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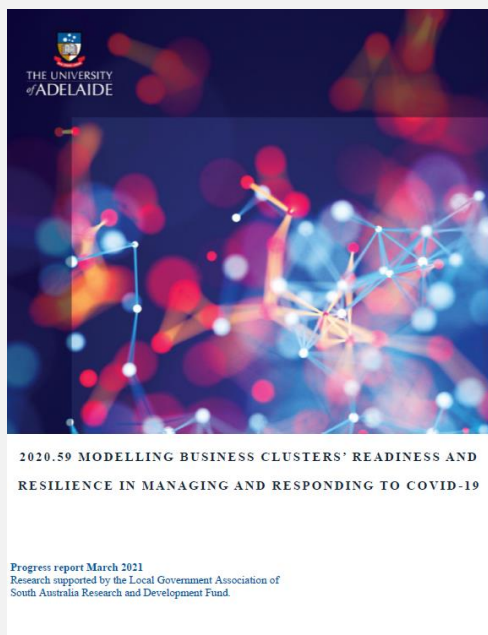
## **2020.59 MODELLING BUSINESS CLUSTERS' READINESS AND RESILIENCE IN MANAGING AND RESPONDING TO COVID-19**

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## Reports presented to the Local Government Association of South Australia



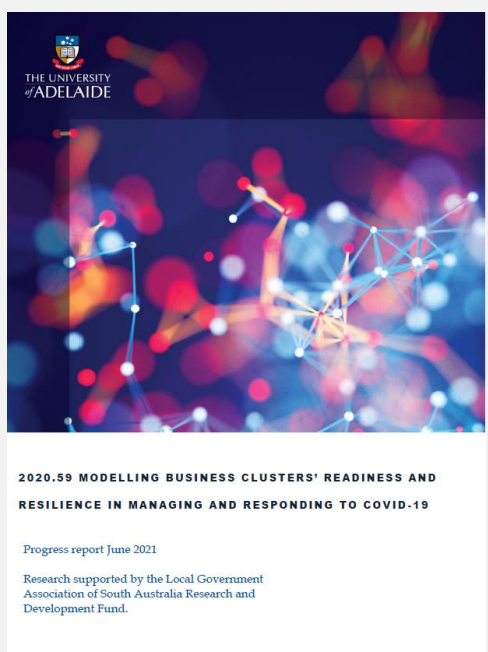
### Focus on literature

This report conceptualises resilience, provides a review of the academic and grey literature, highlights antecedents to resilience, and offers suggestions for building business resilience.

### Progress report March 2021

Available from Local Government Association of South Australia:

[https://www.lga.sa.gov.au/\\_\\_data/assets/pdf\\_file/0036/858087/2020.59-Progress-report-1-March-11-2021.pdf](https://www.lga.sa.gov.au/__data/assets/pdf_file/0036/858087/2020.59-Progress-report-1-March-11-2021.pdf)



### Focus on survey data

This report outlines the research method employed for this project, presents descriptive statistics of survey data from South Australian businesses collected in 2021, and presents a clustering analysis of this data.

### Progress report June 2021

Available from Local Government Association of South Australia:

[https://www.lga.sa.gov.au/\\_\\_data/assets/pdf\\_file/0028/924724/2020.59-Progress-Report-2,-June-29-2021.pdf](https://www.lga.sa.gov.au/__data/assets/pdf_file/0028/924724/2020.59-Progress-Report-2,-June-29-2021.pdf)

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## Executive Summary

Much discussion has occurred about the best way to help businesses recover from and overcome the COVID-19 crisis. This crisis was unexpected and more extended than previous crises. Although the full effects of the crisis are not yet known, some countries are already moving forward in an attempt to live with the virus by vaccinating their populations. This strategy has already been announced in Australia, however, there is no clear timeline for this process to be implemented. Continuing uncertainty has made it very difficult for businesses to work on how to survive, re-adapt and overcome the crisis.

Small businesses in South Australia (SA) are relevant for the economy's growth and job creation. While 98% of all businesses are small businesses, they account for an annual economic contribution of \$35B and employ 36% of the SA workforce (Government of South Australia, 2021). There are about 143,000 small businesses in SA (Government of South Australia, 2021). SA has seen a strong recovery from the COVID-19 pandemic and its economic effects, with a 5% increase in payroll jobs and a 5.3% increase in total wages between March 14 2020 and June 19 2021 (Australian Bureau of Statistics, 2021).

The COVID-19 pandemic has had an unprecedented impact on local economies, where many businesses were affected negatively. However, some businesses were able to react quicker than others and were more ready for facing the crisis and recovered quicker. It is crucial to understand what the characteristics were that allowed these businesses to survive better, re-adapt and overcome the crisis.

This research uncovers those characteristics and provides valuable information for facilitating businesses recovery from the COVID-19 crisis. The research outcomes have been presented in three reports, including this one, which is the last and the integrative report for the project results. The findings from previous reports will not be repeated but used to integrate all the implications of the project in the present report.

One of the objectives of this project was to understand the relationship of business characteristics with businesses performance and how those facilitate recovery from the crisis. By understanding the factors that affect businesses resilience and recovery, Local Governments can provide more customised policy programs and initiatives to support businesses in the ongoing pandemic. During the project, 619 businesses completed a questionnaire. The most significant finding was that more than three-quarters of the businesses reported the ability to survive, adapt, and recover from the crisis.

The use of technology increased during this period. This is an expected result because workers work from home during lockdowns when they can do so and businesses had to increase their use of digital technology to support this; however, our analysis shows that this characteristic was not enough to help businesses to recover from the crisis and increase their performance, but a necessary condition to survive.

The information provided by local businesses was vital for understanding the differences between businesses' ability to recover from the COVID-19 crisis. This report summarises the project outcomes and provides a comprehensive overview of the project objectives, the project scope, and research methods. It also presents a framework of businesses' inputs, actions, and outcomes for SA businesses in the COVID-19 environment and tests the framework quantitatively. Based on the analyses in report 1, report 2 and from this report, recommendations for government and businesses are provided.

## Key findings

- This project identified influential factors divided into three dimensions from previous crises that influence businesses' resilience and impact the performance and recovery of the businesses. These were: (1) human factors – external and internal to the businesses; 2) processes; 3) tools and mechanisms.
- Businesses that implemented resilience mechanisms more efficiently were resilient and recovered better from the COVID-19 pandemic.
- Businesses that implemented innovation processes showed better resilience or ability to bounce back or forward.
- Businesses that had implemented processes to improve supply chain efficiency were better at impacting positive performance.
- Two clusters were identified in the analysis for the three dimensions (human factors, processes, and tools and mechanisms): cluster 1 (group of businesses with less resilience) and cluster 2 (group of businesses with more resilience).
- Businesses with more resilience that implemented processes more efficiently were classified in cluster 2.
- Businesses' performance in cluster 1 (group of businesses with less resilience and that implemented processes less efficiently) is lower than businesses' performance in cluster 2 (group of businesses with more resilience and that implemented processes more efficiently).
- A set of recommendations were developed, connected with training, knowledge sharing and suggestions from the businesses to the Local Government.



## Section 1: Project overview

### 1.1 Learnings from the two previous progress reports

The previous reports have investigated the severe impact of the COVID-19 pandemic on business worldwide and in SA. In report 1, we defined business resilience and conceptualised the effects of resilience capabilities on business performance. Human factors, processes, and tools and mechanisms were highlighted as antecedents to business resilience. We concluded that these are important areas to strengthen resilience and readiness to overcome crises for businesses in SA.

Moreover, the research showed how effective communication and inter-organisational learning could help strengthen preparedness capabilities, which, together with the integration of various resilience antecedents, helps businesses bounce back or even bounce forward during a crisis. These examples provide a picture of the different approaches that Local Governments can take to support businesses.

In report 2, the relationship between these antecedents and business resilience was tested using cluster analysis with data we retrieved from surveying SA businesses. A total of 619 responses were received. After accounting for missing data and impartial completions, the final number of usable responses was 584. These responses from businesses all over SA allowed us to use several statistical analyses, which built the foundation for our recommendations presented in this report.

The descriptive analysis in report 2 showed that most businesses are family businesses, only a few have foreign shareholders, and that more than three-quarters of businesses reported that they had the ability to survive, adapt and recover after the COVID-19 crisis. Surprisingly, almost half of respondents did not consider support from Local Government and community organisations as important for recovery, and more than one quarter were not expecting any help from Local Government in the immediate future. Our survey also showed that SA businesses worked hard and improved during the crisis. Throughout all innovation categories, at least one-third of businesses reported innovations in 2020 and 2021. In addition, the use of digital technologies increased from pre-crisis to crisis levels.

Subsequent cluster analysis revealed significant differences in resilience between businesses' clusters that are either low or high in the respective resilience antecedents. It was deduced that businesses in cluster 1 find it more challenging to determine and implement the mechanisms that will best allow them to recover from the crisis and benefit from external support. In contrast, businesses in the other cluster (cluster 2) have better-implemented processes to recover from the crisis. From a Local Government perspective, we can conclude that businesses require different support depending on the associated cluster.

The findings from the previous reports provided the knowledge to develop a business recovery framework presented in this report.

Building upon the findings from the previous two reports, the following section will provide the background and theoretical rationale for the subsequent data analysis, culminating in implications for Local Governments to consider.

**CLUSTER ANALYSIS OF 584 SURVEY RESPONSES FROM SA BUSINESSES REVEALED SIGNIFICANT DIFFERENCES IN RESILIENCE BETWEEN BUSINESSES' CLUSTERS. FROM A LOCAL GOVERNMENT PERSPECTIVE, WE CAN CONCLUDE THAT BUSINESSES REQUIRE DIFFERENT SUPPORT DEPENDING ON THE ASSOCIATED CLUSTER.**

### 1.2 Background

The COVID-19 pandemic has had an unprecedented impact on economies and health across the globe (Douglas et al., 2020). Many businesses were affected negatively (Donthu and Gustafsson, 2020), and supply chains in many industries were severely disrupted (Richards and Rickard, 2020; Sharma et al., 2020b; Ketchen and Craighead, 2020; Sharma et al., 2020a). Whole industries, such as tourism or hospitality, endured catastrophic impacts (Fernandes, 2020; Chamola et al., 2020; Shen et al., 2020; Duarte Alonso et al., 2020).

While for many industries, the effects were largely adverse, some industries and sectors, such as online food retail, online learning, or information technology, instead benefited from the crisis (He et al., 2020; Dhawan, 2020; Morley and Clarke, 2020; Dannenberg et al., 2020). Research has indicated that crises can present new opportunities for businesses (Wan and Yiu, 2009; Vargo and Seville, 2011). For example, the crisis drove technological innovation (Zimmerling and Chen, 2021). It has also been shown that some organisations were able to react quicker than others (Ebersberger and Kuckertz, 2021). Because of these differences in impact and the different challenges faced, industry sectors would benefit

from more specific support measures (Lu et al., 2021). Due to imposed lockdowns, countries have responded with divergent policies to counteract the challenges for businesses and society (Cantillon et al., 2021). In contrast to previous crises, it can be argued that in the case of the COVID-19 pandemic, a very strong immediate impact is coupled with ongoing negative impacts where businesses are left in uncertainty about when the crisis will end (Shepherd and Williams, 2020).

The situation in Australia has been different to many other countries as Australia closed its international borders to non-citizens and non-residents on 19 March 2020 (Prime Minister of Australia, 2020) and introduced economic support packages (Cassells and Duncan, 2020). Within the country, states and territories controlled their borders and eased initial community lockdown restrictions differently (Storen and Corrigan, 2020). South Australia has seen a strong recovery from the initial pandemic-related downturn, with a 5% increase in payroll jobs and a 5.3% increase in total wages between 14 March 2020 and 19 June 2021 (Australian Bureau of Statistics, 2021).

However, as has been evident with the one-week lockdown in South Australia in July 2021, this pandemic is still ongoing and will continue to affect businesses. Previous research has highlighted the importance of business resilience in overcoming crises (Salvato et al., 2020; Pal et al., 2014). Business resilience also impacts firm performance positively (Ortiz-de-Mandojana and Bansal, 2016). This highlights even more the strong need for supporting businesses by increasing their resilience.

This research project makes three contributions. Firstly, by identifying factors that impact the resilience of businesses and that lead to a better recovery by getting back to pre-crisis levels or even advancing further to an improved situation. Considering these factors and their relationship with business and performance will aid the government in supporting businesses. By understanding how businesses operate, how they were affected by the COVID-19 pandemic, and which businesses were more successful in recovery, the government can provide better and more customised support to businesses. Secondly, this project captures data from one year of operating in the pandemic. It thereby provides context for more specific policy programs to support businesses in the ongoing pandemic. Thirdly, this project aids the government in providing information to businesses on how to increase their resilience and how to better recover from the impact of the COVID-19 pandemic.

### **1.3 Crisis and the importance of Local Government during COVID-19 business recovery**

Crises lead to changes in organisations (Roux-Dufort, 2007); crises can be defined as the “perception that an individual or set of individuals faces a potentially negative outcome unless some type of corrective action is taken” (Dutton, 1986: 502).

Businesses most commonly perceive crises as adversities (Williams et al., 2017); they are unexpected, impactful, and can disrupt business (Bundy et al., 2017). Local Governments are closer to businesses in their area and are in an excellent position to offer more tailored support. Best-practice examples of such support measures can be found both in Australia and worldwide. In Australia, these included establishing committees, local advisory groups, and business recovery centres (Sunshine Coast Council, 2020); supporting business advice, training, and workshops (City of Wanneroo, 2020; City of Port Adelaide Enfield, 2020); establishing a business support hotline (City of Melbourne, 2020); providing support through business advisory (City of Port Adelaide Enfield, 2020); and providing grants that help businesses in developing and offering services online (City of Melbourne, 2020). In other countries, examples can be found in measures such as helping businesses via vocational training (OECD, 2020), providing an online platform to B2B businesses to make searching and offering products and services easier, thereby strengthening local supply chains (Wirtschaftsförderung Region Stuttgart GmbH, 2020), and creating online portals for local businesses (Intelligent Cities Challenge, 2020b; Intelligent Cities Challenge, 2020c; Intelligent Cities Challenge, 2020a; High Streets Task Force, 2020).

### **1.4 Impact of COVID-19 crisis and business impact**

Thus far, this project has highlighted that businesses have been severely affected. More than 15% of SA businesses were shown to struggle severely, with revenues remaining more than 50% below pre-COVID levels (Business SA - Chamber of Commerce and Industry South Australia, 2021a). The pandemic impacts businesses unevenly, with certain sectors seeing strong negative impacts: for many businesses in accommodation & food retail (33%), professional, scientific & technical services (19%), and the tourism sector (19%), COVID-19 restrictions are seen as fundamental problems (Business SA - Chamber of Commerce and Industry South Australia, 2021b). Moreover, even though South Australia has experienced relatively few disruptions, especially when compared to countries on a global scale, the recent lockdown has shown that this pandemic is far from over.

## Section 2: Research framework

### 2.1 Business recovery and resilience

This project has identified human factors, processes, and tools and mechanisms<sup>1</sup> as the main antecedents of resilience that aid businesses in their recovery. These components and their links to both resilience and performance are summarised below.

#### 2.1.1 Business' human factors, resilience and performance

Research has shown that human factors have a significant impact on business resilience. Managers' actions and responses in critical situations and learning from these can strengthen resilience (Turner et al., 2020), especially that individual learning contributes to the resilient performance of Small and Medium-sized Enterprises (SMEs) (Battisti et al., 2019). Other studies, in the context of SMEs, have pointed towards a relationship between the personal resilience of owners/managers and firm resilience (Wall and Bellamy, 2019), showing that personal experience in dealing with uncertainty and adversity in turn aids business resilience (Branicki et al., 2018). Information sharing within supply chains (Li et al., 2017), internal and external knowledge sharing (Demmer et al., 2011), and generational knowledge sharing (Duarte Alonso and Kok, 2021) also influence resilience. Social capital has frequently been shown to positively impact business resilience (Torres et al., 2019; Jia et al., 2020; Polyviou et al., 2019). Social capital can include support from different sources, such as support from family and friends, community organisations, and other private organisations (Torres et al., 2019). Research also suggests that strategic human resource management is foundational for organisational resilience (Lengnick-Hall et al., 2011; Bouaziz and Smaoui Hachicha, 2018). Moreover, supply chain orientation, including trust, cooperation, commitment, and top management support, was an antecedent of supply chain resilience (Chowdhury and Quaddus, 2016).

These human factors also impact firm performance. SMEs learning orientation was shown to positively impact firm performance (Hermann et al., 2012). Moreover, knowledge sharing was also found to contribute to performance through innovation (Wang and Wang, 2012) and intellectual capital (Wang et al., 2014). The management of people also plays a significant role in driving firm performance, for example, through strategic human resource management (Ngo et al., 2008). In small family firms, Santoro et al. (2021) showed that the behavioural dimension of employee-level resilience positively impacts perceived performance, a relationship moderated by the entrepreneur's resilience. Employee's resilience also mattered when observed in the restaurant sector, with operators' resilience having an indirect effect on

performance (Hallak et al., 2018). Collaborations between different stakeholders and their impact on firm performance have been the focus of many studies. Findings show that positive relationships between firm performance and supply chain collaboration (Cao and Zhang, 2011), collaborations with customers and suppliers (Grekova et al., 2016), and the quality of relationships with stakeholders through brand equity (Wang and Sengupta, 2016).



#### 2.1.2 Business' processes, resilience and performance

Well-developed and robust business processes and their positive impact on resilience have been widely researched. Processes that are lean (Bevilacqua et al., 2019) and designed to create products and services (Cheng and Lu, 2017) help businesses increase resilience. Research also suggests that innovation positively impacts resilience (Orchiston et al., 2016; Dahles and Susilowati, 2015). Operational policies and processes (Cheng and Lu, 2017), operational flexibility (Childerhouse et al., 2020) and mitigation processes (Scholten et al., 2014) were shown to impact supply chain resilience. Conversely, the lack of efficient policies, processes (Shareef et al., 2020), preparation, and adaptation (Burnard et al., 2018) hinders the development of organisational resilience. In addition, different process characteristics within the supply chain, such as flexibility, responsiveness (Chowdhury and Quaddus, 2016), agility (Aslam et al., 2020), and diversity (Carvalho et al., 2012) and different processes within supply chain networks (Todo et al., 2015) have been found to impact resilience. It can be argued that businesses profit from strengthening and improving their business processes, leading to better efficiencies. Furthermore, the performance of business processes, in turn, positively contributes to firm performance (Elbashir et al.,

<sup>1</sup> From previous literature review "people" has been renamed "human factors" and subdivided into internal and external. While toolings has been subdivided

into two components, tools and mechanisms, for convenience and clear presentation.



2008; Gu and Jung, 2013; Aydiner et al., 2019). Innovation has long been identified as a key driver of firm performance (Vincent et al., 2004; Gopalakrishnan, 2000). Businesses and their performance were also shown to benefit from deeper integration of the supply chain (M. Beheshti et al., 2014), from a stronger focus on supply chain management strategy (Joel, 2004), and from implementing specific green supply chain practices (Jawaad and Zafar, 2020).

### 2.1.3 Business' tools, mechanisms, resilience and performance

The availability and use of tools and mechanisms is the third factor considered to impact businesses' resilience. Resource management through the accumulation of slack resources (Tognazzo et al., 2016), diversified resources (Conz and Magnani, 2020), and keeping and managing financial reserves (Gittell et al., 2006) strengthens firm resilience. Furthermore, the management of risk through supply chain risk management culture (Chowdhury and Quaddus, 2016) and the extent to which performance management systems take external turbulence into account (Bühler et al., 2016) has implications for how resilient businesses are. Another tool linked to resilience is business continuity planning (Coullahan and Shepherd, 2008; Sahebjamnia et al., 2015). Moreover, different technologies and forms of digitalisation such as the use of blockchain technology (Min, 2019), industry 4.0 technologies (Spieske and Birkel, 2021; Marcucci et al., 2021), and internal and external digital communication (Chewning et al., 2013) can help in increasing resilience. Businesses and their leaders use various tools that contribute to both resilience and firm performance. Studies have shown that more comprehensive implementation of enterprise risk management leads to increased financial performance and market evaluation (Florio and Leoni, 2017).

Moreover, practices to mitigate risks were found to increase firm performance through supply chain risk (Ali et al., 2021). The use of another tool, business continuity planning, was shown to positively influence financial performance through logistics competitive capability and disaster immunity in the context of logistics (Ojha et al., 2013). To decrease reliance on specific suppliers, businesses can choose to diversify suppliers, a practice that has been shown to lead to increased firm performance in environments where resources are not scarce (Richard et al., 2015).

### 2.1.4 Links from resilience to performance

While the previous three sub-sections have shown the different links between human factors, processes, and tools and mechanisms to organisational resilience and performance, this section highlights that resilience could also mediate antecedents and performance as an outcome. This suggests that through increasing these antecedents, businesses increase their resilience and contribute towards an increase in performance. Studies, especially in the area of supply chains, suggest that such a mediating relationship exists. In the context of supply chains, increased dynamism was associated with increased resilience, which was associated with increased financial performance (Yu et al., 2019). Such a mediating role of supply chain resilience was also revealed for the relationship between supply chain information sharing, collaboration, visibility, and agility and performance (Kumar and Anbanandam, 2020). Furthermore, supply chain resilience was a mediator of effective social network relationships and customer-oriented performance (Asamoah et al., 2020). Resilience was also shown to contribute to firm performance through knowledge creation processes (Alharthy et al., 2018; Alharthy, 2018). In small hospitality businesses, adaptive resilience was found to mediate the relationship between planned resilience and performance (Sobaih et al., 2021).

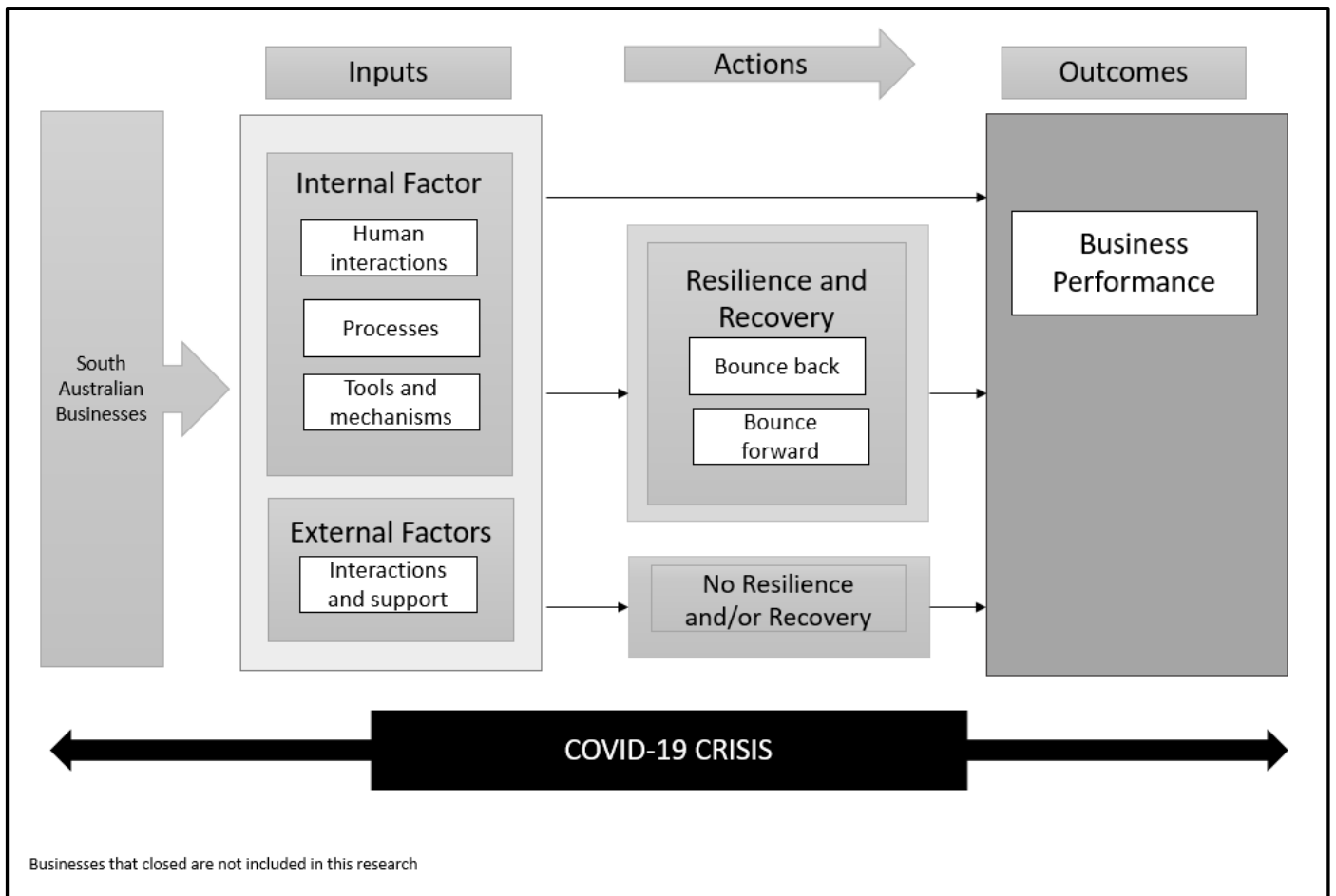
## 2.2 Visualisation of relationships

Figure 1 presents the framework used for this project and shows the relationships between human factors, processes, tools and mechanisms, resilience and firm performance. Our research is primarily interested in the influence of factors and resilience on performance which shows the business's ability to recover from the crisis.

The inputs, actions, and outcomes depicted in this framework were covered in-depth in our survey with SA businesses – please refer to the survey and descriptive analysis presented in report 2. This framework allows us to analyse this data to conclude the relationships under study. These conclusions, in turn, guide the recommendations that we can make to Local Governments on how to support SA businesses in this ongoing pandemic better. The next section of this report will summarise the methodology employed and provide our statistical analyses to uncover proposed relationships from our framework



Figure 1. Research framework



## Section 3. Research methodology

### 3.1 Methodology for testing the framework with South Australian businesses data

We tested what we learned from the literature and grey review (the framework). For that purpose, we used primary data collected from businesses in South Australia during April/May 2021. The descriptive statistics and cluster analysis were presented in the second progress report, where we found a significant difference between those businesses that were more resilient and those that were less resilient to the crisis. In the present report, we used the two different methodological approaches presented below: structural equation modelling and regression analysis (using cluster groups).

### 3.2 Structural Equation Modelling

First, we used structural equation modelling (SEM) to be able to identify a full model that captured all the complex relationships highlighted in Figure 1. Specifically, SEM allowed us to rely on a holistic approach to study the consequences of the different factors (human factors, processes, tools and mechanisms), their influence on performance and the role of resilience in mediating the relationship between human factors, processes, tools and mechanisms; and businesses performance. SEM is a theory-driven technique that allowed us to confirm the theoretical background relationships presented in the framework. SEM was selected based on three characteristics, which allowed us to examine multiple relationships simultaneously. First, variables can be independent and dependent variables at the same time. Second, we used latent variables in this analysis,<sup>2</sup> which contains multiple indicators that help to measure the combined effect of observed variables. The statistical technique used in this section is beneficial to understand how a group of observed variables behave and how independent variables can be transformed in mediators and influence other variables. Third, the ability to facilitate the analysis of mediating effects; which facilitates analysing a third variable that intervenes between two variables, the businesses' factors and performance. By understanding the effects of resilience between the factors and performance, we were able to identify the relevance of resilience in amplifying the effects of those factors in facilitating recovery and impact firm performance. We tested the relationships by using regressions standardised coefficients and significant values.

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<sup>2</sup> A latent variable or construct cannot be measured directly, it is a representation of multiple observed variables.

<sup>3</sup> In our previous report, clusters were formed with the combination of resilience and recovery questions, together with questions in each dimension for "human factors", "process" and "tools and mechanisms". Clustering analysis informed on the existence of groups/clusters of businesses, and we consistently found that there were two clusters for each dimension, that is, one cluster with firms that were more resilient and better in human factors/process/tools and mechanisms

### 3.3 Regression analysis using clusters

Furthermore, we used a regression model to further investigate the results obtained with the cluster analysis. The focus of the additional analysis was on studying whether pertaining to a particular cluster explains businesses' performance.<sup>3</sup> To analyse the relationship between businesses' clusters and performance, we used regression analysis.

In this analysis, we explored whether businesses in the generated clusters perform differently: are businesses in cluster 1 performing worse than businesses in cluster 2 considering all dimensions under study? We relied on a multiple linear regression that allowed analysis of the relationship between a response or dependent variable and the explanatory or independent variables.<sup>4</sup> Specifically, in a set of 5 regressions, we consider 5 different dimensions of performance as dependent variables. The estimated coefficient associated with each independent variable will indicate the direction of the relationship between the dependent variable and each of the independent variables. A positive sign in the estimated coefficient associated with a particular independent variable will indicate a direct relationship (i.e. a higher value of the independent variable is associated positively with performance); while a negative sign will indicate an inverse relationship (i.e. a higher value of the independent variable is associated negatively with performance). The second key source of information in this analysis was obtained from the significance of the independent variables included in the model. If an independent variable is not statistically significant, the interpretation is that there is a non-significant association between that independent variable and the dependent variable (i.e. performance).

In the regression analysis, we relied on the SEM and tested a model that included the same variables as in the previous analysis. In addition, we considered the information on the cluster in which each business was classified. These variables are named cluster1\_human factors, cluster1\_process, cluster1\_tools and mechanisms, being each of these variables equal to 1 for cluster 1, respectively, and 0 for cluster 2 in that same dimensions. It was expected that the estimated coefficients of the clustering variables, i.e. cluster1\_human factors, cluster1\_process, cluster1\_tools and mechanisms would present a negative sign. The reasoning being, that as those businesses classified in cluster 1 presented lower levels of resilience than businesses in cluster 2, performance levels in businesses in cluster 1 were also expected to be lower than those in businesses in cluster 2.

(or cluster 2); and other with businesses less resilient and worse in human factors/process/tools and mechanisms indicators (or cluster 1). In the regressions analysis, we go one step forward and we use the results from the clustering analysis by including the variable "cluster1" for each of the three dimensions.

<sup>4</sup> Regressions in this section are estimated using Ordinary Least Squares (OLS) and standard errors are robust to heteroskedasticity.

## Section 4. Quantitative analysis and results

### 4.1 Structural Equation Modelling

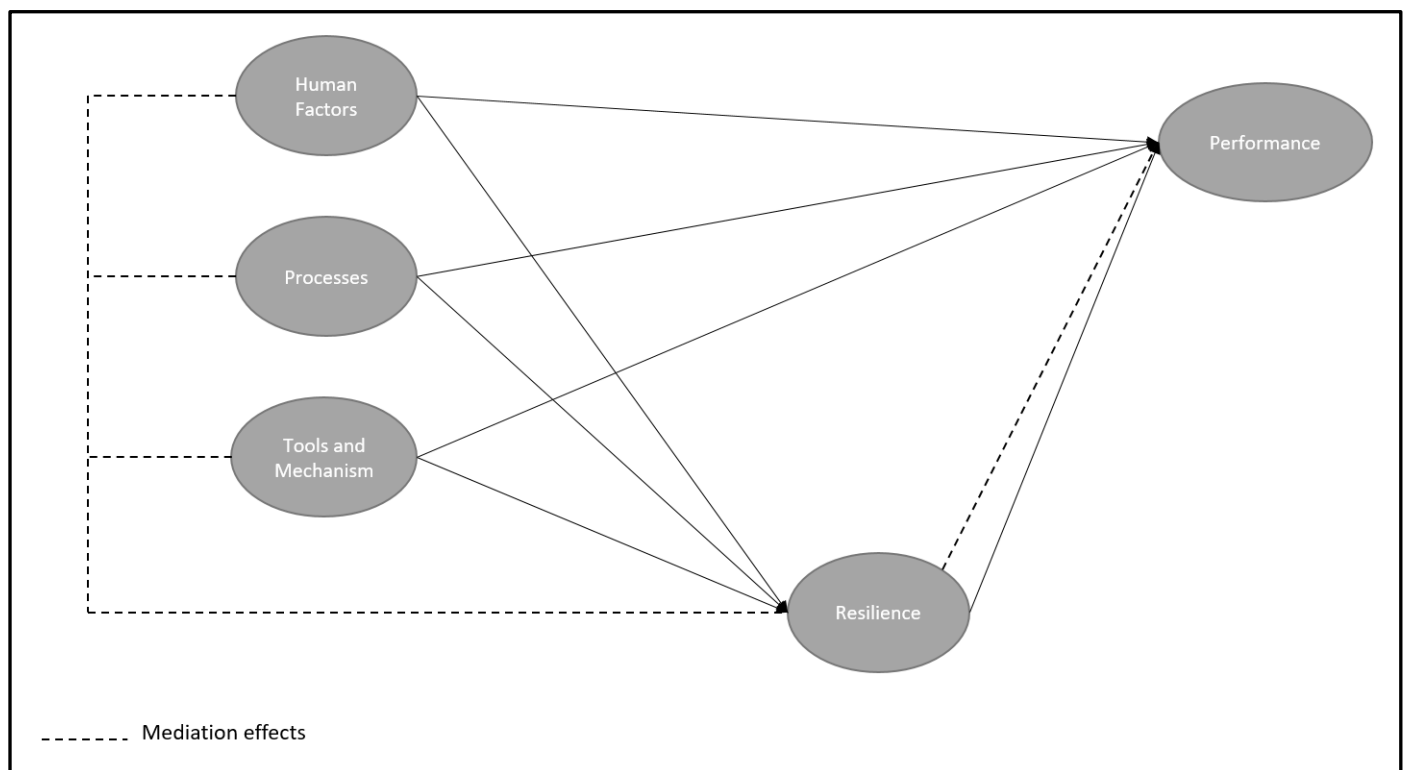
Stata version 17 was used to run SEM. We followed the steps proposed by Anderson and Gerbing (1988,1992) and conducted a confirmatory factor analysis for each construct. Cronbach's  $\alpha$  of the variables under study shows good reliability of the latent variables under study with all the results over 0.705. The variables were selected based on the theory and framework constructed previously. Also, we considered factor loadings and modification indexes to make sure that the model is appropriate during the analysis. Furthermore, we analysed the correlations between the variables under study to ensure no multicollinearity issues. The variables under study are presented in Table 3 in Appendix A.

Second, we examined the full structural model by analysing the casual relationships proposed. We followed Hair et al.

(2005) and used the normed Chi-square ( $X^2/df$ ) 180.731/161 (1.12), which is in the acceptable value of  $< 2$  and allows us to assess the parsimony of the model fit. Furthermore, we used other measures for the model fit. The  $p=0.1369$  statistical significance shows that the null hypothesis of SEM is that the observed sample and the SEM estimated covariance matrices are equal, showing that the model fits perfectly; RMSEA (0.032) shows a good fit as it is lower than 0.05; both CFI and TLI show acceptable values over 0.95 (0.994 and 0.992 respectively).

The model includes resilience as a mediator and intent to understand the overall effect of human factors, processes, tools and mechanisms on resilience and performance (please refer to Figure 2).

Figure 2. Conceptual model to be tested



<sup>5</sup> Cronbach alpha is a measure of reliability that ranges between 0 and 1, with values over 0.70 being acceptable and show reliability.



Table 1 is presented below to introduce the analysis of the relationships under study. The table presents the information about the standardised regressions, coefficients and the significant values associated with them. For this analysis and the regression analysis, only significant values will be considered for interpretation.

**Table 1. Structural Equation Modelling results**

Dimension	Full model (1) $\beta$ (sig)	Interpretation
<b>Resilience <math>\leftarrow</math> Human factors ext q9</b>	0.025 (0.771)	No effect
<b>Resilience <math>\leftarrow</math> Human factors int q10</b>	0.086 (0.413)	No effect
<b>Resilience <math>\leftarrow</math> Process q11</b>	0.270 (0.001) ***	Positive and significant effect
<b>Resilience <math>\leftarrow</math> Process q12</b>	0.011 (0.909)	No effect
<b>Resilience <math>\leftarrow</math> Mechanisms q15</b>	0.027 (0.771)	No effect
<b>Resilience <math>\leftarrow</math> Tools q16</b>	-0.088 (0.315)	No effect
<b>Performance <math>\leftarrow</math> Resilience</b>	0.613 (0.000) ***	Positive and significant effect
<b>Performance <math>\leftarrow</math> Human factors ext q9</b>	-0.116 (0.12)	No effect
<b>Performance <math>\leftarrow</math> Human factors int q10</b>	-0.009 (0.91)	No effect
<b>Performance <math>\leftarrow</math> Process q11</b>	0.0208 (0.76)	No effect
<b>Performance <math>\leftarrow</math> Process q12</b>	0.152 (0.05)**	Positive and significant effect
<b>Performance <math>\leftarrow</math> Mechanisms q15</b>	0.002 (.976)	No effect
<b>Performance <math>\leftarrow</math> Tools q16</b>	0.018 (0.781)	No effect
<b>Performance <math>\leftarrow</math> Resilience <math>\leftarrow</math> Process</b>	0.296 (0.002)***	Positive and significant effect

Note: Sig (\*\*) <0.05 and <0.001 (\*\*\*)

## 4.2 Importance of resilience in facilitating performance

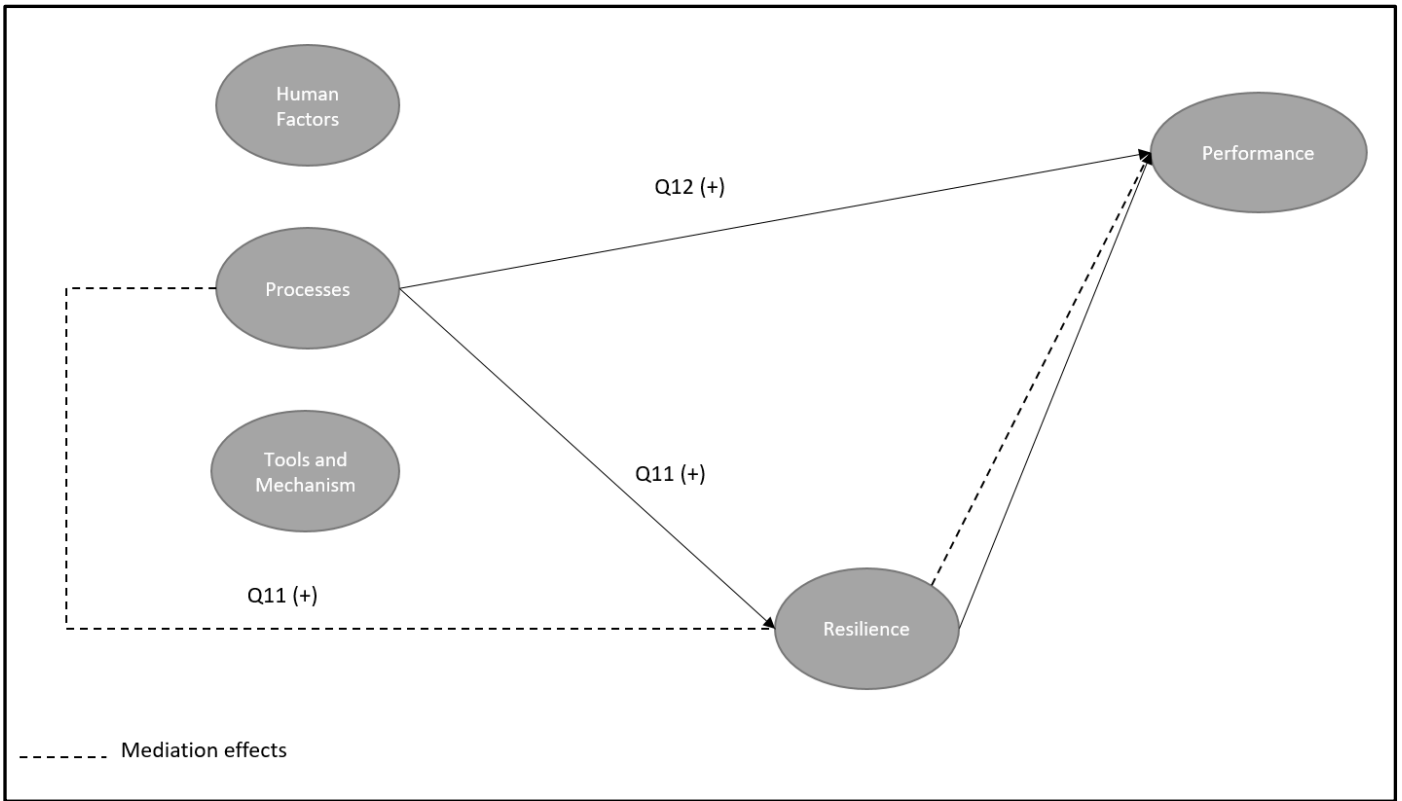
As shown in Table 1, the results indicate the following: the connection between resilience and process (q11) is significant ( $\beta = 0.270$ ,  $p = 0.001$ ). The independent variables directly affect performance; only the relationship between process q12 and performance shows significant and positive results ( $\beta = 0.152$ ,  $p = 0.05$ ). Finally, resilience is significant and positive in impacting performance ( $\beta = 0.613$ ,  $p = 0.000$ ). Further to the direct effects presented in the previous part, we introduced the analysis of indirect effects. The analysis showed an indirect effect between process q11 and performance through resilience ( $\beta = 0.296$ ,  $p = 0.002$ ).

## 4.3 Summary of the SEM analysis

Based on the analysis undertaken, it is clear that businesses have processes in place that are efficient, are better prepared and resilient to influence recovery and bounce back and forward (please refer to Figure 3 on the next page which shows only significant results).

Businesses that achieved resilience have a bigger impact on performance. Innovative practices such as creating products or services or lean practices for providing a means to develop improvements and strategies to build operational resilience are relevant for resilience, which has a strong influence on performance. Furthermore, this has an indirect effect on performance through the ability to recover and adapt. On the other side, businesses that have processes in place regarding supply chain process efficiency can positively impact performance.

**Figure 3. Conceptual model (positive and significant effects)**



In what follows, we proceed with the regression analysis, which allows us to test the role of businesses’ performance of the clusters created within this project. In addition, it allows testing of whether firms with the ability to recover and grow after the crisis struggled in terms of performance to a lower extent.

#### 4.4 Do businesses in the generated clusters perform differently?

Table 4 in Appendix B presents the variables used in the regression model. It is expected that businesses in cluster 1 present lower levels of performance than businesses in cluster 2. In line with this expectation, our results in Table 2 show that the sign of the estimated coefficients of the three variables on “cluster1” is negative, as expected. However, only for the dimension of processes, we validate the expectation that the performance of businesses in cluster 1 (which is the group of less resilient businesses) is lower than businesses’ performance in cluster 2 (which is the group of more resilient businesses). For example, in the case of sales

as measure of performance,  $\beta = -1.081$ ,  $p = 0.000$  (see result for cluster1\_process in column 1 of Table 2). Crucially, a negative and significant result is obtained for cluster1\_process in the 5 performance variables taken on board.<sup>6</sup>

In addition, our results show that the estimated coefficient of Q9FAMILY is negative and statistically significant ( $\beta = -0.173$ ,  $p = 0.009$ , see column 5 in Table 2). This is interpreted as evidence of an inverse relationship between performance (measured as the number of FTE) and support received from family and friends. We interpret this result as an indication that if businesses are asking for support from family and friends to recover, it will be hard for them to increase the number of full-time employees. It is likely that these businesses do not have the option of more favourable loan conditions and they ask for support from family and friends to survive the crisis. In the process between the arising need of support and receiving it, they may have lost the capacity to employ some workers.

<sup>6</sup> As a robustness check, an additional model was estimated with the same “human factors”, “process”, and “tools and mechanisms” variables used to create the businesses clusters together with cluster1\_Human Factors, cluster1\_process, cluster1\_tools and mechanisms. These results are available under request. Obtained results are consistent with the expectations and, as in the regression model in this final report, only significant for the dimension of processes. The result that businesses in cluster 1 perform worse than businesses in cluster 2, but only in the case of processes is, therefore, validated in the robustness check. In addition, we find that the variables on the “human factors”,

“process” and “tools and mechanisms” dimensions used to construct the clusters are not statistically significant at the conventional level of 5% of significance when introduced directly into the model as explanatory variables. This is interpreted as evidence that the variation of these variables is correctly captured with the inclusion of the three clustering variables (i.e. cluster1\_Human Factors, cluster1\_process, cluster1\_tools and mechanisms). Therefore, the clustering variables mediate the effect of resilience and processes on businesses’ performance.

Considering the ability to fund business growth from profits as performance measure, the estimated coefficient for Q11STRATEGIES is positive and statistically significant ( $\beta = 0.383$ ,  $p = 0.093$ , see column 3 in Table 2). This result is interpreted as evidence of the existence of a direct relationship between performance and strategies to build operational resilience: the better the strategies, the higher the ability to fund business growth from profits. Finally, concerning sales level as performance measure, the

estimated coefficient for Q12RESPONSIVENESS is negative and statistically significant ( $\beta = -0.346$ ,  $p = 0.064$ , see column 1 in Table 2).

This result is interpreted as evidence of the existence of an inverse relationship between performance (measured as sales level) and the speed at which the supply chain responds to disruptions within the supply chain.<sup>7</sup>

**Table 2. Regression analysis: relationship of performance, human factors, processes, and tools and mechanisms, and businesses clusters**

	(1) Q18SALESLEVEL $\beta$ (sig)	(2) Q18CASHFLOW $\beta$ (sig)	(3) Q18ABILITY OFUNDBUSGROW $\beta$ (sig)	(4) Q18PROFITS $\beta$ (sig)	(5) Q18FTE $\beta$ (sig)
Q9FAMILY	-0.008 (0.933)	-0.141 (0.166)	-0.059 (0.495)	-0.112 (0.245)	<b>-0.173 (0.009)***</b>
Q9COMMUNITYORG	-0.012 (0.919)	0.008 (0.951)	-0.039 (0.733)	0.046 (0.674)	0.059 (0.567)
Q9PRIVATEORG	-0.084 (0.545)	-0.008 (0.954)	-0.013 (0.923)	-0.048 (0.718)	0.021 (0.863)
Q10PERSATRIBUTTOP	-0.100 (0.470)	-0.009 (0.954)	-0.037 (0.765)	0.019 (0.888)	-0.019 (0.840)
Q10WORKPLACESAT	0.017 (0.915)	-0.016 (0.919)	0.051 (0.717)	-0.039 (0.794)	0.076 (0.458)
Q11ORGPROC	-0.119 (0.578)	-0.103 (0.684)	-0.165 (0.400)	-0.146 (0.539)	0.134 (0.356)
Q11STRATEGIES	0.287 (0.248)	0.093 (0.725)	<b>0.383 (0.093)*</b>	0.277 (0.299)	0.180 (0.285)
Q11LEAN	0.123 (0.538)	0.215 (0.233)	0.083 (0.588)	0.087 (0.641)	-0.012 (0.933)
Q12RESPONSIVENESS	<b>-0.346 (0.064)*</b>	-0.147 (0.436)	-0.217 (0.212)	-0.276 (0.125)	-0.032 (0.798)
Q12AGILITY	0.007 (0.971)	-0.019 (0.922)	0.086 (0.610)	0.108 (0.536)	0.186 (0.125)
Q12STRUCTURALLYREL	0.214 (0.197)	0.079 (0.661)	0.105 (0.491)	0.049 (0.778)	-0.199 (0.113)
Q15RESERVEMANAG	-0.174 (0.188)	-0.075 (0.559)	-0.122 (0.309)	-0.031 (0.802)	0.007 (0.928)
Q15PROACTRISKMANAG	0.172 (0.236)	0.129 (0.299)	0.157 (0.169)	0.072 (0.533)	-0.097 (0.240)
Q15BUSCONTPLAN	0.129 (0.363)	-0.063 (0.631)	0.021 (0.849)	0.031 (0.796)	0.055 (0.552)
Q16COMMEMPLOY2021	0.082 (0.530)	0.134 (0.361)	0.159 (0.211)	0.203 (0.126)	0.002 (0.985)
Q16COMMSTAKEH2021	-0.140 (0.295)	-0.145 (0.326)	-0.042 (0.734)	-0.170 (0.200)	0.045 (0.607)
cluster1_Human Factors	-0.182 (0.582)	-0.065 (0.861)	-0.087 (0.801)	-0.288 (0.396)	0.217 (0.381)
cluster1_process	<b>-1.081 (0.000)***</b>	<b>-0.733 (0.014)**</b>	<b>-0.684 (0.014)**</b>	<b>-0.925 (0.001)***</b>	<b>-0.596 (0.013)**</b>
cluster1_tools and mechanisms	0.338 (0.382)	0.231 (0.538)	0.067 (0.840)	0.513 (0.150)	-0.061 (0.814)
No. of Obs.	163	161	163	163	162
R-Squared	0.218	0.111	0.187	0.176	0.179

Notes: \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% levels, respectively. p-values in brackets. Significant results in bold. Columns (1)-(5) present results obtained for regressions, including as dependent variables the following performance variables: sales (Q18SALESLEVEL), cash flow (Q18CASHFLOW), ability to fund business growth from profits (Q18ABILITYTOFUNDBUSGROW), profits (Q18PROFITS), and number of FTE (Q18FTE).

<sup>7</sup> Note that results for Q11STRATEGIES and Q12RESPONSIVENESS are only significant at a 10% significance level and should be interpreted with caution.

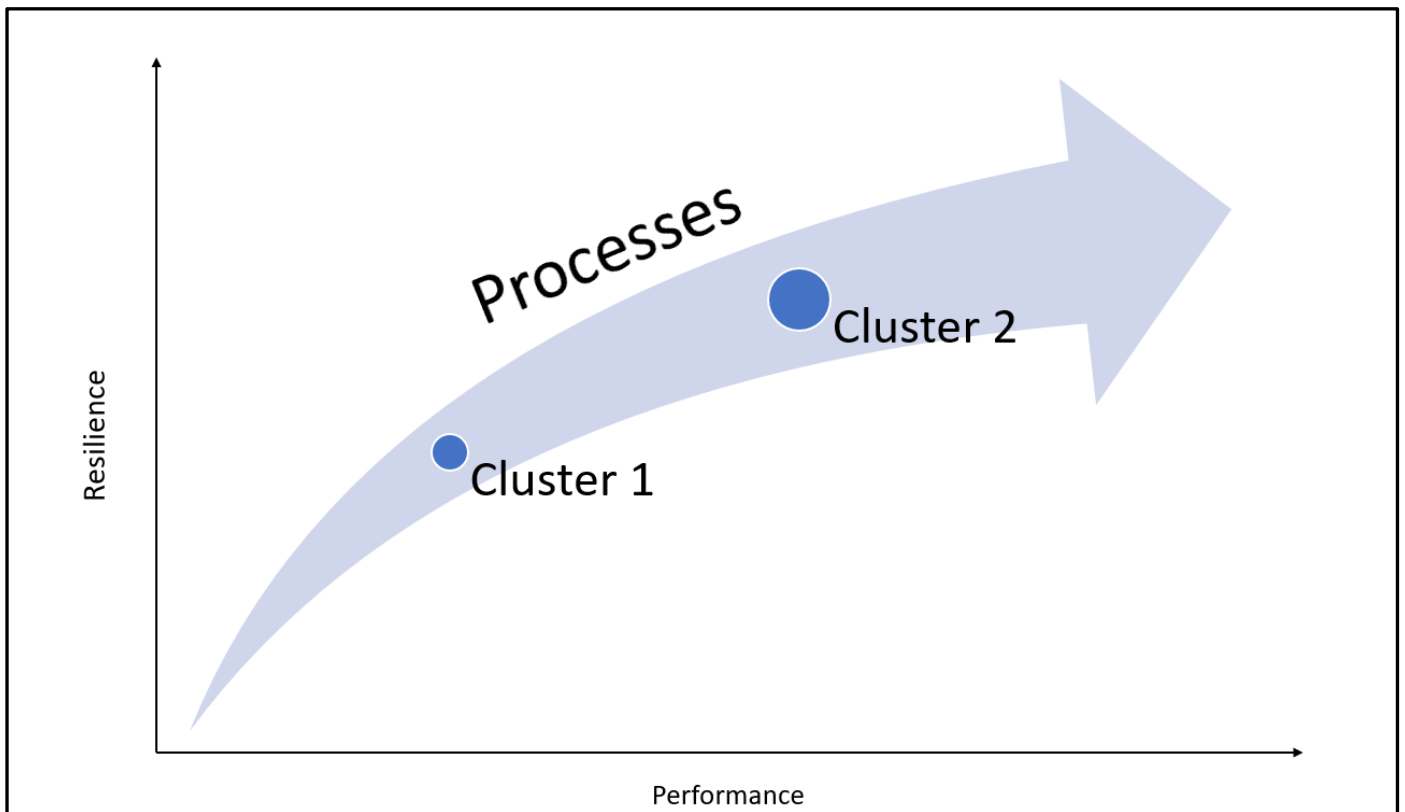
#### 4.5 Summary of cluster analysis

The performance of businesses included in cluster 1 (group of less resilient businesses) is lower than the performance of businesses in cluster 2 for the five performance variables considered in this research. However, this relationship is only significant for the dimension of processes.

Summarising, businesses that have implemented processes associated with innovation and supply chain efficiency are more resilient and, in turn, have better performance.

Figure 4 below graphically depicts the relationships between clusters, resilience, and performance. Through improvements in processes, businesses in cluster 1 with low resilience and low performance can move to cluster 2 as their resilience and their performance increases.

Figure 4. Relationships between clusters, resilience, and performance





## Section 5. Discussion

This section provides and analyses each of the research objectives for this project, beginning with the outputs produced to provide a clear understanding of business characteristics affecting crisis recovery and growth and applying that framework to the SA business data. Finally, it summarises the clustering modelling results and the implications for businesses and decision-makers.

### 5.1 Understanding of business characteristics affecting crisis recovery and growth

Our first objective was to understand business characteristics that can influence businesses' readiness and recovery during the crisis. We undertook an extensive literature and grey literature review to identify factors that facilitate businesses' recovery in crisis time, even though we were cognizant of the fact that no other crisis so far has had the same characteristics as the COVID-19 crisis. However, the business crisis literature provided a comprehensive range of characteristics subdivided into three main groups: human factors, processes, and tools and mechanisms used by businesses to face the crisis. The first group that we identified is connected with human factors; it can be subdivided into factors that are internal and external to the business. The second group relates to processes used within businesses. The third group addresses various tools and mechanisms. As a result, this project provided a framework with possible factors that influence resilience and the performance of businesses. Subdividing factors into these three categories allowed our analysis to consider the different impacts of these categories on business resilience and performance. This, in turn, guided our development of policy recommendations for Local Government presented at the end of this section.

### 5.2 Application of framework to South Australian business data

As part of the project, we analysed the impact of resilience on businesses recovery and performance. Our findings were consistent with the previous research, which highlighted the importance of business resilience in overcoming crises (Salvato et al., 2020; Pal et al., 2014).

The results showed that some businesses benefited or had a competitive advantage over other businesses as they implemented processes connected with innovation (Zimmerling and Chen, 2021), creating new opportunities for businesses (Wan and Yiu, 2009; Vargo and Seville, 2011). Previous research highlighted that innovation positively impacts resilience (Orchiston et al., 2016; Dahles and Susilowati, 2015), which is consistent with our analysis. Businesses that showed a clear connection with resilience have organisational processes for creating products or services (Cheng and Lu, 2017) and had strategies to build operational and lean practices to provide a means

for improvement. Furthermore, operational processes also provided an advantage to firms that could recover and those that can also recover and grow. The results showed a positive and significant association with performance. This is consistent with previous literature showing an association between resilience and operational policies, processes, and flexibility (Cheng and Lu, 2017; Childerhouse et al., 2020) and also structural reliability (Scholten et al., 2014). Although innovation has been identified as a key driver of firm performance (Gopalakrishnan, 2000; Vincent et al., 2004), in this case innovation processes influences the businesses' performance through the increase in resilience. This may be associated with the cross-sectional nature of the data, which is a limitation of this study.

### 5.3 Identification of clusters

We used cluster analysis to identify the number of groups (or clusters) that differentiated whether businesses were resilient and effectively recovered from the COVID-19 pandemic. This analysis showed that there are two groups of businesses: cluster 1 (which is the group of less resilient businesses) and cluster 2 (which is the group of more resilient businesses). Businesses in one of the groups (cluster 1) find it more challenging to determine and implement the mechanisms that will best allow them to recover from the crisis, and this group might benefit from external support. In this final report, we showed that the performance in cluster 1 (the group of less resilient businesses) is lower than businesses' performance in cluster 2, the differentiation in performance between the clusters is explained by the implementation of innovative and supply chain processes.

### 5.4 What we have learned and recommendations for decision-makers: Local Government and businesses

Small and medium businesses play an important role in the South Australian economy. Local councils might consider what strategies they could implement to better support businesses struggling with the COVID-19 pandemic. The Local Government should focus on providing support to businesses in cluster 1 (less resilient businesses) to improve the resilience or ability to recover from the COVID-19 pandemic faster and more efficiently in an effort to move

**THE DIFFERENTIATION IN PERFORMANCE BETWEEN THE CLUSTERS IS EXPLAINED BY THE IMPLEMENTATION OF INNOVATIVE AND SUPPLY CHAIN PROCESSES.**

them to cluster 2 (more resilient businesses). One way is by helping businesses in cluster 1 to implement better processes. This will not only improve resilience but ultimately improve performance and positively impact regional recovery. This research has been made possible by a unique and comprehensive survey of local businesses about their resilience activities to overcome the crisis.

The COVID-19 pandemic is here to stay, and businesses' ability to adapt to the new circumstances is essential for recovery. The Local Government may support businesses to acquire the processes that best help them become more resilient and/or support them to recover and grow faster after crises. One way to support businesses, specifically, small and medium businesses, is to provide the training required to incorporate the skills and capabilities to survive the crisis. Businesses' resilience is associated with human factors, processes, and tools and mechanisms that businesses use.


However, based on South Australian data, businesses perform differently depending on their association with resilience. Furthermore, we found a very strong influence between resilience and business performance. The data shows that businesses that utilised processes connected with creating products or services or lean practices were more resilient than those that did not have this process in place. Processes connecting with innovation activities facilitate business adaptation to unexpected situations. The Local Government can provide training for SMEs to manage innovation, become more innovative and able to adapt faster and create competitive advantages. Training in becoming more innovative as an organisation, innovation strategies and how to include innovation as a core business process is imperative to become more resilient. Furthermore, the introduction of new products or services to gain alternative markets and diversify revenue streams could be targeted in training programs.

Moreover, we found that businesses that develop supply chains with characteristics associated with responsiveness (speed to respond to disruptions), agility (ability to adjust tactics) and structural reliability were able to outperform those businesses with not so versatile supply chains. Mentorship programs on improving supply chain (such as relying less on only a few suppliers), finding alternative suppliers, how to track the supply chain (how to use data), and cloud applications for supply chain management may allow businesses to become more resilient.

Sharing knowledge and information with other businesses and presenting their best practices in the areas highlighted by this report could facilitate knowledge transfer and improve innovation outcomes and efficiency in supply chain management. This knowledge sharing can be facilitated through quarterly meetings for businesses organised by Local Governments. The workshops can have an expert on the area present to facilitate discussion and brainstorming between businesses.

It is recommended that the Local Government creates a tool using variables presented in this research to assess, monitor, and evaluate the changes in business resilience for businesses that participate in the intervention activities. This tool will also demonstrate to businesses the importance of maintaining processes at a competitive level.

Tools and mechanisms did not show any difference between the clusters; however, the use of digital tools has increased since the start of the pandemic. This suggests that digital tools are a requirement for businesses to operate in the new context. The Local Government can provide training or webinars about digital tools, the availability of such tools to SME's and how to use them.



**ONE WAY TO SUPPORT BUSINESSES, SPECIFICALLY, SMALL AND MEDIUM BUSINESSES, IS TO PROVIDE THE TRAINING REQUIRED TO INCORPORATE THE SKILLS AND CAPABILITIES TO SURVIVE THE CRISIS. BUSINESSES' RESILIENCE IS ASSOCIATED WITH HUMAN FACTORS, PROCESSES, AND TOOLS AND MECHANISMS THAT BUSINESSES USE.**

Additionally, although many businesses said that they do not need any support (25.3%), others provided suggestions to Local Government such as the need for financial support (22.2%) for recovering from the crisis (reduction in rates, rate release, more accessible grants for smaller businesses, funds to trial new ideas with benefits to local communities, reduce parking cost, and so on), listen and collaborate (8.9%) (facilitate collaboration with other business, more community events, provide connections with local suppliers, assist with access to volunteers for social projects, and so on), less red tape and faster processes (8.2%) (increase dynamic and agility in response to businesses' needs by reducing time in creating business support programs, emergency contacts available for businesses), and others services (assistance in marketing to support SA products, business management training, and casual businesses services – such as hire casual offices).

## **5.5 Summary of discussion**

This project investigated how businesses' resilience helped their recovery during the COVID-19 crisis. By understanding businesses' activities and how they achieved better resilience and recovery and the connection these had with their performance, Local Governments can provide targeted programs and resources to help businesses achieve better performance results. This, in turn, will benefit the economy of the region. The present research examines the aspects that make a business more or less resilient to crises, specifically, COVID-19, which was an unprecedented situation worldwide. By analysing the antecedents of resilience and recovery, and their combination, this study helps to understand how to strengthen businesses' positions in South Australia. This study can help practitioners and policymakers better understand how to gain resilience and competitive advantages withstanding times of crisis.

Although the findings are from South Australian businesses, which have been in an extremely advantageous situation compared with other regions in the world in relation to the low numbers of restrictive measures such as lockdowns, other restrictions, etc., they can be applied to other regions as they show the impact of certain business activities on resilience and recovery. Results obtained from this research show the importance of businesses processes in resilience and, in turn, in business performance. However, as has been evident with the July lockdown in South Australia, this pandemic is still ongoing and will continue to affect businesses. This highlights even more the strong need for supporting businesses in increasing their resilience. Further studies might analyse whether the results from this research can be connected with Local Government practices to understand how they can better support businesses' resilience and recovery.

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## Appendix A

Table 3. Variables used in SEM

Dimension	Question and measurement	Variable name	Variable description
<i>Dependent variables</i>			
<b>Performance</b>	Q18 Please evaluate your overall business performance in the last 12 months (2020/21) when compared to the 12 months prior (2019/2020) 1 denotes decrease, 2 slightly decrease, 3 neither decrease or increase, 4 slightly increase, 5 increase	Q18SALESLEVEL	Sales level
		Q18ABILITYTOFUNDBUSGROW	Ability to fund business growth from profits
		Q18PROFITS	Profits
<i>Independent variables</i>			
<b>Human factors (internal and external)</b>	Q9 How important were the following sources of COVID19 specific support for your business recovery during the last 12 months (2020/2021)? 1 denotes no at all important, 2 Somewhat important, 3 moderately important, 4 important, 5 extremely important	Q9FAMILY	Support received from family and friends
		Q9COMMUNITYORG	Support offered by community organisations
		Q9PRIVATEORG	Support received from other private organisations
	Q10 How important were the following dimensions within your business during the last 12 months (2020/2021) for the recovery from the COVID19 crisis? 1 denotes not at all important, 2 somewhat important, 3 moderately important, 4 important, 5 extremely important	Q10PERSATRIBUTTOP	Personal attributes of the owners or top managers (adaptability, purposefulness, confidence and sociability)
Q10WORKPLACESAT		Workplace satisfaction	
<b>Process</b>	Q11 To what extent did your business have effective operational policies and processes (operating frontier) to survive the COVID19 crisis during the last 12 months (2020/2021)? 1 denotes far below standards, 2 below standards, 3 meets standards, 4 above standards, 5 far above standards	Q11ORGPROC	Organisational processes for creating products or services
		Q11STRATEGIES	Strategies to build operational resilience
		Q11LEAN	Lean practices for providing a means for improvement
	Q12 To what extent did your supply chain have the following characteristics during the last 12 months (2020/2021)? 1 denotes to a very small extent, 2 to a small extent, 3 to a moderate extent, 4 to a large extent, 5 to a very large extent	Q12RESPONSIVENESS	Responsiveness (speed at which your supply chain responds to disruptions) within the supply chain
Q12AGILITY		Agility (the ability to adjust tactics and operations) in your supply chain operations	
<b>Tools and mechanisms</b>	Q15 Please indicate to what extent did your business used the following practices during the last 12 months (2020/2021) to survive the crisis? 1 denotes never, 2 rarely, 3 sometimes, 4 often, 5 always	Q15RESERVEMANAG	Effective financial reserves management
		Q15PROACTRISKMANAG	Proactive risk Management practices
		Q15BUSCONTPLAN	Business continuity plan (identification of key strategic vulnerabilities, priorities, critical resources and functions)
	Q16 How often were digital resources used as a communication process during the last 12 months (2020/2021)	Q16 COMMEMPLOY2021	Digital media as a medium to communicate with employees
		Q16COMMSTAKE2021	Digital media as a medium to communicate with other stakeholders
<i>Mediating variables</i>			
<b>Resilience</b>	Q5 In your opinion, has your business shown resilience during the last 12 months (2020/2021)?	Q5RETURN Q5BOUNCEFORWARD Q5REDUCE IMPACT	Our business had the ability to survive, adapt and recover after the COVID19 crisis and return to the previous state of perceived normality Our business had the ability to recover and grow (bounce forward) Our business had the ability to reduce the impact of the crisis; it had the required level of readiness and recovery ability

## Appendix B

Table 4. Variables used in the regression model

Dimension	Question and measurement	Variable name	Variable description
<i>Dependent variables</i>			
<i>Performance</i>	Q18 Please evaluate your overall business performance in the last 12 months (2020/21) when compared to the 12 months prior (2019/2020) 1 denotes decrease, 2 slightly decrease, 3 neither decrease or increase, 4 slightly increase, 5 increase	Q18SALESLEVEL	Sales level
		Q18CASHFLOW Q18ABILITYTOFUNDBUSGROW	Cash flow Ability to fund business growth from profits
		Q18PROFITS Q18FTE	Profits Number of FTE (full time employees)
<i>Independent variables</i>			
<i>Human factors (internal and external)</i>	Q9 How important were the following sources of COVID19 specific support for your business recovery during the last 12 months (2020/2021)? 1 denotes no at all important, 2 Somewhat important, 3 moderately important, 4 important, 5 extremely important	Q9FAMILY	Support received from family and friends
		Q9COMMUNITYORG Q9PRIVATEORG	Support offered by community organisations Support received from other private organisations
	Q10 How important were the following dimensions within your business during the last 12 months (2020/2021) for the recovery from the COVID19 crisis? 1 denotes not at all important, 2 somewhat important, 3 moderately important, 4 important, 5 extremely important	Q10PERSATRIBUTTOP	Personal attributes of the owners or top managers (adaptability, purposefulness, confidence and sociability)
Q10WORKPLACESAT		Workplace satisfaction	
<i>Process</i>	Q11 To what extent did your business have effective operational policies and processes (operating frontier) to survive the COVID19 crisis during the last 12 months (2020/2021)? 1 denotes far below standards, 2 below standards, 3 meets standards, 4 above standards, 5 far above standards	Q11ORGPROC	Organisational processes for creating products or services
		Q11STRATEGIES Q11LEAN	Strategies to build operational resilience Lean practices for providing a means for improvement
	Q12 To what extent did your supply chain have the following characteristics during the last 12 months (2020/2021)? 1 denotes to a very small extent, 2 to a small extent, 3 to a moderate extent, 4 to a large extent, 5 to a very large extent	Q12RESPONSIVENESS	Responsiveness (speed at which your supply chain responds to disruptions) within the supply chain
		Q12AGILITY Q12STRUCTURALLYREL	Agility (the ability to adjust tactics and operations) in your supply chain operations Structurally reliable (the degree of connectedness and number of healthy nodes in the supply chain networks during a disruptive event)
<i>Tools and mechanisms</i>	Q15 Please indicate to what extent did your business used the following practices during the last 12 months (2020/2021) to survive the crisis? 1 denotes never, 2 rarely, 3 sometimes, 4 often, 5 always	Q15RESERVEMANAG	Effective financial reserves management
		Q15PROACTRISKMANAG Q15BUSCONTPLAN	Proactive risk Management practices Business continuity plan (identification of key strategic vulnerabilities, priorities, critical resources and functions)
	Q16 How often were digital resources used as a communication process before the crisis (2019), and then during the last 12 months (2020/2021)? 1 denotes never, 2 rarely, 3 sometimes, 4 often, 5 always	Q16COMMEMPLOY2021	Digital media as medium to communicate with employees (WhatsApp messaging, blogs or employees newsletter)
		Q16COMMSTAKEH2021	Digital media as a medium to communicate with other stakeholders (WhatsApp messaging, blogs or employees newsletter)
<i>Clustering</i>		cluster1_Human Factors	This variable equals 1 for cluster 1 in the “people” dimension, and 0 for cluster 2
		cluster1_process	This variable equals 1 for cluster 1 in the “process” dimension, and 0 for cluster 2
		cluster1_tools and mechanisms	This variable equals 1 for cluster 1 in the “tools and mechanisms” dimension, and 0 for cluster 2