

Resourcefulness and Redundancy Dimensions in Achieving Robustness and Rapidity Resilience in Selected Universities in the Philippines

Emilina Sarreal*
De La Salle University

Lara Patricia Chan
De La Salle University

Ma. Sofia Cortez
De La Salle University

Aj-Teanson Radomes
De La Salle University

Carl Jorem Serrano
De La Salle University

— *Review of* —
**Integrative
Business &
Economics**
— *Research* —

ABSTRACT

The COVID-19 pandemic has disrupted education. Higher Education Institutions (HEIs) were forced to close down and rapidly adopt a fully online-based learning to continue delivery of education. Such disruptions are likely to increase exponentially with the increasing threat of climate change. This study aims to investigate how selected universities in Metro Manila promoted academic continuity to achieve university resilience through technical, organizational, and social measures. The research adopted the 4R framework, which classified resourcefulness and redundancy as the means to improve the desired ends of resilience, robustness, and rapidity. A quantitative approach using multivariate regression analysis was used to determine which indicators significantly influence university resilience and to assess the combined impact of means of resilience on the desired ends. In analyzing the 404 student responses, being resourceful and promoting redundancy were both found to have significant effects on resilience in terms of robustness and rapidity. However, when resourcefulness and redundancy were tested jointly, it was revealed that when professors were absent, no substitutes were given for the classes. Students indicated in the open-ended questions that they have a high appreciation for asynchronous classes, which reduced the need for substitutes. This study provides universities with indicators to improve response to unforeseen crises and recommendations to promote resilience.

Keywords: university resilience, COVID-19 pandemic, online learning, academic continuity.

Received 21 April 2023 | Revised 3 September 2023 | Accepted 18 October 2023.

1. BACKGROUND OF THE STUDY

The COVID-19 pandemic poses the same threat and risk to the economy as it does to people's health. The virus is causing massive damage to the global economy, pushing

it towards the lowest in recent years (Rasiah et al., 2020). It does not only drastically impact the economic, psychological, and social aspects of the world, but also the education sector to a great extent. With the imposition of strict lockdowns, Higher Education Institutions (HEIs) around the world were forced to close down, and eventually transform their practices and modalities from the traditional face-to-face classes to an online-based form of learning (Ali, 2020).

Universities have adopted crisis management systems and business continuity plans for events such as storms, mass shooter events, damage to institutional reputation, and natural disasters. However, a global pandemic of this scale that completely shut down campuses for months, or even years, was beyond what most universities anticipated (Donnelly et al., 2020). Such disruptions are likely to increase exponentially with the looming threat of climate change. To some degree, global warming—at this point—is already irreversible (Center for Climate, Health, and The Global Environment, 2021).

Philippine HEIs strived to continue navigating the new normal in education despite the threat of COVID-19. Local universities had to change and adapt their infrastructure and means of communication in order to continue providing a quality education and learning environment for more than 3.5 million tertiary-level students (Stavros, 2020). Despite various efforts from the government to create policies to support the transition to online learning, different sectors have expressed their concerns about the weaknesses and flaws in implementing those policies. As university resilience or business continuity plans, targeted at school administrators and faculty have been a focus in the literature, the students' role in university resilience-building has received little attention.

In order to continue academic functions and operations, universities must be able to provide consistency when it comes to determining and evaluating sources of resilience. In this study, Donnelly et al.'s adaptation of resilient system-thinking (4Rs) was used as a backbone for the analysis of the data that were gathered by the proponents. This framework aimed to help universities on their development path, aid them with the capacity to withstand and respond to pandemics efficiently and reduce the probability and consequences of failure.

The universities in this study were selected due to their comparatively more extensive online learning background compared to other HEIs. These universities did not have to begin from scratch, as they already possessed prior experience with digital platforms, which they were able to build upon during the pandemic.

In line with these realities, this study aimed to investigate the main problem: *What are the indicators under technical, organizational, and social dimensions of Resourcefulness and Redundancy that influence resilience in terms of Robustness and Rapidity of selected universities in Metro Manila?* Specifically, this aimed to answer the following: (1) What is the extent of influence of resourcefulness in terms of technical, organizational, and social dimensions on robustness and rapidity's technical, organizational, and social dimensions of university resilience? (2) What is the level of influence of redundancy in terms of technical, organizational, and social dimensions on robustness and rapidity's technical, organizational, and social dimensions of university resilience? (3) What is the extent of influence of resourcefulness and redundancy in terms of technical, organizational, and social dimensions on robustness

and rapidity's technical, organizational, and social dimensions of university resilience? and (4) What possible courses of action can the selected universities take during and post-pandemic to achieve university resilience?

2. REVIEW OF RELATED LITERATURE

In the context of disasters, whether natural or man-made, resilience is defined as “the coping ability, the ability to bounce back from, pull through or adapt to the disruption of a crisis.” In particular, the concept of resilience refers to a university's capacity to tolerate pressure without compromising its capacity to perform as well as its ability to quickly contain losses and avoid future disruptions. Being resilient is a matter of survival for higher education institutions (Sellnow & Seeger, 2013; Donnelly et al., 2020), as discontinuance of academic endeavors, even in the short-term, can lead to “substantial financial loss, reputation damage, job losses, and curriculum limitations” requiring universities to be resilient in the face of adversity (Dohaney et al., 2020).

2.1 Profile of Philippine HEIs

COVID-19 challenged the ability of Philippine HEIs to quickly adapt in a crisis through steps aimed at learning continuity, research and innovation, community engagement, and communications (Stavros, 2020). Among the local universities, the University of the Philippines - Diliman (UPD), De La Salle University - Manila (DLSU), University of Santo Tomas (UST), and Ateneo de Manila University (ADMU) were chosen as the key participants of the paper given their relatively more comprehensive online learning experience than other universities. Commonly tagged as the top universities in the Philippines, these academic institutions were able to put proactive strategies into place to ensure the continuation of education despite the limitations caused by the COVID-19 pandemic. The four universities also used synchronous and asynchronous online learning through remote delivery, in order to foster academic continuity (Joaquin et al., 2020). Moreover, these universities did not start from scratch as they already have existing experience with using digital platforms, which they were able to expand.

2.2 Resilience Definition

To quantify the concept of resilience, Bruneau et al. (2003) designed the 4R framework which focused on the ability of both physical and social systems to withstand earthquake-related factors. Four properties of physical and social resilience were identified: (1) *robustness* (strength), the system's ability to withstand stress without losing function; (2) *redundancy* which is the extent to which the system has backups and substitutes that can be used in the event of a disruption; (3) *resourcefulness*, which is the capability of problem identification, priority setting, and marshaling resources (material, financial, informational, human) to achieve goals and (4) *rapidity*, or the means to respond swiftly in order to contain losses and avoid future disruptions (Bruneau et al., 2003, as cited in Donnelly et al., 2020).

For the purposes of this research, Bruneau et al. (2003) 4R framework, as cited in Donnelly et al. (2020), will be adapted to address the link between remote learning, and university resilience, in which variables were categorized into *means to improve resilience* (resourcefulness and redundancy), and *desired ends of resilience* (robustness and rapidity). The variables were further classified into four performance measures,

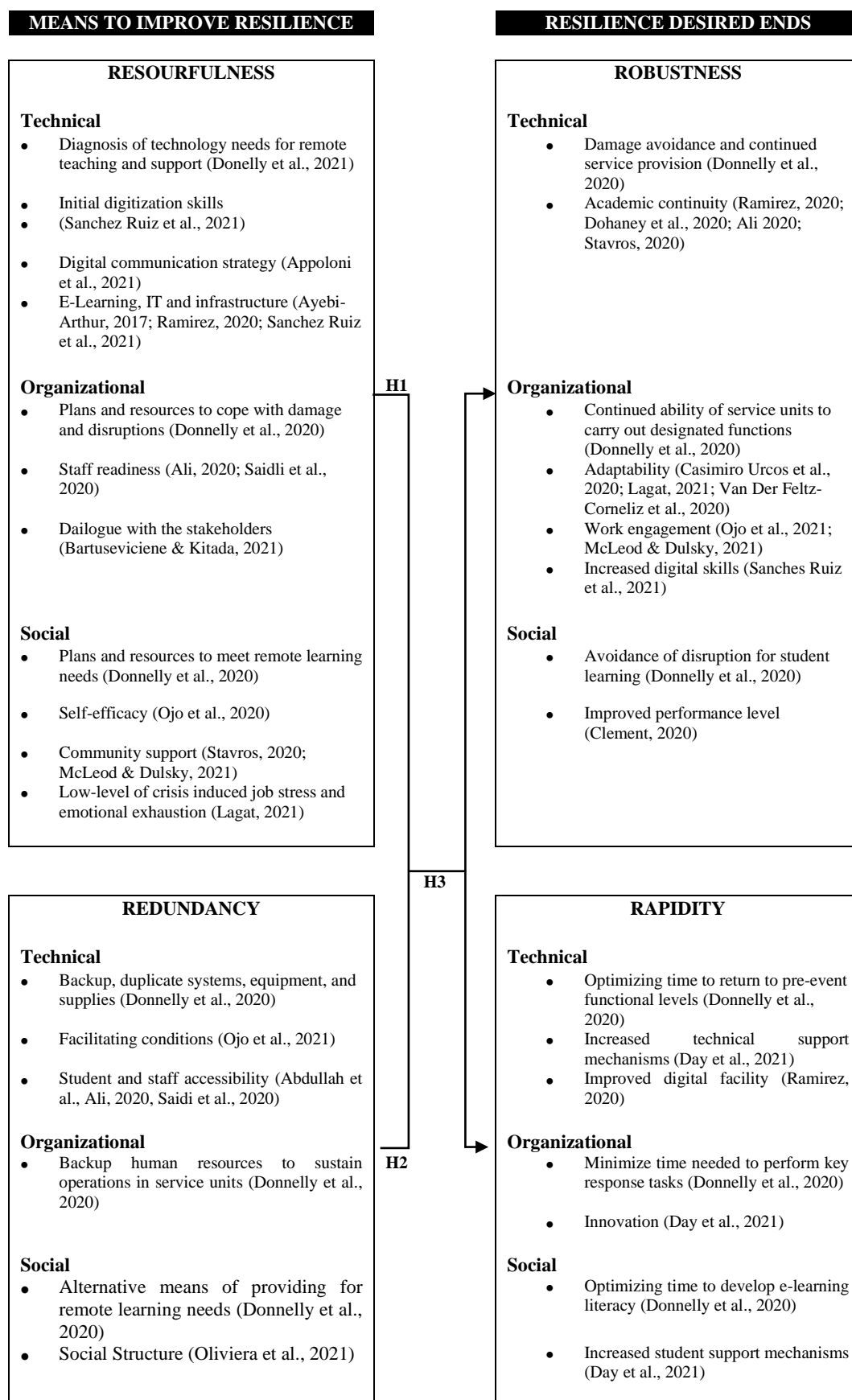
which are the Technical, Organizational, Social, and Economic dimensions. The *technical dimension* refers to the ability of physical systems (platforms, components, IT systems) to perform their functions effectively in the event of a disruption; the *organizational dimension* refers to the capacity of the organization to make decisions and take action in achieving the four properties of resilience; the *social dimension* consists of actions that are specifically designed to mitigate, if not eliminate, the negative consequences to its members and jurisdictions.

3. THEORETICAL FRAMEWORK

The COVID-19 pandemic forced universities globally to switch from traditional, in-person teaching methods to remote teaching and learning. Donnelly et al. (2020) examined the University of Central Florida (UCF), specifically, they investigated the support units in their role in the first round of instructional transition in the pandemic crisis. Using the adapted framework of Bruneau et al. (2003), Donnelly et al. found that the resilience of the organization from a faculty support perspective is evidenced mostly by performance measures in the technical, organizational, and social dimensions of the 4R framework. Tan (2013) justified that the use of faculty measurement frameworks for students provides a concrete and clear approach to explaining the various objectives of assessments, standards, and feedback as it assists students in discovering and achieving their individual learning threshold. Hence, the proponents have adopted the framework utilized by Donnelly et al. (2020), and was used as the foundation for the operational framework that this study employed. As opposed to most studies treating all the 4R framework as dependent variables, this study was distinct as it separated the Resourcefulness and Redundancy, and classified them as the means to improve resilience to meet the desired ends of resilience, which are the Robustness and Rapidity.

Derived from the related concepts and theories explained by the proponents in the theoretical and conceptual framework, the operational framework (please refer to Figure 1) specified indicators that satisfy each variable in the study. These indicators were considered based on the following criteria: (a) the relevance and consistency of the source article to this paper, (b) the timeliness given the context of COVID-19 pandemic, (c) the ability of the respondents, university students, to identify such factors given their primary experiences, (d) the capacity of the participants to accurately explain such indicators through self-report measures, and (e) the influence of the indicators to control measurement error while minimizing respondent burden (National Academy of Sciences, 2013).

Figure 1. Operational Framework of the Study



4. HYPOTHESES OF THE STUDY

For this investigation, the researchers tested three (3) pairs of hypothesis statements, which are largely based on the framework of Donnelly et al. (2020).

H₁: Resourcefulness in terms of technical, organizational, and social dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.

H₂: Redundancy in terms of technical, organizational, and social dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.

H₃: Resourcefulness and redundancy in terms of technical, organizational, and social dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.

5. METHODOLOGY

A sample of 404 students from the four selected universities were the primary respondents of this study. The proponents derived approximate percent allocations based on the population of each university to precisely represent the number of undergraduate students in the selected universities. The chosen respondents for this research were students from the four selected universities in Metro Manila.

All participants (n=404) were asked to answer an online survey questionnaire from November 2021 to April 2022. The survey is composed of five major parts: Introduction and Consent, Demographics, University Resilience Indicators, Student Perceptions of University Resilience, and Closing Statement. Four university administrators were also interviewed to obtain their insights and to validate and give more depth to the open-ended responses of the student participants.

The study utilized a quantitative research design as data collected from the target respondents will consist of numbers that measure one's attitudes, opinions, or perceptions regarding the dimensions of university resilience. A quantitative research design for the study examined the relationships between the means to improve resilience and the desired ends of resilience or the independent and dependent variables of the study. It was also able to discover and answer the cause-and-effect relationship of the variables that can address the research problem of the study (Duckett, 2021). More specifically, the proponents made use of a descriptive and explanatory-causal research design. Specifically, multivariate data analysis was used to assess and examine the differences between the independent variables on the six dependent variables.

For the statistical treatment, Multivariate Analysis was fitted on the data using SPSS 28 software. This is to find the significant predictors of university resilience. This test was used to determine the combined influence of the multiple independent variables on multiple dependent variables. All descriptives, models, and tests were conducted at a 0.05 level of significance. The output from the multivariate analysis includes

multivariate tests for each independent variable, the coefficient of determination (R²), and the adjusted R², as well as the individual univariate tests for each predictor for each dependent and its corresponding beta coefficients.

6. KEY FINDINGS

6.1 Results of Descriptive Statistics

To effectively contextualize the responses of the students based on their experiences and perceptions, verbal interpretations of independent and dependent variables were constructed. Each dimension of the variables was provided with a designated descriptor. For the independent variables Resourcefulness and Redundancy, and dependent variables Robustness and Rapidity, descriptors for the technical, organizational, and social dimensions were provided. These descriptors were contextualized based on the mean response per dimension. Four categories of the mean responses were constructed based on the 4-point Likert scale of 4 - Strongly Agree and 1 - Strongly Disagree. The mean response was determined with the calculated interval of 0.75.

Table 1. Summary of Verbal Interpretations

Variable	Grand Mean	Verbal Interpretation
RES-T	3.1	Diagnosis of technology needs for remote teaching and support is fairly demonstrated
RES-O	2.94	Universities are fairly capable to devise plans and marshal resources to cope with damage and disruption
RES-S	2.89	Plans and resources to meet faculty teaching and remote learning needs are mostly observed
RED-T	3.22	Backup, duplicate systems, equipment, and supplies that can be used in the event of a disruption are fairly demonstrated
RED-O	2.33	Universities rarely provide substitute professors
RED-S	2.84	Alternative means of providing for faculty teaching and remote learning needs are fairly exhibited
ROB-T	3.02	Damage avoidance and continued service provision to withstand the disruption is fairly demonstrated
ROB-O	2.92	Good ability of service units to carry out designated functions
ROB-S	2.77	Avoidance of disruption to faculty teaching and student learning is mostly observed
RAP-T	3.03	Quick recovery to pre-event functional levels is fairly demonstrated
RAP-O	2.97	Prior application and experience to online learning are fairly sufficient to minimize the time to perform key response tasks
RAP-S	2.84	Rapid development of e-Learning literacy is fairly exhibited

6.2 Results of Hypothesis Testing

The researchers fitted a Multivariate Regression Model with robustness and rapidity's technical, organizational, and social dimensions of university resilience as the dependent variables and with resourcefulness in terms of technical, organizational, and social dimensions as the independent variables.

Table 2. Results of First Hypothesis using SPSS Multivariate Test

Variable	p-value	Partial Eta
AVE-REST	<.001	.178
AVE-RESO	<.001	.128
AVE-RESS	<.001	.253

The multivariate test shows that resourcefulness in terms of technical ($p < .001$), organizational ($p < .001$), and social ($p < .001$) dimensions are significantly related to the set of robustness and rapidity's technical, organizational, and social dimensions of university resilience.

With partial eta squared .178 and .253, this means that the technical dimension (AVE-REST) and social dimension (AVE-RESS) of resourcefulness have a large effect size on robustness and rapidity's technical, organizational, and social dimensions of university resilience (Cohen, 1988 as cited in Lakens, 2013). On the other hand, the organizational dimension of resourcefulness (AVE-RESO) has a medium effect on the dependent variables with partial eta squared of .128 (Cohen, 1988 as cited in Lakens, 2013).

It is determined that universities that showed the capacity to identify problems, set priorities, and allocate the necessary resources to achieve organizational goals are found to be resilient in terms of robustness and rapidity. For universities, resourcefulness is exemplified through a) utilizing a digital communication approach for distributing learning materials that is fairly appealing and effective; b) having the necessary training for the faculty and staff to become ready in designing an online course and in delivering a fully online class or hybrid class and c) presence of digital resources such as FAQs, handbooks, and tutorials to assist students in adapting to the online learning environment.

Table 3. Results of Second Hypothesis using SPSS Multivariate Test

Effect	p-value	Partial Eta
AVE-REDT	<.001	.221
AVE-REDO	<.001	.056
AVE-REDS	<.001	.308

For the second hypothesis, the proponents fitted a Multivariate Regression Model with robustness and rapidity's technical, organizational, and social dimensions of university resilience as the dependent variables and with redundancy in terms of technical, organizational, and social dimensions as the independent variables. The multivariate test shows that redundancy in terms of social ($p < .001$), organizational ($p < .001$), and technical ($p < .001$) dimensions are significantly related to the set of dependent variables' robustness and rapidity's technical, organizational, and social dimensions of university resilience.

With partial eta squared .308 and .221, this means that the social (AVE-REDS) and technical dimension (AVE-REDT) of redundancy have a large effect size on robustness and rapidity's technical, organizational, and social dimensions of university resilience (Cohen, 1988 as cited in Lakens, 2013). On the other hand, the organizational dimension of redundancy (AVE-REDO) has a small effect on the dependent variables with partial eta squared of .056 (Cohen, 1988 as cited in Lakens, 2013).

The results indicate that universities that showed backup, duplicate systems, equipment, and supplies, backup human resources to sustain operations in service units, and alternative means of providing for faculty teaching and remote learning needs are found to be resilient in terms of robustness and rapidity. For universities, redundancy is exemplified through a) having alternative digital learning platforms should the main platform fail; b) having a substitute when assigned personnel is absent for a long period, and c) the presence of supporting programs to uplift and maintain good physical and mental health in a remote work environment to improve performance and mood.

Table 4. Results of Third Hypothesis using SPSS Multivariate Test

Effect	p-value	Partial Eta
AVE-REST	<.001	.125
AVE-RESO	<.001	.085
AVE-RESS	<.001	.165
AVE-REDT	<.001	.076
AVE-REDO	.105	.026
AVE-REDS	<.001	.102

For the third hypothesis, the proponents fitted a Multivariate Regression Model with robustness and rapidity's technical, organizational, and social dimensions of university resilience as the dependent variables and with resourcefulness and redundancy in terms of technical, organizational, and social dimensions as the independent variables. The multivariate test shows that resourcefulness in terms of social ($p < .001$), organizational ($p < .001$), technical ($p < .001$) dimensions, and redundancy in terms of social ($p < .001$) and technical ($p < .001$) dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.

However, the multivariate test for redundancy in terms of organizational ($p = .105$) dimension shows no significant relationship with the set of dependent variables robustness and rapidity's technical, organizational, and social dimensions of university resilience. Based on the result of the hypothesis testing, the proponents cannot reject the null hypothesis since the set of independent variables resourcefulness and redundancy in terms of technical, organizational, and social dimensions do not significantly and simultaneously influence the set of dependent variables robustness and rapidity in terms of technical, organizational, and social dimensions.

Moreover, the partial eta squared indicates the effect size between the dependent variable and the independent variables. With partial eta squared .165, this means that the social dimension (AVE-RESS) of resourcefulness has a large effect size on robustness and rapidity's technical, organizational, and social dimensions of university resilience (Cohen, 1988 as cited in Lakens, 2013). Likewise, with partial eta squared of .085, .125, .076, and .102 respectively, this means that the technical (AVE-REST) and organizational (AVE-RESO) dimensions of resourcefulness, and the technical (AVE-REDT) and social (AVE-REDS) dimensions of redundancy have medium effect size on robustness and rapidity's technical, organizational, and social dimensions of university resilience. On the other hand, the organizational dimension of redundancy (AVE-REDO) has a small effect on the dependent variables with partial eta squared of .026 (Cohen, 1988 as cited in Lakens, 2013).

The following pertains to the hypotheses of this study and the corresponding decisions to be made based on the statistical analysis:

Table 5. Summary of Hypothesis Testing Results

Hypotheses	Decisions
H₁: Resourcefulness in terms of technical, organizational, and social dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.	Accept hypothesis
H₂: Redundancy in terms of technical, organizational, and social dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.	Accept hypothesis
H₃: Resourcefulness and redundancy in terms of technical, organizational, and social dimensions are significantly related with robustness and rapidity's technical, organizational, and social dimensions of university resilience.	Fail to accept hypothesis

7. CONCLUSION

The following results are obtained after carefully examining the observed data in relation to the research questions stated:

The proponents determined that resourcefulness and redundancy when tested separately, were found to significantly influence the set of dependent variables robustness and redundancy in terms of technical, organizational, and social dimensions. However, when resourcefulness and redundancy were tested jointly and simultaneously with the dependent variables, the organizational dimension of redundancy was found to be non-significant (Chan et al., 2022).

The four selected universities that demonstrated the ability to recognize problems, set priorities, and allocate the resources needed to achieve organizational goals were found to be resilient in terms of robustness and rapidity. Specifically, the diagnosis of technology needs and plans and resources to meet faculty teaching and remote learning needs have a large effect size on university resilience. This further points to the practical significance of having initial digitization skills, effective e-learning platforms and communication channels, well-defined syllabus, comprehensive tutorials, support services, regular communication, and students' and faculty's mastery of skills in online learning as these practices and resources largely contribute to how universities can withstand losses and to quickly recover from the effects of COVID-19. This highlights the need for universities to prioritize technical and social support, when it comes to resourcefulness, to promote academic continuity and university resilience (Chan et al., 2022).

Second, the proponents found that universities with backup systems and equipment are more resilient in terms of retaining functionality and how quickly they were able to respond to the crisis. These backups include alternative online learning and communication platforms, extra devices, and contingency plans related to academic teaching should there be alarming concerns raised in times of crisis. These redundancies were already in existence even before the pandemic hit, which made it possible for universities to focus on improving these systems, rather than creating them from scratch. The professors also had the necessary equipment/devices for remote teaching, which enabled them to continue performing their duties. Some redundancies were also intentionally created in response to the health crisis, such as increasing the number of sources of learning content and syllabi for students. The universities use virtual repositories, such as their own learning management system and email. Some even use physical backups, such as the flash drive already containing the course content for students without internet access. As for their extent, the alternative means of providing for remote learning needs and the backup systems and equipment were found to have a large effect size on university resilience. This means that access to services including stable internet connection, uploading of lesson recordings, and alternative learning and communication platforms give large contributions to the ability of universities to set new academic guidelines, streamline processes during the pandemic, and provide support to the students. As such, universities were able to migrate to a remote online environment effectively and introduced new ways of working methods and interactions, which allowed students and faculty to better cope with new disruptions and adaptively perform their responsibilities. Some universities also introduced a program wherein there is a buddy system where a professor who is adept in technology can partner up with another faculty who needs help with technological adoption (Chan et al., 2022).

Third, the impact of the organizational dimension of redundancy was outweighed by the TOS dimensions of resourcefulness and the technical and social dimensions of redundancy based on their effect size, in which the former has only a small effect size. Conceivably, the reason for this outcome is because of the increasing innovation and introduction of new methodologies in pedagogy. With the inclusion of asynchronous activities, offline learning packets, and comprehensive course packs, the need for constant meetings with professors has become lower. Furthermore, the technological adoption during the crisis also allowed professors to provide pre-recorded lectures and guest lecture recordings of the lessons, which further minimized the need for a synchronous meeting. Notably, the qualitative responses of the students showed a high appreciation for these new methodologies as they promote greater flexibility in digesting the course materials. The technical and social resources, with their respective redundancies, proved to be more beneficial and more observable for students in times of pandemic (Chan et al., 2022).

8. KEY RECOMMENDATIONS

For universities, given how initial digitization skills are found to be helpful in assisting them in the transition to online learning, support programs should be implemented. Specifically, it is important for universities to initiate regular learning sessions to navigate online resources, trainings, workshops, or webinars, and conduct pilot testing to make the online experience more comfortable. According to Inada (2023), Collaborative Online International Learning (COIL) has a significantly positive impact on academic and practical development. Online international learning needs to be developed in a friendly atmosphere. Since COIL has been introduced during the pandemic, there should be evaluation from peers, instructors, and representatives of host universities and organizations to avoid the problems of the lack of face-to-face approaches on online platforms. Professors should also be given a full introduction to know the merits of COIL as well as be provided with comprehensive training programs and seminars to deepen and enrich the teaching strategies and maximize the digital tools used in a remote setup.

Universities should adjust students' workloads, academic calendars, and working schedules by administering periodic breaks and independent learning weeks. As such, constant open communication between faculty and students should also be present to allow better evaluation of the learning experience from time to time (Chan et al., 2022).

For the Commission on Higher Education and other agencies, the proponents recommend gathering inputs and soliciting feedback from key stakeholders across different segments of the organization to have insights on the effects and consequences of the rapid transition to online teaching, and learning. Second, CHED should highly encourage investment in IT support and programs to provide ease in accomplishing tasks and enhance resilience to continue working despite crisis disruptions. Lastly, it was discovered in the study that a large presence of resourcefulness, such as asynchronous activities, recorded lectures, and course packs, reduces the requirement for substitute professors to facilitate effective online learning. Hence, the proponents recommend that CHED should highly encourage universities to implement flexible learning set-ups such as hybrid and asynchronous modes even after the pandemic (Chan et al., 2022).

For university management, the school administrators should revisit their crisis management plans and should create a task force that will develop plans on how to respond to the challenges of the crisis. This task force must include administrators, faculty, staff support units, and most especially, student representatives. This study has taken a student-centered view of university resilience, revealing that many students felt that their suggestions and sentiments could be considered with more compassion when crafting policies. Thus, it is recommended to provide a student body representative in this task force to have a seat at the table, where they can have a voice in the decision-making process in the policies that directly affect them. Moreover, emergency response plans of the university should be co-created by the administration, faculty, support units, and students. Policy-making should take both a top-down and a bottom-up approach to promote an interconnectedness of efforts across the organization, highlighting most specifically the students' efforts.

Universities as organizations were heavily impacted by the pandemic. According to Zhang and Yang (2022), COVID-19 positively impacts the ratio of the market value of a company divided by its assets' replacement cost or TOBIN's Q. Based on Zhang and Yang (2022) findings' that Chinese online educational firms' ROE (return on equity). This was attributed to the Chinese students being forced to stay at home and take online courses during the epidemic outbreak. Therefore, all of a sudden, online education has become society's focus.

Recognizing the impact of the crisis on student well-being, it is recommended to provide a flexible academic calendar to the students to address several limitations, including technological and economic constraints, brought about by the crisis. The social dimensions of resilience include providing the support the students need in these extremely challenging times. Academic calendar flexibility, including the academic break and easing, helped the student to focus on more immediate and important matters, such as their health and safety, during a crisis. This is a way for the administrators to promote cohesiveness and a nurturing institutional community that champions compassion and inclusivity in extremely challenging times.

9. LIMITATIONS

With the ongoing crisis and emergence of COVID-19 variants in the country, there is no confirmed timeline for how long the pandemic will last (Department of Health, 2021). Hence, the coverage of the study was only limited to the present situation of the pandemic, where lockdowns were imposed and virus cases were still surging after more than a year since its global declaration. Moreover, the variables of the study are limited to the technical, social, and organizational dimensions of the 4R framework. Given that this study focused on the perspective of individual-level participants (students) with regard to the resiliency of their respective universities in times of COVID-19 pandemic crisis, the proponents eliminated the economic variable because students cannot ascertain the economic impacts of the pandemic on the university. Lastly, the study was limited to the experience and responses of Philippine HEIs to the COVID-19 Pandemic. The practices of universities in the pandemic period differ per country and even differ per university; thus the findings were not generalizable and were specific only to the Philippine context.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the reviewers of this research article.

REFERENCES

- [1] Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher education studies*, 10(3), 16-25.
- [2] Bartusevičienė, I., Pazaver, A., & Kitada, M. (2021). Building a resilient university: ensuring academic continuity—transition from face-to-face to online in the COVID-19 pandemic. *WMU Journal of Maritime Affairs*.
<https://doi.org/10.1007/s13437-021-00239-x>
- [3] Bruneau, M., Chang, S. E., Eguchi, R. T., Lee, G. C., O'Rourke, T. D., Reinhorn, A. M., ... & Von Winterfeldt, D. (2003). A framework to quantitatively assess and enhance the seismic resilience of communities. *Earthquake spectra*, 19(4), 733-752.
- [4] Center for Climate, Health, and The Global Environment (2021). Coronavirus, climate change, and the environment: A conversation on COVID-19 with Dr. Aaron Bernstein. Harvard T.H. Chan School of Public Health.
- [5] Chan, L., Cortez, M., Radomes, A., & Serrano, C. (2022). *Examining the dimensions of resourcefulness and redundancy in achieving resilience in terms of robustness and rapidity in selected universities in the Philippines* [Unpublished undergraduate thesis]. De La Salle University.
- [6] Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. New York, NY: Routledge Academic.
- [7] Department of Health. (2021). How long will the COVID-19 virus last? COVID-19 FAQs. <https://doh.gov.ph/COVID-19/FAQs#:~:text=According%20to%20WHO%2C%20there,%2C%20mouth%20or%20nose>
- [8] Dohaney, J., de Róiste, M., Salmon, R. A., & Sutherland, K. (2020). Benefits, barriers, and incentives for improved resilience to disruption in university teaching. *International Journal of Disaster Risk Reduction*, 50, [101691].
<https://doi.org/10.1016/j.ijdrr.2020.101691>
- [9] Donnelly, J., Miller, A. N., & Strawser, M. G. (2020). Resilience in the Face of Crisis: Organizational Response to Developing Faculty eLearning Literacy in a Global Pandemic. *Journal of Literacy & Technology*, 21(2), 37-55.
- [10] Duckett, L. J. (2021). Quantitative research excellence: Study design and reliable and valid measurement of variables. *Journal of Human Lactation*, 37(3), 456-463.
<https://doi.org/10.1177/08903344211019285>
- [11] Inada, Y. (2023). A Comparative Study of Physical Versus Online Classrooms:
- [12] Co-Creation in Industry-Academia Collaborative Education. *Review of Integrative Business and Economics Research*, 12(2), 97-117. ISSN: 2304-1013 (Online)
- [13] Joaquin, J. J. B., Biana, H. T., & Dacela, M. A. (2020). The Philippine higher education sector in the time of covid-19. *Frontiers*.
<https://www.frontiersin.org/articles/10.3389/feduc.2020.576371/full>
- [14] Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*,

- 4:863. <https://doi.org/10.3389/fpsyg.2013.00863>
- [15] National Academy of Sciences. (2013). Nonresponse in social science surveys: A research agenda. <https://www.nap.edu/read/18293/chapter/6>
- [16] Rasiah, R., Kaur, H., Guptan, V. (2020). Business continuity plan in the higher EDUCATION Industry: University Students' perceptions of the effectiveness of academic continuity plans During Covid-19 pandemic. MDPI. <https://www.mdpi.com/2571-5577/3/4/51/htm>
- [17] Sellnow, T. L., & Seeger, M. Q. (2013). Theorizing crisis communication. John Wiley & Sons.
- [18] Stavros, A. (2020). Commitment to leveraging systems for community support: The University of the Philippines system crisis response to COVID-19. United States Agency for International Development
- [19] Tan, K. (2013). A framework for assessment for learning: Implications for feedback practices within and beyond the gap. *International Scholarly Research Notices*, 2013, 1-6. <https://doi.org/10.1155/2013/640609>
- [20] Zhang, J. and Yang, Y. (2022). The Impact of Covid-19 on the Performance of Chinese Online-Educational Industry. *Review of Integrative Business and Economics Research*, 11(4), 91-100. ISSN: 2304-1013 (Online)