



# BUSINESS INNOVATION SURVEY 2019 - 2021

For a more innovative South Africa

## Innovation in South African Businesses, 2019 – 2021: Activities, Practices and Capabilities



Science and Innovation  
Statistics South Africa



**HSRC**  
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# PREFACE

The results presented in this report convey a snapshot of innovation in the South African formal business sector in the three-year period, 2019-2021, adding to the existing South African innovation data set, and complementing other national surveys, including the annual [South African R&D Survey](https://rdisurveys.hsrc.ac.za/).<sup>1</sup> Additional documents accompany this report, which delve deeper into the data to provide further insight into specific topics covered by the survey, as well as the survey methodology. These include:

- An **executive summary** including the headline results of the survey.
- A detailed **methodology note** covering sampling and response, imputations, and projection of results.
- A detailed **weighting methodology note**.
- **Appendix tables** providing the source data for the tables and figures in this report.
- **Aggregated data tables** providing a breakdown of all variables in the survey, by sector and size class.
- Eight **sectoral briefs** with specific statistics for technological capabilities, barriers to innovation and outcomes of innovation for each subsector. Respondents can use these to compare themselves to other businesses in their sectors.
- **Fact sheet 1** on innovation funding in South African innovation-active firms. This covers cost-related obstacles to innovation activities, sources of funding, awareness of public funding, types of public support applied for or obtained and reasons for not applying for public funding.
- **Fact sheet 2** on innovation rates over time from 2002-2004 to the latest period, 2019-2021.
- A **policy brief** on the innovation collaboration activity of innovation-active South African firms. The policy brief classifies groups of innovation-active firms in terms of how they collaborate and looks at their reported barriers to innovation collaboration, types of collaboration partners, and geographic location of collaboration partners.

## The purpose of this report

While providing essential information to enable policy implementers to design effective instruments to support business innovation, equally, this report is intended to provide business leaders, industry association executives and other users with insight into the state of innovation in their sectors. This can allow them to benchmark their achievements against other businesses and industries, learn more about the evolving national innovation landscape, and develop evidence-informed action plans.

How and why should role-players use this report, and its suite of policy-oriented analyses, in their ongoing R&D planning, policy work, industry coordination, or business investments? The research anticipates particular use values across different sectors of South African society:

- **Business leaders and investors:** The South African specificity of balancing environment, social and governance (ESG) outcomes of business has received increasing attention within corporate governance practices. ESG thinking advocates that business, and by extension business innovation, does not and should not occur within a vacuum, as a consequence of the wider societal roles and responsibilities incumbent upon business leaders. This report demonstrates that it is not just innovation—as an end—that should matter: the direction of innovation in leading society toward broader goals of inclusion and sustainability is imperative for a more equitable and prosperous society.
- **Public policy makers, implementers and advisors:** The South African Department of Science and Innovation, which commissioned this survey, shares a broader national commitment to evidence-informed policy. Equally, the National Advisory Council on Innovation (NACI) has an express mandate to provide regular advice, as part of its role in monitoring and evaluating the performance of the national system of innovation (NSI), while other NSI actors, such as the Technology Innovation Agency (TIA) or the Council for Scientific and Industrial Research (CSIR), work to bridge the innovation chasm between the development of new ideas and their wider adoption. This report provides vital new data and analysis to inform implementation.
- **Industry support actors, trade unions and civil society advocates:** The ‘business innovation issue’ is compelling and urgent. Whether from the perspective of ascertaining the profound effects of radical or disruptive innovation on the structure of industries, to the more incremental changes within businesses that may impact employment (positively or negatively), the survey results provide important insights to inform new mobilisation activities.

<sup>1</sup> <https://rdisurveys.hsrc.ac.za/>

- **Community business forums, formal and informal:** Community business forums can be formal structures, within communities, or less formal networks, between businesses within clusters, digital or spatial agglomerations. Survey results can assist these forums to ignite conversations about innovation, using an evidence-informed approach.
- **Public research leaders and technology transfer champions:** Publicly-financed research institutions, including universities and science councils, are essential role-players within South Africa's NSI. They perform combinations of basic and applied R&D, train personnel, and fulfill important duties within their scholarly and spatial communities. The survey results should inform their work, at the level of institutional planning and the implementation of industry linkages.



# WHAT THE RESULTS COVER

## SURVEY REFERENCE PERIOD:



## BUSINESS SECTORS:\*

### INDUSTRY



Mining & Quarrying



Manufacturing



Electricity, Gas & Water Supply

### SERVICES



Wholesale & Retail Trade



Transport, Storage & Communication



Financial Intermediation



Computer & Related Activities



Research & Development



Architectural & Engineering Activities



Technical Testing & Analysis

## TOTAL NUMBER OF BUSINESSES:



**57 025**

INDUSTRY: 21 018 | SERVICES: 36 007

## TOTAL NUMBER OF PEOPLE EMPLOYED:



**6 934 744**

INDUSTRY: 2 857 761 | SERVICES: 4 076 983

## BUSINESS SIZES:



LARGE



MEDIUM



SMALL



VERY SMALL

## TYPES OF INNOVATION:



PRODUCT  
PROCESS

## NOVELTY LEVELS:



NEW TO THE FIRM  
NEW TO THE MARKET  
NEW TO THE WORLD

\* Eight sector-specific briefs accompany this report, providing more detailed insight into the innovation trends within each sector. Due to insufficient numbers of observations within three subsectors – research and development, architectural and engineering activities, and technical testing and analysis – these are grouped together for the purposes of analysis in both this report and the sector-specific reports.

# DEFINITIONS

The key definitions related to innovation used in the BIS 2019-2021 come from the Oslo Manual 2018 of the Organisation for Economic Co-operation and Development (OECD).<sup>2</sup> This edition updated definitions contained in the previous edition (2005). The major change for the definition of business innovation has been the reduction in the complexity of the previous definition of four types of innovations (product, process, organisational and marketing), to two main types: product innovations and business process innovations (see Table 1 on page 13 for a detailed comparison). The revised definition also reduces the ambiguity of the requirement for a “significant” change by comparing both new and improved innovations to the firm’s existing products or business processes.

A **business innovation** is a new or improved product or business process (or combination thereof) that differs significantly from the firm’s previous products or business processes and that has been introduced to the market (product) or brought into use by the firm (process).

- A **product** is a good or service (or combination thereof).
- A **process** includes all core activities by the firm to produce products and all ancillary or supporting activities.

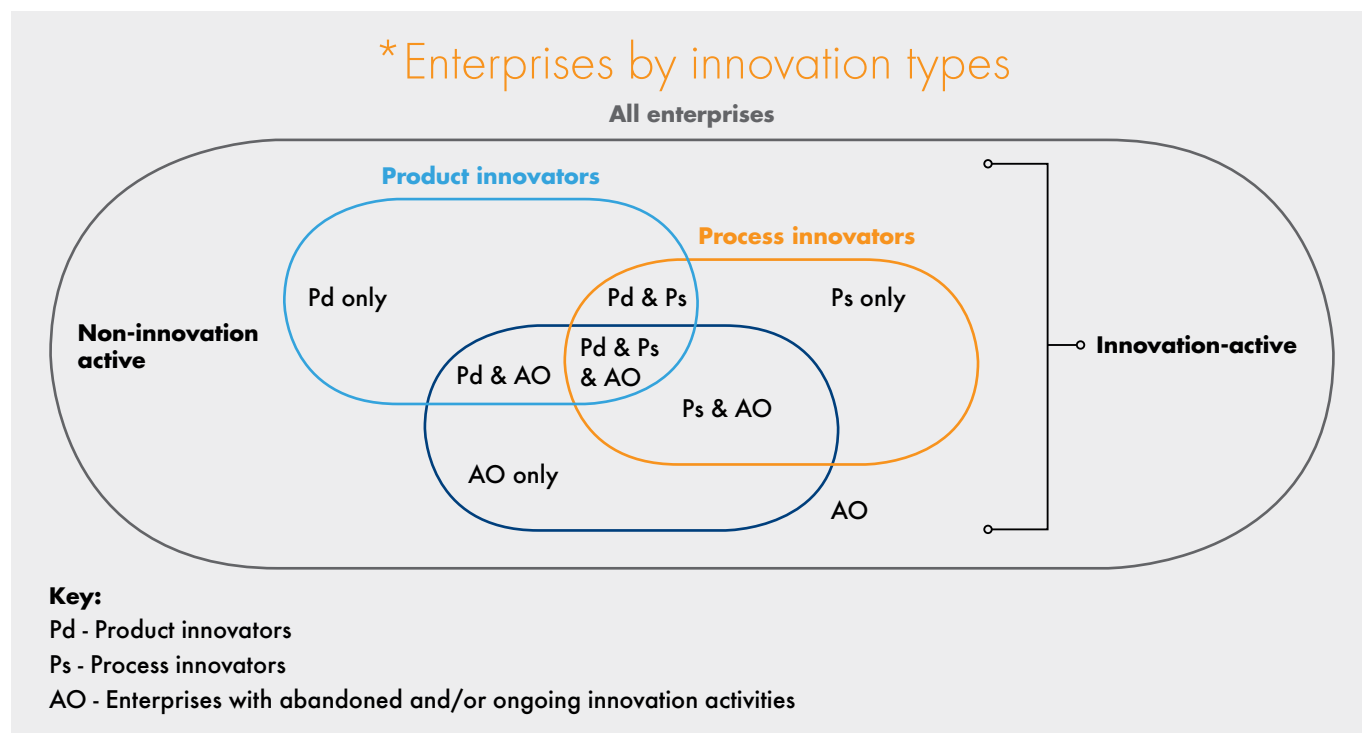
**Innovation activities** include all developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation for the firm. Innovation activities can result in an innovation, be ongoing, postponed or abandoned.

An **innovative firm (or innovator)** reports one or more innovations within the observation period. This applies equally to a firm that is individually or jointly responsible for an innovation.

It is important to note that innovation is an outcome of various combinations of activity, but not all innovation activity results in an innovation.

An **innovation-active firm** is engaged at some time during the observation period in one or more activities to develop or implement new or improved products or business processes for an intended use. Both innovative and non-innovative firms can be innovation-active during an observation period. A firm that had only ongoing or abandoned activities is still innovation-active.\*

A **non-innovation active firm** is a firm without any innovation activities.



<sup>2</sup> OECD/Eurostat (2018). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities. (OECD Publishing: Paris/Eurostat: Luxembourg) <https://doi.org/10.1787/9789264304604-en>

# EXECUTIVE SUMMARY

## The big picture

**#1** Less than two-thirds of South African businesses were innovation-active during 2019-2021 and a significant proportion had innovation activities that did not result in product or process innovations.

- Only 61.8% of South African businesses tried to innovate and 17% of these businesses did not have innovations by the end of 2021.

**#2** The computer sector had the highest proportions of businesses with innovation activities and innovations.

**#3** Businesses reported a range of effects from the Covid-19 pandemic on their innovation activities, requiring them to adjust their innovation strategies to cope in a difficult business environment.

- Key strategies innovation-active businesses used to mitigate Covid-19 impacts included cutting expenditure, reprioritising budgets, and delaying or abandoning innovation activities.

## Comparing innovation-active with non-innovation active businesses

**#4** Innovation-active and non-innovation active businesses did not differ considerably by sector and size class but there were some differences in geographic location.

- Most of South Africa's innovation-active businesses were in Gauteng (55% of innovation-active businesses) and the Western Cape (30% of innovation-active businesses).

**#5** Innovation-active businesses had more skilled labour, had greater access to external knowledge, and were more connected to global markets compared to non-innovation active businesses.

## Businesses with innovation activities

**#6** Building human capabilities was an important component of innovation activity.

- Training was the most frequently reported innovation activity (by 47% of innovation-active businesses), followed by software and database activities (29% of innovation-active businesses) and marketing and brand equity activities (25% of innovation-active businesses).



**#7** Set against South Africa's current working-age demographic profile statistics<sup>3</sup>, the demographic profile of employees involved in innovation activities did not reflect an inclusive working environment in innovation-active businesses.

- Only 38 in 100 workers involved in innovation activities were female, 62 in 100 were African, and 17 in 100 were white. 70 in 100 were aged 35 years or younger.

**#8** Collaboration and the nature of innovation activities were associated with different patterns of innovation outcomes.

- Businesses that did not carry out formal innovation activities (R&D or patenting), and did not collaborate with other institutions, were most likely to have abandoned or not completed their innovation activities in 2019-2021.

**#9** The most important sources of information for innovation-active firms were other businesses that were clients or customers.

## Businesses with innovations

**#10** Innovative businesses mainly had a combination of both product and process innovations.

**#11** Product innovations were more likely to be incremental, and new to the firm only than new to the market or world.

- More businesses with product innovations reported improving existing goods and services rather than making new goods and services available to their customers.
- 10% of product innovators and 6% of process innovators had new to the world innovations. By contrast, 51% and 63% of these innovators had new to the firm only innovations, respectively.

**#12** Innovators developed most innovations on their own.

- Only 28% of product innovators and 17% of process innovators developed their innovations by working with other businesses or institutions.

**#13** Businesses with more novel product innovations and operating in international markets were more likely to fall into the technical sectors.<sup>4</sup>

<sup>3</sup> Statistics South Africa (2023). Census 2022 Statistical Release P0301.4. Available at: [https://census.statssa.gov.za/assets/documents/2022/P03014\\_Census\\_2022\\_Statistical\\_Release.pdf](https://census.statssa.gov.za/assets/documents/2022/P03014_Census_2022_Statistical_Release.pdf). Last accessed 21 February 2024. Also: Statista (2024). Population of working age in South Africa from Q1 2019 to Q1 2020, by population group (in 1,000s). Available at: <https://www.statista.com/statistics/1129144/population-of-working-age-by-population-group-in-south-africa/>. Last accessed 21 February 2024.

<sup>4</sup> The technical subsectors include computer and related activities, R&D, technical testing and analysis, and architectural and engineering activities.

## #14 Businesses with more novel product innovations and operating in international markets were more likely to be medium sized.

- 58% of businesses that introduced new to market product innovations and operated in international markets had 50-249 employees.

## #15 Businesses with more in-house capabilities and greater levels of product innovation novelty had higher turnover.

- 18% of businesses that introduced new to market product innovations and operated in international markets were in the largest turnover size class.

## #16 Businesses that introduced new to market product innovations and operated in international markets faced less competition.

- On the other hand, 41% of businesses that operated in domestic markets only and modified already existing innovations from elsewhere had more than 50 competitors.

## #17 Businesses that were more connected to global markets, and had more novel product innovations, had more intellectual property rights.

## #18 80% of all innovative businesses used or developed technologies classified as Internet of Things.

## #19 The most successful innovation outcomes were quality rather than cost related.

- Improved working conditions, improved quality of goods and services, and improved quality of life and well-being were among the most important outcomes of innovations.

## #20 Cost- and market-related factors were the most important barriers to business innovation among innovative businesses.

- 36% of all innovative businesses considered high costs to innovation as being a highly important barrier.

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# INTRODUCTION

## Why this survey, now

South Africa's National Development Plan identifies science, technology and innovation (STI) as primary drivers of economic growth, job creation and socio-economic transformation. In turn, developing an enabling environment for innovation, through a whole-of-society approach that aims to overcome the major structural limitations within the South African economy, is a cornerstone of current South African science and innovation policy and planning, expressed in the White Paper on Science, Technology and Innovation (2019) and its accompanying Decadal Plan 2022-2032.<sup>5</sup> Here, innovation is understood as the essential catalyst to increase individual business competitiveness, promote new technology-based firms, modernise and revitalise industries, and chart new growth paths.<sup>6</sup>

South African businesses are key players in the development of STI through their own investments as well as their collaboration with other businesses, government, academia and civil society. A thriving, innovative business sector is vital for South Africa's future prosperity and its resilience in the face of significant domestic and global challenges. In an economic context characterised by persistently low growth, South African businesses continue to face a myriad of dynamic opportunities and challenges. These include, on the one hand, high international demand for raw commodities, rapidly accelerating digitalisation and platform-driven business models, the transition to renewable energy sources and technologies, and the meteoric rise of advanced technologies including Internet of Things and generative AI.

On the other hand, weakened state-owned infrastructure, social unrest within communities, and ongoing load shedding as demand for electricity exceeds supply, dramatically impacted productivity, are a distinct feature of doing business in South Africa. The conditions facing South African business in the three years, 2019-2021, were also profoundly shaped by the Covid-19 pandemic, and the differential, localised short and longer-term effects of pandemic-related regulation on business models and strategy choices.

This report shares the results of the South African Business Innovation Survey (BIS), 2019-2021, conducted by the Centre for Science, Technology and Innovation Indicators on behalf of the Department of Science and Innovation. It includes a high-level summary of South Africa's business innovation and innovation activity rate for 2019-2021, including Covid-19 responses; a profiling and comparison of innovation-active versus non-innovation active South African businesses; an examination of innovation activity types and the people involved in those activities; a characterisation of businesses that were trying to innovate, according to their activity types and collaboration practices; and a characterisation of businesses that reported innovation. The survey updated data covering the 2014-2016 period, and complements the annual South African R&D Survey, covering the formal business sector.<sup>7</sup>

## How does this round of the BIS differ from previous rounds?

In this round of the survey, the methodology and questionnaire were updated to reflect the guidelines of the most recent Oslo Manual 2018, published by the OECD. This included an updated definition of innovation, a new way of classifying process innovations (Table 1), as well as the inclusion of new focus areas of research, such as the external environment affecting innovation (in particular, competition) and the 4IR. The questionnaire was further tailored to the South African context with a greater focus on inclusivity, to measure the demographic makeup of personnel involved in innovation activities, the socio-economic outcomes of innovation, and the change in skilled vs. unskilled employment over the survey reference period. Finally, a section on Covid-19 assessed the impact of the pandemic on business innovation.

<sup>5</sup> Department of Science and Technology (2019). White Paper on Science, Technology and Innovation, Chapter 4. See also Department of Science and Innovation (DSI) (2022). Science, Technology and Innovation Decadal Plan 2022-2032, Chapter 6

<sup>6</sup> See Decadal Plan, p. 75.

<sup>7</sup> <https://rdisurveys.hsrc.ac.za/>

Table 1 compares the types of product and business process innovations used in the fourth edition (2018) Oslo Manual (which the BIS 2019-2021 is based on) with the definitions used in the third edition (2005) Oslo Manual (which the previous survey rounds were based on).

Table 1: Comparing types of innovation in the 2018 (OM4) and 2005 (OM3) Oslo Manual editions

OM3	OM3 subcomponents	OM4	Differences
Product	Goods Services	Goods Services Goods and services include knowledge-capturing products, and combinations thereof. Includes the design characteristics of goods and services.	Inclusion of product design characteristics, which were included under marketing innovation in OM3.
Process	Production Delivery and logistics Ancillary services, including purchasing, accounting and ICT services	Production Distribution and logistics Information and communication systems	Ancillary services in OM3 moved to administration and management.
Organisational	Business practices Workplace organisation (distribution of responsibilities) External relations	Administration and management	Organisational innovations in OM3 are under administration and management subcategories a, b and f in OM4. Ancillary services in administration and management (subcategories c, d and e) were included under process innovation in OM3.
Marketing	Design of products Product placement and packaging Product promotion Pricing	Marketing, sales and after-sales support	Marketing innovations in OM3 are included under subcategories a and b in OM4. Innovations in sales, after-sales services, and other customer support functions were not included in OM3. Innovations related to product design are included under product innovation in this manual.
N/A	N/A	Product and business process development	Not explicitly considered in OM3, most likely reported as Process innovation.

Source: Oslo Manual 2018

## A different approach to analysing the data

This report improves on traditional ways of presenting South African innovation data that use simple binary indicators (such as the proportion of innovation-active vs. non-innovation active firms) by incorporating new composite indicators, drawn from elsewhere in the developed and developing world. These provide deeper insight into the different patterns of innovation in the business sector by classifying firms according to their **mode of innovation** – in terms of both innovation inputs and innovation outputs (Figure 1).

For a granular understanding of the innovation patterns unearthed through the data analysis, different types of businesses are classified at different stages of the innovation process: the input side (characterised by innovation activity) and the output side (characterised by innovations that have been implemented).

On the input side, **innovation-active firms** are grouped according to a combination of two elements of the business's innovation activity:

1. The **types of innovation activities** the business engages in. These can include either 'formal' types of innovation activity – including R&D and patenting activity – referred to as knowledge-driven innovation, or activities that are less knowledge-intensive such as training, design work, or marketing activities, referred to as activity-driven innovation.
2. Whether or not the business **collaborates** with other businesses or institutions in their innovation projects.

The combination of these elements results in four mutually exclusive groups of firms: knowledge-driven collaborators; knowledge-driven non-collaborators; activity-driven collaborators; activity-driven non-collaborators.

On the output side, **product innovators** are grouped according to three business traits:

1. **Market reach**: whether the business operates in international markets or domestic markets only.
2. **Novelty** of their product innovations.
3. Whether any of their innovations (including both product and process) were developed **in-house or adopted** from other businesses or organisations, which reflects business capabilities. Firms that adopted their innovations are split into two groups according to whether or not they were part of an enterprise group. Adopters that were part of a group had more access to knowledge and market reach and therefore differ from adopters not part of a group, in terms of their business capabilities.

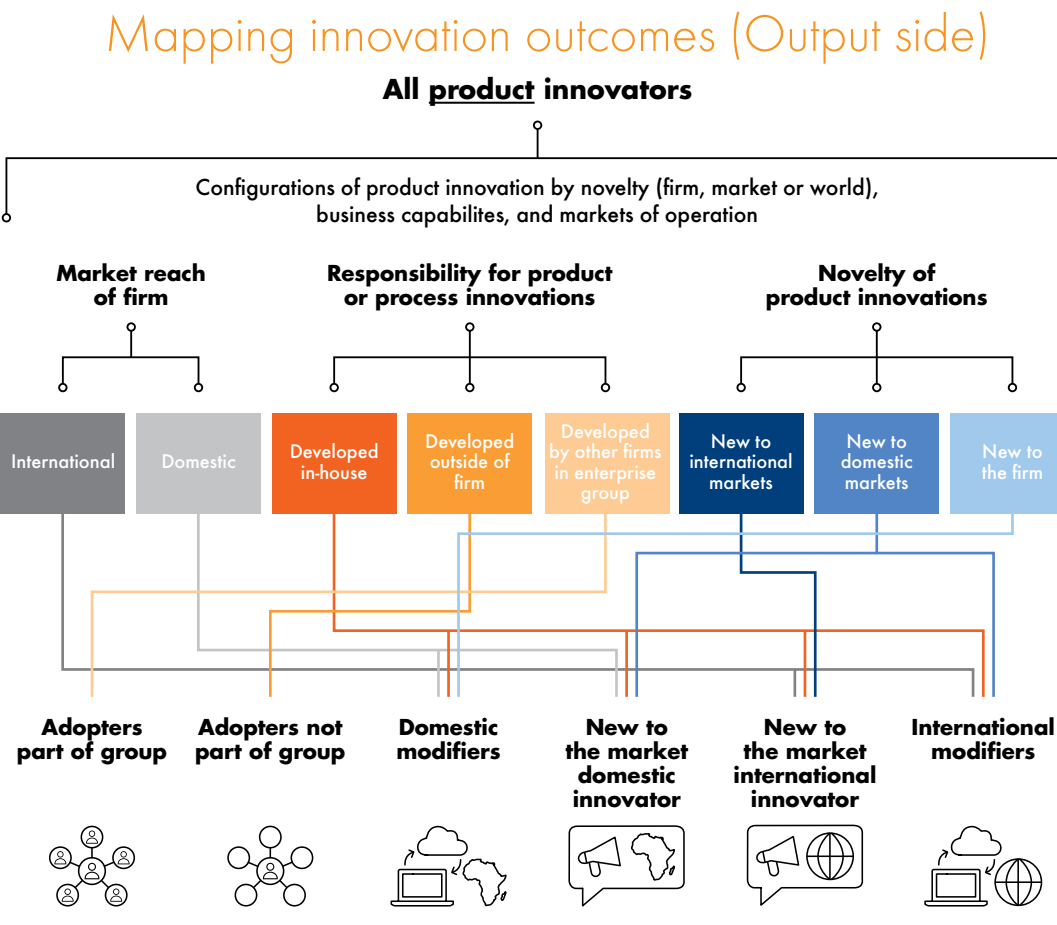
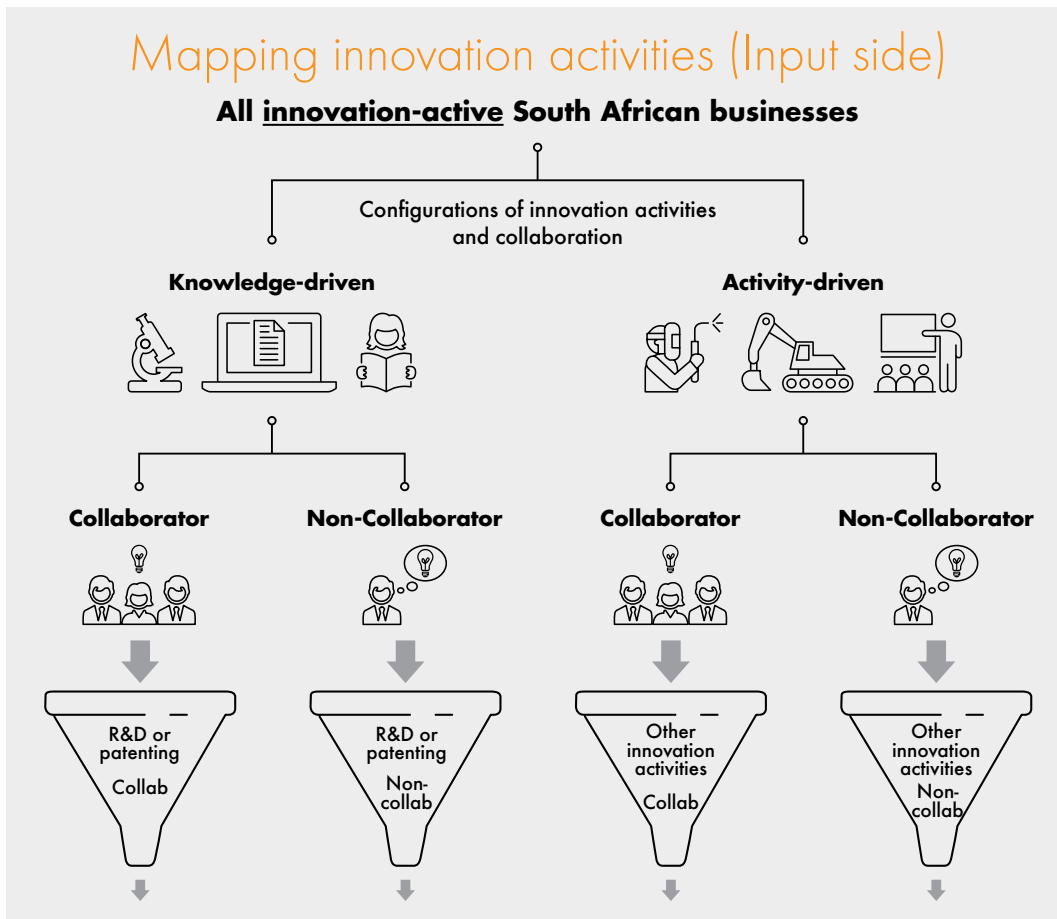
The combination of these elements results in six mutually exclusive groups (modes) of firms: new to market international innovators; new to market domestic innovators; international modifiers; domestic modifiers; adopters; adopters part of a group.

These multidimensional groupings of businesses, on both the input and output sides, are more descriptive and insightful compared to binary groupings. The application of this classification scheme to the data enables the monitoring and review of innovation trends in a way that provides a more complex view of the specific patterns of businesses' innovation activities and outcomes. Principally, this helps to understand the underlying capabilities and capacities of businesses to absorb and combine new knowledge and deploy skills and resources to address business problems. With this insight, policy instruments can be designed and deployed in far more targeted ways than 'blunt' instruments. This is consistent with current South African innovation policy and planning, to forge an innovation compact, which, among other goals, aims to improve the capabilities of government to support innovation.<sup>8</sup>

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<sup>8</sup> Decadal Plan, p. 93.

Figure 1: Patterns of innovation in South African businesses



Sections in this report, at a glance

**Sections 3&4**  
(features of innovation-active businesses)

**Sections 1&2**  
(high-level results including rates of innovation activity and innovation, and differences between innovative and non-innovative businesses)

**Sections 5&6**  
(features of businesses that reported innovation)



The report is arranged in six sections:

1. **Section 1** provides an overview of South Africa's business innovation and innovation-active rates for 2019-2021, at a high level and by sector. The effects of Covid-19 are also presented.
2. **Section 2** explores the difference between innovation-active and non-innovation active South African businesses.
3. **Section 3 and 4** characterise businesses that engaged in innovative activities focusing on types of innovation activities, employee demographics, collaborations, information sources, and showcasing their input modes of innovation.
4. **Sections 5 and 6** characterise businesses that reported innovation, focusing on their types of innovations, the novelty of their innovations, and showcasing their output mode(s) of innovation.

To enable readers to situate the survey's findings in a broader context, each major topic addressed in the sections is linked to current South African innovation policy and planning concerns. This approach is used to ignite ideas and conversations among stakeholders around key challenges and opportunities for businesses within the context of the national system of innovation.



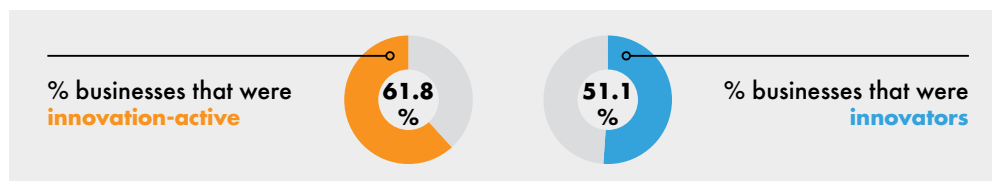
# 1. THE BIG PICTURE OF SOUTH AFRICAN BUSINESS INNOVATION

Keeping track of innovation indicators is vital for effective innovation policy design and planning. It also allows for international benchmarking against the innovation performance of other countries employing the same OECD methodologies to collect and analyse innovation data.<sup>9</sup> Key indicators include: (1) the innovation-active rate, and (2) the innovation rate, split by type of innovation i.e. product and process. This section reports these high-level indicators for the period 2019-2021 and provides a breakdown by sector. Data on the impacts of Covid-19 on innovation activities during the reference period are also presented, to provide important contextual information to consider while interpreting these high-level indicators as well as the analysis presented in the rest of this report.

## # 1 Less than two-thirds of South African businesses were innovation-active during 2019-2021 and a significant proportion had innovation activities that did not result in product or process innovations.

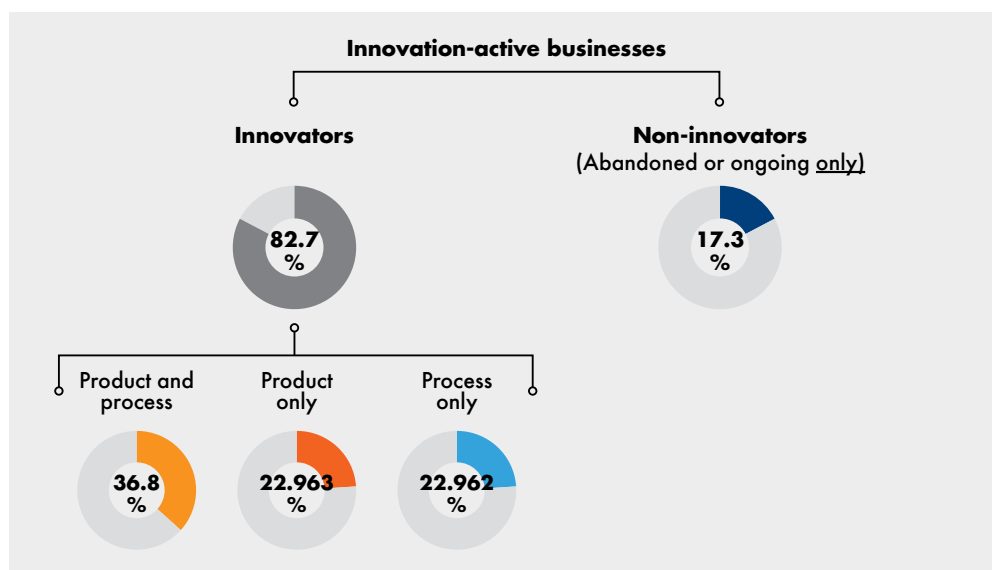
More than 60% (61.8%) of South African businesses were innovation-active in that they took some scientific, technological, organisational, financial, or commercial steps towards the implementation of an innovation (Figure 2). Of the innovation-active businesses, 37% introduced or implemented both product and process innovations, 23% introduced product innovations only and 23% implemented process innovations only (Figure 3). The remaining 17% of innovation-active firms had abandoned and/or ongoing innovation activities only.

Figure 2: High-level breakdown of innovation-active and innovation rates, 2019-2021



Source: Appendix table A1.1

Figure 3: Breakdown of innovation-active businesses, 2019-2021



Source: Appendix table A1.1

### Box 1: South African business innovation trends, 2002- 2021

The survey's historic data sets on innovation rates are explored in a [fact sheet](#), which is an accompaniment to this report. The fact sheet covers rates of innovation activities; top innovation activity types; types of innovation in industry and services; and turnover contributions of innovation.



<sup>9</sup> OECD (2024). Business innovation statistics and indicators. Available at: <https://www.oecd.org/sti/inno/inno-stats.htm>. Last accessed: 21 February 2024.

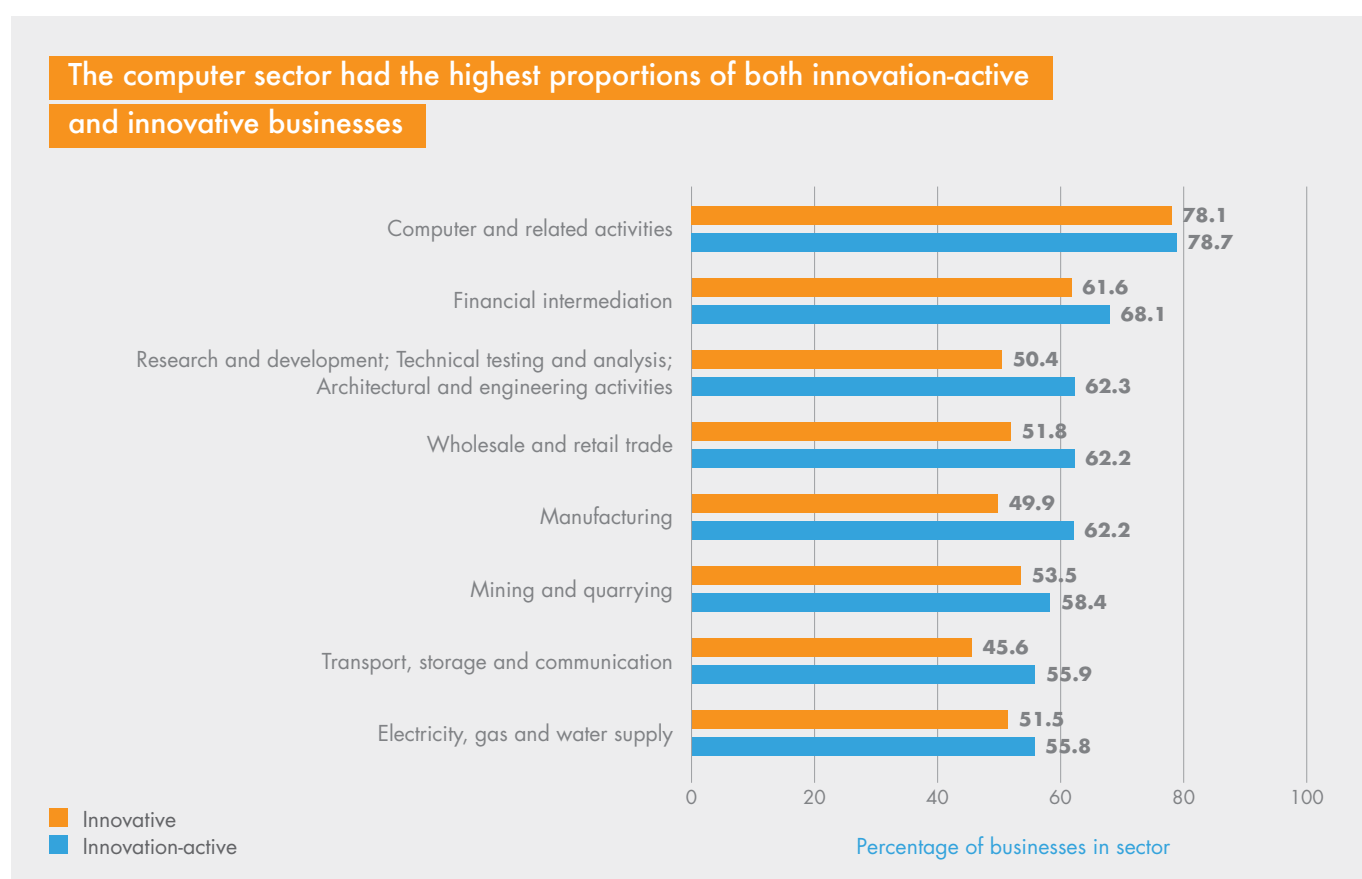
## #2 The computer sector had the highest proportions of businesses with innovation activities and innovations.

The DSI's current policy and planning approach is oriented to innovation within important cross-cutting sectors, such as energy and health. Equally, modernising key sectors such as mining and manufacturing, and promoting new sources of growth, particularly within the digital and circular economies, are important priorities.

The South African formal business sector comprises economic sectors defined in terms of established industrial taxonomies and supported by specific governmental line departments. While some businesses may work across one or more of these sectors, examining innovation trends within specific high-level sectors yields insights into those activities or types of innovation that are most predominant. In turn, more useful advice to policy or business actors can be generated.

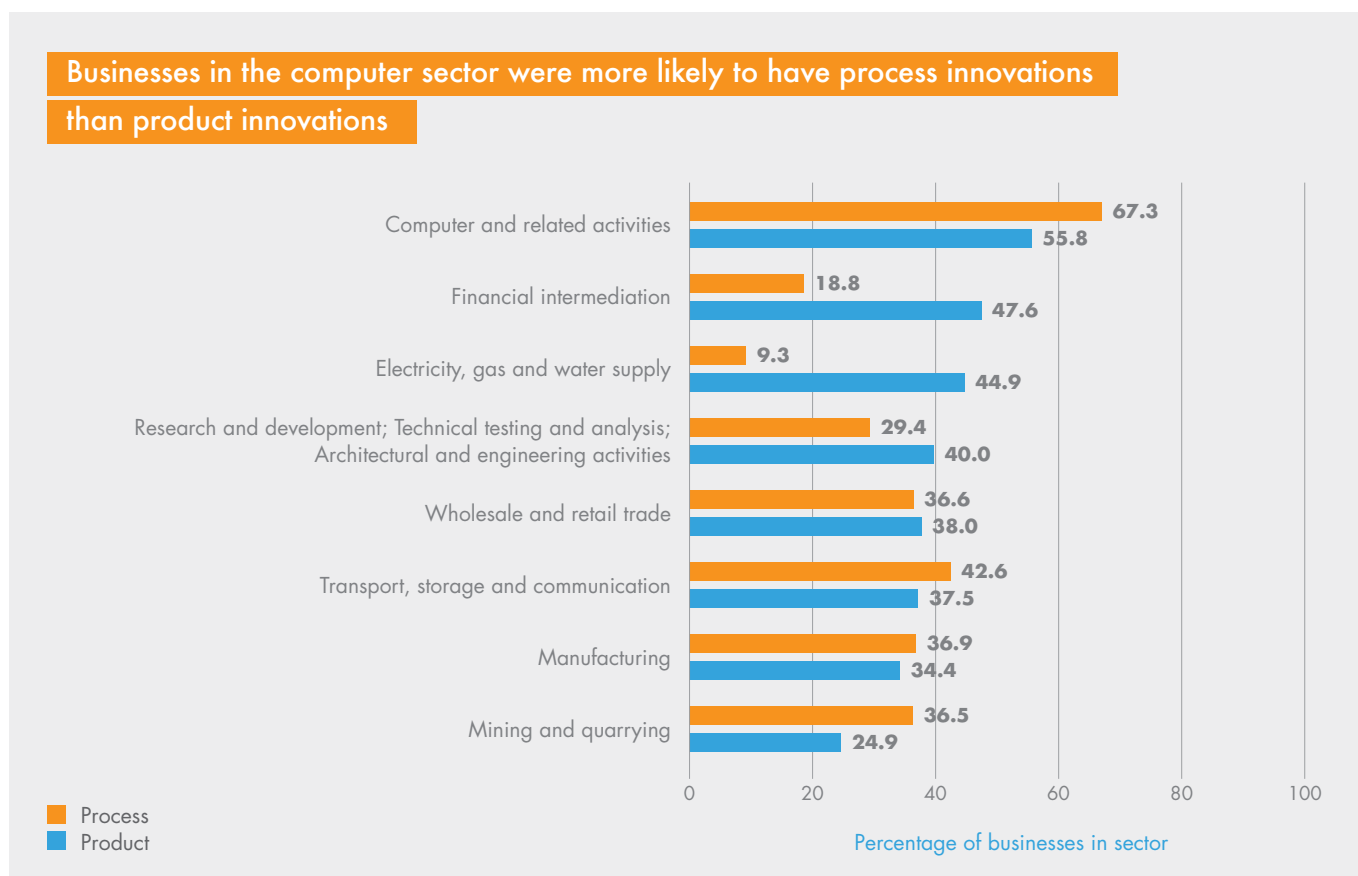
During the study period, the computer sector had the highest proportions (almost 80%) of both innovation-active and innovative businesses, reflecting the prominence of the 4IR as a driver of digital transformation (Figure 4). These businesses were more likely to have process innovations (67%) than product innovations (56%) (Figure 5). Both the financial intermediation and electricity, gas and water supply sectors had notably higher proportions of product innovations compared to process innovations.

Figure 4: Innovation activity and innovation rates among businesses, 2019-2021



Source: Appendix table A1.2

Figure 5: Product and process innovation rates of innovation-active businesses across sectors, 2019-2021



Source: Appendix table A1.2. See also sectoral briefs.

### #3 Businesses reported a range of effects from the Covid-19 pandemic on their innovation activities, requiring them to adjust their innovation strategies to cope in a difficult business environment.

The capacity of many South African businesses to “use scientific advances to meet new challenges and build resilience in a fragile world”<sup>10</sup> was severely tested with the impact of Covid-19 lockdown regulations. For businesses providing non-essential services in particular, almost all areas of business operations, from trade and continuity to workforce and IT, were found to have been substantially affected by Covid-19 regulations.<sup>11</sup> How did Covid-19 impact their innovation performance?

Businesses that had a combination of both product and process innovations appeared to be the most affected by the pandemic, because they were engaged in multiple types of innovation activities or projects (Figure 6). They were the most likely to reduce their expenditure on innovation activities or have their innovation activities or projects put on hold, delayed or abandoned due to the Covid-19 pandemic. However, they were also able to reprioritise their existing innovation activities (about 75% of this group) and engage in new innovation activities (about 55% of this group). This suggests that these businesses were able to adapt more easily to the change in business environment brought about by the pandemic.<sup>12</sup>

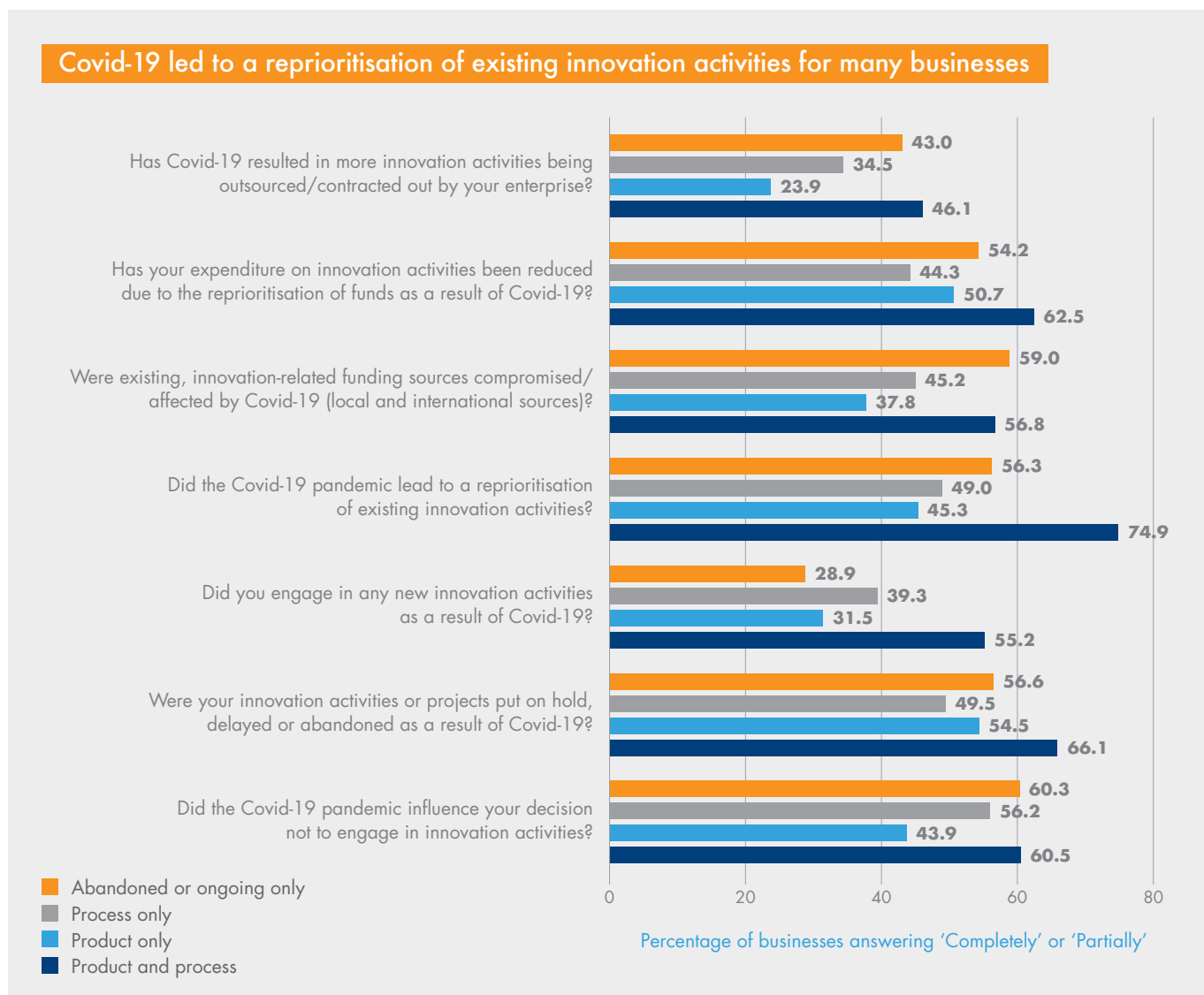
<sup>10</sup> White Paper on Science, Technology and Innovation, p. 14

<sup>11</sup> Statistics South Africa (2020). Business impact survey of the COVID-19 pandemic in South Africa. Available at: <https://www.statssa.gov.za/publications/Report-00-80-01/Report-00-80-01April2020.pdf>. Last accessed: 25 October 2023.

<sup>12</sup> The Decadal Plan is explicit in regard to the issue of future pandemic preparedness: “Covid-19 demonstrated that South Africa (like the rest of the world) can no longer depend on a single health system intervention, especially where pandemic preparedness is central.” (p. 45)

The group of innovation-active businesses that did not introduce any innovations during the period were also relatively sensitive to the effect of Covid-19. Almost 60% of this group had their funding sources compromised or affected.

Figure 6: The effects of Covid-19 on the innovation activities of innovation-active businesses, 2019-2021



Source: Appendix table A1.3

The high-level results presented in this section provide a snapshot of the state of innovation in the South African business sector during the period 2019-2021. They also highlight the possible negative effects the Covid-19 pandemic may have had on business innovation performance. The remainder of the report unpacks these general trends by focusing on *where* innovation occurred, *how* innovation occurred, and the patterns and nature of innovation outcomes.

## 2. PROFILING INNOVATION-ACTIVE AND NON-INNOVATION ACTIVE BUSINESSES

An examination of the extent to which innovation-active businesses differ from non-innovation active firms, as well as *how* they differ, provides an understanding of where innovation activity is concentrated in the business sector. This section compares innovation-active and non-innovation active businesses according to several characteristics, including subsector, size, geographic location, human resources (skilled labour), whether the business is part of an enterprise group, and markets of operation. These characteristics reflect the knowledge, competencies, and resources available to the firm, which form part of a firm's innovation-relevant capabilities. These insights can help inform the design of differentiated support mechanisms to incentivise and assist non-innovation active businesses to engage in innovation activities, and to deepen innovation capabilities in businesses that are already trying to innovate.

### #4 Innovation-active and non-innovation active businesses did not differ considerably by sector and size class, but there were some noteworthy differences in geographic location.

Notwithstanding the relative importance of mining, manufacturing and agriculture, South Africa's economy is services driven, with industries such as finance, trade, communication and personal services, contributing 61.2% to domestic output in 2019.<sup>13</sup> Equally, without diminishing the relative importance of SMMEs, large businesses contribute the lion's share of the country's economic output. In the first quarter of 2019 large businesses with 250+ employees generated 62% of business sector turnover, followed by small (29%) and medium-sized (10%) businesses.<sup>14</sup> In 2019-2021, economic activity by formal businesses remained highly concentrated within the country's more wealthy and populous provinces (Gauteng, KwaZulu-Natal, Western Cape). Against this backdrop, South Africa's innovation policy goals explicitly include bridging longstanding spatial divides through, for example, building local and regional innovation systems and reforming existing socio-technical systems for mobility, energy, or healthcare provision, as well as better supporting SMMEs and start-ups.<sup>15</sup> But how much did sector, business size and geography matter for businesses when it came to deciding to undertake innovation activity?

The sectoral and turnover size class distributions were almost identical between innovation-active and non-innovation active businesses (Figure 7 and Figure 8). Innovation-active businesses were slightly more likely to be large, medium or small, while non-innovation active businesses were more likely to be very small. The distributions of firms across employee size classes were also very similar between innovation-active and non-innovation active businesses (Figure 9). A higher proportion of innovation-active businesses were categorised as large (250+ employees) compared to non-innovation active businesses (14% versus 6% respectively).

Innovation-active and non-innovation active businesses looked similar in terms of years of operation, and over half of both groups were established 20 or more years prior to the survey (Figure 10). Innovation-active businesses were slightly younger, however, with a higher percentage falling within the 0-9 years group (20% of innovation-active businesses versus 14% of non-innovation active businesses). Younger businesses may still be establishing themselves and therefore have more need and drive to innovate. In addition, they may be more agile in implementing change compared to older businesses if they are less affected by organisational inertia and have lower adjustment and sunk costs.<sup>16</sup>

Innovation-active businesses were more likely to be in Gauteng or the Western Cape compared to non-innovation active businesses (Figure 11). Over 50% of innovation-active businesses were located in Gauteng (compared to less than 40% of non-innovation active businesses) while 30% of innovation-active businesses were located in the Western Cape (compared to less than 20% of

<sup>13</sup> Statistics South Africa (2020). Gross domestic product: Fourth quarter 2019. Statistical Release P0441. Available at: <https://www.statssa.gov.za/publications/P0441/P04414thQuarter2019.pdf>. Last accessed: 25 October 2023.

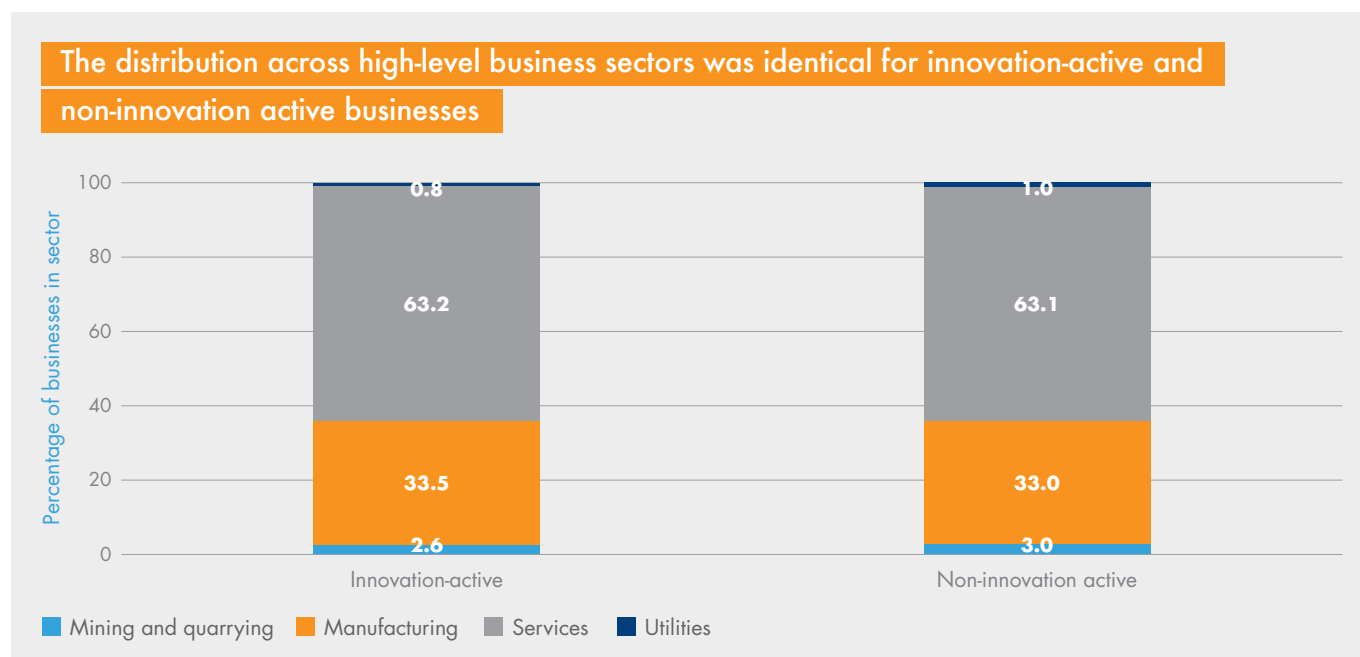
<sup>14</sup> Statistics South Africa (2019). How large is the small business footprint? Available at: <https://www.statssa.gov.za/?p=12264>. Last accessed: 25 October 2023.

<sup>15</sup> White Paper on Science, Technology and Innovation, p. 15. See also Section 4.9.

<sup>16</sup> Oslo Manual 2018, p. 105.

non-innovation active businesses).<sup>17</sup> Non-innovation active businesses were more likely to be in KwaZulu-Natal (35%) compared to innovation-active businesses (23%). Lower proportions of all businesses were located in the other provinces but there were some differences in innovation activity: innovation-active businesses were more likely to be in North West and Limpopo, while non-innovation active businesses were more likely to be in the Eastern Cape, Free State and Mpumalanga.

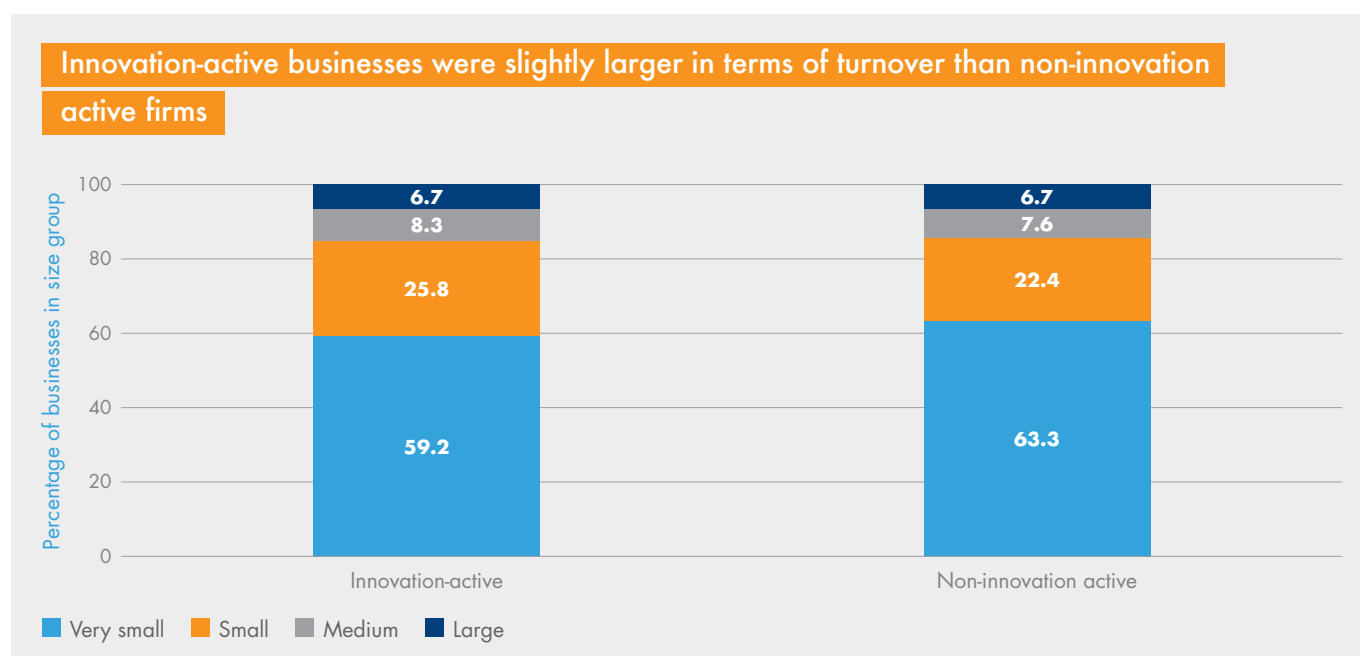
Figure 7: Differences in innovation activity in different sectors, 2019-2021



Source: Appendix table A2.1

Note: Percentages do not add up to 100% due to rounding.

Figure 8: Differences in turnover size class in innovation-active vs non-innovation active businesses, 2019-2021<sup>18</sup>

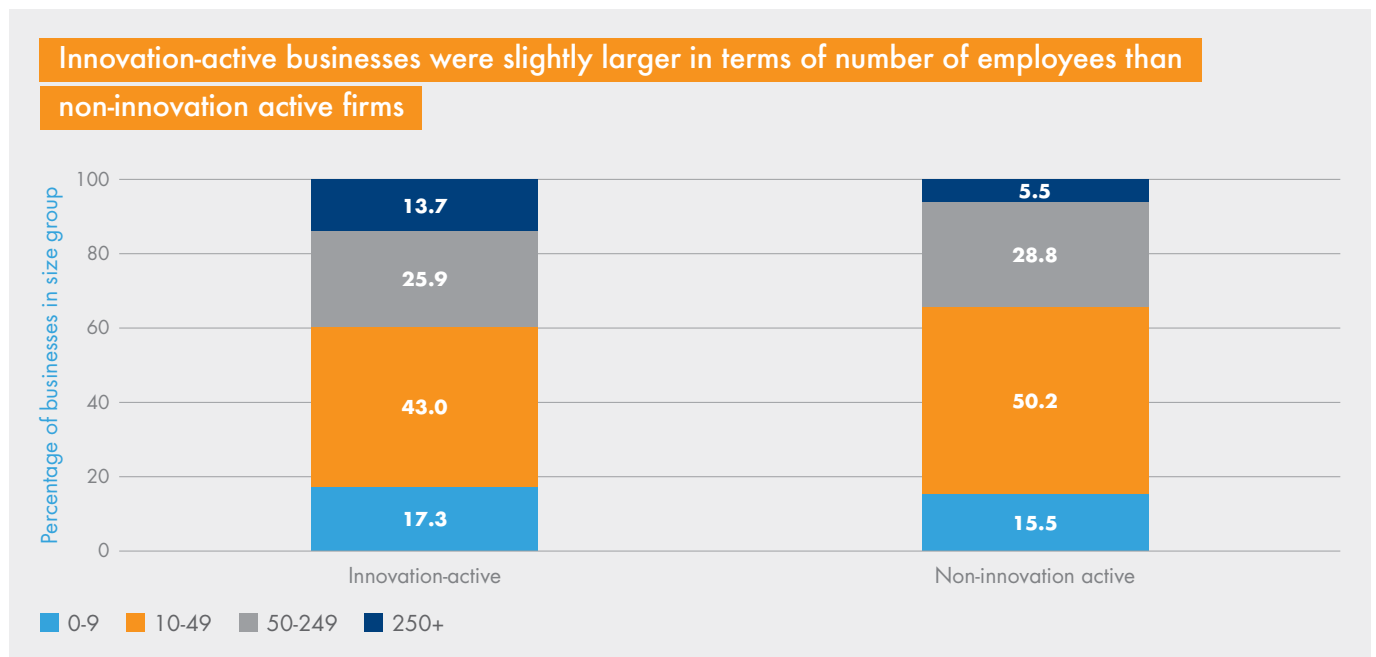


Source: Appendix table A2.2

<sup>17</sup> Note that firms can be located in more than one province, hence the percentages total more than 100% (see Figure 11).

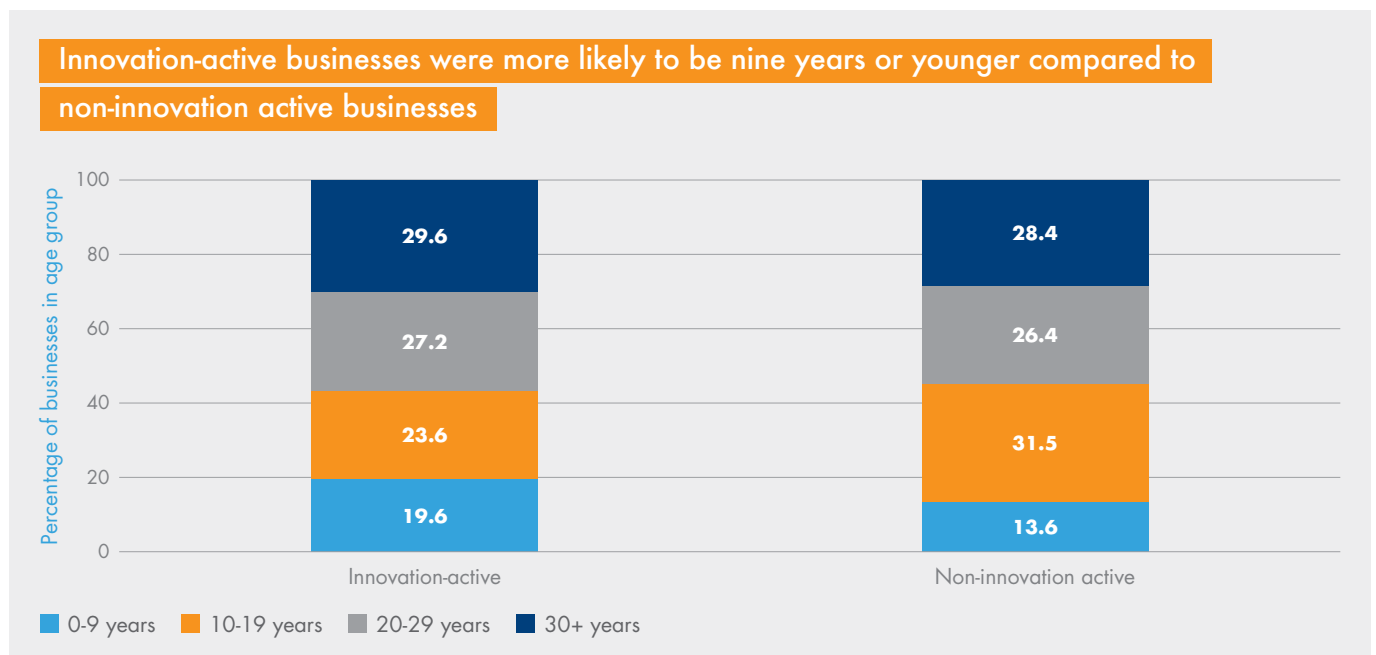
<sup>18</sup> The turnover size classes were created by Statistics South Africa (Stats SA) when pulling the sample from the 2021 national business register. The turnover bands for the four size classes vary by sector (refer to the [Survey Methodology Note](#) for turnover cutoff values by sector).

Figure 9: Numbers of employees in innovation-active vs non-innovation active businesses in 2021



Source: Appendix table A2.3

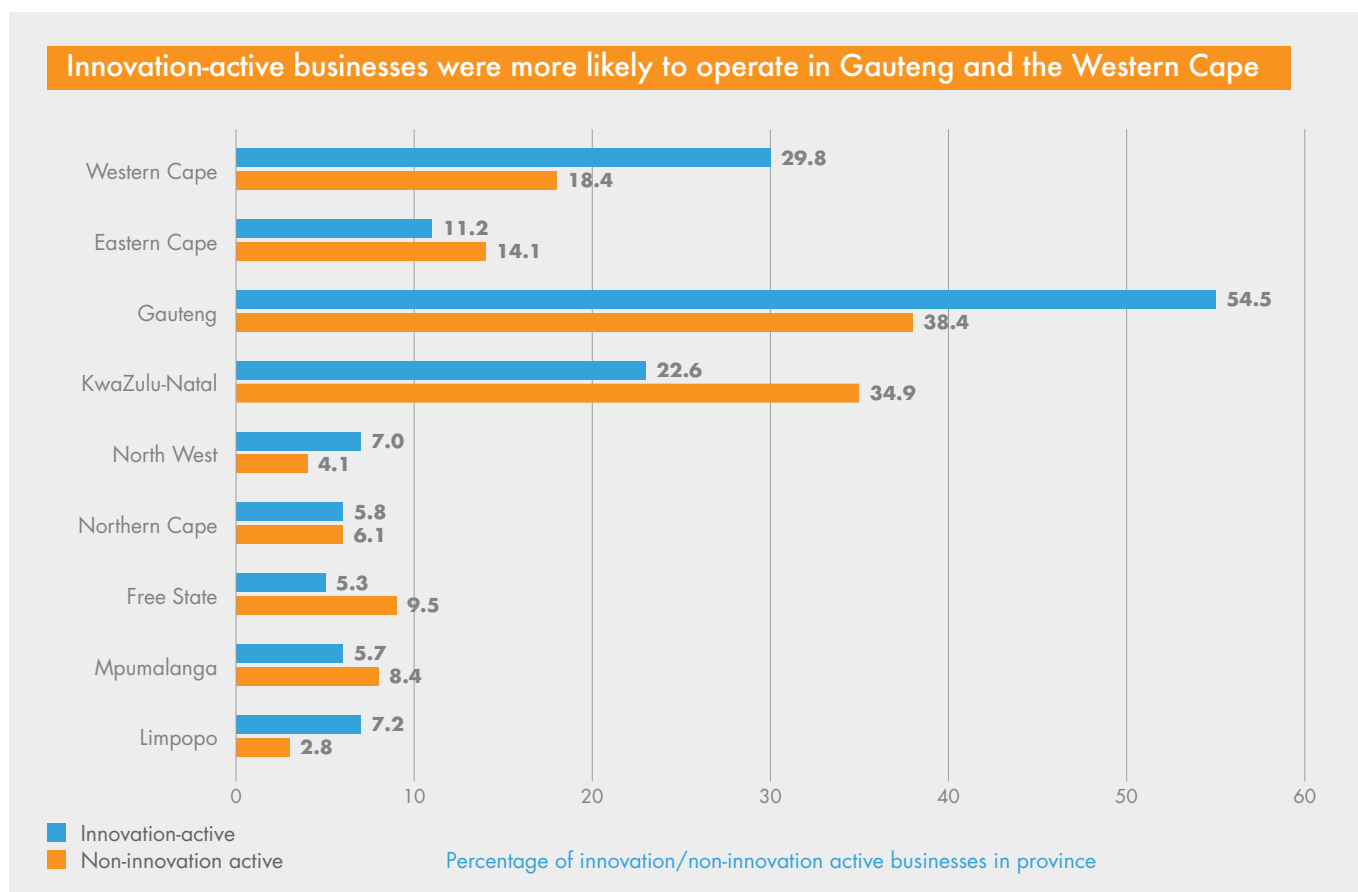
Figure 10: Age of innovation-active vs non-innovation active businesses in 2021



Source: Appendix table A2.4

Note: Percentages do not add up to 100% in non-innovation active category due to rounding.

Figure 11: Provincial location of innovation-active and non-innovation active businesses in 2021



Source: Appendix table A2.5

Note: Percentages do not add up to 100% as businesses could have selected more than one province.

## #5

**Innovation-active businesses had more skilled labour, access to external knowledge, and were more connected to global markets compared to non-innovation active businesses.**

As active role-players in the national system of innovation, South African businesses also operate, to greater or lesser degrees, within what the South African White Paper on Science, Technology and Innovation calls an “increasingly connected and globalised environment”<sup>19</sup> characterised by rapid change. The drivers of global change, the White Paper suggests, include a confluence of social, scientific and technological, environmental, geopolitical and policy factors, that need to be addressed in resilience-building efforts. These efforts include expanding human capabilities, strengthening knowledge networks, and increasing investment, among others.<sup>20</sup> Within these areas, how did South African businesses pursuing innovation compare to those not doing so?

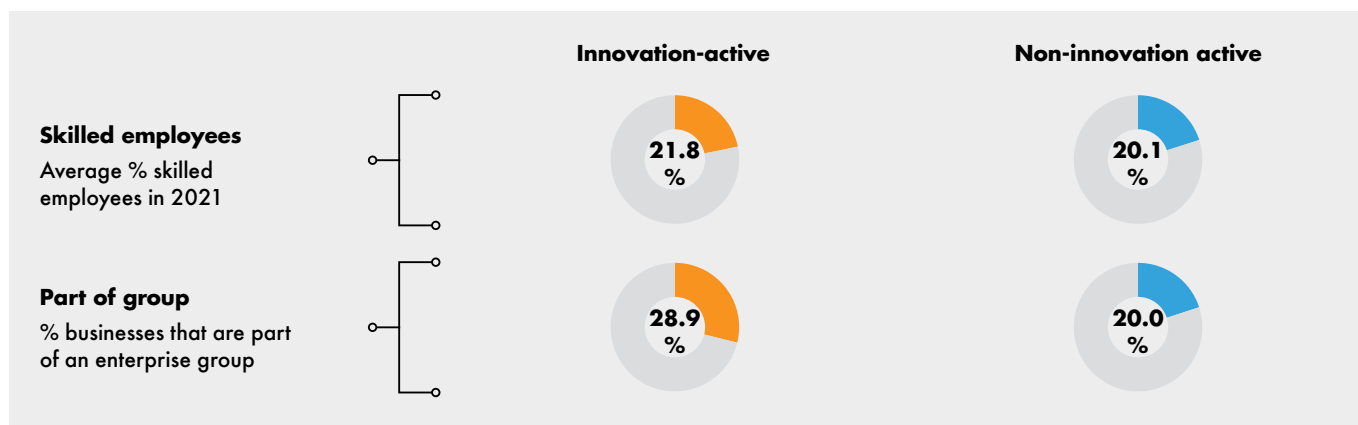
Across all businesses, the average percentage of employees with a degree or diploma (skills ratio) was low at just over 20% (Figure 12). Innovation-active businesses had slightly greater proportions of skilled employees (with an average skills ratio of 21.8%) compared to non-innovation active businesses (with an average skills ratio of 20.1%). Innovation-active businesses were more likely to be part of an enterprise group (29%) compared to non-innovation active businesses (20%). Innovation-active businesses therefore benefitted from knowledge-sharing that can promote innovation activity through increasing capabilities.

<sup>19</sup> White Paper on Science, Technology and Innovation, p. 14

<sup>20</sup> White Paper on Science, Technology and Innovation, pp. 14-18



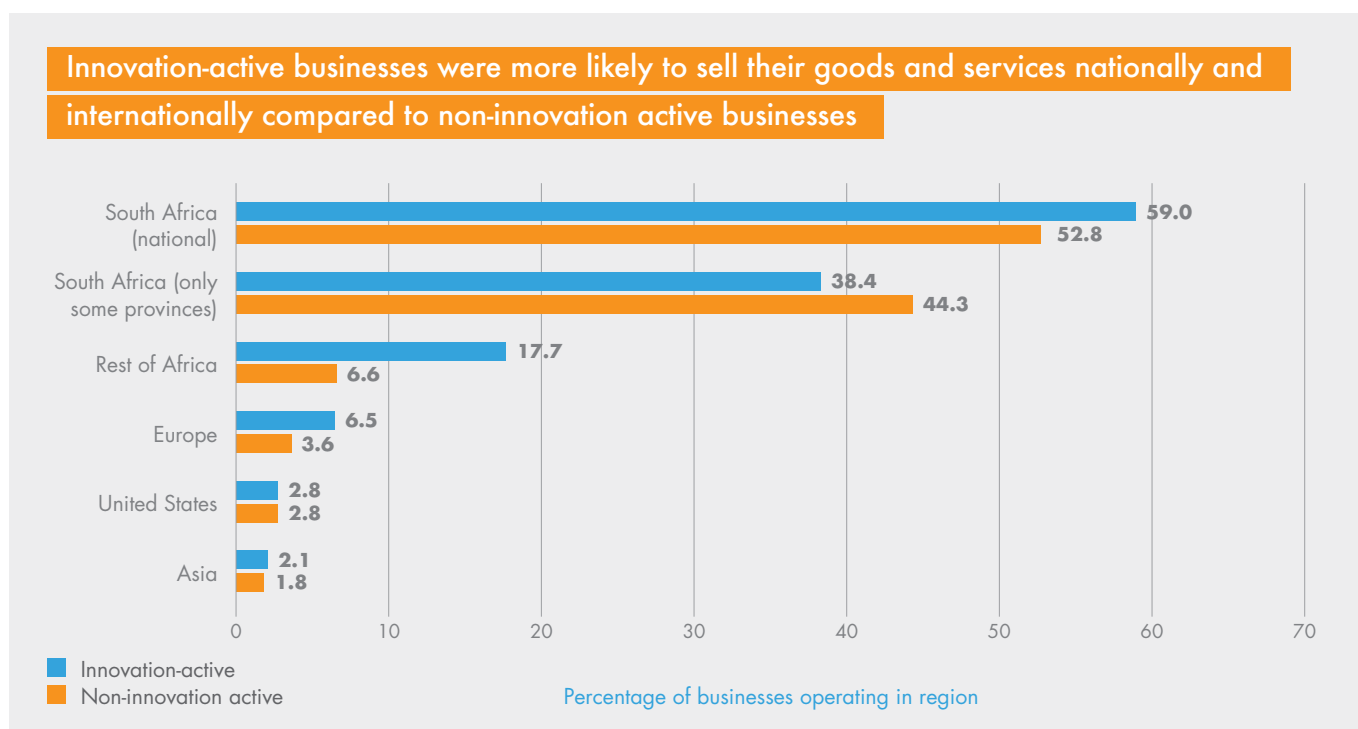
Figure 12: Average percentage of skilled employees in 2021, and businesses part of an enterprise group



Source: Appendix tables A2.6 and A2.7

Innovation-active businesses were more likely to operate at the national level compared to non-innovation active businesses which were more likely to operate in only some provinces of South Africa (Figure 13). Most notably, innovation-active businesses were more than twice as likely to operate in the rest of Africa (18%) than non-innovation active businesses (7%). A greater proportion of innovation-active firms also operated in European markets. Only small portions (2-3%) of both groups operated in the United States and Asian markets. Thus, overall, South African businesses lacked the capacity to participate in global markets, particularly outside of Africa.

Figure 13: Geographic markets of operation of businesses, 2019-2021



Source: Appendix tables A2.8

Note: Percentages do not add up to 100% as businesses could have selected more than one province.

The results in this section show that innovation-active and non-innovation active businesses looked similar in terms of high-level sector, size and age, but there were some notable differences in terms of their provincial location, being part of an enterprise group, and their markets of operation. The next section focuses on innovation-active firms to look at their specific innovation-related activities as well as the demographics of the employees engaged in these activities.

# 3. INNOVATION-ACTIVE BUSINESSES: INNOVATION ACTIVITIES AND EMPLOYEE DEMOGRAPHICS

The previous section profiled innovation-active and non-innovation active businesses, to gain a broad understanding of the types of firms that have the capacity to perform innovation activities. To further refine instruments that aim to support businesses that were already trying to innovate, the analysis in this section distinguishes between the different types of activities they were involved (or not involved) in, and the innovation outcomes that these activities were associated with. Furthermore, to ensure that interventions promote inclusivity in the workplace, and do not deepen existing inequalities, the analysis describes the demographic makeup of employees that were involved in these activities.

## #6 Building human capabilities was an important component of innovation activity.

Increased human capabilities and an expanded knowledge enterprise reflect South Africa's innovation policy intent for the workforce and infrastructure within the national system of innovation.<sup>21</sup> Strengthening skills is a key component to achieve this end, alongside improving the capacity of the system to produce knowledge workers and upgrading research and innovation infrastructure.

The most common innovation activity was employee training, with almost half (47%) of innovation-active businesses having engaged in training activities during the three-year period (Figure 14). The next two most common innovation activities were software development and database activities (29% of innovation-active businesses), and marketing and brand equity activities (25% of innovation-active businesses). The percentage of businesses that engaged in intramural R&D was fairly low at 17%. However, the data also show that expenditure on intramural R&D contributed 26% to total expenditure on innovation activities in 2021. In addition, 77% of businesses rated their innovation-led R&D activities as being highly important to their firm's business strategy (see the [BIS 2019-2021 Aggregated data by sector or size class](#), Tables 7.3 and 7.5).

Businesses with both product and process innovations engaged in more activities than businesses with only product or only process innovations. Businesses with abandoned and ongoing activities only (i.e. did not have any innovations by the end of the period) were least likely to engage in all activity types. Almost half of businesses with process only innovations were involved in employee training activities compared to only a third of product only innovators. Product only innovators were the only group of businesses more likely to engage in software development and database activities than employee training activities.

Given the generally low uptake of innovation activities among innovation-active businesses, from a policy perspective, it is useful to understand the role that public funding plays, or could play, in supporting businesses to engage in a greater variety of innovation activities (see Box 2).

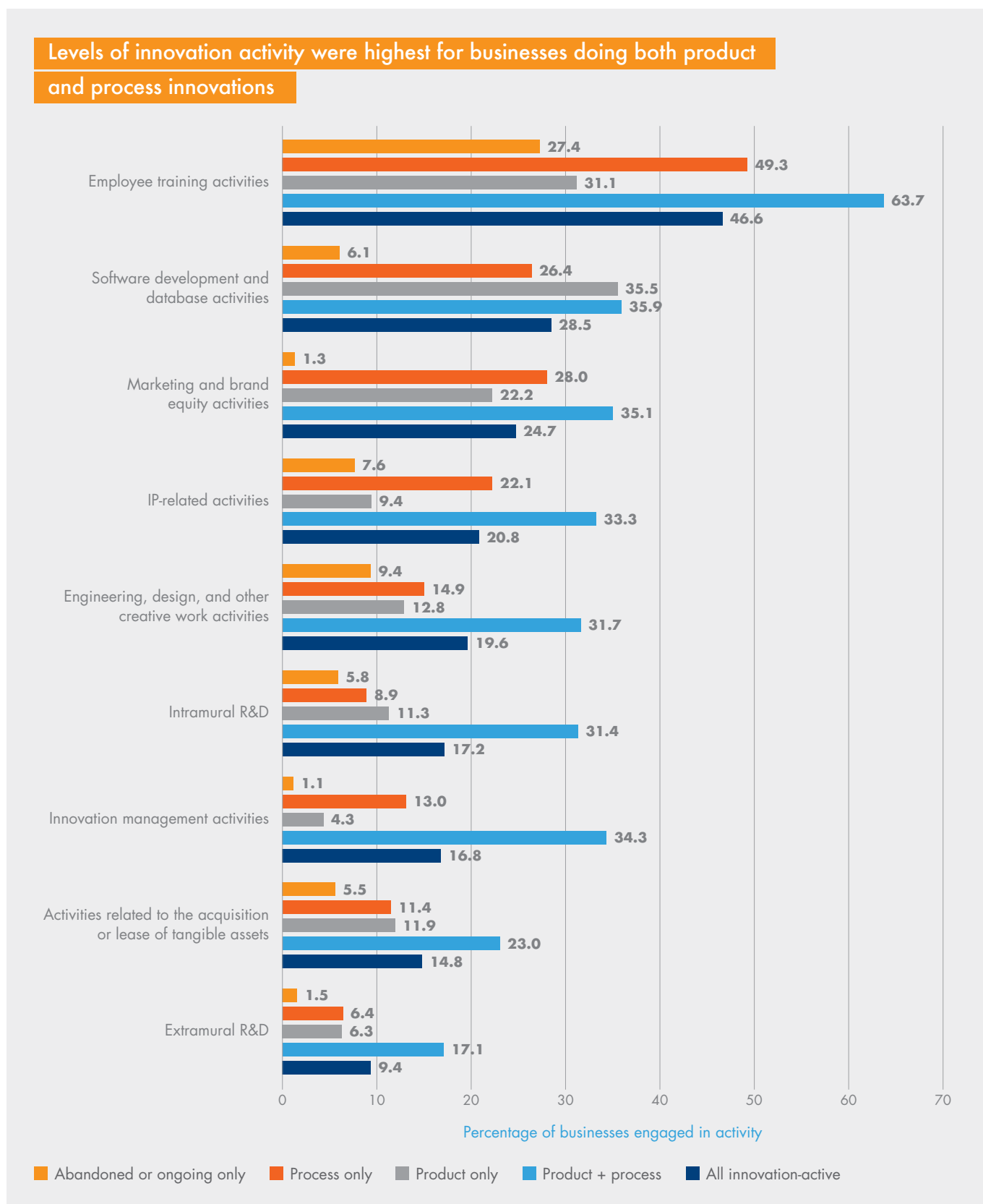
### Box 2: Funding for innovation

The data on funding are explored in a [fact sheet on innovation funding in South African innovation-active firms](#), which is an accompaniment to this report. The fact sheet covers cost-related obstacles to innovation activities; sources of funding; awareness of public funding; types of public support applied for and/or obtained; and reasons for not applying for public funding.



<sup>21</sup> White Paper on Science, Technology and Innovation, Chapter 5

Figure 14: Innovation activities of businesses by innovation-active type, 2019-2021



Source: Appendix table A3.1

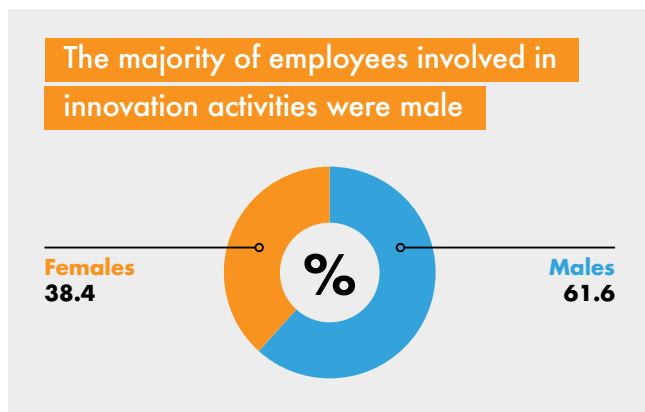
# #7

Set against South Africa’s current working-age demographic profile statistics<sup>22</sup>, the demographic profile of employees involved in innovation activities did not reflect an inclusive working environment in innovation-active businesses.

The South African business sector is challenged to build more inclusive boards and workforces, and close the gender pay gap. Equally, the mainstreaming of inclusion is explicit within South Africa’s innovation policy and planning outlook, to ensure both distribution of the benefits of innovation and direct or indirect participation by potential innovators. Measuring the extent of inclusion within business innovation provides a new indicator of progress toward these ends. The findings for the 2019-2021 period reflect a lack of transformation within South African businesses when it comes to some inclusion indicators.

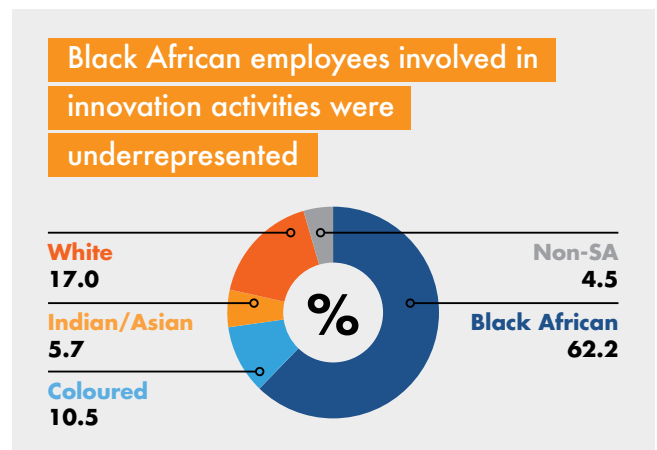
Only 38% of employees involved in innovation activities were female (vs. 62% male) (Figure 15). Black Africans were underrepresented (making up only 62% of employees), while white employees were overrepresented (making up 17% of employees) (Figure 16). The proportion of employees involved in innovation activities skewed towards the younger age categories (Figure 17). Over two-thirds (70%) of employees involved in innovation activities were 35 years or younger, while the remaining 30% were aged 36 and above.

Figure 15: Gender of employees involved in innovation activities, 2019-2021



Source: Appendix table A3.2

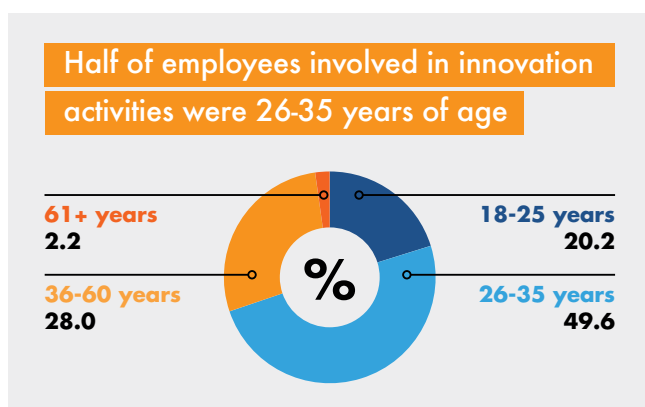
Figure 16: Population groups of employees involved in innovation activities, 2019-2021



Source: Appendix table A3.3

Note: Percentages do not add up to 100% due to rounding.

Figure 17: Age groups of employees involved in innovation activities, 2019-2021



Source: Appendix table A3.4

The analysis of innovation activities classifies businesses according to the result of their innovation activities (i.e. whether they were a product and/or process innovator, or had abandoned or ongoing activities only). The next section continues the focus on innovation-active businesses but takes the analysis further, classifying them according to a combination of characteristics, enabling a more in-depth understanding of how different types of firms innovate and, in turn, the different types of support that they may need.

<sup>22</sup> In 2020, black Africans made up 81% of the working-age population. See Statista (2024). Population of working age in South Africa from Q1 2019 to Q1 2020, by population group (in 1,000s). Available at: <https://www.statista.com/statistics/1129144/population-of-working-age-by-population-group-in-south-africa/>. Last accessed: 21 February 2024. In 2022, 15-35 year olds made up 52% of the working-age population and the proportion of females was higher than males (Statistics South Africa (2023) Census 2022 Statistical Release P0301.4. Available at: [https://census.statssa.gov.za/assets/documents/2022/P03014\\_Census\\_2022\\_Statistical\\_Release.pdf](https://census.statssa.gov.za/assets/documents/2022/P03014_Census_2022_Statistical_Release.pdf). Last accessed 21 February 2024).

# 4. CLASSIFYING INNOVATION-ACTIVE BUSINESSES: KNOWLEDGE INTENSITY AND COLLABORATION

Since the National R&D Strategy was introduced by the Department of Science and Technology in 2002, there has been a concerted effort to deepen R&D-led innovation support, but also to broaden the suite of tools available to support innovation activities, both within businesses and their partners in academia. These have included, for example, the Sector Innovation Fund Programme, aimed at increasing private sector innovation, as well as Technology Stations and Technology Localisation. More recent initiatives such as the South African SME Fund, first operationalised in 2017, include dedicated venture funds for university-based technology transfer, and the newer Innovation Fund (scaled up in 2022)<sup>23</sup> and Circular Innovation Fund (established in 2023) indicate an ambitious commitment to a more targeted, sectoral approach.

Equally, the DSI's sustained focus on fostering innovation linkages nationally and internationally has emphasized the value of collaboration. Collaboration is vital to facilitate knowledge and technology flows, build capabilities and enhance the economic and social effects of innovation. Unfortunately, the measurement of innovation over the past three decades has consistently shown low innovation collaboration between formal businesses and other actors in South Africa's national system of innovation (NSI). The Decadal Plan proposes a variety of strategies to address this challenge in new ways, including the establishment of new funding instruments, particularly a Collaboration Fund (see Box 3).

In the previous sections, we profiled innovation-active against non-innovation active firms, to identify how these groups differ. We then looked at the types of activities that innovation-active businesses engaged in and analysed this according to the types of innovation the businesses introduced. This section takes a more in-depth approach to analysing innovation-active businesses, grouping them based on a combination of characteristics. These characteristics relate to the policy initiatives discussed, namely support for broader innovation activities beyond R&D, and the promotion of collaboration with other businesses or organisations.

The classification is based on a combination of the following two business characteristics:

1. The types of innovation activities the business engages in. These can include either 'formal' types of innovation activity – including R&D or patenting activity – referred to as **knowledge-driven innovation**, or activities that are less knowledge-intensive such as training, design work, or marketing activities (see Figure 14 for the full list), referred to as **activity-driven innovation**.
2. Whether or not the business collaborates with other businesses or institutions in their innovation projects.

The combination of these two factors results in four mutually exclusive groups ('input modes') of innovation-active businesses (Figure 18).

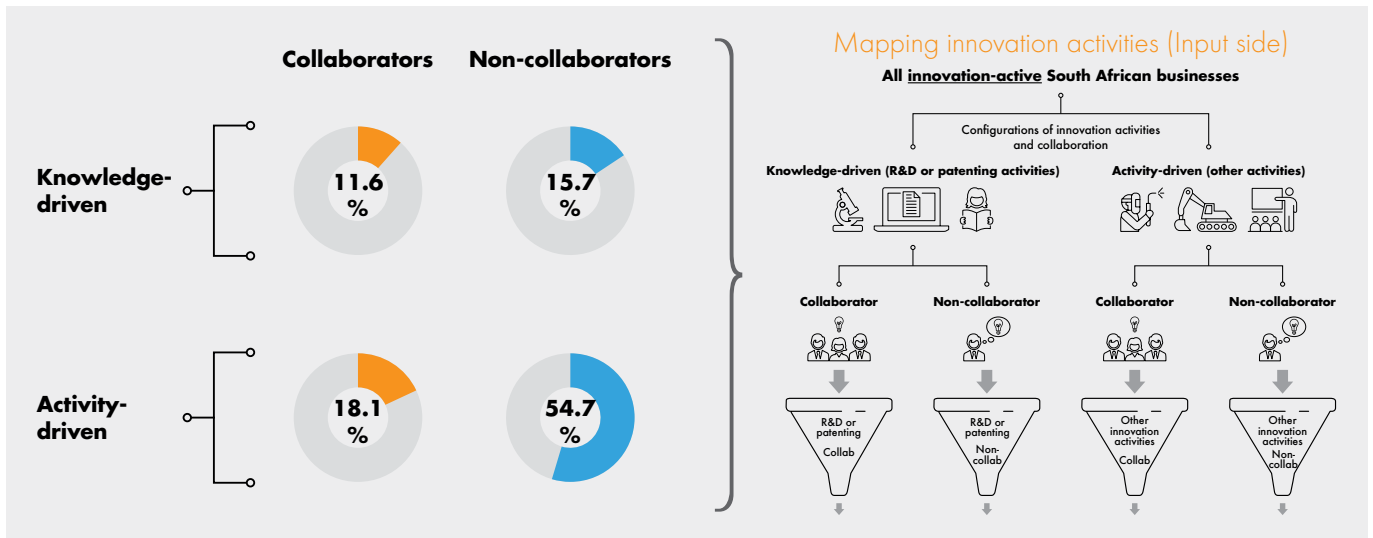
### Box 3: Collaboration for innovation

A policy brief, "Promoting innovation collaboration in South Africa: Unveiling patterns and barriers", accompanies this report and provides a more in-depth analysis of the innovation collaboration activity of innovation-active businesses, including barriers to innovation collaboration; types of collaboration partners; and geographic location of collaboration partners.



<sup>23</sup> DSI (2023). 2022/23 Annual Report. Available at: [https://nationalgovernment.co.za/department-annual/476/2023-department-of-science-and-innovation-\(dsi\)-annual-report.pdf](https://nationalgovernment.co.za/department-annual/476/2023-department-of-science-and-innovation-(dsi)-annual-report.pdf). Last accessed: 25 October 2023.

Figure 18: Percentage distribution of innovation-active businesses across input modes, 2019-2021



Source: Appendix table A4.1  
 Note: Percentages do not add up to 100% due to rounding.

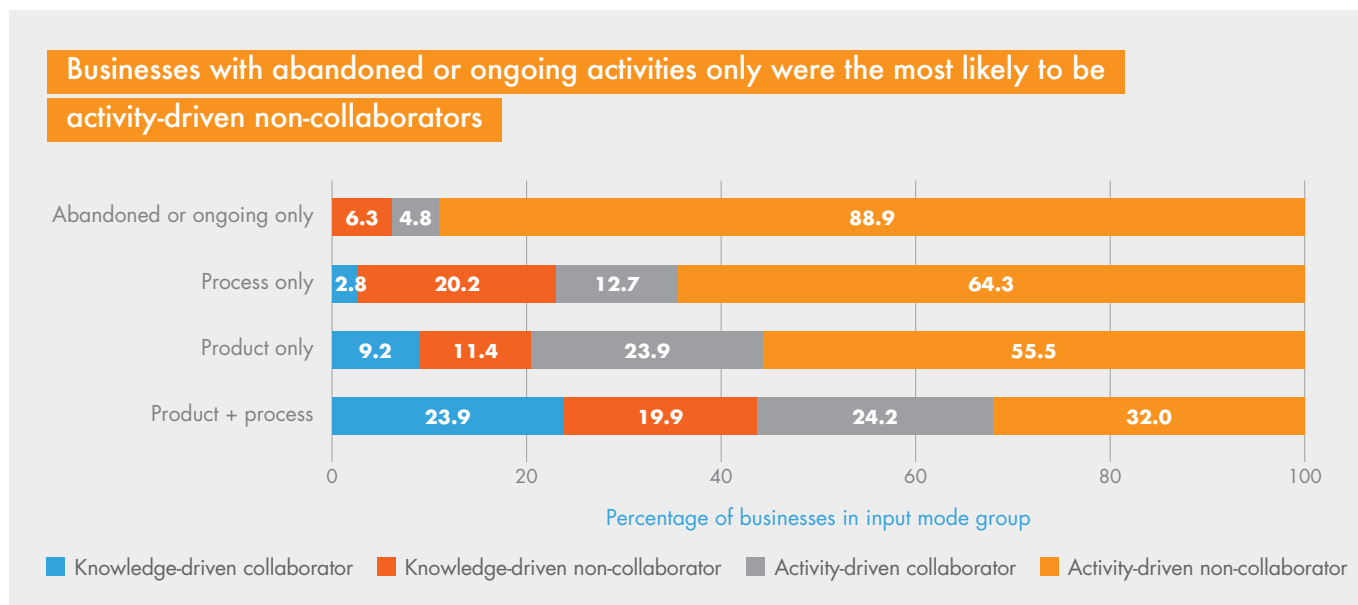
Most (73%) of innovation-active businesses were activity- rather than knowledge-driven (Figure 18). Approximately 55% were classified as activity-driven non-collaborators, while the smallest proportion (12%) were knowledge-driven collaborators. There were low levels of collaboration among both knowledge- and activity-driven firms.

These groupings of businesses are more descriptive and meaningful than binary groupings and can provide useful insights into innovation trends. The classification scheme provides a useful lens through which to examine the nature of a business’s innovation efforts, by providing a more holistic understanding of how South African firms innovate. Furthermore, mapping the different groups against other firm characteristics highlights more detailed patterns of innovation activities, providing evidence to inform the design of more targeted policy instruments and allowing further refinement of support programmes to ‘meet firms where they are’ rather than where they are expected to be. The rest of this section maps the four groups of businesses against the types of innovations that the firms had by the end of the periods, and the sources of information they used for their innovation activities.

## #8 Collaboration and the nature of innovation activities are associated with different patterns of innovation outcomes.

Figure 19 shows that 89% of businesses that had abandoned or ongoing activities only (i.e. did not have any innovations resulting from their innovation activities) were activity-driven non-collaborators. At the other end of the spectrum, businesses that had both product and process innovations were least likely to be activity-driven non-collaborators and most likely to be knowledge-driven collaborators. However, similar proportions of product only and process only innovators were either knowledge- or activity-driven collaborators.

Figure 19: Innovation-active business type by input mode, 2019-2021



Source: Appendix table A4.1

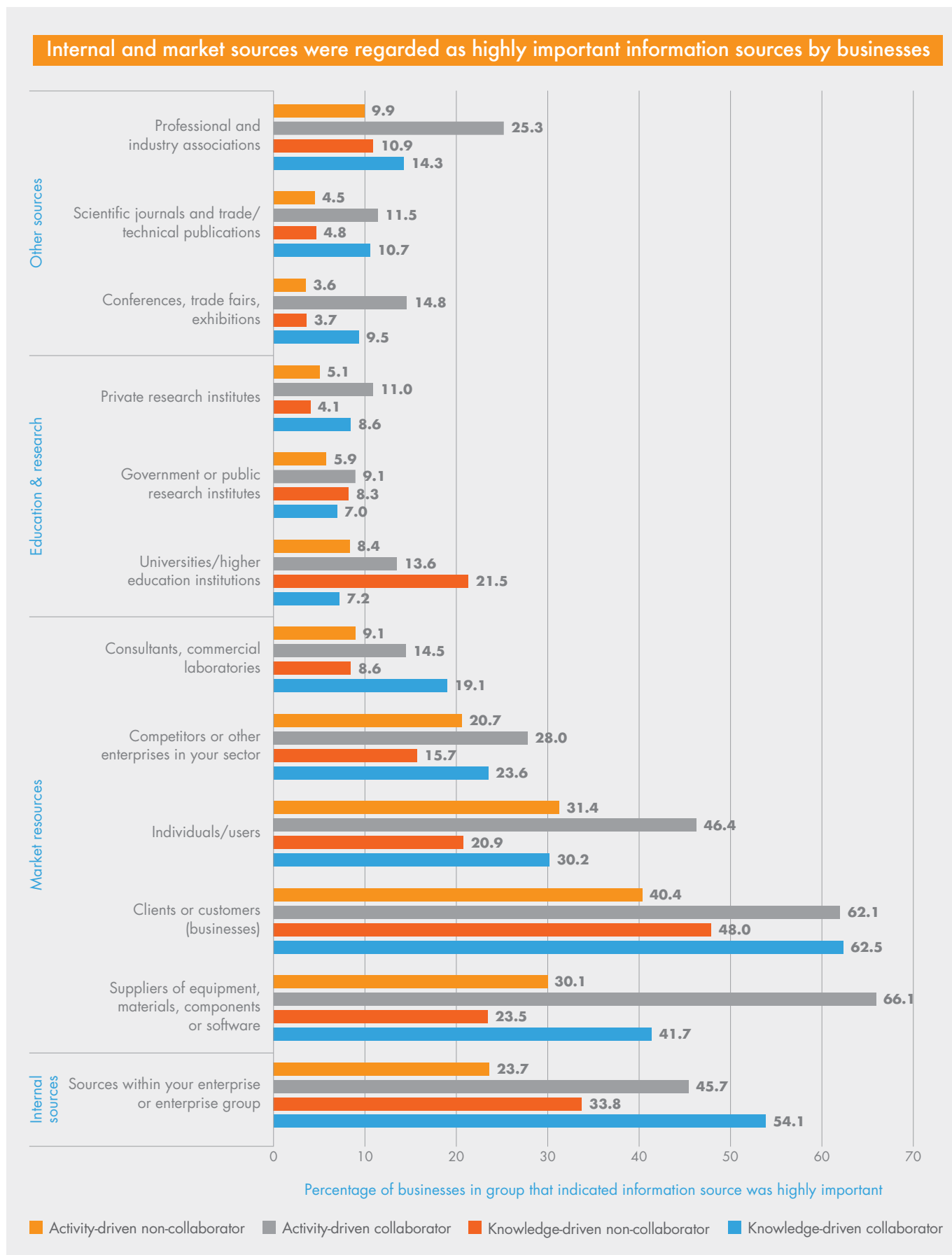
## #9 The most important sources of information for innovation-active firms were other businesses that were clients or customers.

Underpinning South African innovation policy and planning is the national system of innovation, in which businesses are key role players alongside, or in partnership with, government actors, private labs, universities or intermediaries. To the extent interaction is deliberate or intentional, the costs, risks and rewards of joint undertakings can be shared or pooled, and synergies exploited.<sup>24</sup> Conversely, the absence of key actors or activity within innovation systems can point to opportunities to foster connection and develop interactive learning.

Figure 20 indicates that highly important information sources were internal or market sources. In general, compared to non-collaborators, both knowledge- and activity-driven collaborators were more likely to consider external information sources as highly important, highlighting the value of knowledge exchange for innovation among collaborating businesses. Suppliers of equipment, materials, components or software were the most important information source for activity-driven collaborators.

<sup>24</sup> R. Hamann & F. Boulogne. (2008). Partnerships and cross-sector collaboration. In: R. Hamann, R., Woolman, S. and Sprague, C., eds., The business of sustainable development in Africa: Human rights, partnerships, alternative business models. Pretoria: Unisa Press, pp.54-82.

Figure 20: Highly important information sources by input mode, 2019-2021



Source: Appendix table A4.2



The results presented in the report thus far show that uptake of all types of innovation activities was low, activities tended to be of low knowledge-intensity, and there was limited innovation collaboration between business and other institutions.

The remainder of the report focuses on the outcomes of the innovation activities that businesses engaged in, presenting results on the types of innovations that were introduced (products) and used (processes), as well as the different profiles of innovative businesses.

## 5. INNOVATIVE FIRMS: INNOVATION TYPES, CAPABILITIES, AND NOVELTY

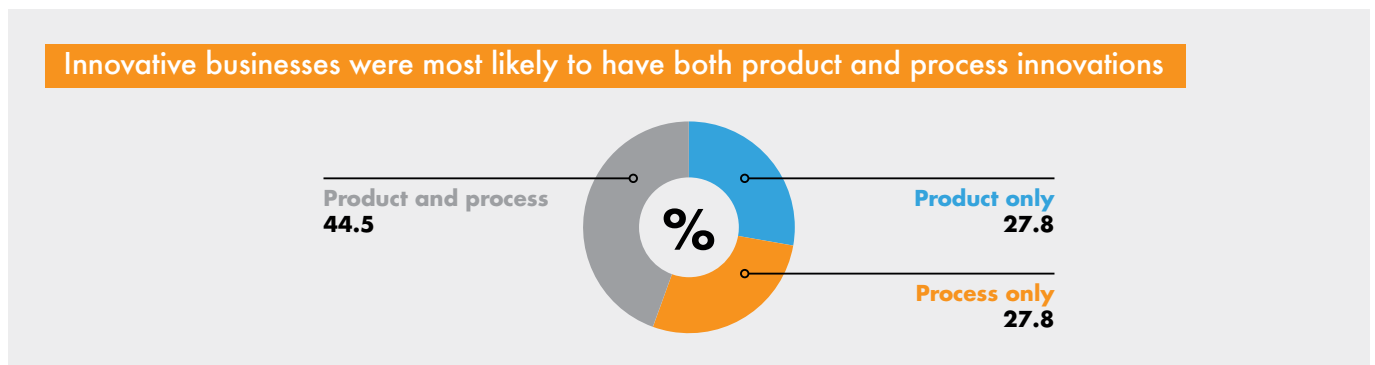
The analysis thus far has focused on the input side of innovation by analysing innovation activities and profiling innovation-active businesses during the period 2019-2021. In this section, the focus shifts to the output side of innovation, presenting results on the types and novelty of innovations introduced and implemented, and businesses' innovation capabilities.

### #10 Innovative businesses mainly had a combination of both product and process innovations.

Products, as defined within this survey, can be either goods or services, while processes cover a range of functional areas within businesses, from finance and IT to HR and communication. When it comes to innovation, the implementation of a new or improved product (a mobile shopping and delivery tracking application, for example) may mean a concomitant change in business processes (for example, an increase in IT personnel working in particular configurations to support and develop the application). The existence of product and process innovation as opposed to just product or just process innovation within a business, can suggest that businesses may be adopting new 'blends' or varieties of innovation in relation to broader technological shifts or trends in business process management, or the demands of customers.

The data presented in Figure 21 indicate that businesses with innovations were most likely to have a combination of both product and process innovations (45% of innovators), while there was an equal share (28%) of firms with either one or the other type of innovation.

Figure 21: Innovative businesses by innovation type, 2019-2021



Source: Appendix table A5.1

Note: Percentages do not add up to 100% due to rounding.

### #11 Product innovations were more likely to be incremental, and new to the firm only than new to the market or world.

The disruptive or radical nature of recent technological innovation has re-shaped entire sectors and value chains globally. Equally, broader geopolitical shifts and uncertainties underscore the dynamism within which South African businesses operate. The digital and circular economies, current priority areas for South African innovation policy and planning, are prime examples where opportunities and threats for local businesses are expanding and intensifying in relation to big technology firms in the global north

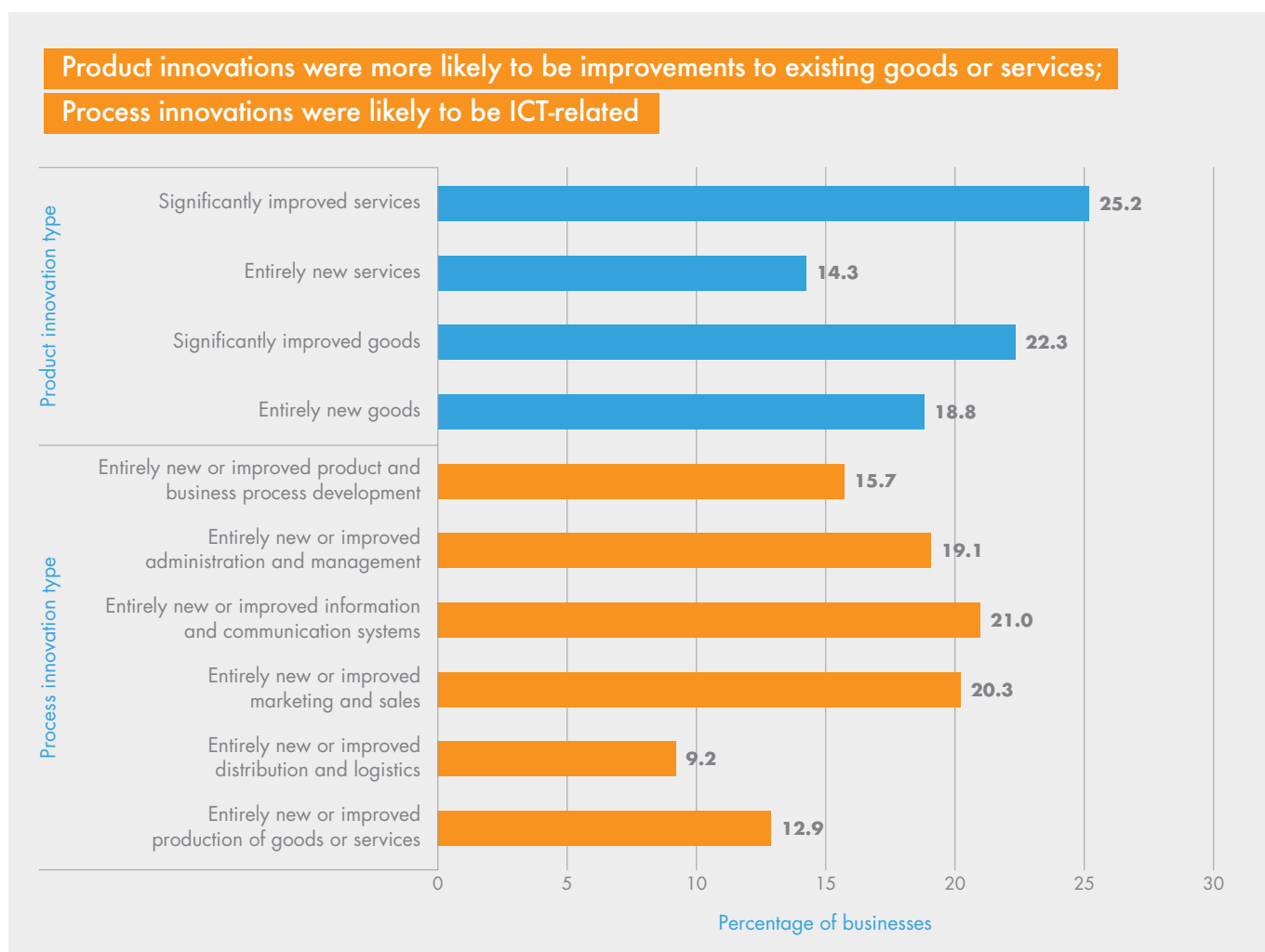
and east, as well as advancements within European renewables firms and Asian manufacturing economies. In this dynamic global context, what kind of innovation do South African businesses aim at?

Product innovations were more likely to be in the form of improvements to existing goods or services, rather than entirely new goods or services (Figure 22). The most common type of product innovations were significantly improved services, with one quarter of businesses reporting this type of innovation.

These trends reflect the generally incremental nature of innovations in emerging/developing country contexts, due to factors such as differential capabilities, and the high risks and rates of investment associated with the development of radical innovations. Nevertheless, incremental innovations can be crucial for businesses to keep up with their competitors and market trends, or to maintain their customer base.

The most frequently occurring type of process innovation was new or improved information and communication systems, possibly reflecting the increasing prominence of the 4IR in business processes. The second most common type of process innovation was entirely new or improved marketing and sales. These trends correspond with the types of innovation activities that were most reported in Figure 14: software development and database activities (which can lead to new or improved information and communication systems), and marketing and brand equity activities (which can lead to new or improved marketing and sales).

Figure 22: Novelty of product and process innovation types, 2019-2021



Source: Appendix table A5.2

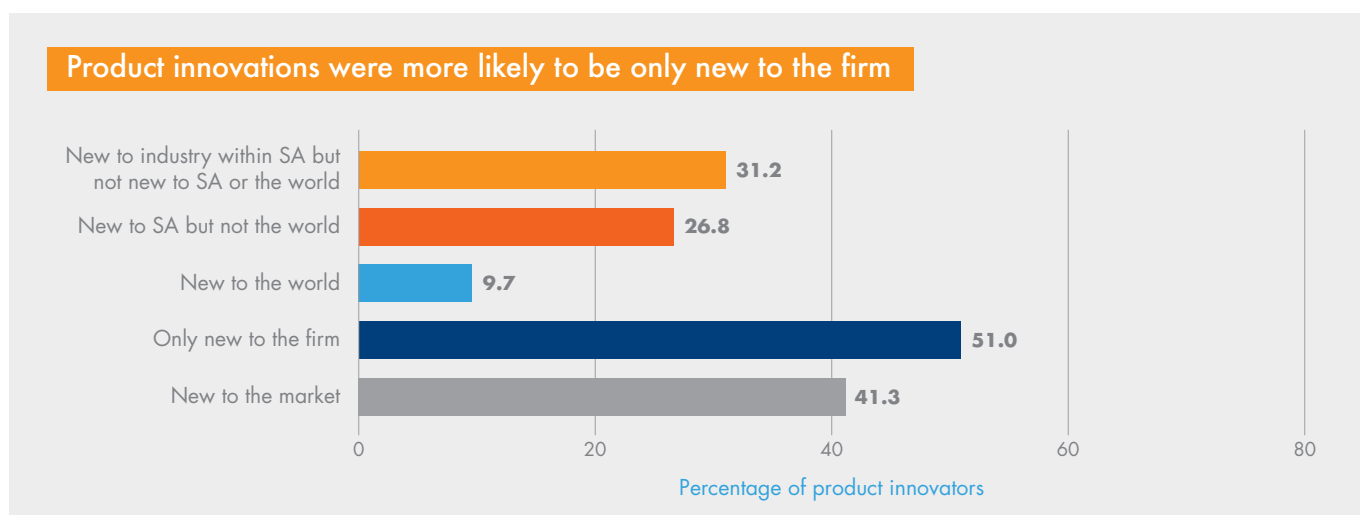
Note: Percentages do not add up to 100% as businesses could have selected more than one product or process innovation type.

Innovative products or processes can be novel to the extent they may be new to the world, market or business. While each level of novelty reflects an orientation of the business toward its customer-base (present or future), novelty data also provide key insights into the extent of business capabilities (for example, R&D, IP protection, export orientation) as well as whether there is more 'borrowing' of the state-of-the-art versus generation of novel applications. South Africa's position within global trade and its position relative to large and technologically sophisticated economies necessitates creative cooperation strategies by businesses.

Both product and process innovations were mostly only new to the firm (rather than the market, industry, country or world) (Figure 23 and Figure 24). 51% of product innovators had innovations that were only new to the firm, while only 41% had product innovations that were new to the market. A small proportion (10%) had new to the world product innovations. The pattern of novelty was similar for process innovators, though overall novelty levels were lower. Specifically, 63% had new to the firm only innovations, 23% had new to the market innovations, while only 6% of process innovators had new to the world innovations.

The low levels of novelty of product innovations are consistent with the predominantly incremental nature of product innovations as seen above. A single, significant improvement of a product may be more likely to be new to the firm only rather than new to the market. However, many incremental innovations over time could lead to more novel products in the long run.

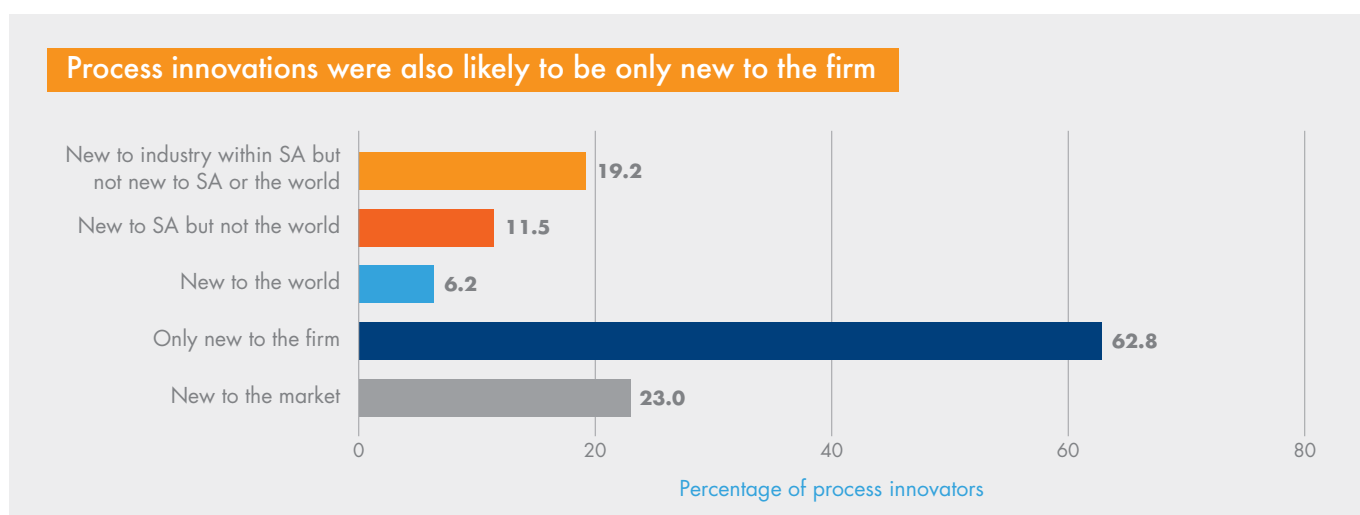
Figure 23: Novelty of product innovations, 2019-2021



Source: Appendix table A5.3

Note: Percentages do not add up to 100% as businesses could have selected more than one product novelty option.

Figure 24: Novelty of process innovations, 2019-2021



Source: Appendix table A5.3

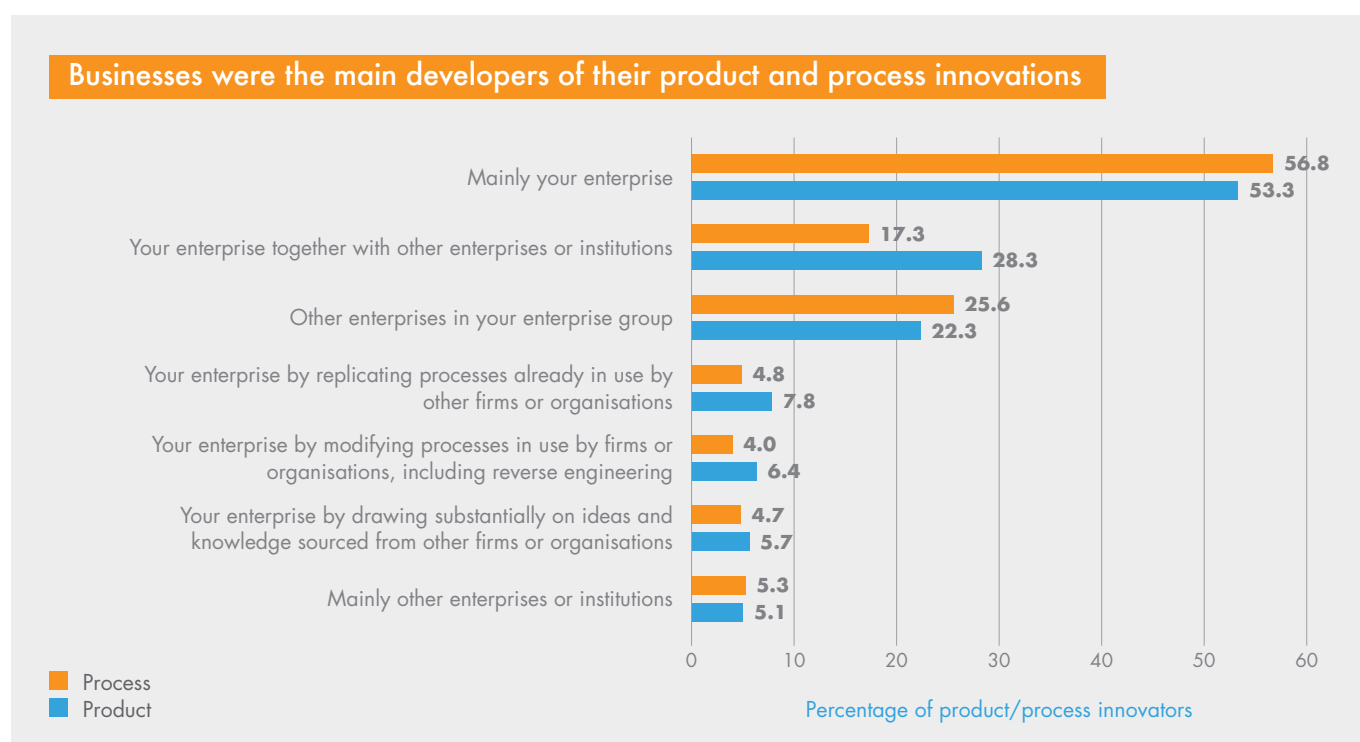
Note: Percentages do not add up to 100% as businesses could have selected more than one process novelty option.

## #12 Innovators developed most innovations on their own.

Earlier, it was noted that South African innovation policy and planning approaches adopt a whole-of-society lens in creating an enabling environment for innovation. This recognises the benefits of joined-up, collaborative work, between actors within different mandates, capabilities and resources. It also recognises the importance of reducing duplication. At the level of individual businesses, however, responding to the urgencies of continuity, collaboration may be a disincentive to the extent it introduces new risks or costs, including those pertaining to intellectual property protection.

The data indicate that both product and process innovators developed their innovations primarily by themselves, reflecting the low levels of collaboration among innovation-active businesses as seen in Section 4 (Figure 18 and Figure 19). Product innovators were more likely to develop their innovations together with other businesses or institutions compared to process innovators (28% and 17% respectively), while a similar share of product and process innovators developed their innovations with other businesses in their group. Very low proportions of both types of innovators reported that they replicated, modified, or adopted innovations from other organisations, or drew substantially on the ideas and knowledge sourced from others.

Figure 25: Main developers, and strategies of development, of product and process innovations, 2019-2021



Source: Appendix table A5.4

Note: Percentages do not add up to 100% as businesses could have selected more than one option.

This section presented binary indicators, including innovation types, innovation novelty, and business capabilities. Innovations were more likely to be improvements to goods or services rather than entirely new goods or services, and both product and process innovations were mainly developed in-house, without collaboration with other institutions. Following the methodology used in Section 4, where innovation-active businesses were classified according to a combination of characteristics of their innovation activities, Section 6 classifies innovative businesses according to the novelty of their innovations, their innovation capabilities, and their ability to operate in international markets.

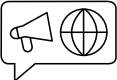





## 6. CLASSIFYING PRODUCT INNOVATORS: MARKETS, NOVELTY AND FIRM CAPABILITY

Building on the methodology introduced in Section 4, this section combines the indicators presented in the previous section, namely degree of novelty and business capabilities, to create a multi-dimensional indicator ('output mode') to effectively describe the different types of innovators and their innovation outcomes. This helps to identify the different kinds of support that businesses may need to improve their innovation performance.

The classification of businesses according to *how* they innovate (Section 4) is extended to group businesses according to their **product (goods and services)**<sup>25</sup> innovation outcomes (Table 2) based on three business traits:

1. **Market reach:** whether the business operates in international markets or domestic markets only.
2. **Novelty** of product innovations.
3. Whether product or process innovations were developed **in-house or adopted** from other businesses or organisations.<sup>26</sup> Firms that adopted their innovations are split into two groups according to whether they were part of an enterprise group. Adopters that were part of a group had more access to knowledge and market reach, via other businesses in their enterprise group, and therefore differed from adopters not part of a group in terms of their business capabilities and other characteristics.

Table 2: Classification of output modes according to three dimensions<sup>27</sup>

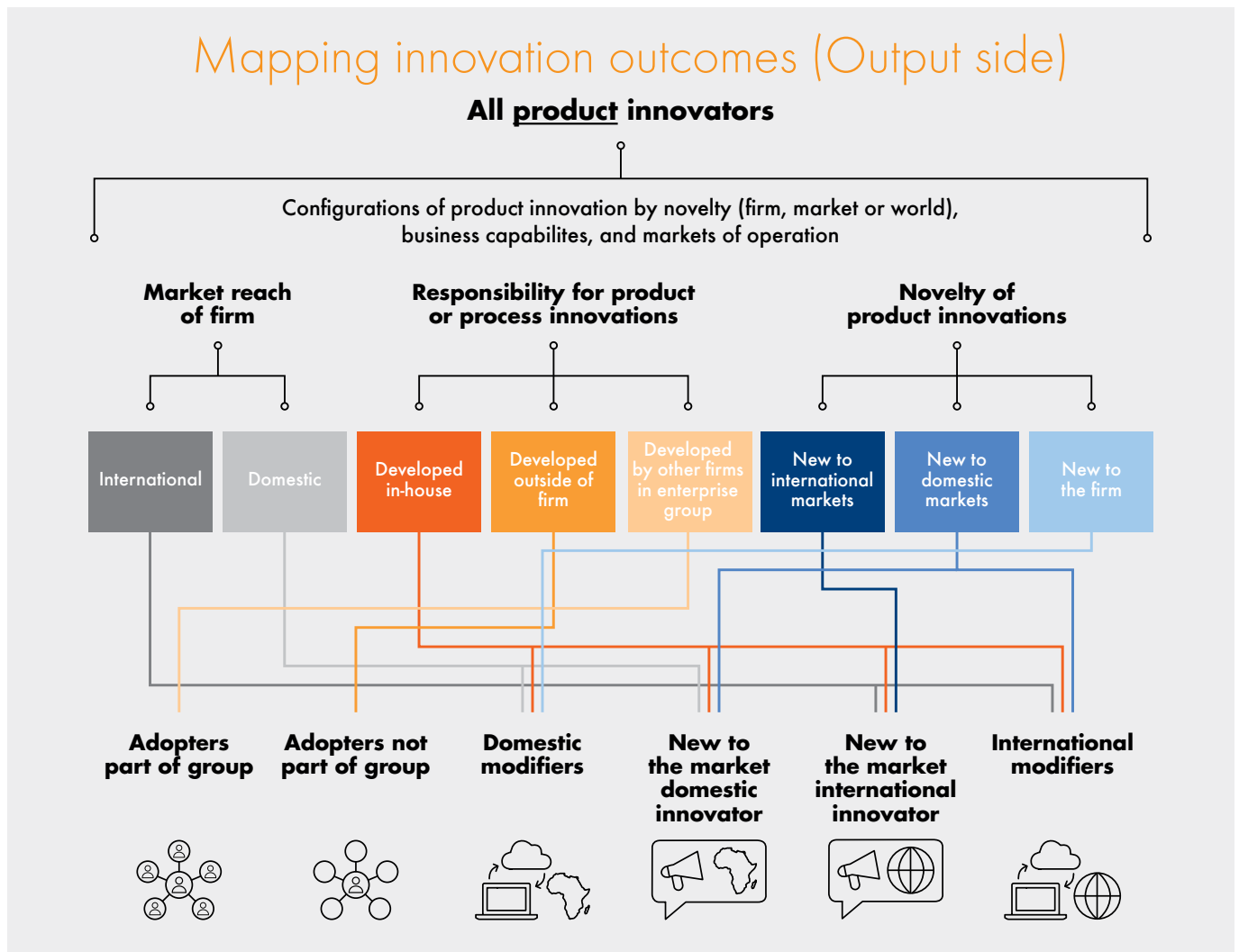
Output mode	1. Market reach of firm	2. Novelty of product innovations	3. Responsibility for product or process innovations
 New to market international innovator	International	New to international markets	Developed in-house
 New to market domestic innovator	Domestic	New to domestic markets	Developed in-house
 International modifiers	International	New to domestic markets	Developed in-house
 Domestic modifiers	Domestic	New to the firm	Developed in-house
 Adopters not part of an enterprise group	N/A	N/A	Developed outside of firm
 Adopters part of an enterprise group	N/A	N/A	Developed outside of firm

<sup>25</sup> The novelty of business process innovations in comparison to what is already in use by other firms can be difficult for respondents to determine due to the importance of secrecy and confidentiality to protect business processes (see Oslo Manual 2018, p. 78). Therefore, the classification of businesses by innovation outputs considers product innovations only.

<sup>26</sup> Although the output modes are applied to product innovators only, their in-house capabilities are determined by both their product and process innovations.

<sup>27</sup> Note that both groups of adopters are defined only by their inability to develop their innovations in-house. Thus, their market reach and the novelty of their product innovations are not applicable (N/A) in terms of how they are classified.

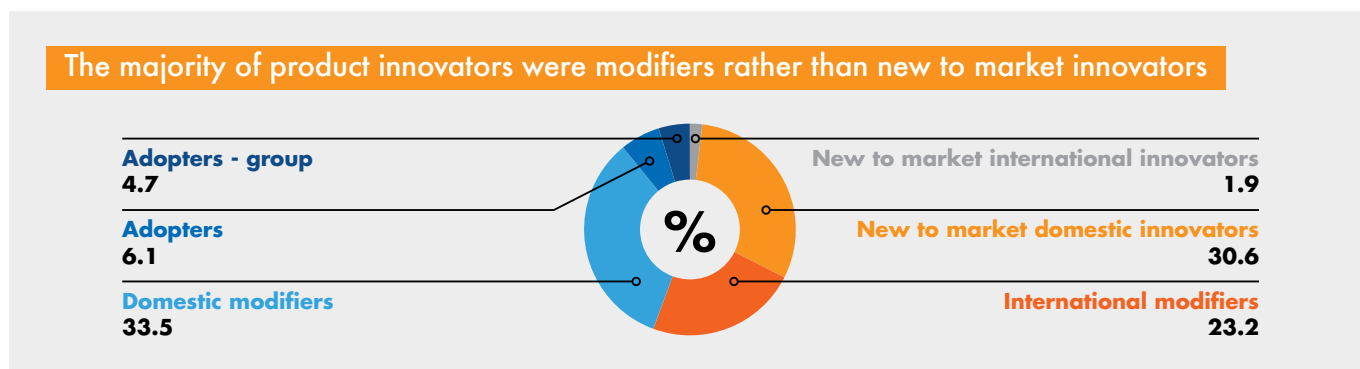
Figure 26: Mapping business innovation outcomes



Grouping businesses according to the different dimensions (Figure 26), provides a more a comprehensive understanding of innovation outcomes reflective of business capabilities. This classification provides a useful lens to view the interplay between business capabilities and innovation outcomes.

As seen in Section 5, businesses were more likely to be modifiers than new to market innovators (Figure 27). However, the new classification approach reveals a small portion of new to market innovators that were operating at the international level, as opposed to the domestic level only. Only 1.9% of businesses are classified as **New to market international innovators**, while a much larger portion (23.2%) are **International modifiers**. Similarly, businesses operating at the domestic level only were more likely to be modifiers than have new to market innovations. The portions of businesses classified as **Adopters not part of a group** and **Adopters part of a group** were relatively low at 6.1% and 4.7% respectively.

Figure 27: Product innovators' output modes, 2019-2021

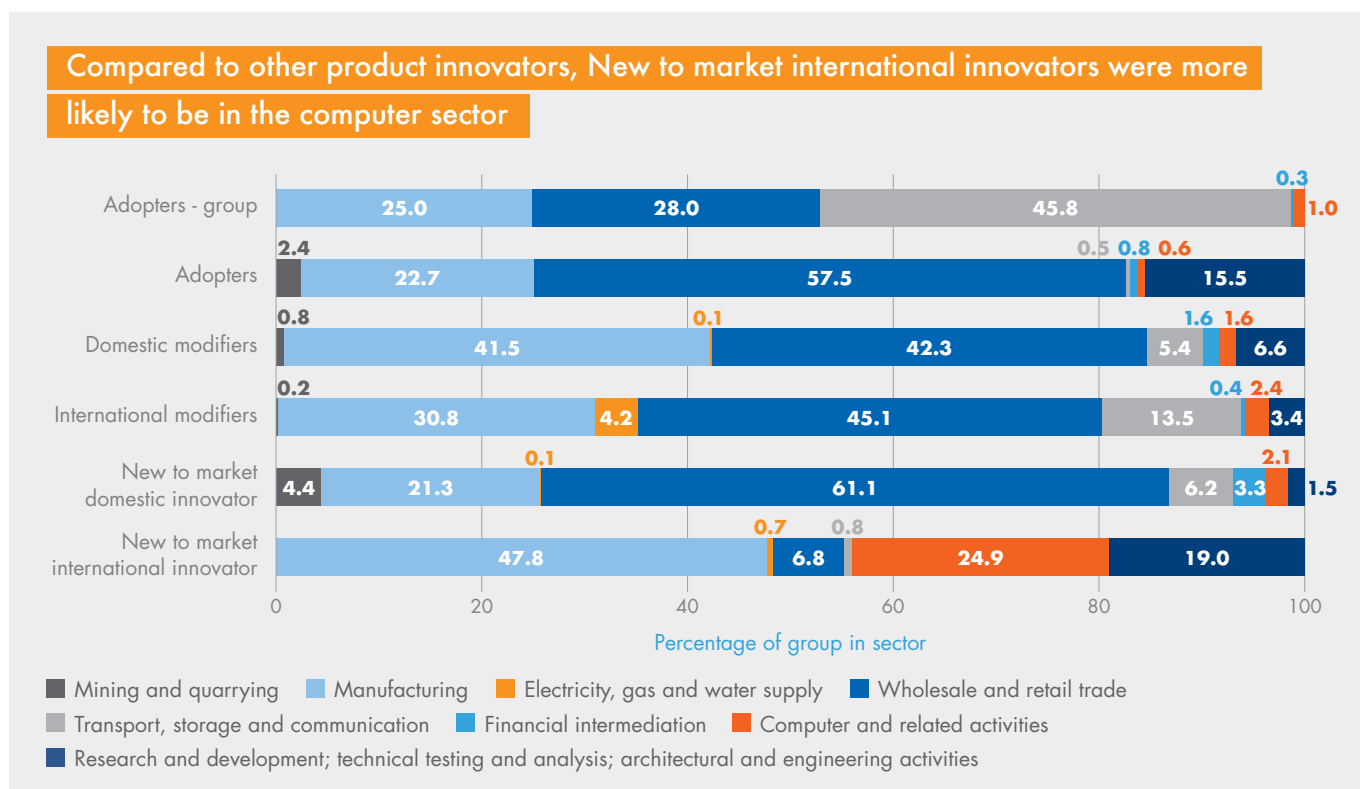


Source: Appendix table A6.1

## #13 Businesses with more novel product innovations and operating in international markets were more likely to fall into the technical sectors.

A quarter of **New to the market international innovators** fell into the computer subsector, highlighting the importance of the 4IR in a business's capacity to engage in international markets (Figure 28). This group of product innovators also had a significant proportion of businesses in the subsector research and development, technical testing and analysis, and architectural and engineering activities, reflecting the high levels of innovation novelty in these areas. The other groups were more likely to include businesses in the wholesale and retail trade subsectors. Adopters that were part of a group had the highest proportion (almost 50%) of businesses in the transport, storage and communication subsector.

Figure 28: Sectoral distribution of output modes, 2019-2021



Source: Appendix table A6.2

Note: Percentages within an output mode do not always add up to 100% due to rounding.

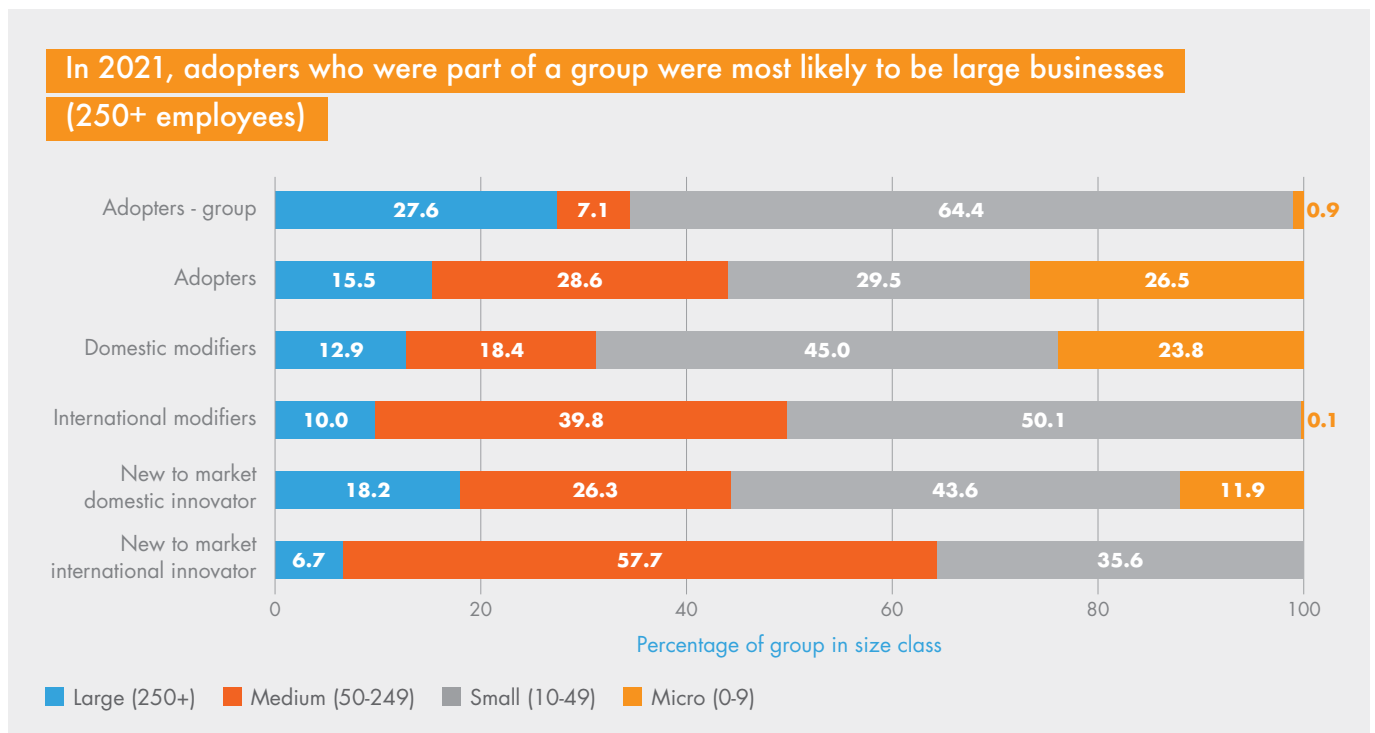


# #14

## Businesses with more novel product innovations and operating in international markets were more likely to be medium sized.

Businesses classified as **New to market international innovators** were the most likely to be medium-sized (50-249 employees) in 2021 (58% of businesses in this group) (Figure 29). They were also least likely to be large (250+ employees). Business that adopted their innovations and were part of a group had 28% of businesses in the large employee-size category. Overall, businesses that operated only in domestic markets, and adopters that were not part of a group, were more likely to have less than 10 employees compared to businesses operating internationally.

Figure 29: Business employee size in 2021 by output mode

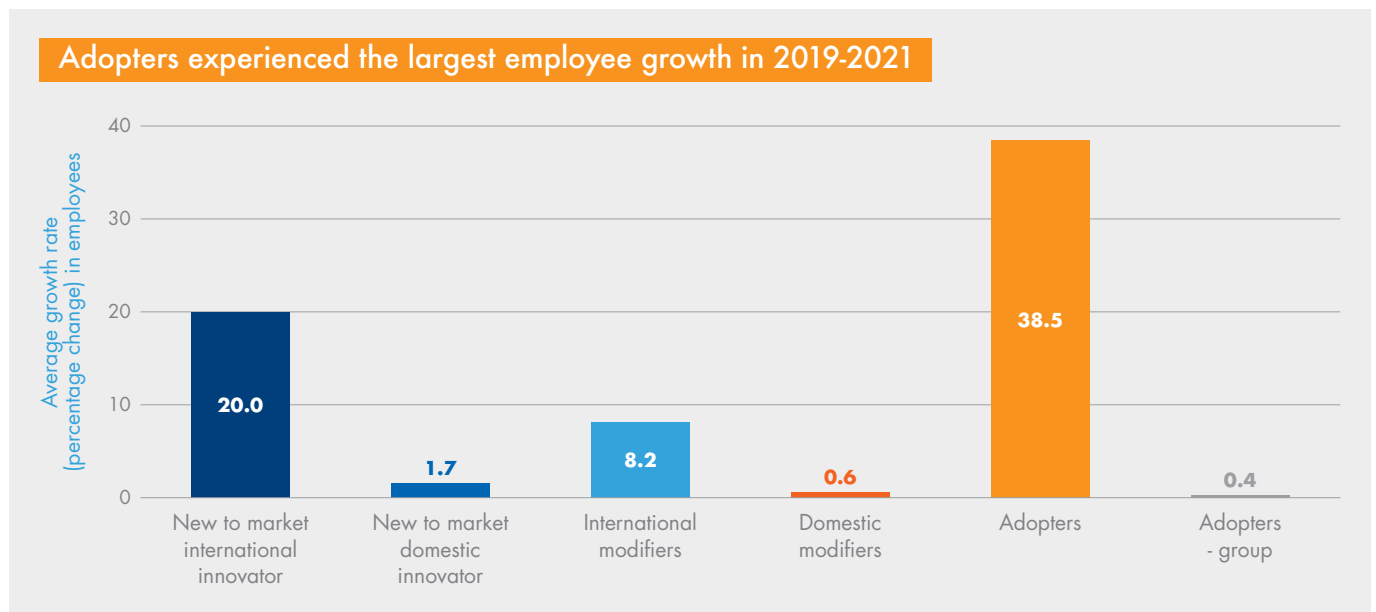


Source: Appendix table A6.3

Note: Percentages within an output mode do not always add up to 100% due to rounding.

**New to market international innovators** and **Adopters not part of a group** were by far the fastest growing businesses, increasing their employees by an average of 20% and 39% respectively between 2019 and 2021 (Figure 30). Businesses with the most novel innovations are likely to grow faster than those with lower levels of novelty, as they expand their market reach. And, as **Adopters not part of a group** were the most likely to be micro businesses (0-9 employees), they may have been able to grow at a much faster rate. Businesses operating in domestic markets only had lower growth rates compared to innovators operating at the international level.

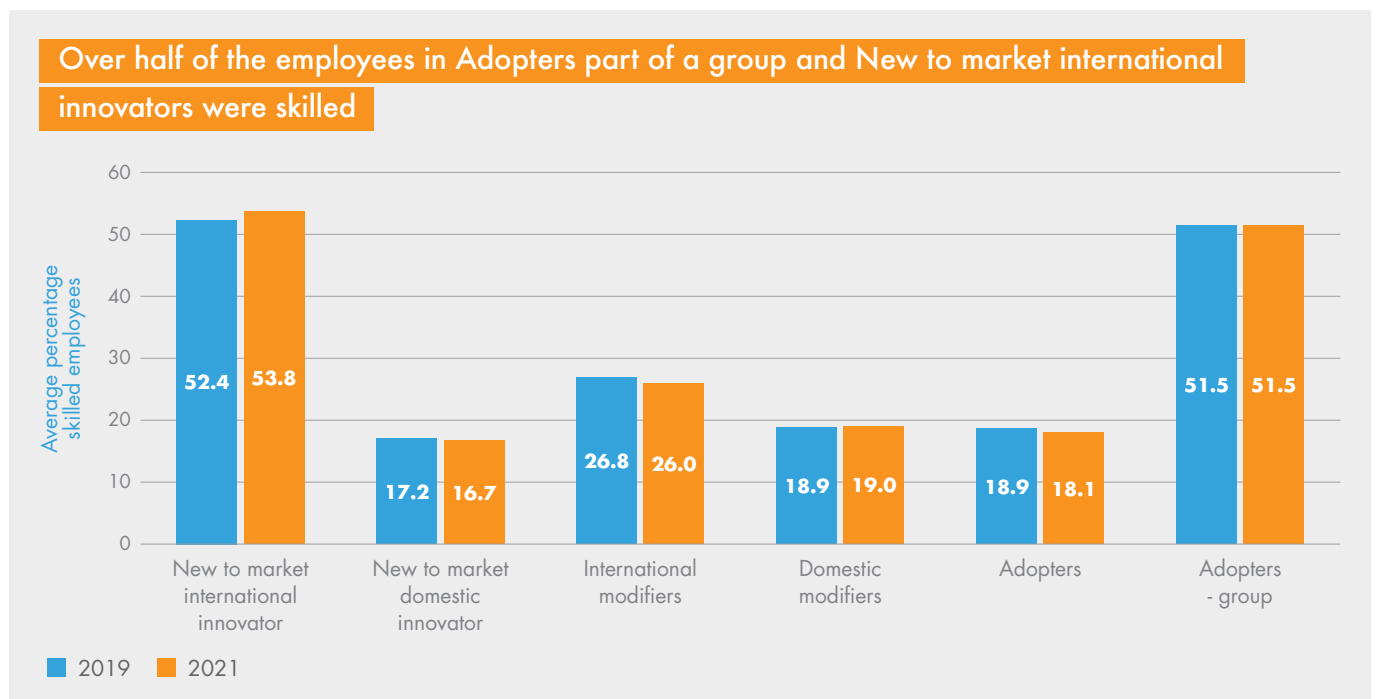
Figure 30: Average employee growth rate between 2019 and 2021 by output mode



Source: Appendix table A6.4

**New to market international innovators** and **Adopters part of a group** had more than a 50% average skills ratio (percentage of skilled employees to total employees)<sup>28</sup> in 2019 and 2021, while the skills ratio was lowest for firms operating in domestic markets only and **Adopters not part of a group** (Figure 31). This reflects the importance of highly skilled labour to compete in international markets and produce new to the world innovations. Generally, the change in skills ratio from 2019-2021 was minimal, for all output modes.

Figure 31: Proportion of skilled employees in 2019 and 2021 by output mode



Source: Appendix table A6.5

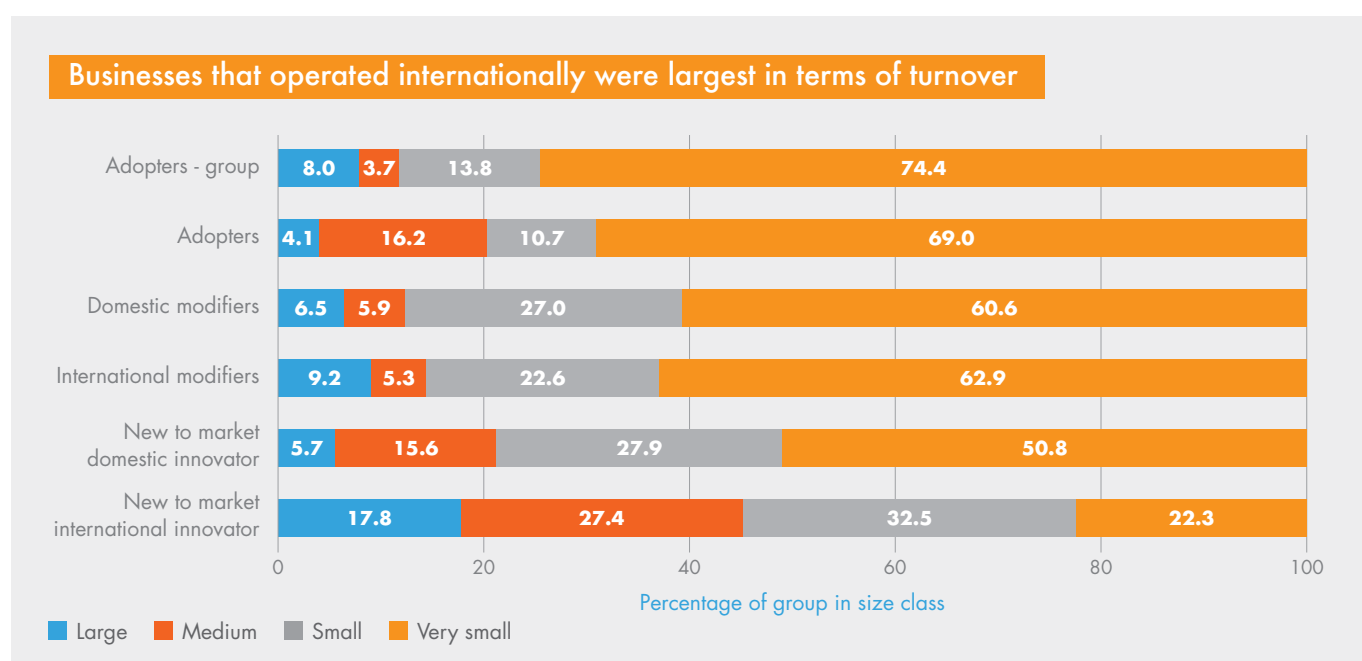
<sup>28</sup> A skilled employee is defined as an employee with a university degree or diploma.

## #15 Businesses with more in-house capabilities and greater levels of product innovation novelty had higher turnover.

Business innovation capabilities include the combination of a firm's asset base, financing, and ownership, alongside its strategy, management capacities, workforce skills, and technological capabilities.<sup>29</sup> This confluence of capabilities may be leveraged, in full or part, as innovation activities and projects are undertaken. In this way, capabilities can be considered the 'engine of innovation'.

What information about the business capabilities of innovative businesses can be gleaned from the survey results? Analysis of total revenues by profile of innovative firm provides insights into the mix of capabilities characteristic of businesses with higher or lower turnover. For example, **New to market international innovators** had the highest percentage (18%) of businesses in the largest turnover size class, while **Adopters not part of a group** were mostly very small businesses (69%) (Figure 32). Other businesses that operated in international markets (including **Adopters part of a group**) were also more likely to be large compared to those that operated in domestic markets.

Figure 32: Business turnover size by output mode, 2019-2021<sup>30</sup>



Source: Appendix table A6.6

Note: Percentages within an output mode do not always add up to 100% due to rounding.

## #16 Businesses that introduced new to market product innovations and operated in international markets faced less competition.

An evidence-informed approach is key for public policy actors to work together to achieve an appropriate policy mix to support the improved competitiveness of South African businesses.<sup>31</sup> Even though innovation is an engine of business growth, a variety of factors influence business competitiveness, such as the competitive structure of markets and the capabilities of their incumbents, both local and international.

<sup>29</sup> Oslo Manual 2018, Chapter 5

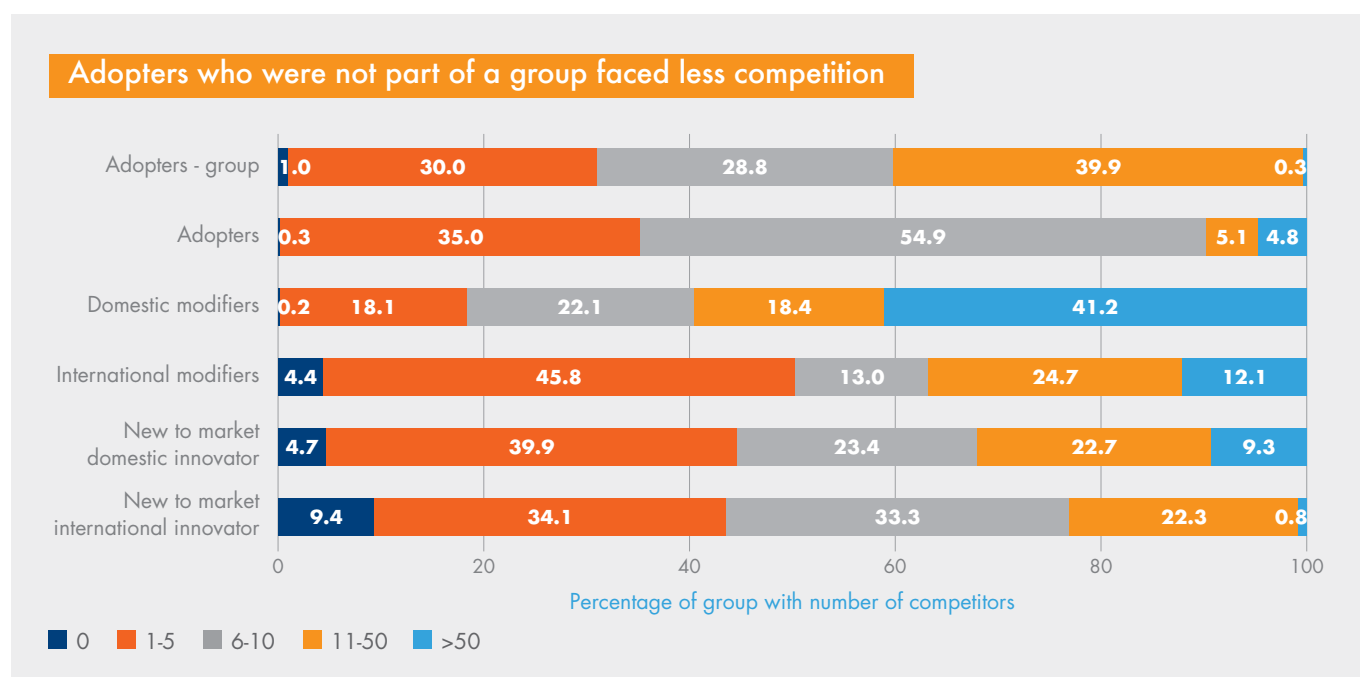
<sup>30</sup> The turnover size classes were created by Statistics South Africa (Stats SA) when pulling the sample from the 2021 national business register. The turnover bands for the four size classes vary by sector (refer to the [Survey Methodology Note](#) for turnover cutoff values by sector).

<sup>31</sup> Decadal Plan

Competition can act as a barrier to innovation and the capacity to take part in international markets. Comparing domestic and international new to market innovators and modifiers (Figure 33), it appears that businesses that introduced more novel product innovations faced less competition in their main markets. Furthermore, businesses able to operate in international markets faced less competition compared to businesses that operated in domestic markets only. **Domestic modifiers** faced the most competition with 41% of this group having more than 50 competitors in their main market.

A large portion (90%) of **Adopters not part of a group** had very few (10 or less) competitors in their main market, suggesting that less competition can also demotivate businesses to innovate. **Adopters part of a group** faced relatively more competition, probably due to their linkages to larger, international markets.

Figure 33: Number of competitors in main market by output mode, 2019-2021

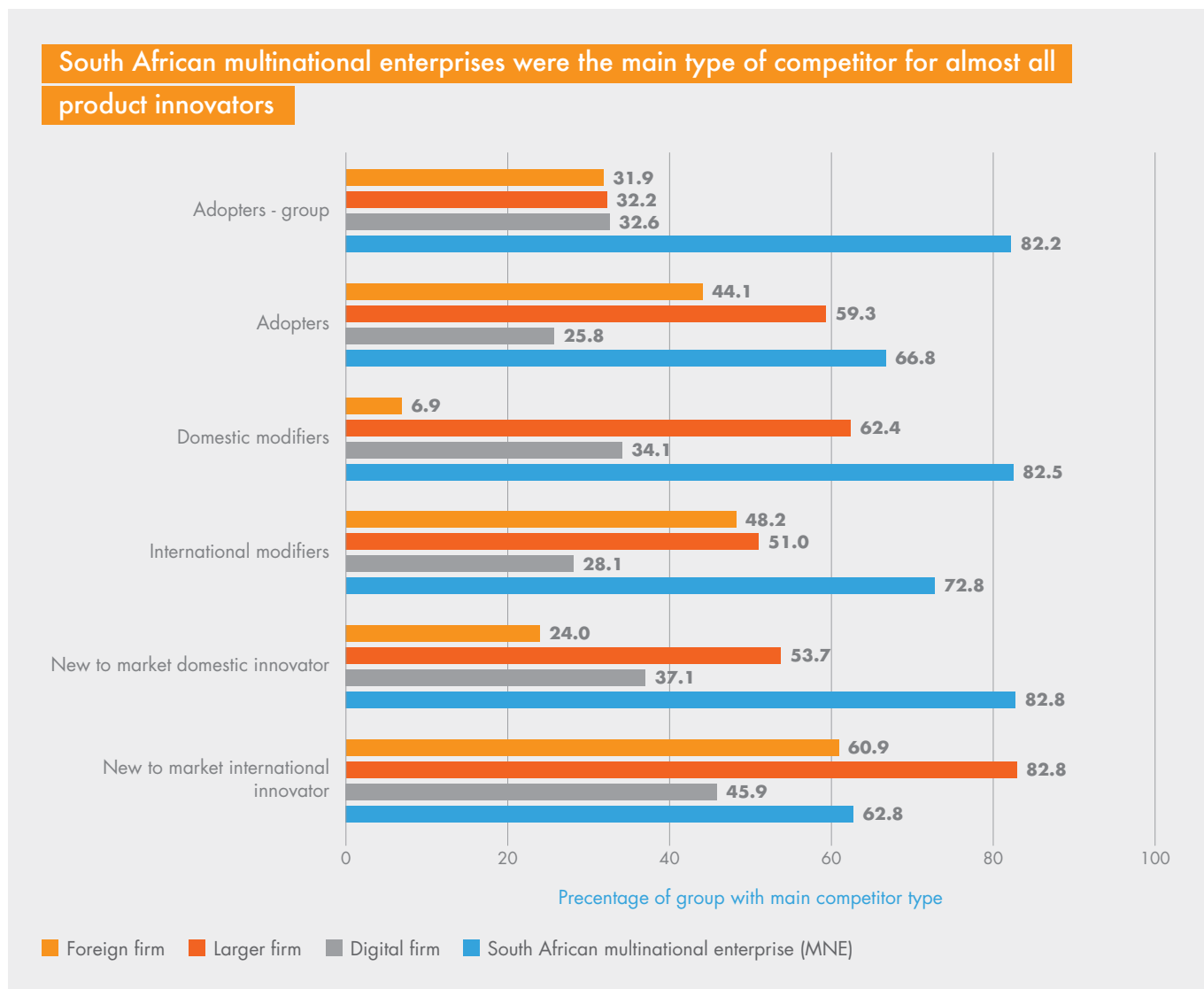


Source: Appendix table A6.7

Note: Percentages within an output mode do not always add up to 100% due to rounding.

South African multinational enterprises were the main type of competitor for all groups of product innovators, except **New to market international innovators** (Figure 34). In particular, 83% of both **New to market domestic innovators** and **Domestic modifiers** had a South African multinational enterprise as their main competitor, highlighting the inhibiting effect of global competition on a business's ability to engage in international markets. On average, all groups had main competitors that were larger than them in terms of number of employees, except for **Adopters part of a group**.

Figure 34: Type of main competitor by output mode, 2019-2021



Source: Appendix table A6.8

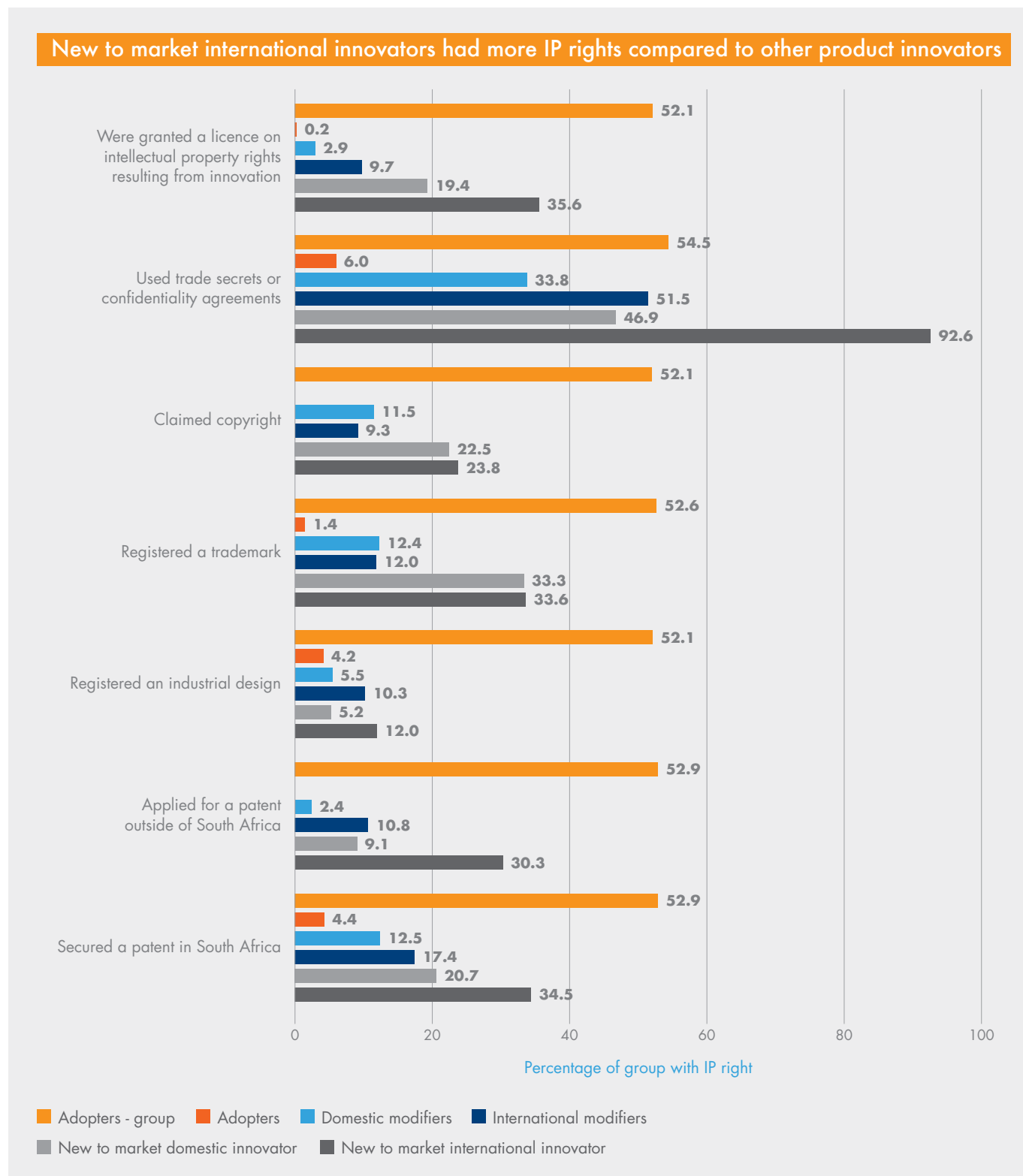
## #17 Businesses more connected to global markets, with more novel product innovations, had more intellectual property rights.

A feature of South African innovation policy and planning is the strategic use of intellectual property rights. This includes promoting public procurement of locally produced technologies, supporting commercialisation of publicly funded R&D, creating a second-tier patenting system, and promoting patenting across jurisdictions. However, there is also a need for IP bottlenecks to be removed.<sup>32</sup> An understanding of the use of IP rights within particular types of South African business innovation is therefore critical as evidence to inform implementation of strategies to leverage IP in line with policy goals.

<sup>32</sup> Decadal Plan, pp. 75-76.

**Adopters part of a group** and **New to market international innovators** owned the most IP rights, while **Adopters not part of a group** had the least IP rights (Figure 35). **Adopters part of a group** had the widest range of IP rights with more than half of these businesses owning each type of right. The most common types of IP rights across all output modes were trade secrets and confidentiality agreements.

Figure 35: Intellectual property rights held by product innovators, 2019-2021



Source: Appendix table A6.9

# #18

## 80% of all innovators used or developed technologies classified as Internet of Things.

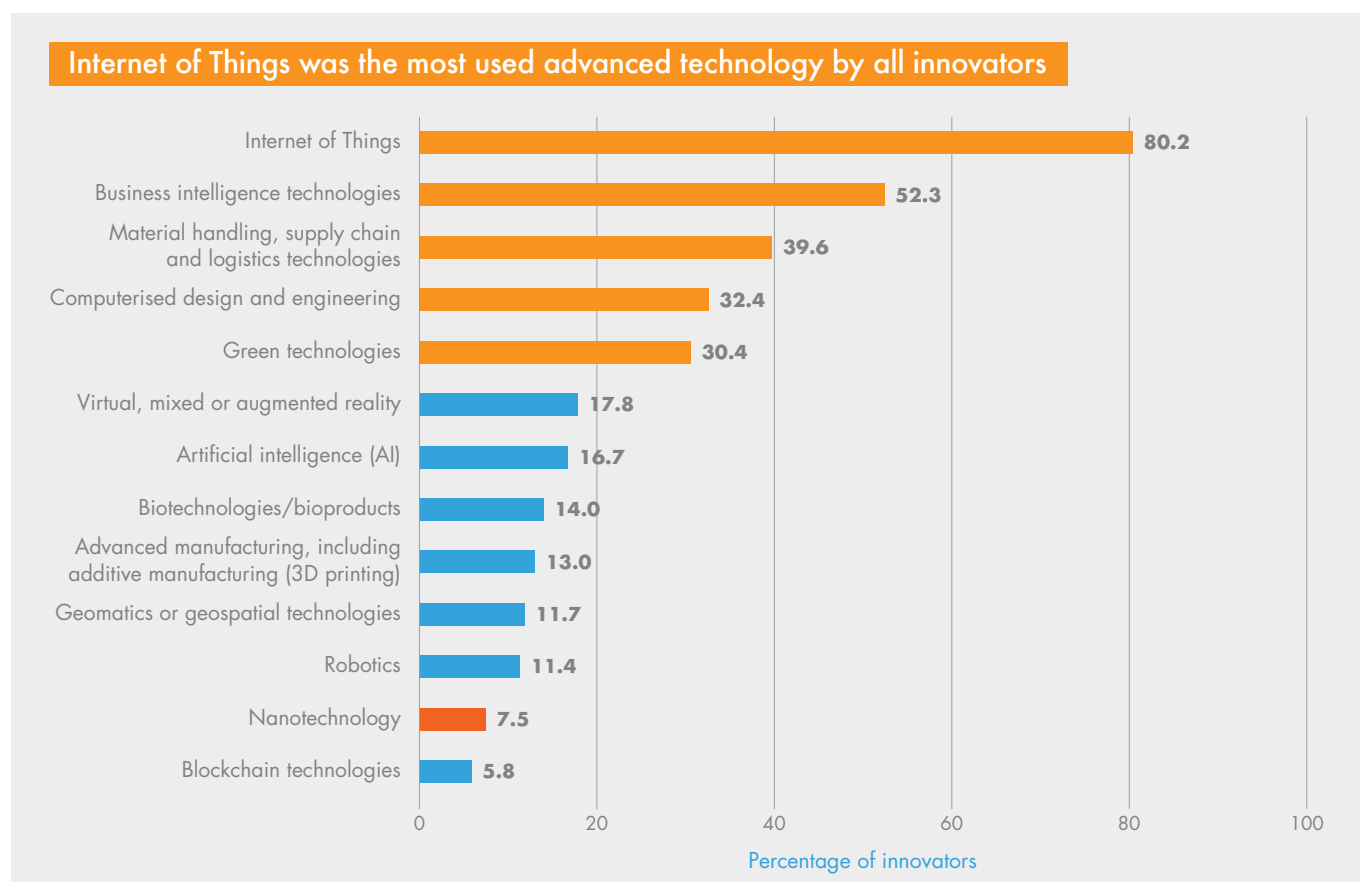
The rapid emergence of advanced technologies, sometimes referred to as the 4IR, has given rise to significant new risks, costs, and opportunities for South African businesses in all sectors and size classes. It has also necessitated innovation policy and planning to work towards harnessing its benefits in sectors such as manufacturing, health, the digital economy, and education, and to ensure the necessary investments in technological upgrading and upskilling are made across the national system of innovation and not only in high-technology businesses. To what extent did innovative South African businesses use or develop advanced technologies in 2019-2021?

Figure 36 indicates that the most common type of technology was Internet of Things, with 80% of all product and process innovators having used or developed this technology. The next most used or developed technology type was business intelligence technologies - just over half of innovators used or developed this.

The top five most used or developed technologies were the same across the different categories of product innovators. In general, the use or development of advanced and emerging technologies was greatest among businesses connected to international markets (Figure 37), highlighting the importance of advanced technological capabilities for businesses to compete in global markets. Internet of Things was the most widely reported type of technology that was used or developed by product innovators. **Adopters part of a group** were the most likely (98%) to have used or developed Internet of Things.

Notably, only 8% of innovative businesses used or developed nanotechnology (Figure 36), regarded as highly valuable in the advancement of healthcare-related technologies.<sup>33</sup> However, there was wide variation across the groups of product innovators (Figure 38). A sizable share of **New to the market international innovators** (29%) and **Adopters part of a group** (25%) used or developed nanotechnology, while the shares of the other groups were all below 10%.

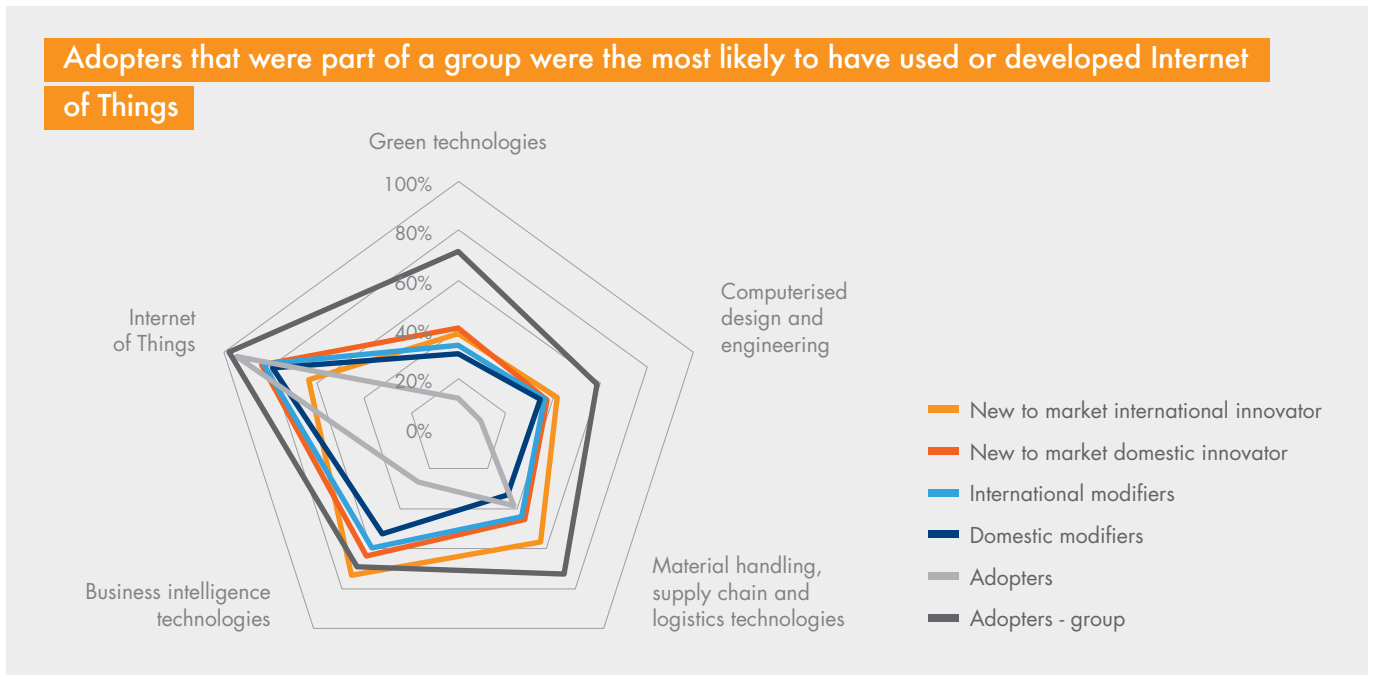
Figure 36: Advanced technologies that were used or developed by all innovators, 2019-2021



Source: Appendix table A6.10

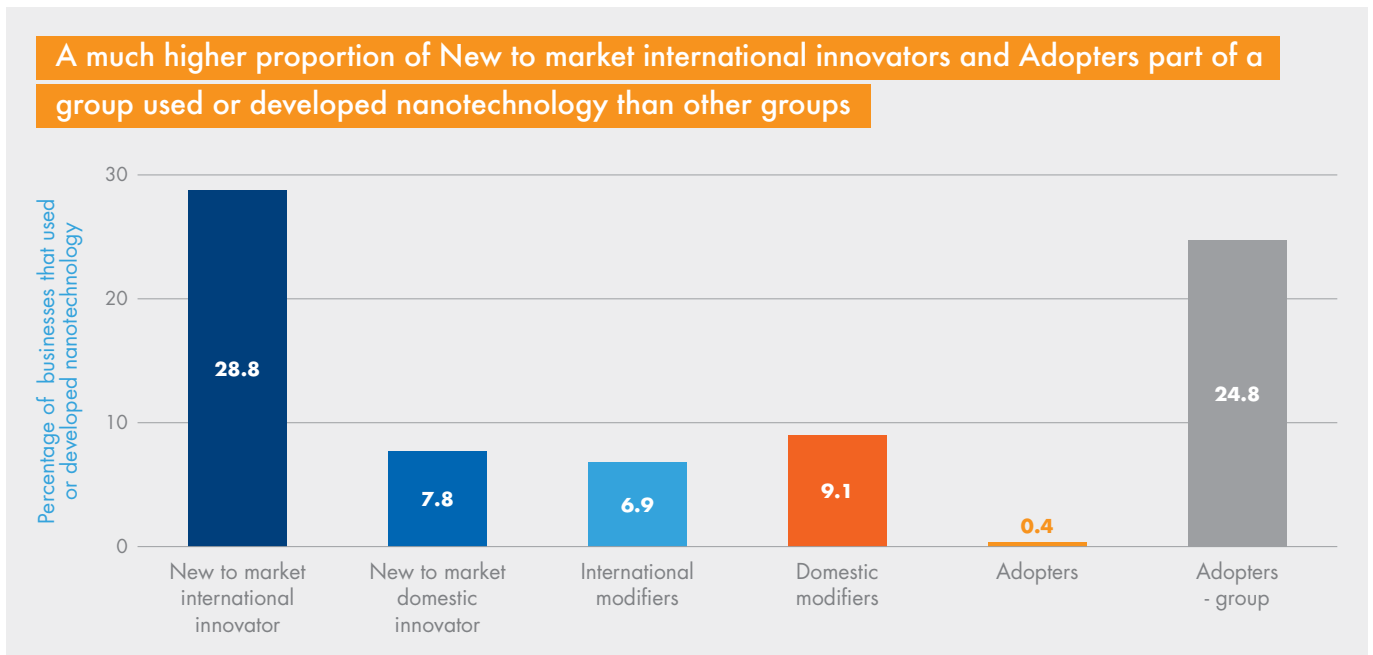
<sup>33</sup> Decadal Plan

Figure 37: The top five advanced technologies used or developed by product innovators, 2019-2021



Source: Appendix table A6.10

Figure 38: Use or development of nanotechnology among product innovators, 2019-2021



Source: Appendix table A6.10

## #19 The most successful innovation outcomes were quality rather than cost related.

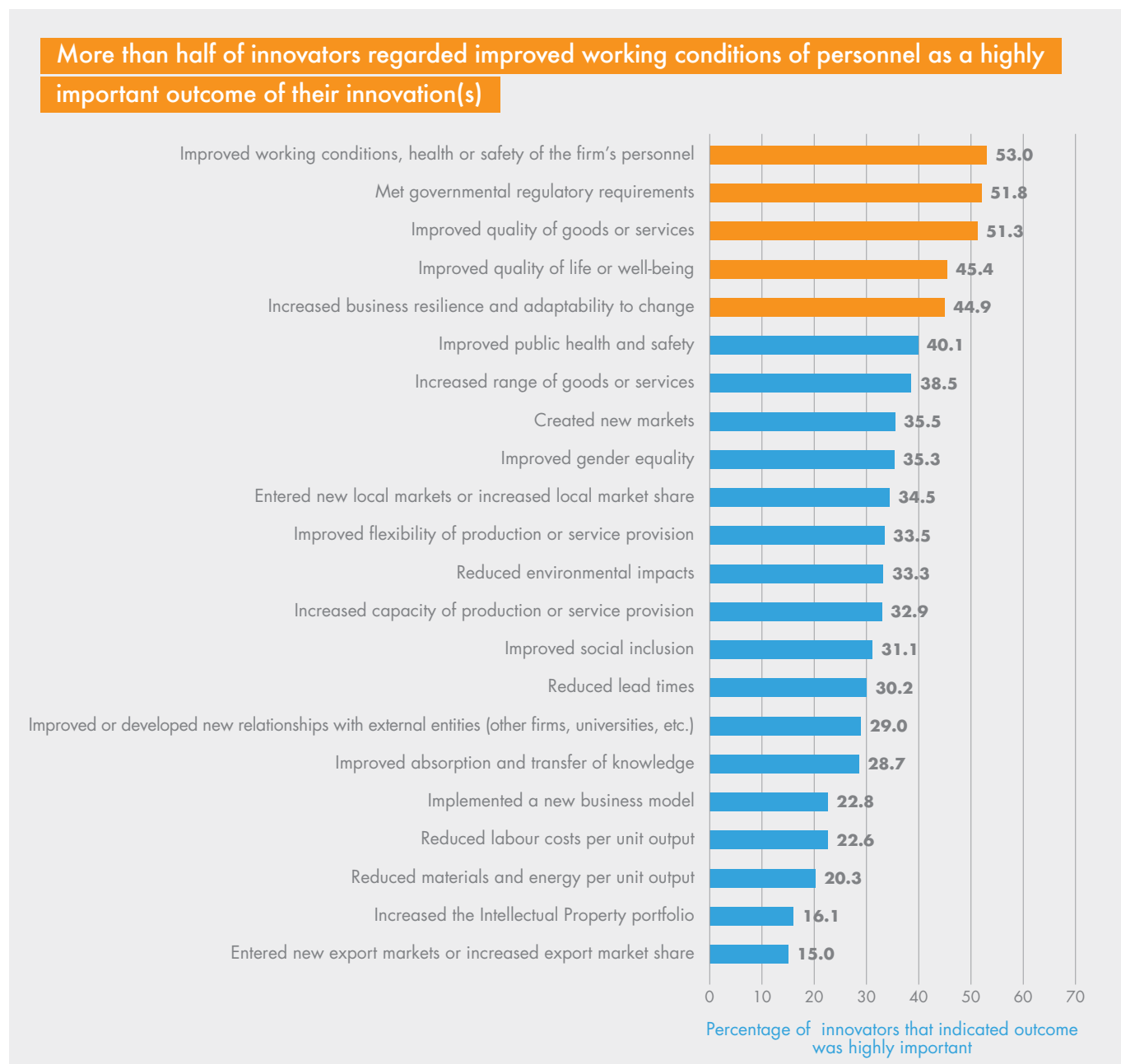
In recent years, the South African environment for doing business has been increasingly characterised by operational bottlenecks (energy insecurity, most recently), a high regulatory burden, policy uncertainty in key areas, and a highly organised and effective bargaining system. Equally, the South African financial system is robust and the entrepreneurial capabilities of large businesses



and SMMEs are both actively promoted and buttressed by a supportive policy mix. However, the extent to which businesses used innovation to manage risk downsides, exploit new opportunities, and overcome uncertainty is an area in which better data on the intended outcomes of innovation means more targeted support is possible. All of these objectives nest within a broader set of national, regional and global trends and aspirations, toward inclusion and sustainability within a context of expanding digitalisation, but also deepening inequality.<sup>34</sup> Bridging these gaps remains a pressing priority for South Africa. Within this context, businesses play a key role through their innovation efforts.

Businesses experienced a range of outcomes resulting from their product or process innovations (Figure 39). In general, innovative businesses believed that their innovations had a positive impact on people’s lives (including their personnel). More than half (53%) of innovative businesses indicated that improved working conditions, health or safety of the firm’s personnel was a highly important innovation outcome, while 45% indicated that improved quality of life or well-being was a highly important innovation outcome.

Figure 39: Highly important innovation outcomes for all innovators, 2019-2021



Source: Appendix table A6.11

<sup>34</sup> United Nations Conference on Trade and Development (2023). Technology and Innovation Report 2023. Available at: <https://unctad.org/tir2023>. Last accessed: 25 October 2023.

**New to market international innovators** were the most likely to report positive innovation outcomes (Figure 40). They were also able to adapt more easily to change occurring externally and internally to the business. 88% of this group considered an increase in business resilience and adaptability to change as a highly important outcome, while almost 70% considered improved flexibility of production or service provision as a highly important outcome.

Figure 40: Top five innovation outcomes product innovators indicated as highly important, 2019-2021



Source: Appendix table A6.11

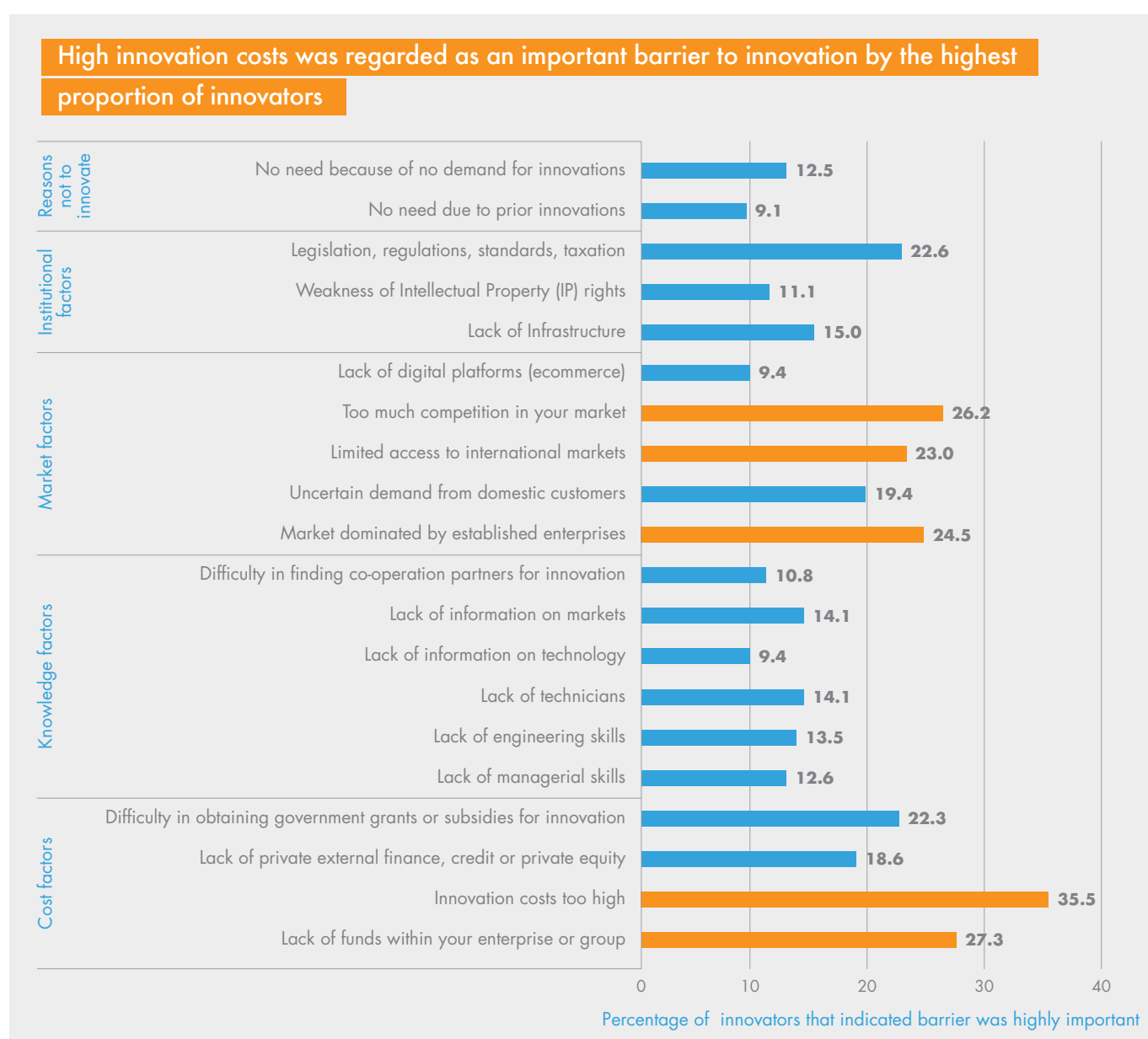
# #20

## Cost- and market-related factors were the most important barriers to business innovation among innovative businesses.

Next to the potential for realising welfare and environmental benefits of innovation, South African innovation policy is explicit about the potential of innovation to increase business competitiveness, exploit new economic growth sources, develop new and emerging industries as well as renew and modernise existing industries, and catalyse new technology businesses.<sup>35</sup> To realise these benefits, an explicit goal set by the Department of Science and Innovation is creation of an enabling environment. But what were the barriers to innovation that South African businesses faced in 2019-2021?

The high costs of innovation was the most important barrier among all innovative businesses (36% of product and process innovators reported this as a highly important barrier to innovation) (Figure 41). Competition and dominance of other established businesses were also commonly cited barriers to innovation.

Figure 41: Highly important barriers to innovation for all innovators, 2019-2021



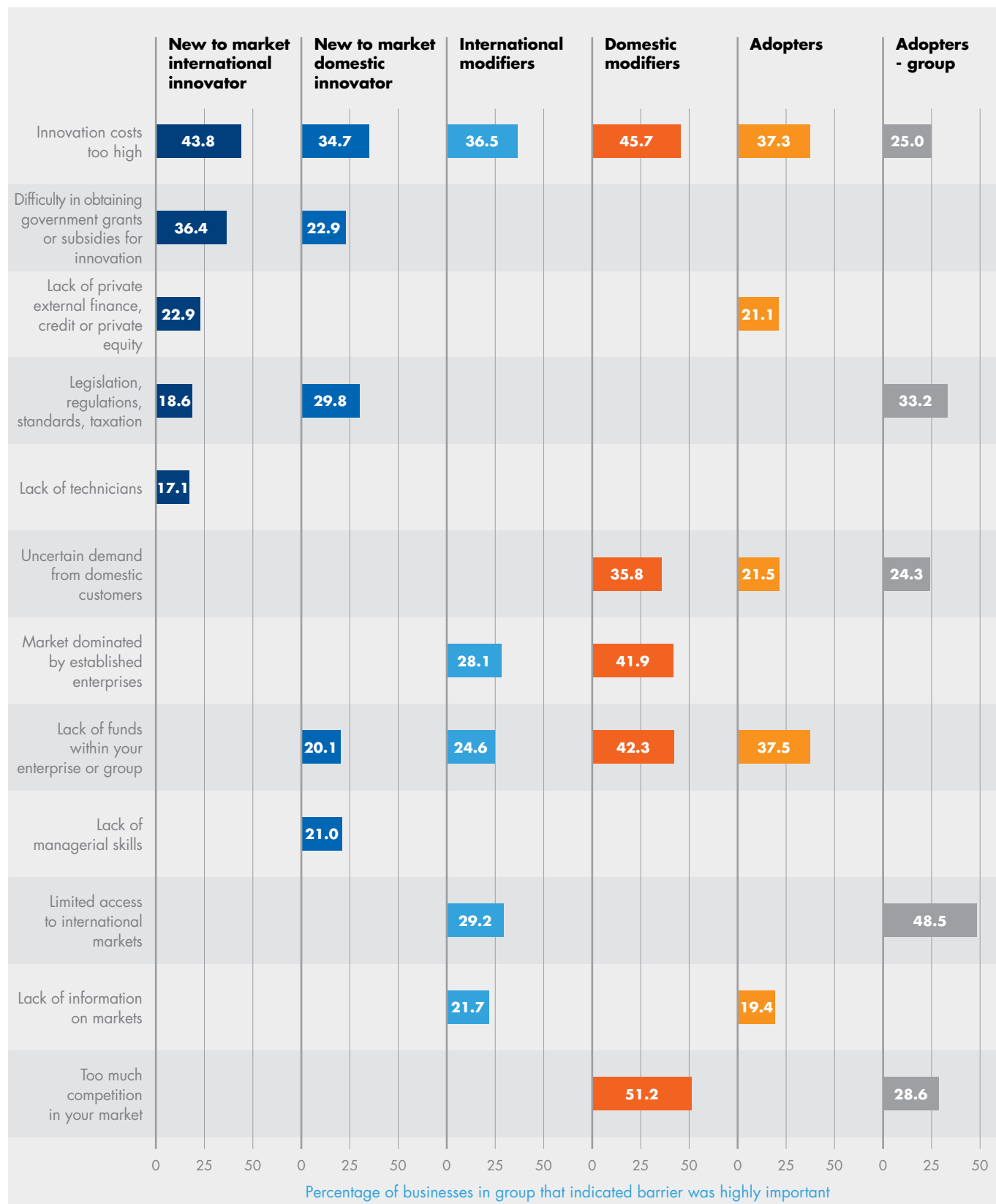
Source: Appendix table A6.12

<sup>35</sup> White Paper on Science, Technology and Innovation, p. 30

Businesses that introduced new to market product innovations, in both international and domestic markets, were most likely to have reported that difficulties in obtaining government grants or subsidies for innovation was a highly important barrier (Figure 42).

**Domestic modifiers** were the most likely to have reported that competition (51%) and market domination of established businesses (42%) were highly important, while (interestingly) 49% of **Adopters part of a group** reported that limited access to international markets was a highly important barrier.

Figure 42: Top five highly important barriers to innovation for product innovators, 2019-2021



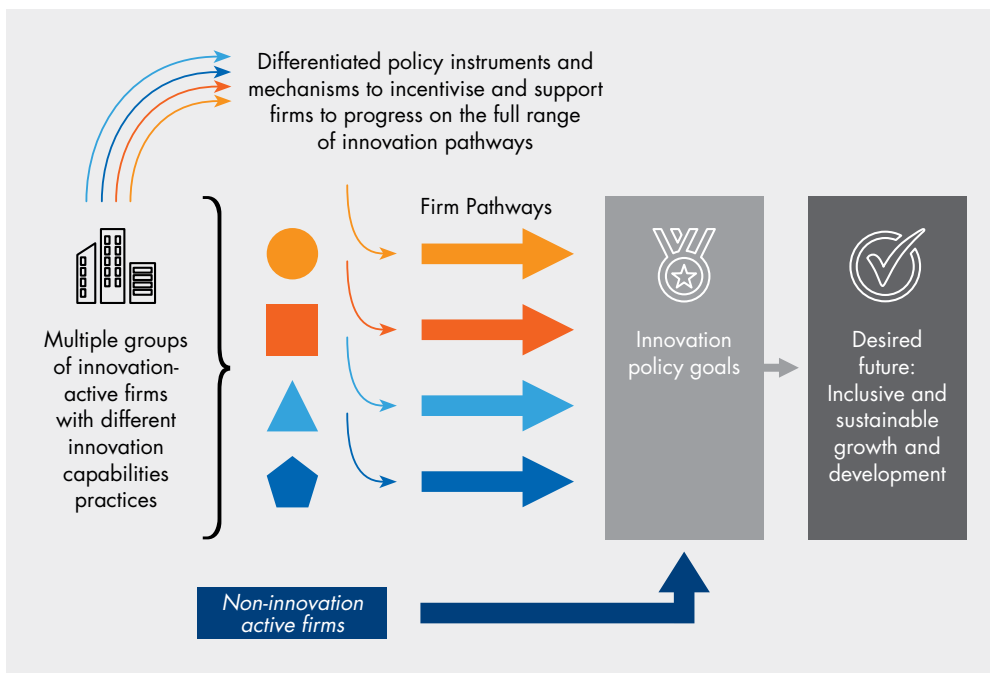
Source: Appendix table A6.12

# CONCLUSIONS

## Policy relevant insights

The interrelated nature of business within broader economic governance, whether public or privately driven, necessitates a reliable evidence base that can be used by corporate decision-makers, policy actors, and academic analysts. The data and analysis presented in this report aim to provide both high level and a more granular account of how South African businesses performed from an innovation perspective during 2019-2021. Deliberately oriented to the practical needs of role-players in business, government and civil society, from industry groups to unions and academia, the analysis is situated at the research-policy nexus. The analysis in this report can be encapsulated in a model of business innovation policy and change. The model proposes a process in which differentiated policy instruments, based on the needs of different business profiles, support businesses along their unique pathways to a desired policy goal (Figure 43, Box 4).

Figure 43: A conceptual model of innovation activities, pathways and policy goals



### Box 4: A model to inform policy

Figure 43 provides a visual representation of the model. On the left, the different shapes and colours represent multiple groups of businesses with different innovation capabilities and practices. On the right, the DSI's desired future of inclusive and sustainable growth and development, and innovation policy goals that support this, are presented as innovation outcomes. The horizontal arrows represent the unique pathways on which different groups/types of businesses must advance, to achieve the innovation policy goals. Finally, the curved arrows represent the differentiated policy instruments needed to support the different groups/types of businesses, based on their innovation capabilities and activities, as they progress along their unique pathways.

The report reflects the types and scale of innovation activity and innovation across and within key sectors of the economy. The high-level results reveal that:

1. Less than two-thirds of South African businesses were innovation-active during 2019-2021.
2. Among the innovation activities undertaken most frequently were a variety of non-R&D related activities such as training of staff, software development and database activities, and marketing. Only 17% of innovation-active businesses conducted in-house R&D.
3. More South African businesses tended toward improvement of existing products as innovation than the introduction of entirely new products.
4. Product innovations tended to be new to the firm rather than new to the market or world.
5. Innovative businesses tended to report a combination of product and process innovation as opposed to product only or process only innovation.

The results reinforce trends seen in the past in that South African business innovation tends to be incremental, with low levels of R&D relative to other innovation activities. Building an enabling environment for innovation by South African businesses means supporting a broad range of activities, including but not limited to R&D.

The application of multidimensional indicators, in addition to the more traditional binary indicators, provides further insight into the general trends observed in the data. The insights reveal more about the nature of innovation activities, business capabilities, and linkages to markets. Among these insights are the following:

1. More than half of innovation-active business were not involved in knowledge-intensive (R&D or patenting) innovation activities and did not collaborate. But there were also low levels of collaboration among businesses with knowledge-intensive activities.
2. Businesses not involved in knowledge-intensive innovation activities but did collaborate, generally placed a higher degree of importance on their information sources compared to other product innovators, but most notably on suppliers of equipment, materials, components or software, and professional and industry associations.
3. Businesses whose innovations were mostly modifications of existing products, tended to face more competition compared to new-to-market innovators. But adopters faced the least competition.
4. Innovators that introduced new-to-world innovations, and adopters that were part of an enterprise group, were likely to have the most IP rights.
5. Overall, 80% of innovative firms were using/developing Internet of Things, while only 7% were using/developing nanotechnology. But over a quarter of innovators that introduced new-to-world innovations used or developed nanotechnology.

The value of this multidimensional approach is that it points to more specific areas of strength and weakness among different categories of businesses, suggesting differentiated needs in terms of innovation support. Policy instruments to promote innovation in businesses can therefore be designed in more targeted and effective ways.

# SUMMARY OF METHODOLOGY

The BIS 2019-2021 was based on the guidelines of the OECD's Oslo Manual 2018. More specifically, the survey used the methodological recommendations for the Community Innovation Survey (CIS) series of European Union countries as provided by Eurostat, the Statistical Office of the European Commission. Indicators that are both relevant for South Africa and internationally comparable were produced using these guidelines.

The survey design was also informed by the structure of the Business Register of Statistics South Africa (Stats SA), which was used to draw a suitable stratified random sample for the survey. The sample frame from which the original sample was drawn had 30 Standard Industrial Classification (SIC) codes, representing industry and services sectors, and four size-classes (determined on the basis of annual turnover), which gave a total of 120 strata. Industry covered the sectors: mining and quarrying, manufacturing and electricity, gas and water supply. The services sectors covered: wholesale and retail trade, transport, storage and communication, financial intermediation, computer and related activities, R&D, architectural and engineering activities, and technical testing and analysis.

The survey achieved an overall response rate of 33.2% from a cleaned sample of 5,002 enterprises. A non-response survey was conducted, the results of which were subsequently used to adjust the weights of the strata for potential bias in the estimation of innovation rate and other indicators that might arise due to non-response. The results of the survey were extrapolated to the target business population of 57 025 enterprises by applying the weights of the 120 sample strata based on SIC codes and four size-classes used by Stats SA in 2021.

## Box 5: Methodology notes

Further methodological details of the BIS 2019-2021 are contained in two documents, which form part of a collection of documents that accompany this report:

### 1. **BIS 2019-2021:**

#### **A note on**

#### **methodology**

(contains further details on sampling and response, non-response survey, imputations, and projection of results)



### 2. **BIS 2019-2021:**

#### **Weighting**

#### **methodology**

(contains further details on the calculation of statistical weights)



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Your participation matters.



# CONTACT US

## **Department of Science and Innovation**

Private Bag X894, Pretoria, 0001  
Republic of South Africa  
[www.dst.gov.za](http://www.dst.gov.za)

### **Dr Phil Mjwara**

Director-General: DSI  
[Phil.Mjwara@dst.gov.za](mailto:Phil.Mjwara@dst.gov.za)

### **Dr Mmboneni Muofhe**

Deputy Director-General: DSI  
[Mmboneni.Muofhe@dst.gov.za](mailto:Mmboneni.Muofhe@dst.gov.za)

### **Mrs Kgomotso Matlapeng-Matjila**

Chief Director: DSI  
[Kgomotso.Matjila@dst.gov.za](mailto:Kgomotso.Matjila@dst.gov.za)

## **Centre for Science, Technology and Innovation Indicators (CeSTII)**

Human Sciences Research Council  
POBox 15200, Vlaeberg, Cape Town, 8018  
[www.hsrc.ac.za](http://www.hsrc.ac.za)

### **Dr Glenda Kruss**

Executive Head: CeSTII  
[gkruss@hsrc.ac.za](mailto:gkruss@hsrc.ac.za)

### **Dr Moses Sithole**

Research Director: CeSTII  
[msithole@hsrc.ac.za](mailto:msithole@hsrc.ac.za)

### **Dr Amy Kahn**

Research Specialist: CeSTII  
[akahn@hsrc.ac.za](mailto:akahn@hsrc.ac.za)

### **Gerard Ralphs**

Senior Research Manager: CeSTII  
[gralphs@hsrc.ac.za](mailto:gralphs@hsrc.ac.za)









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