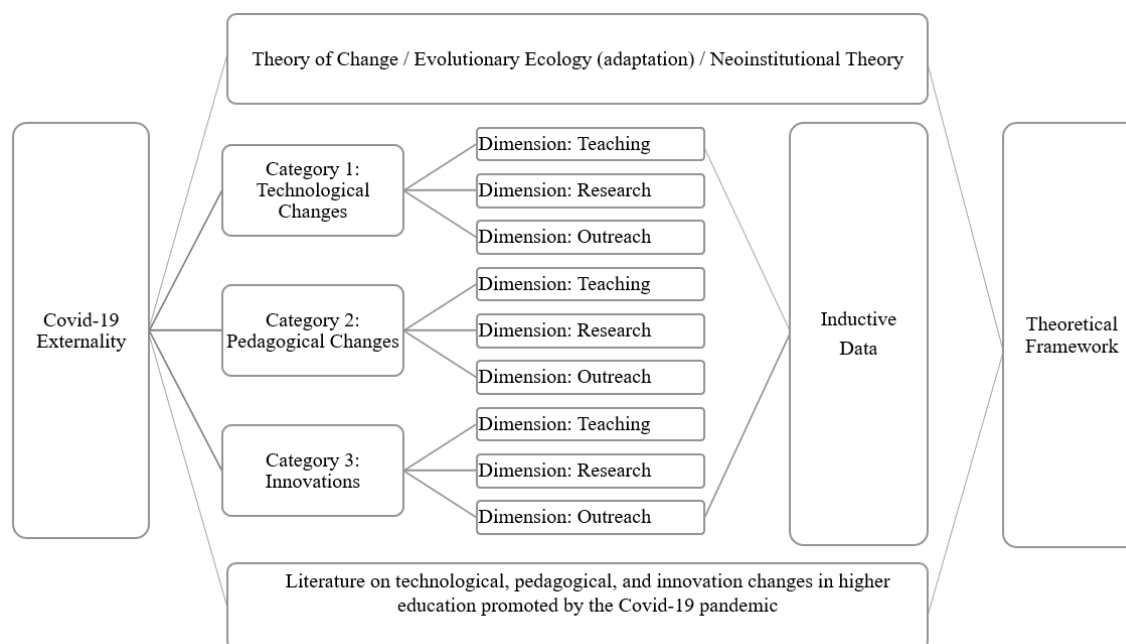


Figure 1. Analytical Framework: Data Categories and Dimensions

The categories and dimensions were initially structured based on findings from the literature, capturing global patterns as well as sociocultural distinctions identified in the narrative comparison of the results. However, the inclusion of thematic subtopics that emerged inductively was also accommodated. Incorporating this inductive logic reinforces the principle advocated by Gil (2017), according to which scientific knowledge moves away from speculative hypotheses and becomes grounded in the systematic analysis of reality.

3. Results

Of the ten individuals initially invited to participate in the study, six agreed and completed their participation. The interviews were conducted between October and November 2024 via videoconference using Google Meet, with simultaneous transcription supported by Tactiq. The respondents had previously worked in different Pro-Rectorate areas, including Teaching, Administration, Outreach, and Research/Graduate Studies. The interviews lasted between 28 and 60 minutes, resulting in transcripts ranging from 11 to 18 pages. Table 1 systematizes the information related to the data collection process, including the interview date, the corresponding Pro-Rectorate area, the duration, the number of transcribed pages, and the means of collection, providing a detailed overview of the construction of the empirical corpus that underpins the subsequent qualitative analyses.

Table 1. Interview Data

Participant		Interview Date	Pro-Rectorate	Duration	Transcribed Pages
Participant (P1)	1	28 October 2024	Teaching	48 min	17
Participant (P2)	2	29 October 2024	Research, Outreach, and Graduate Studies	60 min	18
Participant (P3)	3	31 October 2024	Outreach	41 min	14
Participant (P4)	4	31 October 2024	Teaching	49 min	17
Participant (P5)	5	4 November 2024	Administration	47 min	17
Participant (P6)	6	13 November 2024	Teaching	28 min	11

The interview results were organized according to three analytical categories previously defined in the methodology: (1) technological changes, (2) pedagogical changes, and (3) institutional innovations. Within each category, the findings were classified according to the structural pillars of higher education (teaching, research, and outreach) (Figure 2).

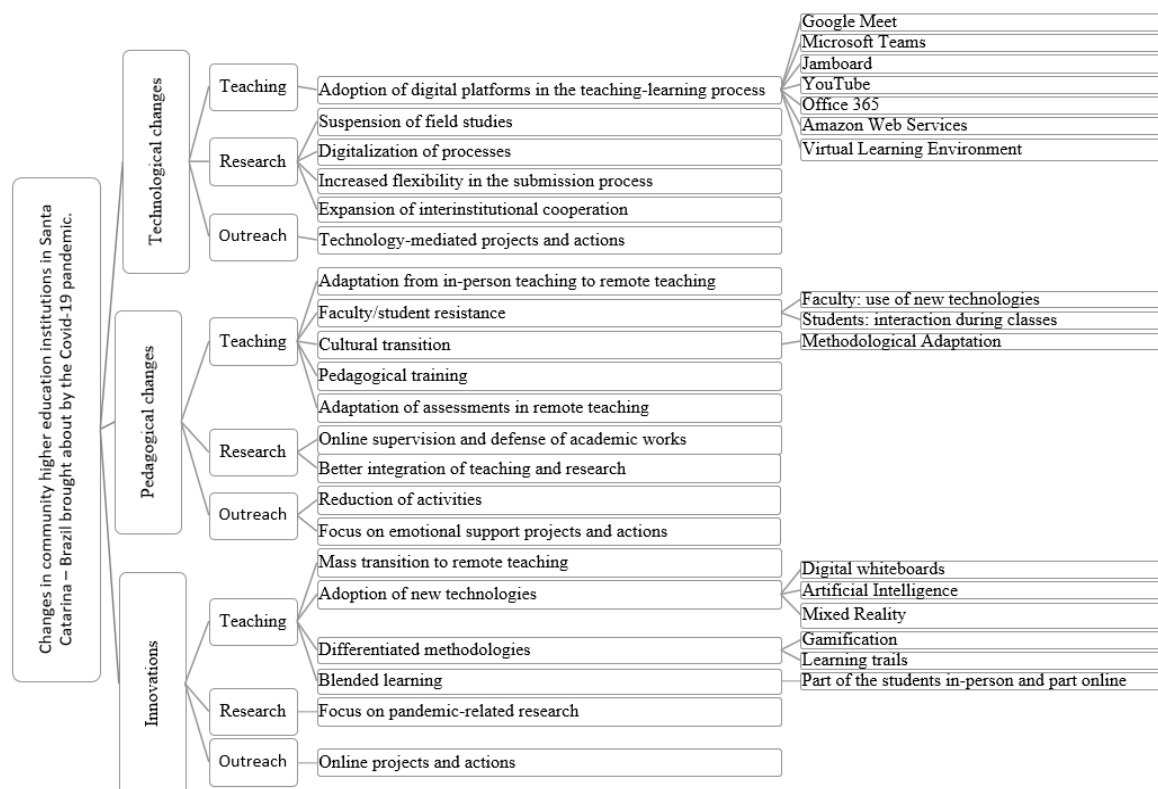


Figure 2. Technological and Pedagogical Changes and Innovations in Community HEIs in Santa Catarina, Brazil

This structure enabled the identification of patterns of response and adaptation across the institutions. Figure 2 summarizes the reorganization of teaching and learning, research, and outreach processes in community HEIs in Santa Catarina during the pandemic.

4. Discussions

4.1 Technological Changes

The transition to remote teaching required an adaptation period ranging from 2 to 20 days across the institutions analyzed, underscoring the urgency of implementing emergency measures to ensure instructional continuity. P1 reported the transition process to remote teaching as a significant logistical and organizational challenge for the institution. P2, in contrast, characterized the process as one marked by intense pressure and rapid adaptation. P2 employed the expression “*we changed the car’s wheel while it was moving*” to illustrate the urgency of the transition and the absence of time for structured planning.

This statement encapsulates the nature of contingent change imposed by external environmental pressures, in which strategies emerge under conditions of high uncertainty (Mintzberg & Waters, 1985). From this perspective, the phenomenon reflects the adaptive and unplanned nature of the organizational response, consistent with theories of change and evolutionary ecology, wherein organizations develop incremental adjustments in response to external disturbances (Aldrich, 1979; Nelson & Winter, 1982). The need for rapid responses to governmental directives and institutional survival requirements resulted

in the centralization of decision-making, typically decentralized and participatory in community HEIs, within senior management, according to P1's reports.

In contrast, P6 noted that the transition process unfolded in two distinct phases: an initial moment of immediate adaptation followed by a phase of structural organization and standardization of educational practices. In the initial stage, decision-making was agile, with the institution being among the first in the region to suspend face-to-face activities. In this initial moment, a decentralized approach prevailed, in which courses and teachers created their own solutions to maintain activities. As P6 explained, *"we were not prepared [...] so we gave freedom to courses and even teachers to implement their own solutions so that teaching would not stop"*. The subsequent phase was defined by the institutionalization of procedures and the establishment of standardized practices, according to the testimony of P6: *"a second moment, then yes, we had a standard and a whole procedure to follow"*. This transition from initial improvisation to the formalization of routines exemplifies the process of progressive institutionalization described in neoinstitutional theory (DiMaggio & Powell, 1983; Scott, 2008).

P3's account reinforces the process of institutional reorganization in response to the crisis: *"When we were faced with the pandemic situation and had to remain at home, we spent two weeks preparing to restart classes in the remote format"* (P3). This statement reflects efforts to reorganize institutional operations to maintain continuity in an unstable environment.

In the same vein, P5 highlighted the role of the institutional contingency plan developed following State Decree, which mandated the suspension of in-person activities: *"On March 17, when the university received the official notice from the State Government, it immediately created a contingency plan to ensure continuity of academic activities, which had previously been almost entirely in-person"* (P5).

This episode illustrates the coercive pressure exerted by governmental regulations, indicating that HEIs sought regulatory legitimacy in their responses rather than reacting solely to technological imperatives (DiMaggio & Powell, 1983). Consequently, the technological adaptation process reflects a balance between strategic agency and environmental constraints.

Among the strategies adopted to maintain teaching continuity, the expansion of digital academic processes and the use of platforms such as Google Meet, Microsoft Teams, Jamboard, YouTube, Office 365, and Virtual Learning Environments were prominent. Although these tools were already available, they were not systematically utilized prior to the pandemic, a pattern consistent with distinctions highlighted by Hodges et al. (2020) between deliberate digitalization and emergency remote teaching.

P1's report reinforces this point: *"A favorable aspect was our long history in Distance Learning, since we already had a Virtual Learning Environment and both professors and students were familiar with it to some extent"*. This finding aligns with Sánchez Ruiz et al. (2021), who observed that prior familiarity with hybrid methodologies facilitated digital transitions by reducing resistance and accelerating technological incorporation. From an evolutionary theory standpoint, prior technological routines provided these institutions with an adaptive advantage during the transformation process (Nelson & Winter, 1982).

Technological changes also involved significant investments in digital infrastructure, particularly the migration to cloud-based servers to ensure greater stability and performance. As P5 explained, *"this led the university to invest in cloud services with Amazon to ensure stable interactions between professors and students due to heavy internet use"*. This initiative reflects a structural adaptation to environmental

shocks (Aldrich, 1979), and reinforces the pursuit of technical and social legitimacy through the adoption of higher-capacity digital technologies (Scott, 2008).

In research, technological changes included the digitalization of procedures, increased use of remote meeting platforms, and the partial replacement of laboratory experiments with computational simulations, consistent with the literature findings (Sobti et al., 2023; Sohrabi et al., 2021; L. Wang et al., 2021).

The closure of physical laboratories led researchers to adopt digital alternatives, resulting in methodological reconfigurations. As noted by P1, *“research was able to adapt more flexibly, partly due to the student profile”*, indicating a higher adaptive capacity among graduate-level researchers. The literature similarly highlights that the expanded use of digital tools and simulations ensured continuity and became progressively institutionalized in academic research (Hedding et al., 2020; Mudzi & Mudzi, 2022; Sohrabi et al., 2021).

University outreach activities were reconfigured through technology-mediated formats. P4 emphasized that the transition from in-person to remote outreach was particularly challenging due to the community-based nature of these activities, resulting in an initial period of stagnation. As noted by the interviewee, *“Initially, the transition caused a certain sense of despair, because outreach takes place within the community it does not make sense outside the territory and direct interaction with people”* (P4).

Outreach reorganized more slowly than coursework. Institutions shifted to virtual events, livestreams, and social media interactions, increasingly addressing pandemic-related social demands, especially mental health support. These findings align with prior studies on outreach during Covid-19 (Amancio et al., 2020; Byiringiro et al., 2022; Cristofolletti & Pinheiro, 2023; M ão et al., 2021). These results align with neoinstitutional theory, which posits that organizations tend to replicate practices perceived as effective elsewhere, a process known as mimetic isomorphism (DiMaggio & Powell, 1983).

4.2 Pedagogical Changes

Resistance to remote teaching extended beyond technical issues, involving cultural and institutional challenges. Limited preparation time led to administrative difficulties and faculty resistance due to unfamiliarity with digital tools, requiring institutional reorganization, as also reported in other contexts (Fauzi et al., 2021; Sánchez Ruiz et al., 2021). Consequently, institutions relied on Distance Education units and technical support teams to assist instructors in using digital tools, particularly for synchronous virtual activities. Comparable findings are reported by Figueiredo Pasqualetto et al. (2021).

Many instructors faced difficulties adapting to digital platforms, with initial resistance linked to limited digital proficiency. As P2 stated, *“some professors were practically refusing to teach via Google Meet because they did not know how to use it”*. This situation aligns with findings by Akram et al. (2021), who emphasize disparities in faculty technological competencies.

Within the pedagogical domain, the pandemic reconfigured academic practices. As P4 noted, *“university outreach strengthened the link between outreach and research, as activities carried out virtually could generate scientific output”*. Remote teaching also fostered greater research autonomy and restructured supervision practices (Nind et al., 2023).

Inter-institutional cooperation expanded as a positive outcome, enabling shared experiences and joint initiatives. As P4 noted, *“many universities created online platforms to offer courses, information, and partnerships, thereby increasing cooperation among institutions”*. Such commitment to collaborative

research is also documented in prior studies (Mudzi & Mudzi, 2022; Nind et al., 2023; Sohrabi et al., 2021).

Scientific output increased during the pandemic. As P4 observed, *“there was indeed an increase in research output, which is evidenced by the volume of articles produced during this period”*. This growth was associated with increased time for research and the emergence of new pandemic-related research demands. His interpretation is supported by several studies (Kaul et al., 2020; Nind et al., 2023; Oliveira et al., 2022; Sohrabi et al., 2021).

The pandemic strengthened the interface between academic research and public policy. P4 cited a study on tourism’s economic impacts that informed discussions on ISS tax reduction, illustrating the role of applied research in supporting evidence-based decision-making during crisis contexts (Kaul et al., 2020; Nind et al., 2023; Oliveira et al., 2022; Sohrabi et al., 2021). The cited example reinforces the role of community HEIs as adaptive organizations that respond to social demands in a contextualized manner (Aldrich, 1979).

Adaptation varied across research fields. As P6 noted, laboratory-dependent research resumed more slowly, while other areas adapted more easily to remote methods, reflecting disciplinary differences in responsiveness (Mudzi & Mudzi, 2022; Sohrabi et al., 2021). As P3 stated, *“Situations needed to be adapted and simultaneously innovated”*, framing the innovations identified below.

4.3 Innovations

As the pandemic persisted, institutions expanded the use of virtual learning environments and complementary tools, such as digital whiteboards and recorded classes, to address disciplinary specificities. As P3 noted, *“each area has its specificities”*, indicating that effective adaptation required differentiated pedagogical solutions beyond merely transferring in-person teaching to digital formats (Rapanta et al., 2021). This recognition reinforces the argument that innovations arise from external pressures combined with institutions’ internal learning capacities and ability to reconfigure routines (Nelson & Winter, 1982).

Innovations materialized through the incorporation of new educational technologies, such as digital whiteboards, artificial intelligence, and mixed reality, into teaching practices and differentiated methodologies, including hybrid teaching, gamification, and structured learning pathways. These transformations demonstrate the adaptive capacity of the institutions and the consolidation of an organizational culture oriented toward continuous innovation, constituting a practical expression of variation and adaptive selection (Aldrich, 1979).

P1 reported that the university adopted contingency plans aimed at standardizing instructional continuity, a clear indication of normative isomorphism (DiMaggio & Powell, 1983), in an effort to align with state and national resolutions: *“I will never forget that every Friday night the governor [...] changed everything. So we had to be cautious even when defining the rules. Because things kept changing [...]”* (P1).

The institution formed partnerships with private organizations to offer postgraduate programs, created a school for hybrid technical programs, expanded its undergraduate distance-learning portfolio in the distance learning modality, and initiated discussions on new curricular models grounded in pedagogical innovation: *“So this model [...] that the university is implementing now, it incorporated a lot of the issue of hybrid teaching, right, of the distance learning workload within the in-person format. So all this movement started there during the pandemic period”* (P1).

According to P3's accounts, the year 2020 was described as a period of intense movement toward technological, pedagogical, and curricular innovation. *"In addition to innovation in technological tasks, in the sense of appropriating an environment that was not our daily one, we also went through a process of curricular pedagogical innovation"*. According to P5, *"it was an entirely new, complex process, and the university, at no point, right? Failed to organize itself to deliver excellent education"* (P5), demonstrating that the institution structured an action plan to minimize impacts and ensure the quality of the education offered during the crisis.

These accounts exemplify what Mintzberg and Waters (1985) define as emergent strategies, responses that gradually emerge under conditions of uncertainty and, once consolidated, evolve into enduring institutional innovations. They also illustrate processes of collective organizational learning, in which crises function as catalysts for change and for the incorporation of new routines (Aldrich, 1979).

Among the most significant innovations, P5 highlighted the organization of the country's *"first 100% online graduation ceremony"*, symbolizing the digitalization of academic rituals and institutional continuity. P5 also emphasized the early implementation of biosafety protocols that enabled the gradual resumption of practical activities: *"we were a university that launched one of the first biosafety protocols to ensure that students returning to campus for internships or laboratory activities had all possible safety"* (P5). The physical adaptation of campus infrastructure reflects institutional reconfiguration efforts oriented toward legitimacy, consistent with Scott's (2008) framework.

Faculty creativity emerged as a key dimension of pedagogical adaptation. As P5 noted, *"for example, the teacher taught cooking didactics from her home kitchen so that the child could do it in their home kitchen"* (P5), representing an example of incremental innovation (Nelson & Winter, 1982).

In 2021, institutions adopted hybrid rotation models to balance online and in-person participation. As P1 noted, *"we transformed all these classrooms into the hybrid model with simultaneous transmission"*, requiring technological upgrades and logistical adjustments. Hybrid practices were later consolidated in academic supervision and thesis defenses, which increasingly occurred online, as P1 observed: *"But we also learned a lot from the process. And many of these processes were incorporated into the classes, right, master's and doctoral defenses. We have defenses with online professors. In the past it was more difficult, it didn't exist, right, nowadays it does"* (P1). Such planning proves that the institution reacted to the circumstances and internalized a continuous organizational learning process, aligned with the evolutionary view of institutional adaptation (Aldrich, 1979).

According to P3, remote teaching stimulated technological innovations, including expanded use of Microsoft platforms. The migration to virtual environments required new forms of interaction and was supported by continuous faculty training and peer learning throughout 2020.

Regarding practical classes, P1 explained that the experience posed challenges for the faculty, who had to rapidly adapt to the new conditions, resulting in a period of intense workload and extensive instructional replanning. Consequently, opportunities for pedagogical innovation were identified, with the introduction of alternative approaches for teaching practical content, allowing for greater flexibility in class formats.

Restricted access to laboratories posed a major challenge, especially for research requiring animal facilities or specialized equipment. P1 mentions that, *"regarding the use of the laboratories, there was a certain level of concern because they really wanted to come to the laboratories at the beginning, and we could not allow it"*. This situation resulted in leading to substantial delays in the execution of scientific experiments, as reported by P1: *"Considering the field research that had to be postponed, it*

was delayed. Or health laboratory research that heavily utilized the animal facility, right? The animals, I think a lot of things were delayed". The suspension of these activities compromised research timelines and limited the acquisition of experimental results, necessitating methodological adaptations. Despite the constraints, essential laboratory-based research and community-serving clinical activities continued under strict safety protocols to avoid interruptions, according to P2.

In outreach activities, travel restrictions disrupted many projects, prompting the adoption of remote strategies such as virtual lectures and online materials. Although innovative for community-based HEIs, digital outreach expanded social impact but required targeted training (Byiringiro et al., 2022).

From the perspective of the Theory of Change (Mintzberg & Waters, 1985), the incorporation of educational technologies, expansion of hybrid teaching, and curricular redesign did not result from pre-established plans, but rather emerged as strategic responses that later consolidated into institutional innovations (Nelson & Winter, 1982).

From the viewpoint of Evolutionary Ecology, universities functioned as organisms adapting to a newly configured digital ecosystem, wherein only the most flexible and responsive routines were preserved and strengthened (Aldrich, 1979; Nelson & Winter, 1982). This adaptive selection of technological and pedagogical practices signals the evolution of HEIs towards more open, collaborative, and sustainable models (Nelson & Winter, 1982).

Finally, in light of neoinstitutional theory, innovations can also be interpreted as legitimacy-seeking behaviors within the educational field and broader society (DiMaggio & Powell, 1983; Scott, 2008). Normative isomorphism driven by governmental regulation, and mimetic isomorphism, through the replication of practices perceived as effective in other institutions, consolidated patterns of conformity that reinforced the credibility of HEIs (DiMaggio & Powell, 1983).

4.4 Inductive Data

The data analysis also generated emergent categories illustrating how community institutions in Santa Catarina responded to the Covid-19 pandemic, suggesting mechanisms for retaining practices within institutional routines (Aldrich, 1979), as shown in Figure 3.

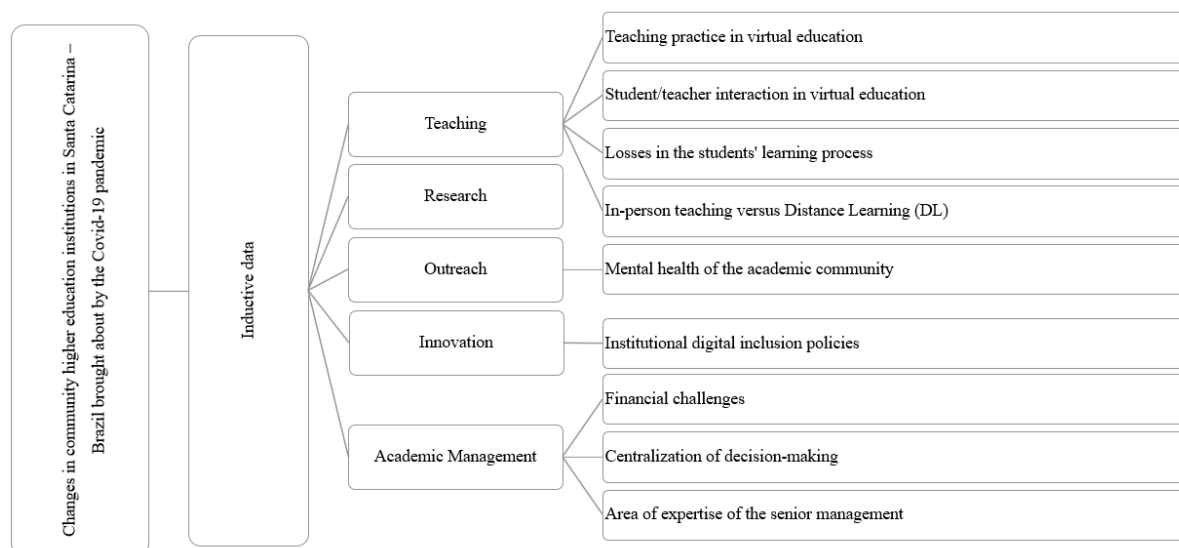


Figure 3. Inductive Data

In addition to institutional investments, individual faculty efforts played a key role, as instructors adapted their personal teaching environments. As highlighted, *“the professors, they surpassed themselves. Many created their own strategies. They used the home TV as a data show. They did many things [...] they adapted their environments. I say that they were heroes”* (P5). This proactive instructional behavior illustrates, to some extent, the voluntarist dimension of organizational change (Mintzberg & Waters, 1985).

P4 described institutional actions to mitigate digital inequalities among students. As reported, *“A survey was conducted to identify students lacking the technological conditions to participate online, so several computer labs were dismantled and computers were loaned to students”* (P4). This institutional response to student vulnerability was further reinforced through additional connectivity strategies: *“There were cases in which students truly had no internet access, so mobile chips were purchased to allow tethering. Cell phone chips were bought to allow for tethering”* (P4). Such measures reflect the social and inclusive mandate of community HEIs, aligned with the mission of university outreach and with processes of normative legitimation (DiMaggio & Powell, 1983; Scott, 2008).

P5 recalled that, after assessing students’ technological conditions, *“we discovered that some students did not have a computer to attend classes”* (P5). Consequently, the university invested in digital infrastructure. The decision to rent equipment, including computers and Wi-Fi networks, was fundamental to enabling students’ participation in remote education, demonstrating a commitment to equity in educational access. These curricular adaptations were supported by a federal legal framework enacted in 2020, which established exceptional educational measures during the pandemic.

Such investments reinforce the notion of regulatory isomorphism (DiMaggio & Powell, 1983), as they emerged in response to legal and normative requirements, while simultaneously promoting sustainable institutional innovation.

Another relevant aspect was the redirection of outreach activities to address needs arising from the health crisis. Outreach projects in health, engineering, and fashion prioritized initiatives such as producing personal protective equipment (PPE), hand sanitizer, and protective masks: *“the outreach actions had to be remodeled for what the communities needed, what was possible to do where it was possible, and what was necessary to complement”* (P4). These practices embody the university’s commitment to social responsiveness (Koglin & Koglin, 2019), reaffirming its role as an agent of local and social development.

The emergence of practices centered on digital inclusion, mental health support, and the reorganization of academic management demonstrates institutions’ adaptive capacities (Mintzberg & Waters, 1985), consistent with principles of evolutionary ecology (Aldrich, 1979; Nelson & Winter, 1982). Investments in technological infrastructure, the development of psychosocial support structures, and the adoption of flexible methodologies represent a process of adaptive selection of organizational practices, in which efficiency and institutional legitimacy operate as criteria for organizational survival. P5 noted that another institutional innovation was the creation of a *“situation room”*, an initiative that demonstrated the institution’s capacity to integrate interdisciplinary expertise to confront the critical phase of the pandemic. According to the interviewee, this room brought together *“faculty from public health, nursing, and various other programs to ensure biosafety on campus”* (P5). This interdisciplinary approach reinforces the importance of collaborative strategies for managing university outreach initiatives. Studies such as those by Heleno et al. (2020) indicate that interdisciplinary models

in outreach can enhance outreach impact and effectiveness by ensuring greater alignment with community needs.

4.5 Institutional Changes

Figure 4 outlines the main transformations identified across three structural pillars-teaching, outreach, and academic management, confirming the institutional character of the changes implemented during the pandemic period.

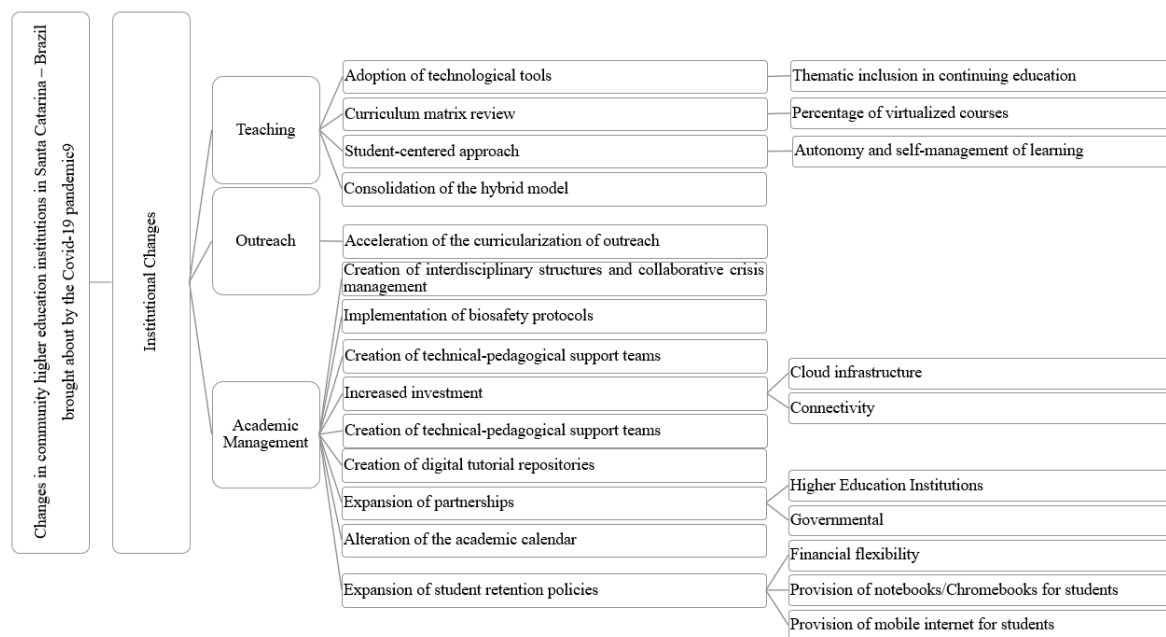


Figure 4. Institutional Changes

According to P1, the Covid-19 pandemic brought about profound and lasting transformations in higher education, representing not merely an emergency response but a turning point for the institution. P1's statement reveals indicators of emergent strategies (Mintzberg & Waters, 1985), which contributed to the consolidation of hybrid teaching models and the reorganization of academic structures, resulting in the formation of new institutional routines and patterns (Nelson & Winter, 1982).

Alongside the expansion of remote and hybrid teaching, concerns about educational quality and inequality emerged. As P4 noted, *"However, at that moment, the academic community was not prepared for this. It was not culturally prepared for this"* (P4). Limitations in devices, connectivity, and study spaces reinforced digital inequality as a barrier to educational equity (Rivera, 2020). The manner in which each institution internalized these pressures varied according to available resources and adaptive capacity, demonstrating institutional heterogeneity (Scott, 2008).

For P4, increased student autonomy in the learning process represents one of the most significant and lasting changes. This change introduced curricular components oriented toward autonomous study, while remaining aligned with current educational regulations. The participant emphasizes this adaptation by stating that *"Students learned that there are two days a week when they do not go to the University [...] That they have self-study classes. This discipline within this concept is something that came, that was a result of the pandemic."* (P4).

These findings suggest that higher education is moving toward a more consolidated hybrid instructional mode, in which autonomous learning becomes a fundamental component of academic training, promoting increased student-centeredness. This curricular reconfiguration expresses the principle of retaining effective organizational routines (Nelson & Winter, 1982) and institutional learning (Aldrich, 1979).

4.6 Conclusions

This study examined the technological and pedagogical changes, as well as the institutional innovations, that emerged in community universities in Santa Catarina during the Covid-19 pandemic, with the objective of understanding how these institutions adapted to a crisis context. Drawing on theories of organizational change, evolutionary ecology, and neoinstitutionalism, the study examined how community HEIs transformed traditional educational models into emergency practices.

The findings indicate that the pandemic functioned as a critical event for organizational learning, triggering simultaneous processes of technological adaptation, pedagogical restructuring, and institutional innovation. Motivated by the need to ensure academic continuity and maintain social legitimacy, community universities responded to the crisis through both deliberate and emergent changes, confirming the dynamic and evolutionary nature of educational organizations.

From an organizational change perspective, HEIs displayed strategic learning capacity by transforming emergency measures, such as remote teaching and administrative digitalization, into consolidated institutional routines. The adaptation process was cumulative: it began reactively but evolved into a planned and reflective transformation, supported by the incorporation of new technological and pedagogical competencies.

From an evolutionary ecology standpoint, the pandemic acted as a mechanism of organizational selection, favoring institutions that were more flexible and capable of innovation. Hybrid teaching practices, research digitalization, and the virtualization of outreach activities represented adaptive variations that, once proven effective, were retained and institutionalized within organizational culture. Finally, according to neoinstitutional theory, HEIs pursued social legitimacy through isomorphic alignment with emerging public policies, regulations, and quality standards. The adoption of active methodologies, the expansion of digital inclusion, and the creation of psychosocial support programs indicate movements of normative and mimetic conformity through which universities reaffirmed their public and community-oriented mission.

The articulation of these perspectives demonstrates that the transformation of higher education during the pandemic was both operational and evolutionary-institutional, resulting from an adaptation process that combined learning, variation, and legitimation. This integrative interpretation reinforces the argument that institutional resilience emerges from the interaction between organizational agency and environmental pressures.

Among its theoretical contributions, the study advances the literature by integrating three distinct frameworks, organizational change, evolutionary ecology, and neoinstitutionalism, traditionally analyzed in isolation. This triangulation offers a conceptual proposition that broadens the understanding of digital and pedagogical transformations in higher education during crises.

The adoption of a qualitative, interpretive, multi-case approach enabled the capture of nuanced institutional experiences. The use of semi-structured interviews and thematic analysis facilitated the reconstruction of organizational adaptation narratives, revealing intangible dimensions such as culture, belonging, and legitimacy that are often overlooked in quantitative research. The methodological

design developed here provides a replicable model for future investigations into institutional resilience and innovation.

The findings hold direct relevance for university managers and educational policymakers. The study proposes guidelines for institutionalizing sustainable innovations, grounded in the integration of technological infrastructure, continuous faculty development, and strategies for enhancing student engagement. The study further suggests that policies addressing mental health and academic quality of life should be incorporated into university management as essential components of institutional sustainability. These contributions guide strategic decision-making oriented toward equity, inclusion, and digital sustainability in higher education.

The empirical focus of this research was limited to community-based universities operating within a regional higher education system, which constrains the generalizability of the findings to other institutional types, including public and for-profit private HEIs. The qualitative nature of the study, based on subjective perception, precludes quantitative measurement of the impacts of the observed transformations. Furthermore, data collection took place during a post-pandemic transition period, which may have influenced participants' perceptions. These limitations, however, do not invalidate the findings; instead, they underscore the need for triangulation with quantitative and comparative data in future research.

Based on the evidence presented, this study identifies five promising directions for future investigation. First, longitudinal studies could examine how the institutional and pedagogical changes identified here consolidate or recede in the post-pandemic period. Second, comparative research across community, public, and private universities, both nationally and internationally, could illuminate differentiated trajectories of adaptation and innovation. Third, quantitative analyses may explore the relationship between the adoption of educational technologies and indicators of academic performance, engagement, and student retention. Fourth, student-centered studies are needed to deepen understanding of experiences, perceptions, and persistent inequalities in access to digital education. Finally, research on public policy and university governance could build on these findings to inform national strategies for digital inclusion and sustainability in higher education. Together, these avenues extend the debate on educational transformation and reinforce the understanding of universities as adaptive, legitimate, and socially innovative organizations.

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