COVID-19 and disruptive technology in New Zealand

Asma Mat Aripin and David Brougham
Massey University, Palmerston North, New Zealand

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Abstract

Purpose – COVID-19 has immensely disrupted business dynamism, providing catalyst innovation opportunities and transposing society's perception of disruptive technology (DT). This research increases the understanding of the impact of the pandemic in influencing the way organizations perceive DT and whether any mitigating factors were considered when deciding to adopt new technology during the pandemic.

Design/methodology/approach – A qualitative approach was adopted in this research, consisting of 14 semi-structured interviews with eight senior managers and six employees, representing both the private and public sectors in New Zealand. All participants had in-depth knowledge of organizational DT adoption during the pandemic. Two separate sets of semi-structured interviews were used to enable comparison between senior managers' and employees' experiences of organizational adoption of DT post-emergence of COVID-19. Due to the nature of this research being conducted on organizational adoption of DT during the pandemic, time constraints and sample size were two of the key limitations of this research. Specifically, potential participants widely cited unavailability due to additional pressure from COVID-19. Given the limited research in this area, this study is explorative by nature and adds significant insights to the literature.

Findings – The findings suggest that COVID-19 has contributed towards an increased acceptance of, reliance on and adoption of DT across both organizational and social landscapes. The authors found that one of the reasons COVID-19 expedites the adoption of DT correlates with the notion of technology dependency, with organizations citing DT as a viable part of a business continuity plan (BCP) to counter the unpredictability of ongoing disruptive events associated with COVID-19 or any similar disruption which may be on the horizon. These findings are highly relevant as they suggest that the labor market in New Zealand is flexible so organizations and employees can adapt to DT and COVID-19.

Originality/value – This research adds much-needed insight into the emerging field of research that examines COVID-19's impact on the adoption of DT from both management and employee perspectives.

Keywords Covid-19, Technology, Disruption, Technological change, Automation

Paper type Research paper

Introduction and literature review

The COVID-19 outbreak had immediate social implications, causing businesses to re-envision their business model (McKendrick, 2020) and providing an opportunity for catalytic innovation (Christensen *et al.*, 2015). This included increased reliance on disruptive technology (DT), such as automating and digitalizing tasks, digital reality, the cloud and the Internet of things (Kande and Sonmez, 2020; McKendrick, 2020). The pandemic has been a catalyst in accelerating DT adoption in businesses, as well as accelerating its diffusion into society.

According to Christensen *et al.*'s (2015) disruptive innovation, DT is a process of mainstream customers starting to adopt new entrants offering products or services to address social problems. This includes, for example, cloud-based automated online

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banking systems for customer onboarding, replacing traditional systems (Bunce, 2022); Boston Dynamics's mobile robots, reminding parkgoers of social distancing requirements in Singapore; Starship's robots delivering food to house-bound residents in the United Kingdom (UK) and OhmniLabs's robots representing isolated and distance-learning students at graduation ceremonies in Japan (Tucker, 2020). Working-from-home options have reduced the demand for services in cities, having a large impact on many businesses.

Lockdown restrictions, social distancing and self-isolation requirements have transformed how people work, connect socially and network (Farooq *et al.*, 2020). Online communication technologies such as Zoom, Webex and Microsoft Teams are providing significant virtual opportunities for organizations. These technologies have had a significant uptake during lockdowns to provide social and cognitive support, facilitate learning and teaching, enable trade, promote leisure activities and carry out collaborative innovative research. Due to mobility restrictions during the pandemic, employees have also been adjusting to the new normal of working from home, with online meetings, online transactions and online education (Akala, 2020). The use of Internet-based services was reported to rise from 40% to 100%, compared to pre-lockdown levels, while the utilization of video-conferencing services increased ten-fold (Branscombe, 2020). Microsoft Teams reported a 500% growth in the usage of meetings, calls and conferencing in China since the outbreak began (Spataro, 2020).

One of the critical differences between digital transformation and DT is that while digital transformation technologies such as ChatGPT, Microsoft Teams and Zoom have changed the way work is performed, DT such as artificial intelligence, automation and machine learning are predicted to lead to widespread disruption in the labor market. For example, Frey and Osborne (2017) predict that up to 47% of jobs are likely to be impacted by DT by 2030. In a similar research study, Coombs (2020) estimated that more organizations could start adopting higher levels of artificial intelligence to compensate for the unavailability of human workers during the pandemic. This leads to speculation as to whether COVID-19 could drive the emergence of higher DT capabilities.

This has significant implications when considering the recent impacts of COVID-19, which has already resulted in widespread disruption across the labor market. This new trend of adopting DT includes increases in analyzing consumer preferences, cyberchondria, survival instinct, familiarity with DT technologies and business confidence in DT. As a result, businesses are examining ways they might expedite the cultivation of an innovation catalyst by enhancing the social acceptance of DT as part of the new norms. Understanding the process firms undertake in adopting DT to address the challenges posed by a pandemic is the focus of this research.

While the adoption of technology is generally welcome – especially among business owners and investors – historically, outright resistance is not uncommon, particularly if the technology threatens jobs and incomes. Historically, most technological adoption decisions were taken on the basis of the neo-classical concept of price competition among firms to increase efficiency, output and profits, as well as to please consumers (Mokyr, 1998). Industrialization could lead to task automation. The repetitive nature of tasks caused workers to either give up or lose their jobs and brought about the deterioration of workers' quality of life and other social issues (Blokhin, 2021), often giving rise to anti-technology activism.

Technological change and adoption of DT can create more jobs than it automates and increase productivity, wealth and standards of living. In the past, machines replaced humans, revolutionized human labor and reshaped economies, so today's automation anxiety is entirely justified (Frey, 2019; Shekhtam, 2016). However, business owners have unlimited possibilities to hire new workers with appropriate skills or invest in upskilling and reskilling

current workers to more than make up for the losses. This research uses Labor Market Theory to assess the supply and demand for labor which exists in the occurrence of COVID-19 and the adoption of DT.

Methodology

A qualitative approach using thematic analysis was adopted for this research.

The data collection consisted of 14 semi-structured interviews, with eight senior managers and six employees representing both the private and public sectors in New Zealand. Due to the limitations of the literature and the exploratory nature of this research, the use of semi-structured interviews was critical to provide the ability to establish and explore emerging themes that were discussed by participants (Flick, 2018) in the interviews. Participants were identified through purposive sampling (Bryman and Bell, 2015) from three key industry criteria.

The criteria for participation required all senior managers to be employed in organizations that have adopted, or be in the process of adopting, DT after COVID-19 emerged in 2020. Employee participants were required to be involved in, or to have in-depth knowledge of, organizational DT projects that were commenced after COVID-19 emerged. The key exclusion criterion was senior managers and employees who did not have an adequate understanding of the new DT adopted during the pandemic. Due to the specific participant criteria, snowball sampling (Flick, 2018) was also adopted – participants were asked at the end of the interview whether they had anyone they could refer to who might be suitable to participate in the research. Note that low-risk ethics approval was obtained by the researchers' university.

An overview of participant information including their position, industry, sector and organization size are provided in Table 1 below. SM represents a senior manager, while E represents an employee. The number on each acronym represents the order of the interview.

Interview questions

The study used two separate sets of semi-structured interviews to collect insights into senior managers' and employees' experiences of their organizational adoption of DT post-emergence of COVID-19. The interview structure consisted of follow-up and probing

Participant	Industry	Sector	Organization size
SM1	Business and finance	Private	Medium
SM2	Education	Public	Medium
SM3	Business and finance	Public	Large
SM4	Information technology	Private	Small
SM5	Retail	Private	Large
E6	Retail	Private	Large
E7	Education	Public	Large
E8	Tourism	Private	Large
SM9	Information technology	Private	Medium
E10	Healthcare	Private	Small
SM11	Business and finance	Public	Large
E12	Retail	Private	Medium
E13	Education	Public	Medium
SM14	Food services	Private	Medium

Source(s): Authors own work

Table 1. Participant information

questions. The unpredictable nature of the pandemic and the lockdowns in March–July 2020 and August–September 2021 highly influenced how the initial participants responded to the impact of DT in relation to the pandemic. As a result, additional interview questions were added to capture the change between the NZ lockdowns in 2020 and 2021.

Procedure

The research data were collected between August 2021 and October 2021. The timing of data collection was critical to acquiring relevant and accurate insights into how COVID-19 changed the way organizations perceive DT. A pilot study, consisting of two senior managers, was conducted prior to the main data collection stage. Coding started in the pilot stage of the research to test the feasibility of the study's research design, to confirm the robustness of data collection processes, to ensure that senior managers and employees represented the appropriate sample and to test whether the relevant questions were being asked. Following the pilot study, the decision was made to include employees in the sample to understand the impact of DT during COVID-19 from the employees' perspective.

A total of seven industries were represented across the 14 participants. All audio recordings were transcribed by the lead author, and the participants were provided with a copy of the final transcript for validation. The data were coded, re-listened to, organized and analyzed using NVivo (Bryman and Bell, 2015; Flick, 2018). Thematic framework analysis was incorporated to identify, analyze, report and discuss the emerging themes from the findings (Clarke and Braun, 2017). Evidence of data saturation and theme interpretations are presented in the results section to clearly distinguish between participants' responses and their interpretations. Research by Guest *et al.* (2006) justifies that data saturation can occur at 12 interviews.

Results and discussion

The results of this research provide insight into the senior managers' and employees' perceptions of COVID-19's impact on the organizational adoption of DT. The senior manager and employee insights were categorized into six themes through a thematic analysis, as outlined below.

Theme 1: COVID-19 accelerated adoption of disruptive technology

A significant theme emerged among the participants: COVID-19 does contribute to expediting the organizational adoption of DT. In line with Clayton Christensen's Disruptive Innovation Theory, SM1 emphasized that "*COVID-19 has accelerated this*".

Businesses had to quickly set up new ways to keep employees delivering from any location (mainly home), maintain relationships with suppliers and continue serving clients with minimal physical contact (The Economist, 2020). This perspective resonated with both managers and employees, as highlighted by SM2 and E6, who recognized the significant benefits of DT in meeting new consumers' lifestyle choices and demands, as well as supporting working from home following the social distancing requirements due to the pandemic lockdown restrictions.

> We have moved to using Teams because it's cheaper than using Zoom but just used it a little bit, but when COVID came in, we had to use it a lot. – SM2

> Machine learning went from something we never fully considered to trying to locate one overnight. – E6

One of the most prominent themes that emerged from this research, yet not well-highlighted within the literature, was the use of DT as a key part of a BCP, which businesses were not required to have. However, the COVID-19 lockdowns caused some businesses to close their physical shops or offices for a few weeks or months. A viable BCP is crucial to improve the likelihood of a business surviving and recovering as quickly as possible, in the aftermath of a crisis. Workforce immobility was prominent due to lockdown restrictions or the social distancing requirements. As highlighted by SM5, anything that involved relocating was "meaningless".

> Our most severe CBP plan actually consisted of relocating our staff from [Location] to either [Location A] or [Location B]. Now, that whole preparation was meaningless with a nationwide lockdown. – SM5

SM2, SM3 and SM14 suggested the importance of digitalization and automation so their businesses could keep operational, especially when employees did not have access to their physical workplace with lockdown restrictions in place. This finding validates the proposition of this research that COVID-19 restrictions expedited the organizational adoption of DT.

> We had to keep operating . . . and . . . they just absolutely had to find a solution very quickly.– SM2.

> It's not viable from a cost standpoint, but since COVID-19 came through and we can't do certain rudimentary tasks at the office . . .. It requires that to be basically fast-tracked, to be automated, because it just needs to be done from any point where lockdown can occur. – SM3

SM4 and SM5 expected that the uptake of machine learning, AI and automation – predicted to be adopted in 20–30 years–would have to be adopted earlier, as soon as three to ten years after the COVID-19 pandemic.

> I've seen predictions around 2030 sort of thing, and I think we're looking at a lot sooner now; a lot of businesses have seen much more resources, pulled around the development of machine learning and AI and automation, so we're going to see rapid uptake . . . we already seen a rapid uptake on this, so I think what was previously expected around . . . in 10 years' time. – SM4

Within this theme, the findings of this research have identified that the pandemic acted as a catalyst in influencing stakeholders' decision to adopt DT in their business, either due to the health aspect or government lockdown restrictions. Undoubtedly, lockdown restrictions and social distancing requirements, as well as society's paranoia towards the pandemic, caused some disruptions to business operations and productivity.

Theme 2: COVID-19 changed consumers' lifestyles and increased social acceptance, demands on and expectations of DT

The pandemic also provided a conducive environment for enhancing social acceptance of and organizational perceptions on the adoption of DT in business. This theme further encapsulates the increase of social acceptance of DT, with examples such as online shopping platforms and internet banking, as society had to adapt to a contactless way of living due to the lockdown restrictions. E6 claimed that "*customers can't go out, can't shop at the [organization].*" – E6.

> E9 stressed that, due to the health and safety reasons during the pandemic, customers preferred contactless shopping in retail stores, or the pandemic limited the options.

> It's a situation where people can't or don't want to have contact with each other because of the spread of an illness. Previously, before COVID-19, it was convenient so people could just get it and they wouldn't have to go through the store. – E9

> I think people realize that they can't or won't be going back to how things were and that I have to be more ready to deal with change. – SM2

With the emergence of COVID-19 drastically changing the way people work, communicate and shop, most business stakeholders were forced to make changes to their trading concept. SM1, SM5, SM11 and SM 14 reported that their businesses needed to adopt an online platform to meet customer demand for goods and services.

> Everything is online shopping now, so we need to change how we run the business. With the lockdown, all customers changed to online shopping. – SM5

> In terms of . . . digital platform for customers, we have seen the greater uptake in the technology, and that's why our call centers were bombarded for a time from these people who haven't used the technology before. It was a really new thing for them, a new experience. We've seen a greater need for it. – SM11

> Our customers find it hard when you can't shop like normal. But they did email us about online shopping, so we had to improve our website for our customers. – SM14

This theme highlighted that the pandemic increased the social acceptance of online platforms and accelerated DT diffusion into society.

Theme 3: disruptive technology prioritization

The DT prioritization theme emerged as an outcome of businesses recognizing the importance of rapidly adopting DT to help them navigate through the COVID-19 environment. The contextual factors of lockdown restrictions, social distancing, employees' immobility, and the emergence of a contactless society influenced the organizational perception of DT and its prioritization.

> We needed to sit down and really prioritize what needed to be automated. There are difficulties in this where every department manager wants their particular function prioritized for automation, but we had to really segregate this and focus on what was most detrimental to our business by not being automated. – E9

> The prioritization, so going from a low priority to a high priority, so this essentially meant that we have got more funding in for the project as well. So, it has been more customer focused. So, because . . .. basically, all branches are closed, no one can come in, need to do everything digitally, and we have used sort of automation in this sense to just enable faster response times for customers when they're using the platform. – SM1

A significant finding here is that while the participants indicated a rapid rise in adopting DT, this might not be implemented throughout a business. Rather, participants suggested that COVID-19 established a form of DT prioritization for what area of operations required the most technological development.

Theme 4: enhanced business continuity planning between lockdown 2020 and lockdown 2021

This key theme recognized the benefits of adopting DT between the 2020 and 2021 lockdowns to help the business transition from office to working-at-home options for both senior managers and employees. E7, SM2, SM3 and SM4 claim to have transitioned smoothly to working either from home or a designated area for the second lockdown as some critical tasks were automated. Additionally, most businesses had a BCP in place as a lesson learned from the first lockdown. This is an important theme in the context of putting DT capabilities in place as it was expected that the technology would enable more people to work from home on an ongoing basis.

> About 80% of [selected] tasks have now been fully automated, so it's not an entire set of daily tasks that people perform . . . when it came to the second lockdown, basically everything was already in motion . . . and it was just a simple transition, 20% [of it] were the highly critical tasks, so that was basically that they had been the software and everything set up at home to be able to transition. – SM3

Furthermore, SM2 reported that the organization started to focus on making sure each employee had a good work-life balance and that they were more aware of health and well-being during the second lockdown.

> This time they're trying to provide more health and well-being advice, and they're aware that it's not just a matter of if you're working from home, it's not just having your laptop set up; it's missing out on working with people and having good health and well-being and things like that and worrying about people's well-being. – SM2

More businesses are now introducing the policy of working remotely as part of their BCP or strategic plan. For instance, SM3 claims that their staff now have the option to choose what days to work from home.

> We've introduced four days working from office so people can choose one day a week to work from home, so I think it's had a positive effect. – SM3

This new mode of working from home is predicted to enhance employees' welfare by improving their work-life balance as they now have more time for family and leisure and are able to work from the comfort of their home. Participants also cited another positive effect of this new trend – reduced traffic leads to lowered nitrogen oxide emissions and less pollution.

> Having this technology in place has a multitude of benefits where you can have people working from home, so it increases work-life balance, and it has a positive effect on the environment; we don't need people coming into the office. All the congestion on the road with the pollution and then not being in the office and saving office space. – SM11

DT adoption can also have a positive influence on the environment as digitalization and paperless documentation reduces the use of paper and fewer trees need to be cut.

> Having this whole paper system and coming into the office is quite detrimental to the environment because we're based in [region], then you're spending over an hour each day just traveling and think of the impact it has on the environment. – SM4

This is consistent with other findings such as research conducted by Bates *et al.* (2021). NASA satellites surveyed the fifteen largest metropolitan areas in the United States and found that the extraordinary drop-in human activity during the pandemic significantly reduced air pollution. This was especially evident in vehicle exhaust emissions, which saw the level of nitrogen dioxide drop by 10–35%.

Theme 5: disruptive technology as a mechanism for reducing work burden

In McKinsey's 2019 discussion paper on their "tech for better lives" simulation project (Bughin *et al.*, 2019), the authors analyze 600 cases and discuss the use of technology applications that contribute to employee well-being. They found that in 61% of organizations adopting AI capabilities, the adoption of this DT could mitigate business disruption and improve employees' well-being by reducing working hours by 45%. They base this conclusion on currently demonstrated automation base technology, which is predicted to enhance employee annual welfare growth by 45–95%.

The findings of our research are comparable to those from the "tech for better lives" simulation. Specifically, the employee participants in this study recognized the positive impact of DT adoption. SM14 claims that automating tasks reduces some of the pressure.

> It is actually easier for the workers as order comes in online, the invoice is automated. We just pack and deliver. – SM14

The adoption of DT that focuses on innovation-led growth accompanied by efficient technology adoption strategies, rather than purely on labor reduction and cost savings through task automation, could reduce work burden and increase employees' efficiency and productivity.

The content of this theme holds a deeper meaning beyond the work burden reduction. It also focuses on employees' welfare and work-life balance by automating certain critical tasks.

> It's not actually made people redundant or lost their jobs; it's just helped us as a management team to structure the employee workflow so we could ensure that the more critical elements of the job that people are performing are being done, and having the automation perform those less critical tasks. – SM3

While these findings suggest that DT helps reduce the work burden, a separate theme also emerged that indicates that DT can increase the work burden on employees. This accentuates the significance of including both senior managers and employees in this research, in order to understand the issue from multiple perspectives. These increased work burdens include higher expectations of employee efficiency and the challenges to employees of working remotely. E6 pointed out that DT adoption increases employee stress, as customers and management expect increased efficiency. Also, automation for the customer may mean manual operation for the employee. If there is a parallel increase in consumer demand, this increases the pressure on employees to perform efficiently with higher work volume within a tighter timeframe.

> It was just the pressure from the huge volume of customers wanting to use that [online] technology to buy their goods, just that extra pressure on staff because there was a pressure [to process] with top speed, and . . . with the accuracy . . . then at a healthier pace. – E6

This theme further highlights how important it is for organizations to invest in long-term DT adoption and appropriate planning, especially in providing appropriate staff training before, during and after DT adoption. This is necessary for DT to be an effective mechanism for work burden reduction.

As the capability of technology, especially artificial intelligence-driven systems, and processes, expands, there is an increasing likelihood of it being exploited by hackers. In its research on DT in 2016, Wipro found that DT had caused a significant rise in cyber security threats globally (ERMA, 2021). The 2016 State of Cyber Security Report showed a 53.6% increase from 2015 in the number of records stolen globally as a result of cyber security disruptions (ERMA, 2021). With the increased use of DT, especially the internet of things, with easily exploited vulnerable firmware, the risk of cybercrime has risen exponentially.

Theme 6: labor market impacted by disruption technology adoption or pandemic

Both the adoption of DT and the COVID-19 pandemic are predicted to reduce labor demand and increase the unemployment rate due to task automation, consumer immobility and employment immobility. For example, International Finance Corporation (2020) is predicting that adopting DT in emerging markets post-COVID-19 risks long-term unemployment or underemployment. Our research findings show a similar theme: both SM4 and E13 predict that "*a combination of automation as well as COVID-19"* could contribute significantly to job

loss, and SM4 claims that the front-facing staff are more likely to lose jobs because of lockdowns.

> How technology will impact employment versus how COVID-19 will impact employment, so I think both have a significant contribution in terms of jobs lost, and especially customers facing jobs, which have taken a significant hit with people staying at home. – SM4

The COVID-19 pandemic has definitely affected labor demand. E8, from the tourism industry, claims their business is experiencing job losses caused by reduced travel demand. This is in line with the Labor Market Theory, which states that less customer demand could reduce labor demand.

> Since [activity] is limited, we had a lot of clients asking about refund almost every hour . . . Business needed to close down . . . and people were offered to be laid off or were made redundant. – E8

This research study does not assess job loss data, but evidence such as SM4's comment above does show that front-facing workers are at a higher risk of rapid job loss with the combination of lockdown restrictions, task automation and online customer service.

Similar to what happened during the industrial revolution, this research also found a parallel trend of technological resistance – specifically a fear of emerging technology among senior managers and employees. SM3 reported that the organization faced some employee resistance as "*people get a bit paranoid about job losses*" and fear automation taking over their tasks and eventually their jobs. On the other hand, SM11 and E6 accentuated the factors of age stereotyping when it comes to the technological gap. This refers to the customers' and employees' anxiety over unfamiliarity with new technology and a lack of skills when it comes to using it.

> Not trying to discriminate, but our employees, especially the older group, are not comfortable with the new [system]. Some keep saying they do not like it. But I think it is because they are not used to it, and they take time to learn how to use it compared to the younger employees. – SM11

> Our older customers don't know how to go online, so they can't buy via online. – E6

It is important to acknowledge that the anxiety about and resistance to, the adoption of DT comes from both customers' and employees' understanding of technology or the level of their digital skills. SM4 points out the "issue around machine learning understanding," especially when related to the technicalities of using new functions. New solutions may only support IT-savvy people or drive the rise of digital consumers (International Finance Corporation, 2020). Organizations may need to invest in long-term technology adoption strategies to improve the diffusion of DT. Those that fail to narrow the technological gap, especially among employees, face the risk of losing workers and consumers alike.

It is undeniable that automating some tasks will impact labor demand. Automation will reduce the burden on some employees and lead to fewer working hours for others, which means some reductions in labor costs. In extreme cases, automation and machine learning might eliminate jobs. However, despite the usual expectation of labor demand reductions, SM3 and SM4 state that they do not anticipate redundancies when their organizations adopt new DT. Instead, they expect employees to be flexible and able to work with new technologies.

> What we hope to see is not necessarily making employees redundant from it, but we rather like to see, employees potentially move into new functionalities or using or working with the [technology] that's being integrated. – SM4

> Automation doesn't impact all employees, might impact one or two employees at a time, depending on what we're automating and sort of just finding that balance between recognizing what level of

> automation will have the greatest fit essentially so you can automate a task, and it might only impact one person whereas you could do something else. – SM3

Both SM4 and SM3 think that automation could only affect certain types of labor. It is important for the organization to consider both the impacts of labor reduction and how to optimize its use by upskilling employees into what SM4 called "new functionalities". In support of this view, SM5 claims that they are aware of the importance of training staff to upskill so they can handle new technology and become more flexible to work in other departments or other projects when needed.

> People need more training, need to be trained to use the different tools to work in the different areas in the [organization], including [service] just to meet the needs. – SM5

Furthermore, automation is able to replace repetitive tasks, but it cannot replace certain customer services or frontline tasks, especially as some customers prefer the "human touch" to a robot's automated response. This is highlighted by E5, who thinks that DT cannot take over human labor when there is demand for work requiring human interaction.

> There are people that just like to come into the [organization], they don't want to use that [system], so there's a lot of regulars that come in. So, I can't see it taking over completely. – E5

This perspective is critical to understanding the impact of DT on the labor market, so DT adoption does not necessarily lead to job loss. Rather, participants pointed out that there are other alternatives to replacing employees, including upskilling staff. Similarly, Christensen *et al.* (2015) point out that businesses could have a problem of conflating disruptive innovation because different types of innovation, business models, or DT selection could require varying approaches.

Research limitations and implication for research

A primary limitation associated with this research is time constraints due to the specific research requirement to collect data between August 2021 and October 2021, during the peak of the pandemic. While data saturation was reached across the fourteen participants within this period, the initial proposal was to interview 20 participants. Although unintended, the research timeframe coincided with the unexpected snap Delta lockdown in New Zealand from August to September 2021 (Morton, 2022). While the conditions of the lockdown provided additional valuable insight into organizational preparedness and organizational adoption of DT as a form of business continuity planning, it also negatively impacted the participant response, with several potential participants withdrawing from the research due unexpected unavailability. While these limitations have been identified, it does not detract from the importance of this research to open a dialogue between academics, businesses, government agencies, employees and unions of the ongoing challenges of COVID-19 and DT adoption occurring simultaneously. Future research should include both industry-specific and industry-wide quantitative research into this topic.

Conclusion

It is important to understand the implications of COVID-19, including how to respond to a pandemic that offers immense challenges at the global level. It is also important to understand if DT has the potential to contribute to the current knowledge base on how to maximize the return on investment of DT strategies. Organizations in New Zealand and the world must address the need to replace workers through the digitalization and automation of jobs, while concurrently improving employment conditions through automating burdensome tasks and promoting flexibility. Through research such as the current study, academics and business leaders can learn how DT's strategies, practices and procedures work well and

which elements require changes to create a superior model going forward. Furthermore, this study highlights the importance for policy makers to invest in researching the ethics behind the adoption of DT to put long-term strategies behind the labor market post-COVID-19, as well as to ensure a lower risk of job losses due to the adoption of DT.

While there are both positive and negative implications associated with DT, earlier estimates of almost half of the workforce being impacted by the adoption of DT by 2030 may be incorrect. DT may become reality much earlier than anticipated due to the pandemic. This is a concern heightened by the impact of DT and COVID-19 occurring simultaneously, which may have profound implications on the labor market. Another issue is whether jobs lost due to COVID-19 can be filled with DT capabilities. Our findings highlight that COVID-19 has contributed towards an increased acceptance of, reliance on and adoption of DT across both organizational and social landscapes. This field of research is more important than ever as a way to open a dialogue between academics, government agencies, businesses and employees to prepare for the ongoing impact that the pandemic and DT are likely to have on the labor market.

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Corresponding author
David Brougham can be contacted at: d.brougham@massey.ac.nz