# A Meta-Methods Analysis of Academics' Challenges Affecting Research Productivity During COVID-19: Insights from a South African University

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*The purpose of this research study was to examine challenges experienced by academics at Stellenbosch University that hinder their research productivity during the COVID-19 pandemic, involving 248 academics who completed an online questionnaire. A qualitative analysis of open-ended responses revealed five themes that characterized the extent that the COVID-19 pandemic impacted these academics' research productivity: Online Teaching, Increase in Research Productivity, No Difference to Research Productivity, Reduced Research Productivity, and No Research Productivity. A mixed methods analysis revealed that only 25% of academics were not adversely affected by online teaching in terms of research productivity. Two thirds of the academics experienced either a reduction in productivity or reported no research productivity at all. Compared to academics who reported an increase in productivity, academics who reported undertaking no research productivity at all tended to be women, not to hold a professor position, not to have a doctorate degree, to have less experience as academics, to have access at home to a tablet, but not to have access at home to cellphone data.*

*Keywords: academics, COVID-19, meta-methods, online teaching, quantitizing, research productivity, South Africa*

## INTRODUCTION

Research productivity is an essential metric for universities (Abramo, et al., 2013). It characterizes the university's ability to generate knowledge at the cutting edge of science and to produce high-quality outputs. Research productivity has been linked to research funding opportunities (Hicks, 2012) and career progression in academia (Carr, et al., 2021) across the world. It is an important factor in determining "individual research performance and academic rank" (Abramo, et al., 2011, p. 915). Without sustained research productivity, universities in today's knowledge-driven, global economy will find it difficult to thrive and to compete. Further, the measurement of research productivity in global higher education is an important index in the global ranking of universities (Reddy, et al., 2016).

The seminal work by Paul Ramden was one of the earliest attempts to understand research productivity of universities in the 1990s (Ramsden, 1994). He argued that the focus of universities is the development of knowledge and ideas, and that the most important research output measure is publication (Ramsden, 1994). He characterized research productivity as estimating "the output (in terms of quantity of publications) of individual staff and academic departments across different subject areas and types of institutions" (Ramsden, 1994, p. 207). Akbaritabar et al. (2018) elaborated on Ramsden's claim and emphasized the importance of the individual productivity index in measuring research productivity. Drawing on the Scopus citation database of Italian sociologists as key records of research output, these authors claimed that research productivity is a function of the individual productivity index. This is measured by taking into account the "number and type of records, the impact factor of journals in which these records were published and each record's citations" (Akbaritabar, et al., 2018, p. 859).

### Research Productivity and the COVID-19 Pandemic

Irrespective of how we define research productivity, there is a consensus in the literature that there is a confluence of institutional, organizational, and individual elements that might impact the productivity of scientists in their research (Akbaritabar, et al., 2018). Measuring scientists' research output and understanding the impact of institutional and organizational variables are convoluted (Pepe & Kurtz, 2012).

A number of studies have been published in the context of the COVID-19 pandemic to investigate how this has influenced university research production (e.g., Carr, et al., 2021; Krukowski, et al., 2021). The role of gender regarding research productivity in the global pandemic is a major observation shared by all recent studies. Overall, considerable inequalities in research productivity by gender and child age have been identified during the pandemic (Krukowski, et al., 2021). This finding coincides with Carr et al. (2021). Jointly, these authors have put forward an argument that should their findings be validated by more studies, academic institutions and funding agencies should take this into account when making financing and recruiting choices, as well as decisions regarding promotion and tenure.

### Purpose of Study

In an attempt to assess the replicability of these findings from the extant literature, the purpose of this study was to examine the challenges experienced by academics at Stellenbosch University in South Africa that hindered their research productivity during the nationwide lockdown resulting from the COVID-19 pandemic. Further, this study involved an investigation of the challenges experienced by academics, as well as how these challenges varied as a function of an array of dispositional variables (i.e., demographic variables) and situational variables (i.e., technology-related variables) to provide insights into their ability to conduct research during a period of emergency remote teaching and learning.

### Research Questions

The research questions underlying this study was what Plano Clark and Badiee (2010) termed as general overarching mixed methods research questions. According to Plano Clark and Badiee (2010), a general overarching mixed methods research question represents a broad question that is addressed using both quantitative and qualitative research approaches. Addressing such a question lends itself to what Onwuegbuzie and Hitchcock (2019a) refer to as *the 1 + 1 = 1 mixed methods-based integration formula*,

which represents the full integration of qualitative and quantitative elements at the data collection, data analysis, and data interpretation phases (see also Onwuegbuzie & Johnson, 2021). Specifically, the following two central research questions were addressed: (a) To what extent has the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University? and (b) What factors predict the extent to which the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University? It was hoped that findings from this study would add to the relatively scant body of literature on the impact of COVID-19 on academics in South African universities. Further, it was hoped that findings from this investigation would yield important information for administrators of Stellenbosch University and beyond.

## METHOD

### Participants

A total of 248 academics were recruited via convenience sampling to participate in this study. Of these participants, two were complete member participants, being both a researcher and participant. The majority (55.2%) of the participants were women. This proportion of women is slightly higher than the 47.2% of women academics in the total population at Stellenbosch University reported for 2018 (Stellenbosch University, 2018). Regarding their ages, 4.8% of the participants were 30 years old or younger, 26.6% were between 31 and 40 years old, 34.3% were between 41 and 50 years old, 24.2% were between 51 and 60 years old, and 10.1% were older than 61 years old. The majority of participants (71.8%) had a doctoral degree, whereas 25% of participants had a Master's degree, 2% had an Honours degree, and 1.2% had a Bachelor's degree.

The majority of participants (72.6%) were married or had a domestic partner, 20.2% were single and had never married, 6% were divorced, 0.8% were widowed, and 0.4% were separated. Regarding the number of children, 33.8% of participants had two children, 28.2% had no children, 16.1% had one child, 12.5% had three children, 3.2% had four children, and 0.4% had five children, whereas 6% did not indicate how many children they had. The highest proportion of participants did not have any other household members (31.9%), whereas 29.4% had one other household member, 9.7% had two other household members, 6.9% had three other household members, 5.2% had four other household members, 1.6% had five other household members, and 0.8% had six other household members, with 14.5% not indicating how many other household members they had. Most participants (98.8%) did not have a disability, whereas 1.2% indicated that they had a mental health disability. Regarding ethnicity, 74.6% of participants were White, 12.1% were "Coloured," 8.5% were African, 3.6% were Indian, 0.8% were Chinese, and 0.4% were of other ethnicities. According to Pirtle (2021), being coloured in the South African context is "defined and situated in the 'racial middle' as neither White nor Black African" (p. 145). This distribution is almost identical to the 2018 distribution reported for Stellenbosch University (2018), as follows: 74.8% White, 13.7% "Coloured," 8.3% Black, 2.8% Indian, and 0.4% unknown.

The majority of participants (87.1%) were permanently employed by the University, whereas 12.9% had contract employment. Regarding academic position, 37.1% were lecturers, 26.6% were senior lecturers, 11.7% were associate professors, and 24.6% were professors. The highest proportion of participants (30.6%) had 20 years or more experience as academics, 15.3% had between 15 and 19 years of experience, 18.5% had between 10 and 14 years of experience, 18.5% had between 5 and 9 years of experience, and 16.9% had less than 5 years of experience. The highest proportion of participants represented the Faculty of Economic and Management Sciences (25%), followed by the Faculty of Medicine and Health Sciences (19.4%), the Faculty of Arts and Social Sciences (16.5%), the Faculty of Science (12.5%), the Faculty of Engineering (10.9%), the Faculty of AgriSciences (8.1%), the Faculty of Education (4%), the Faculty of Law (2%), and the Faculty of Theology (1.6%), respectively. Table 1 presents the countries, provinces, and cities where participants lived, and the countries, provinces, and cities where participants worked remotely.

**TABLE 1**
**WHERE PARTICIPANTS LIVED AND WHERE PARTICIPANTS WORKED REMOTELY DURING LOCKDOWN**

| | Where participants lived | Where participants worked remotely |
|---|---|---|
| **Country:** | | |
| South Africa | 100% | 98.8% |
| **Province:** | | |
| Western Cape | 98.0% | 95.6% |
| Gauteng | 1.6% | 1.6% |
| **City:** | | |
| Stellenbosch | 41.5% | 42.3% |
| Cape Town | 29.4% | 26.6% |
| Somerset West | 10.5% | 9.7% |
| Durbanville | 3.6% | 2.0% |
| Bellville | 2.8% | 4.4% |
| Paarl | 2.8% | 2.4% |
| Brackenfell | 0.0% | 1.2% |
| Gordon's Bay | 0.0% | 1.2% |

*Note. Countries, provinces, and cities with less than 1% of participants selected are excluded from this table.*

Most of the participants (90.3%) were South African nationals, whereas 7.3% were permanent residents, and 2.4% were work permit holders. Regarding distance from home to Stellenbosch University, 89.5% of the participants indicated that they lived less than 50 kilometres from the University, 7.3% lived between 50 and 99 kilometres from the University, 2.4% lived more than 500 kilometres from the University, and 0.8% did not indicate how far they lived from the University.

Table 2 presents the distribution of the device(s) to which participants had access, the distribution of the device(s) to which participants had access at home, the distribution of the ways that participants had access to the Internet at home, and the distribution of the participants' cell phone providers.

**TABLE 2**
**ACCESS TO DEVICES AND INTERNET**

| Device access | |
|---|---|
| Laptop | 94.4% |
| Smartphone | 73.4% |
| Tablet | 31.0% |
| Desktop computer | 20.2% |
| Hybrid or 2-in-1 device | 6.5% |
| **Device access at home** | |
| Laptop of desktop computer with a webcam | 94.0% |
| Smartphone | 90.7% |
| Tablet | 42.3% |
| Laptop or desktop computer without a webcam | 4.4% |

| Access to Internet at home | |
|---|---|
| Fixed home Internet connection | 71.4% |
| Wireless home Internet connection | 35.5% |
| Cell phone data | 26.2% |
| Home Internet connection of a family member or friend | 2.0% |
| **Cell phone providers** | |
| Vodacom | 50.8% |
| MTN | 27.0% |
| Telkom | 16.1% |
| Cell C | 8.9% |
| Other | 5.2% |

**Research Approach**

This study represented a fully integrated mixed methods research approach, which involves qualitative and quantitative research perspectives being fully integrated within a single mixed methods research study at all phases of the research process (Hitchcock & Onwuegbuzie, 2022; Onwuegbuzie & Hitchcock, 2019a, 2019b, 2022; Onwuegbuzie, et al., 2018). As noted previously, fully integrated mixed methods research approaches are consistent with what Onwuegbuzie and Hitchcock (2019a) referred to as representing the 1 + 1 = 1 integration formula. Accordingly, this formula replaces the quantitative–qualitative dichotomy by continua that facilitate this full[er] integration. Importantly, research studies that represent the 1 + 1 = 1 integration formula typically are characterized by integrated data collection, integrated data analysis, and integrated data interpretation.

**Research Design**

The research design underlying this study was a *fully mixed concurrent equal status design* (Leech & Onwuegbuzie, 2009), which involves integrating quantitative and qualitative research within one or more or across the following four components in a single mixed methods research study: the research objective, type of data and operations, type of analysis, and type of inference. In this investigation, the quantitative and qualitative phases were mixed concurrently across *all* of these components, with both the quantitative and qualitative components being given approximately equal weight.

Further, this investigation involved the use of what Onwuegbuzie and Hitchcock (2019b) conceptualized as a *meta-methods research approach*. This research approach involves the full(er) integration of multiple methods research approaches and mixed methods research approaches. More specifically, this approach included the use of *crossover mixed analyses* (i.e., Onwuegbuzie & Combs, 2010), wherein one or more analysis types associated with one tradition (e.g., quantitative analysis) were used to analyze data associated with a different tradition (e.g., qualitative data) (see also Hitchcock & Onwuegbuzie, 2020; Onwuegbuzie & Johnson, 2021).

**Research Philosophy**

The research philosophical stance that drove the current study was what Onwuegbuzie and Frels (2013) conceptualized as critical dialectical pluralism. According to these authors, this stance reflects the assumption that, to some degree, social injustices permeate every society. Using this lens, a major goal of the study was to obtain meta-inferences (i.e., inferences stemming from both the quantitative and qualitative findings being combined into a coherent whole; Tashakkori & Teddlie, 1998) that would empower academics and administrators at South African universities, and beyond, to make evidence-based decisions regarding how to maximize the research productivity of academics during this COVID-19 era.

**Instruments and Procedure**

The instruments and procedure of this study was approved by Stellenbosch University's Health Research Ethics Committee on 2 November 2020. The instrument used in this study was an online questionnaire. This questionnaire was sent out to all academics at Stellenbosch University between 11 December 2020 and 21 April 2021. The questionnaire was built on SUNSurvey, the University's questionnaire management system, and was sent out via the SUNSurvey system. As approved by Stellenbosch University's Health Research Ethics Committee, an incentive of a chance to win a gift voucher was provided.

The questionnaire consisted of six sections. The first section contained demographic items; the second section measured academic staffs' perception of readiness and motivation for online teaching, postgraduate supervision, and assessment via 9 items; the third section consisted of the 9-item Utrecht work engagement scale; the fourth section measured academics' perception of research in the context of the COVID-19 pandemic via an adaptation of the Faculty Research Survey, developed by Hoyt et al. (2008), which contains 20 items; the fifth section contained 13 items that assessed the general health of South African academics to online teaching, postgraduate supervision, and assessment during the disruption caused by the COVID-19 pandemic; and the last section consisted of the following open-ended questions: "To what extent do you consider your current home situation suitable and adaptable to do your work as an academic?"; "What personal challenges do you have that could hinder your ability to successfully function effectively online?"; "How have you managed with your postgraduate supervision role since the lockdown started and the University moved to teaching online?", "In what ways have you managed your postgraduate supervision role during this period?", "How has the current situation impacted on your research productivity as an academic?", and "Please provide any general comment that you think might be useful to share." The scales in Sections 2-5 each represented a Likert-type scale. For the purposes of the present study, alongside the dispositional variables and situational variables, responses to the following open-ended question were analysed: "How has the current situation impacted on your research productivity as an academic?"

**Analysis**

To address the first research question (i.e., To what extent has the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University?), constant comparison analysis—conceptualized by Glaser (1965)—was used to analyze responses to this open-ended question. In so doing, we hoped to generate a set of themes. During this analysis, multiple readings of each response were necessary in order to generate themes, via a systematic and exhaustive process, that were descriptive of the data (Leech & Onwuegbuzie, 2007, 2008).

To address the second research question (i.e., What factors predict the extent to which the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University?), a series of discriminant analyses was used to correlate the emergent themes with the dispositional variables (i.e., demographic variables) and situational variables (i.e., technology-related variables).

## RESULTS

**Qualitative and Mixed Methods Phase**

The constant comparison analysis of responses to the first research question (i.e., To what extent has the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University?), led to the identification of the following five themes that characterized the extent to which the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University: *Online Teaching*, *Increase in Research Productivity*, *No Difference to Research Productivity*, *Reduced Research Productivity*, and *No Research Productivity*. Each of these five themes will be described and supported with select quotations from 248 academics. The authors offer these excerpts using the following nomenclature: (i) career level (early, mid, or experienced career); (ii) age (0-30, 31-40, 41-50, 51-60, 61-65); gender (male, female); and race (White, coloured, African, Indian, Chinese; other ethnicities). Early career academics in this research are those with or without a Ph.D within 5 years, not associate professors or professors. Mid-

career academics hold a Ph.D. for more than 5 years and may be senior lecturers. A Ph.D.-holding associate professor or professor is an experienced academic in this study.

*Theme 1: Online Teaching*

The Online Teaching theme refers to how the change to emergency remote teaching and learning was extremely disruptive with regard to the academics' research output. For example, a 30-year-old, early career academic who is a White woman with a Master's degree provided the following description:

> The shift to online teaching and assessment had a material impact on my workload. I was not able to do any research and feel completely burned out. I teach a final year module with 670 students, all my time and energy were expended on teaching, assessment.

Interestingly, this academic experienced problems shifting to online learning despite having access at her home to a smartphone, tablet, and laptop/desktop with a webcam and had fixed Internet connectivity. Moreover, several academics reported how time-consuming online teaching was for them, compared to the face-to-face teaching that took place before the global pandemic, as exemplified by the following statement by a mid-career academic who is a White 39-year-old man with a Ph.D.:

> Teaching online has taken up to three times the effort/time than teaching on campus. This has greatly reduced the time available for research.

*Theme 2: Increase in Research Productivity Theme*

The *Increase in Research Productivity* theme was the most positive theme because it indicates that, despite the COVID-19 pandemic and all the challenges that it brought, the faculty members classified under this theme experienced an *increase* in research output. Interestingly, for one academic, "2020 was the best year [for] research productivity in the 30 years that I have been working at a university" [experienced academic who is a White man in his sixties]. For some academics, working remotely afforded them more time to focus on their research, as described by the following two academics:

> It actually gave me more time due to not having to travel to campus every day, although still challenging due to online preparation for numerous undergraduate modules.

> Positive: It was a little easier to set aside time to concentrate on research task that require uninterrupted attention. It is easier to ignore the e-mails in my inbox than to ignore a knock on my office door.

For other academics who reported an increase in productivity, the COVID-19 pandemic positively impacted their research productivity because it enhanced collaboration, as exemplified by the following two statements:

> Working from home has increased by research productivity and outputs. It has also opened up new and more opportunities for collaboration, with local and international partners.

> It has strengthened it massively due to an increase in collaborations.

For one academic, the period when there were no classes enhanced their levels of productivity: "It helped my research. We were able to do a lot of research during the weeks when there were no classes." Another academic explained how he/she was able to improvise in terms of research productivity by using existing data: "It has been quite a productive time, because I could use the time to write up all the backlog of papers. The new lab work was severely reduced, but we made up for that by analysing existing data." For some

academics, the increase in research productivity likely was a temporary outcome, and possibly, or even likely, was not sustainable:

> There was very little time for research last year. The move to online teaching took so much time - but I had the highest number of publications I have ever had because my post graduate student submitted more articles.
>
> Productivity increased - easier to schedule own time for writing - limited access to laboratories will probably have a detrimental effect on output in 2021.
>
> I was actually more productive initially. I managed to get to a number of draft articles which had been waiting for my attention. However, that well has since dried up, and new work will be more hard to finalize without new data being generated in the lab.

*Theme 3: No Difference to Research Productivity Theme*

The *No Difference to Research Productivity* theme characterizes academics at Stellenbosch University who were not significantly impacted by the COVID-19 era in terms of research productivity. The following are examples of statements made by academics who fell into this category:

> Not in any way that I am aware of. I usually teach one semester and have one semester dedicated to research.
>
> Laboratory work was set back to some degree, but largely productivity was maintained. Most research and supervision activities could be conducted virtually.
>
> It has not affected me in any way because I was already tuned to working online to do my research.

*Theme 4: Reduced Research Productivity Theme*

The *Reduced Research Productivity* theme characterizes academics for whom the COVID-19 pandemic led to a reduction in research productivity. For many of these academics, having to prepare online materials was the major source of their reduced levels of research productivity, as exemplified by the following entries:

> I feel that I have spent more time preparing online material for online classes (as I would under normal circumstances). I feel that this has resulted in less research time for me.
>
> I definitely feel more stressed and less productive overall. Preparing online materials took lots of extra time and energy that might otherwise have been used for research.
>
> I am currently working on my Ph.D. and it has greatly impacted my productivity. I hardly worked on my own research as I was either preparing for lessons, marking, or responding to the abundance of emails.

In contrast, another academic—an early career academic who is in her forties and a White woman with a Master's degree—stated that "My research productivity was impacted by my teaching and administrative load, not by the move to online teaching and learning."

Beyond the negative impact that the preparation of online materials and workload had on these academics' levels of research productivity, some of them also were hampered by their research endeavors being cancelled or, at least, reduced:

> Many research contracts were cancelled. We do a lot of government work (research and training) and all research funds were redirected to the COVID response.
>
> With the rapid transition to online and consequent massive increase in workload, as well as research being suspended (due to the nature of the research), my research has really suffered this year.
>
> The reduced access to labs has reduced our productivity.

For a few academics, their levels of research productivity were affected by the difficulties that they experienced collaborating both locally and internationally, as illustrated by this following description:

> I was unable to do some of the empirical work I had planned to do. It was also not possible to meet with some of my international and local collaborators as planned. Some of the work we have been able to do remotely, but not all.

Even when academics were able to submit their manuscripts to journals for consideration for publication, they were slowed down by a lengthier review process, which was a direct byproduct of the COVID-19 pandemic and ensuing lockdowns:

> Some journals have struggled with turnaround time because reviewers have become a limitation—so the process has slowed.

A few other academics cited the household or health—presumably exacerbated by the COVID-19 pandemic and its ensuing lockdowns—as also contributing to their reduced levels of research productivity:

> I think there has been a lot less time for me to work on my research, in addition to moving all my lecturing and teaching online and running the household.
>
> It has gone down, as it is too difficult to manage all the work and home responsibilities.
>
> My research has tapered off but that was largely due to health and teaching reasons.

Interestingly, a few academics specified the amount of additional time needed for online teaching compared to the face-to-face teaching that prevailed before the global pandemic, as follows:

> In plain words, I would say that it impacted negatively on my research productivity. Personally, it takes me 2/3 longer to prepare for ONE lecture.

One academic—an experienced academic in her sixties who is a professor and an African woman—even declared the percentage reduction in her research productivity as being "25% lowered." At the lowest end of academics who were classified under this theme was an early career academic who is a White man with an Honors degree, who reported that "Due to the significantly higher teaching workload from 'always' online teaching (including such things as student queries and support as late as 11pm), my research productivity has dropped to almost zero."

Some of the academics were able to maintain a level of research productivity, albeit a reduced one, by working on existing research projects or by writing grant proposals:

> I have not been able to do any new research. I have used the time to complete a publication for an existing project and concentrate on a funding proposal for a new research project.

> I have done very little research during the lockdown, but I was able to submit a grant proposal.
>
> Very much. The only reason I was able to publish this year, is because I co-authored with a colleague and our research was 90% done before lockdown. We therefore only had to 'finalize' and did not have to start anything from scratch. There was zero time.

However, many academics falling into this category of reduced productivity expressed a sense of underachievement, as exemplified by the following two descriptions:

> While I did initiate a study on our students' experiences of emergency remote teaching and learning, I still feel that I was not as productive as I planned to be this year.
>
> Even though I did not publish a paper during this time, I set up some collaborating networks which met on a regular basis and made progress on some of the projects I am working on. I did not manage to get as much done as I planned.

Most disturbingly, a few academics who experienced reductions in their levels of productivity, referred to mental health issues:

> The psychological impacts mean that I tend to suffer from a lack of focus and motivation, which slows down (or halts) research productivity.
>
> Initially, I was able to be productive and make time for my research but the longer the year and all the stresses that came with it dragged on it moved to the bottom of the list of priorities. My workload feels like it has grown exponentially.

*Theme 5: No Research Productivity Theme*

Finally, the *No Research Productivity* theme characterizes academics for whom the COVID-19 pandemic maximally affected their levels of research productivity. Indeed, academics classified under this theme were not able to be productive at all. A significant proportion (11.8%) of the academics falling into this category implicated challenges associated with online teaching as the root cause of their lack of research productivity, as exemplified by the following statements:

> Did not have a chance to work on research, as I was busy mostly with teaching and learning and changing to an online teaching and learning arrangement.
>
> It has completely stopped. With the demands on online undergraduate teaching, I have not had enough time in the work day to even do that, let alone contemplating research.
>
> The pandemic has a major impact on my own research. With online teaching and a significant postgrad supervision workload, my own research has been neglected as I simply do not have time to focus on that.

A similar proportion of academics (i.e., 10.3%) blamed the (teaching) workload, as follows:

> It has had a big negative impact. I did not have any time this year for research, as I was struggling to cope just with my teaching workload.
>
> Non existing research. Had to cope with massive online marking and additional exam setups!

> SEVERELY! No research productivity, as my teaching load increased dramatically and my very young son keeps me from concentrating for long periods of time. [emphasis in original]

A few other academics attributed their lack of research productivity to their inability to conduct onsite (e.g., non-virtual) research, including the following:

> No data face-to-face data collection possible.

> I could not do research, could not travel to my research field.

> No lab work done during lockdown. Lost cell strains. NO TIME FOR RESEARCH. NO TIME FOR READING NO TIME FOR APPLYING FOR FUNDING PROPERLY. [emphasis in original].

*Descriptive-Based Quantitizing*

Once the five themes had been identified, these themes were quantitized. Broadly speaking, quantitizing involves converting qualitative data into numerical codes that can be analyzed statistically (Tashakkori & Teddlie, 1998). For the purposes of the current investigation, the quantitizing process was undertaken as described by Onwuegbuzie (2003). Specifically, if an academic provided one or more statements that were unitized under a particular theme, then a score of "1" was assigned to this theme for that academic's response; a score of 0 would be given otherwise. This quantitization led to the formation of what Onwuegbuzie (2003) referred to as an *interrespondent* matrix of themes (i.e., Academic × Theme Matrix) that consisted only of 0s and 1s. This interrespondent matrix then was used for the purpose of descriptive-based quantitizing and inferential-based quantitizing. Descriptive-based quantitizing involves the use of descriptive analyses, which are characterized by one of the following four measures: measures of central tendency, measures of variation/dispersion, measures of position/relative standing, and measures of distributional shape; Onwuegbuzie & Johnson, 2021). In contrast, inferential-based quantitizing involves the quantitizing of qualitative data for the purpose of estimation or prediction via analyses such as some type of general linear model (GLM) analysis (Onwuegbuzie & Johnson, 2021).

The interrespondent matrix was used to conduct descriptive-based quantitizing of the five themes. In particular, the frequency distribution of these themes was determined. These frequencies then were converted to proportions, which served as manifest effect sizes, which represent effect sizes that pertain to observable content (Onwuegbuzie, 2003). In essence, manifest effect sizes represent proportions (or percentages) of significant statements (e.g., words, phrases, sentences, paragraphs, pages) that characterized the emergent themes. Table 3 presents the results from the descriptive-based quantitizing, which yielded the prevalence rates for each of the five themes. It can be seen from this table that only 25.8% of faculty were not adversely affected by the emergency remote teaching and learning in terms of research productivity. In contrast, nearly two thirds (i.e., 62.5%) of the academics experienced either a reduction in productivity (i.e., 35.1%), or, worse still, reported no research productivity at all (27.4%).

**TABLE 3**
**DESCRIPTIVE-BASED QUANTITIZING:**
**EMERGENT THEMES AND THEIR PREVALENCE RATES**

| Theme | % |
|---|---|
| Online Teaching | 21.4 |
| Increase in Research Productivity | 14.1 |
| No Difference to Research Productivity | 11.7 |
| Reduced Research Productivity | 35.1 |
| No Research Productivity | 27.4 |

**Inferential-Based Quantitizing**

*Dispositional and Situational Predictors of the Five Themes*

Because the themes, as coded in the inter-respondent matrix, represented nominal variables—specifically, dichotomous variables, a series of *all possible subsets* (APS) canonical discriminant analysis was conducted, with both the dispositional variables and situational variables serving, in separate analyses, as independent variables. Dispositional variables are factors that the academics bring to the emergency remote teaching and learning setting—specifically, demographic variables, such as their age and gender. In contrast, situational variables refer to variables in the immediate environment that surround a stimulus. In the context of this study, the stimulus involved the COVID-19 pandemic and the ensuing emergency remote teaching and learning, whereas very important situational variables pertain to the technology to which each academic had access (see Table 2).

In APS discriminant analyses, separate discriminant functions are extracted for all thematic variables singly, all possible pairs of thematic variables, all possible trios of thematic variables, and so forth, until the optimal subset of thematic variables is obtained with respect to a pre-determined set of criteria. For the current investigation, the criteria used were Wilks's lambda, the probability level (i.e., *p* value), the squared canonical correlation (i.e., the primary effect-size measure), the standardized canonical discriminant function coefficients, and the structure coefficients. The APS discriminant analysis differs from *stepwise* discriminant analysis, in which the order of entry of variables is determined exclusively by the probability level. Indeed, stepwise discriminant analysis is not guaranteed to find the optimal model and, consequently, many statisticians strongly criticize this type of analysis and, instead, recommend some form of canonical discriminant analysis.

APS discriminant models that included one or more of the thematic variables were examined with the themes being utilized as dependent variables. However, the most interesting findings from the discriminant analyses emerged when two new dichotomous variables were created to serve as the dependent variable. The first new variable contrasted academics who reported either an increase in research productivity or no difference in research productivity with academics who reported either a reduction in research productivity or no research productivity at all. The second new variable contrasted academics who reported an increase in research productivity with academics who reported no research productivity at all—representing the two extreme cases.

*Academics With Increase/No Difference in Research Productivity vs. Academics with a Reduction/No Research Productivity*

This analysis led to the selection of a discriminant model that yielded a statistically significant discriminant function, $\chi^2(5) = 14.00$, $p = .016$, and accounted for 100% of the between-groups variance (Wilks's $\Lambda = .94$). The effect size, as measured by the Canonical *R* value of .25, was moderate. The group centroids were 0.41 for academics who reported an increase/no difference in research productivity and -0.17 for academics who reported a reduction/no research productivity at all. These statistics indicated that the discriminant function maximally separated these two groups of academics.

Table 4 displays the standardized coefficients and structure coefficients pertaining to the final discriminant function. It can be seen from this table that this discriminant function contained the following five variables: gender, academic position (i.e., professor vs. other academics), educational level (i.e., doctorate vs. other educational attainment), having access at home to a tablet, and having access at home to cellphone data. The first three variables represented dispositional variables (i.e., demographic variables), whereas the last two variables represented situational variables. An examination of the standardized canonical discriminant function coefficients (Table 4) revealed that, using a cutoff loading of 0.3 (Lambert & Durand, 1975), all five demographic variables were practically significant, with educational level being by far the most significant, followed by having access at home to cellphone data. Further, the structure coefficients (i.e., structure matrix) between the independent variable set and the standardized canonical discriminant function (Table 4) indicated that, using a cutoff loading of 0.3 (Lambert & Durand, 1975), all three dispositional variables significantly discriminated the two groups of academics, as well as one

situational variable, namely, having access at home to cellphone data. Educational level again was the most significant predictor, followed by the academic position.

**TABLE 4**
**DISCRIMINANT ANALYSIS: FUNCTION 1: STANDARDIZED CANONICAL DISCRIMINANT FUNCTION AND STRUCTURE MATRIX FOR THEMES DISCRIMINATING ACADEMICS WHO REPORTED AN INCREASE OR NO DIFFERENCE IN THEIR LEVELS OF RESEARCH PRODUCTIVITY FROM ACADEMICS WHO REPORTED A REDUCTION IN THEIR LEVELS OF RESEARCH PRODUCTIVITY OR NO RESEARCH PRODUCTIVITY AT ALL**

| Theme | Standardized Canonical Discriminant Function | Structure Matrix |
|---|---|---|
| Gender | 0.33* | .50* |
| Academic position | 0.30* | .52* |
| Educational level | -0.61* | -.65* |
| Having access at home to a tablet | 0.45* | .19 |
| Having access at home to cellphone data | -0.56* | -.35* |

* Coefficients with the effect sizes larger than .3 (Lambert & Durand, 1975).

As recommended by several researchers (e.g., Courville & Thompson, 2001), comparing standardized coefficients and structure coefficients can reveal important information about the contribution of each variable in a discriminant model. Comparing the standardized and structure coefficients pertaining to the discriminant function revealed that having access at home to a tablet served as a suppressor variable because the standardized coefficient associated with it was large (i.e., ≥ .30), whereas the corresponding structure coefficient was relatively small (i.e., < .30) (Courville & Thompson, 2001). Suppressor variables are variables that assist in the prediction of dependent variables (i.e., they increase the effect size) due to their relationship with other independent variables.

Overall, the canonical discriminant function indicated that gender, academic position, and educational level are extremely important dispositional predictors of whether an academic experienced an increase/no difference in research productivity or a reduction/no research productivity. Further, having access at home to a tablet and having access at home to cellphone data are important situational predictors. Specifically, compared to academics who reported an increase/no difference in productivity, academics who were more likely to report either a reduction in research productivity or no research productivity at all tended to be women, not to hold a professor position, not to have a doctorate degree, to have access at home to a tablet, but not to have access at home to cellphone data.

*Academics With Increase in Research Productivity Versus Academics with No Research Productivity*

The analysis of academics who were affected the most/least in terms of research productivity led to the selection of a discriminant model that yielded a statistically significant discriminant function, $\chi^2(6) = 33.33$, $p < .0001$, and accounted for 100.0% of the between-groups variance (Wilks's $\Lambda = .75$). The effect size, as measured by the Canonical *R* value of .50, was large. The group centroids were -0.92 for academics who reported an increase in research productivity and 0.36 for academics who reported no research productivity at all. These statistics indicated that the discriminant function maximally separated these two groups of academics.

Table 5 displays the standardized coefficients and structure coefficients pertaining to the final discriminant function. It can be seen from this table that this discriminant function contained the following six variables: gender, academic position (i.e., professor vs. other academics), years of experience,

educational level (i.e., doctorate vs. other educational attainment), having access at home to a tablet, and having access at home to cellphone data. The first four variables represented dispositional variables (i.e., demographic variables), whereas the last two variables represented situational variables. An examination of the standardized canonical discriminant function coefficients (Table 5) revealed that, using a cutoff loading of 0.3 (Lambert & Durand, 1975), all six demographic variables were practically significant, with educational level being by far the most significant, followed by years of experience. Further, the structure coefficients (i.e., structure matrix) between the independent variable set and the standardized canonical discriminant function (Table 5) indicated that, using a cutoff loading of 0.3 (Lambert & Durand, 1975), three dispositional variables significantly discriminated the two groups of academics, namely, gender, academic position, and educational level. Educational level again was the most significant predictor, followed by the academic position. Comparing the standardized and structure coefficients pertaining to the discriminant function revealed that years of experience, having access at home to a tablet, and having access at home to cellphone data served as suppressor variables because the standardized coefficients associated with these variables were large, whereas the corresponding structure coefficients were relatively small.

**TABLE 5**
**DISCRIMINANT ANALYSIS: FUNCTION 1: STANDARDIZED CANONICAL DISCRIMINANT FUNCTION AND STRUCTURE MATRIX FOR THEMES DISCRIMINATING ACADEMICS WHO REPORTED AN INCREASE IN THEIR LEVELS OF RESEARCH PRODUCTIVITY FROM ACADEMICS WHO REPORTED NO RESEARCH PRODUCTIVITY AT ALL**

| Theme | Standardized Canonical Discriminant Function | Structure Matrix |
|---|---|---|
| Gender | 0.30* | .33* |
| Academic position | 0.48* | .40* |
| Years of experience | -0.53* | -.12 |
| Educational level | -0.93* | -.71* |
| Having access at home to a tablet | 0.41* | .13 |
| Having access at home to cellphone data | -0.40* | -.15 |

* Coefficients with the effect sizes larger than .3 (Lambert & Durand, 1975).

Overall, the canonical discriminant function indicates that gender, academic position, and educational level are extremely important dispositional predictors of whether an academic experienced an increase in research productivity or no research productivity at all. Further, having access at home to a tablet and having access at home to cellphone data are important situational predictors. That is, these variables discriminated whether an academic either were facilitated or were maximally debilitated in terms of research productivity as a result of the emergency remote teaching and learning. Specifically, compared to academics who reported an increase in productivity, academics who reported undertaking no research productivity at all tended to be women, not to hold a professor position, not to have a doctorate degree, to have less experience as academics, to have access at home to a tablet, but not to have access at home to cellphone data.

## DISCUSSION

The present study is unique in at least two ways. First, the present study is one of the first studies to examine research productivity of academics in Africa in general and South Africa in particular within the context of COVID-19. Second, this study likely is the first study in this area to involve use of a fully integrated mixed methods research approach, wherein quantitative and qualitative perspectives were fully integrated at all phases of the mixed methods research process (Hitchcock & Onwuegbuzie, 2022; Onwuegbuzie & Hitchcock, 2019a, 2019b, 2022; Onwuegbuzie, et al., 2018).

This study is about research productivity of academics in South Africa. While acknowledging the five themes from the empirical data, a major finding stemming from this study is that only one in four academics were not adversely affected by the emergency remote teaching and learning in terms of research productivity. Contrastingly, approximately two thirds of the academics experienced either a reduction in productivity or, even more disturbingly, reported no research productivity at all. In addition, the meta-methods analysis confirmed that the claims in this study are consistent with the literature, that there is a gender dimension to research productivity during this pandemic period, that the level of academic cadre is an important factor that relates with research productivity, and that the access academics have to a tablet, laptop, or computer as well as mobile data access from home is a contributing factor.

The results from this study are similar to what other authors have found out about the impact of the pandemic on research productivity. The research workforce has been impacted globally by various challenges, such as the effort to develop online resources, domestic responsibilities, decreased access to laboratory space, procurement of research equipment/materials, international collaboration, cancelling of international travel and conferences, delay in recruitment of participants, and the moratorium on in-person research and clinical trials, impacting on the completion of research projects of staff and students (Farnell, et al., 2021; The Lancet, 2020). It is clear from the findings that academics at Stellenbosch University experienced similar challenges.

The impact of the pandemic on research infrastructure and outputs at academic institutions are still largely unexplored and might vary across institutions (Farnell, et al., 2021). However, highly resourced higher education institutions (HEIs) were more resilient to the changes brought about by the pandemic. Jung et al. (2021) found that research activities in higher education in Hong Kong were not as affected as the academic project because mixed and online routines and collaboration have been practiced prior to the pandemic. Although laboratory research was initially prevented, it could later continue with safety precautions. The impact of the pandemic on research productivity mostly affected the areas of conducting field work and time constraints due to the adaptation to online teaching. Some universities, especially those with health science departments that were directly involved in COVID-19 research, significantly increased their research output and global visibility (Jung, et al., 2021). However, IAU Global Survey Report on the Impact of COVID-19 on Higher Education around the world revealed that only 41% of HEIs were involved in COVID-19-related research in 2020 (Marinoni, et al. 2021). The second IAU Global Survey Report, 1 year into the pandemic revealed that the impact of delays in research activities was more marked in Africa and the Americas (Jensen, et al., 2022). The authors claimed that travel restrictions, inability to conduct fieldwork, more time spent on teaching activities, lack of access to laboratories/equipment, increased Ph.D. completion time, and decreased fellowships and scholarships, were among the research disruptions at HEIs. The same report indicated an increase in research publications across HEI's but attributed this to writing up previously collected data rather than commencing new projects. Despite this, one in four academics indicated a decrease in research publications (Jensen, et al., 2022). Therefore, our study has revealed a much lower self-reported research productivity ratio compared to international HEIs.

There is a strong gender dimension to this study. Academics who were more likely to report either a drop in research productivity or no research productivity at all tended to be women. Other characteristics from this study showed that these women tend not to be at the professor grade level, do not hold a doctorate degree, and have less experience as academics. This finding aligns with recent reports of the disproportionate effect of the pandemic on the research productivity of women in academia (Krukowski, et al., 2021). Cui et al. (2021) reported that the research productivity of women social science academics

dropped by 13.2% relative to that of men academics in the period after lockdown in the United States. This is despite a general increase in research productivity overall. The productivity gap was more marked for academics who were assistant professors and those in top-ranked universities. On the contrary, a spatiotemporal analysis of preprint depositions pre and post the pandemic outbreak revealed a general decrease in research in the life sciences (including Europe, North America and the Far East), but no difference between men and women (Abramo, et al., 2022). Further, overall research productivity of women is much lower (at least 2.6 times lower in Europe to 4.6 times lower in the Far East) than that of men, even before the pandemic (Abramo, et al., 2022). Although few researchers have examined the trends in the South Africa context, it is reasonable to conclude that similar evidence exists in this study, given the traditional gender roles and household demands that generally fall to women.

More recently, Walters et al. (2022) published their findings on the precarious nature of woman's work within the academy. Due to the systematic and institutionalized nature of equality within the South African Higher education system, the pandemic might negate commitments made to promote women and especially Black women in academia. Through rich qualitative inquiry, 2,029 participants detailed how the COVID-19 pandemic has diminished part-time workload and funding, has jeopardized further professional development and prospects of promotion, and has destabilized employability further within the higher education sector in South Africa (Walters et al., 2022). Ultimately, the pandemic has negatively impacted all areas of academia, and contributed to deepening systemic and institutionalized inequalities that women and previously disadvantaged academics face within the South African context.

Low research productivity among women might be multifactorial. A South African study focused specifically on women's academics experiences emphasized the emotional toll of *academic guilt* resulting from competing home and work demands (Walters, et al., 2021). Although women might have more family responsibilities, they also might be impugned in the academic environment due to being employed in lower rungs of the academic ladder. In the present study, the significant majority of associate professor and professor positions were held by men (professor 69% and associate professor 59%). Conversely, senior lecturers and lecturers tended to be women (56% and 75%, respectively). Because lecturers generally carry the brunt of teaching and learning activities in HEIs, it might be one reason in the academic context why women were more likely to report no or little research productivity. It is somewhat implied in academic contexts that the percentage of time spent on research and leadership increases with academic position, but this also might vary among institutions and academic disciplines.

In contrast to the gender factor mentioned in the preceding paragraph, this study provides evidence that junior academics and less experienced staff were more likely to report lower research productivity. As mentioned before, academics at lower cadres are more likely to teach undergraduate courses and thus have a higher teaching load with less time to spend on research activities. Higher ranked academics also are more likely to teach postgraduate courses with lower student numbers and contact time than undergraduate courses. As presented in the result section, teaching workloads increased significantly during the national lockdown due to the need to develop materials for remote online teaching. In addition, Jung et al. (2021) note that doctoral students and early career researchers encountered various delays due to cancellation of field work, the necessity to redesign their research studies due to constraints, and a reduction in project funding/redirection of funding, resulting in the extension of timelines of their studies or projects, with a knock-on effect on graduation and publication plans. The authors also highlighted the lack of institutional funding to employ Ph.D. holders and that they might end up in contract/non-permanent positions. Therefore, HEIs might need to enhance career support and mentoring for doctoral students and early career researchers to counter the impact of the pandemic.

The relationship between research productivity and academics' home access to a personal computer, tablets, and mobile data is the last factor of importance to this study's findings. In this study, no access at home to cell phone data and access to a tablet were associated with less research productivity. Although data agreements with cellular companies were in place for students during the lockdown, the same benefit might not have been extended to staff, or those who needed it, might not have been aware of the option. Academics who have devices with limited functionality, for example, tablets versus a laptop or personal computer, might struggle to function effectively in online environments.

## CONCLUSION

The production of knowledge is central to universities' role in the global knowledge economy. This is demonstrated by the essence that research-intensive institutions, such as the University of Oxford, responded to the global pandemic by advancing the COVID-19 vaccine. Similar universities from around the world participated and contributed to global vaccination initiatives. Consequently, regardless of whether a nation is characterized as a low, middle, or high income, the importance of research cannot be overstated. This study explored the notion of research productivity within the context of a South African university. By posing the following two research questions: (a) to what extent has the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University? and (b) what factors predict the extent to which the COVID-19 pandemic impacted the research productivity of academics at Stellenbosch University?, this meta-methods study uncovered five themes. The analysis revealed that gender, academic ranks of the sample, access to a working laptop or tablet at home, and the capacity to access mobile data are significant variables influencing research productivity.

While accepting the gender element of research productivity in this study, which is similar to other studies, obtaining a Ph.D. is a major factor that corresponds positively with greater research productivity in the South African university system. The South African Department of Higher Education and Training (DHET) has a subsidy scheme based on research outputs that drives an incentive model for South African universities to maintain and to improve annual research productivity. Low research productivity thus will negatively impact university publication subsidies. Although universities might have put strategies in place to support women to achieve higher academic positions, it appears that multifaceted interventions, including socio-cultural and institutional normative reforms, are needed to address the continued gender productivity gap. Oleschuk (2020) and Walters et al. (2021) suggest flexible work strategies and policies to accommodate faculty members with family or caregiver responsibilities and providing them with teaching and research support. However, it is unclear if this will be feasible in low-resource countries and for under-resourced HEIs.

In order to protect research productivity in the event that another pandemic of this scale emerges in the near future, it is necessary to build on the findings of this study through the replication of similar studies across the world. The gender dimension is an essential factor to investigate further, particularly in terms of capacity building to enable more women in academia to advance through the ranks and be sufficiently supported to become mainstream academics who contribute to greater research outputs and quality research. By doing so, higher education in South Africa will become more inclusive and promote social justice in a male-dominated academic sector.

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