

## **TECHNOLOGICAL CHANGE AND THE DTIC: INNOVATION IN THE INDUSTRY**

### **OVERVIEW**

The rapid pace of technological change is taking place in the context of South Africa slipping in international benchmarks of competitiveness, digitalisation, and its readiness for these changes. At the same time, the urgency to create and retain jobs, especially in new industries and markets, has increased. Policies to support structural economic change in the economy, such as moving from a strong dependence on mining and related industries and commodities, are being implemented. Technological change and innovation are important elements of this structural change. The aim of this Policy Brief is to give context to these technological changes and the industrial policy interface.

### **INTRODUCTION**

Moving up the value chain is a central theme in industrial policy. One outcome of a successful approach to technological innovation, and as part of an industrial policy framework, is partnership between business, government and research institutions to push the boundaries of technological change. These engagements require an understanding of the high-level technology-related issues, the innovations and technologies impacting on an industry, and the roleplayers or institutions surrounding these technologies and innovations. The current period of rapid technological change has great risks for companies – and could range from either not shifting their production processes to be in line with the most modern, efficient and cost-effect approaches, or on the other side of the coin, adopting incorrect new technologies that stall their business or make them uncompetitive.

Understanding these dynamics as well as why firms innovate, and other key issues around technological change, is a growing

requirement for government, in particular policymakers working with sectors and companies as part of their core outputs.

### **WHY LOOK AT TECHNOLOGICAL CHANGE?**

At the heart of these new technological changes are attempts by entrepreneurs, scientists, engineers, public officials and policymakers to be more innovative. While technology is focused on action, on exploiting or harnessing natural phenomena, innovation is focused on change.

Innovation and absorbing new technologies require a conducive environment that combines different types of knowledge, such as production knowledge or market knowledge, capabilities, skills, and resources such as facilities, a well-functioning distribution system, and finance, among others. Innovation is also cumulative. Those that innovate frequently are more able to learn from their own and the efforts of others, while those that innovate less frequently gradually fall further and further behind.

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### **TECHNOLOGICAL CHANGE AND INNOVATION SYSTEM OBSERVATORY**

The aim of the Technological Change and Innovation System Observatory project is to support the Department of Trade, Industry and Competition (the dtic) and industry sectors to develop an integrated, strategic response to discontinuous technological change and disruptive innovation. It aims to equip public and private organisations to become more sensitive to global technological shifts, and the changing demands placed on the innovation system, the manufacturing sector and its stakeholders. This Policy Brief focuses on the role of the DTIC sector desks in strengthen the technological capability of the country or an industry to enable change, adaptation and economic resilience. It builds on a series of four research reports [available online here](#).

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*We tend to overestimate the effect of a technology in the short run  
and underestimate the effect in the long run – Attributed to Roy Amara,  
The Age, October 2006*

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Many industries in South Africa are characterised by a few modern companies competing globally, and a bulk of companies using outdated technology combined with cheap labour to survive in niches they have created. The leaders in each sector are often global players and exporters, and consequently are exposed to the most relevant technological developments, including through their supplier and client networks. Due to global and local competition they are incentivised to continuously seek out better solutions, new technologies and different arrangements. They are incentivised to learn on many different fronts. In contrast, companies that are not well integrated into global markets, or are not exposed to the same levels of competitive pressure, are more at risk of falling behind or being disrupted as they face less pressure to innovate continuously.

The implication of these changes are that frontier technologies might be more relevant for those companies that are competing against other global players (both domestically and abroad). For the medium- to lower-technology companies the threat is that off-the-shelf technologies that are already proven and efficient might be used by new entrants or international competitors to render them obsolete. In these kinds of companies there are huge productivity gains to be made by upgrading and modernising. Furthermore, an improvement in the performance of these companies will also serve to diversify the manufacturing base and create employment of low, medium and highly skilled workers. However, for companies catching up, it involves not only upgrading processes and equipment, it may also require a rethink in organisational structure, supplier networks, markets and ownership.

#### **A FOURTH INDUSTRIAL REVOLUTION?**

The fourth industrial revolution (4IR) concept has emerged in recent years as a way to understand the rapid pace of technological change taking place. It is characterised by the convergence of several technological domains that have previously developed in relative isolation of each other. With digitisation reaching many aspects of daily and productive life, it feels like demands of technological change are increasing.

The implication is that it is no longer enough to keep an eye open within a sector or a technological domain: disruptive changes can be introduced from different parts of the economy. For example, the rapid dissemination of digital technologies in the society will most likely increase in momentum as more companies and markets integrate digital services into their solutions.

South African enterprises of all kinds have to become better at identifying new ideas, concepts and technologies, irrespective of where they originate. These must be combined and integrated into the local context by using emerging technologies as platforms to innovate. To compete effectively South African enterprises have to become better at innovating at the product, process and business model levels.

Investments by the public sector are also crucial to ensure tertiary institutions, science councils and similar institutions are engaging with these issues. This needs effective regulation, establishing relevant and modern infrastructure, and ensuring fair access.

To better understand the implications of the 4IR for South Africa, a Presidential Commission was established. In August 2020, the Presidential Commission for the Fourth Industrial Revolution delivered its report to President Cyril Ramaphosa. The commission made recommendations to:

- Invest in human capital development;
- Establish an Artificial Intelligence Institute;
- Establish a platform for advanced manufacturing and new materials;
- Secure and avail data to enable innovation;
- Provide incentives for future industries, platforms and applications of Fourth Industrial Revolution (4IR) technologies;
- Build 4IR infrastructure;
- Review and amend (or create) policy and legislation; and
- Establish a 4IR Strategy Implementation Coordination Council in the presidency.

The project to translate these recommendations into actions is underway but it may still take time before impacting on a significant number of manufacturing enterprises.

In the short to medium term, much remains to be done. While it is necessary to pay attention to frontier technologies that are already being adopted by leading companies and public institutions, it is not sufficient. South Africa is lagging in the adoption or absorption of many medium and low technologies that have already been proven in other contexts. Research by the National Advisory Council for Innovation as well as TIPS has looked at several indicators that measure the country's performance on technological change. Some are positive, but several show a decline, highlighting future economic challenges for South Africa. Consequently, South Africa must find ways to encourage both exploration at the technological frontier as well as improving the rate of adoption, adaptation and integration of existing and proven technologies.

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The OECD Oslo Manual provides guidelines on measuring innovation. It defines innovation as *“An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).”* – OECD and Eurostat, 2018:21

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### WHY DO ORGANISATIONS INNOVATE?

It is crucial for policymakers to understand why firms innovate and then embed that into their policy approach to support the improvement of firm performance. A new product or process can differentiate a firm and give it a market advantage. Or it can gain a cost advantage. New processes can enhance a firm’s ability to innovate. For instance, new organisational practices can improve knowledge exchange or the ability to respond faster to shifts in market demand. Translating these issues into policies that are accessible by firms therefore becomes a priority.

However, not all organisations innovate because they want to. Many organisations innovate because they have to and therefore it is necessary that the policy framework incorporate these reluctant innovators into programme design. Drivers of innovation may come from clients of a firm who may demand a new service, product or feature. Others innovate defensively because they have to respond to trends set by competitors. Sometimes organisations can innovate because new equipment, materials, new suppliers or business models make new combinations or arrangements possible. Innovations could also be serendipitous, when something is discovered in pursuit of another objective. Regulations can also induce innovation. For instance, changing the regulations for plastic bags in the Environment Conservation Act No. 73 of 1989 led to many companies having to rethink their business models, materials and processes. Many plastic manufacturers and retailers, and also organisations such as municipalities, waste management companies and others, had to innovate to comply with the changed legislation.

In some cases, ideas from other contexts are copied and then adapted into a specific context, so innovation could also take the form of copying and adapting ideas from others. This means that exposure to other organisational contexts that are different could be an important advantage. Learning from others is also dependent on trust and diverse social relations, hence innovations tend to concentrate in places where there is a cultural diversity and a concentration of different kinds of expertise.

Although there are many scholars who believe that all innovations result in a commercial benefit, organisations in the public sector and the civil society

also innovate, but with a different motivation. When they innovate consistently, the effects may change the trajectories of locations, market segments or industries even long after the programmes cease to exist. The incentive for public innovation is therefore not always to gain a competitive advantage, although some public services do compete with the private sector. Innovation in the public sector is often about increasing impact of services, improving inclusion, reducing costs of service delivery, or providing specific support to industry, or to ensure sustainability.

There are also good reasons why organisations that can innovate do not. Innovation requires change, resulting in discomfort, inefficiency, reorganisation and stress. It introduces variation into existing systems. A small tweak to a product design may result in costly changes in the manufacturing process or distribution chains. Not all innovations work in the marketplace, and a mistake can be costly to rectify.

There are search and discovery costs involved in finding good ideas or solutions. It may be difficult to identify or compare potential solutions. Innovation is a process of combination and recombination, but this is only possible if the modules that could be combined are known or accessible. Often ideas and tacit knowledge spread through social networks and chance encounters. This partially explains why innovations tend to cluster in certain locations – innovators benefit from proximity to other innovators and the exposure to a rich stream of ideas.

In more hierarchical organisations, innovation efforts are often led from the top and are typically implemented as improvement projects. This is especially true in more traditional industries. However, in the service economy and more modern parts of the economy, innovation could be a distributed effort that is more iterative in nature. The reasons for these differences are not only about leadership, and also relate to economies of scale, the capital intensity of the organisation, the sunk costs, and also the difficulty of instigating changes in suppliers and markets.

In domains in the economy in which technological progress is slower, older and more experienced workers have a clear advantage. In domains in which the pace of development is rapid, employees who have recently graduated or are undergoing further education have an advantage.

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*“An innovation system is the key to capturing tacit knowledge because it is developed over time through practice and interactions in environments specific to a particular technology. The effectiveness of a national innovation system will, therefore, be largely defined by how it incentivises and supports such learning interactions.” – UNCTAD 2014:23*

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One of the issues for both companies and policymakers to consider in effectively taking forward innovation, is that innovation may require simultaneous investments in other organisations, infrastructure, markets or supply chains. This is typically referred to as the costs of co-ordination that arise when several organisations need to make changes for an innovation to be effective. Attention must also be paid to the pressure or incentives that make it worthwhile for individuals, organisations and companies to take risks, try new ideas and explore different ideas.

Innovation is typically managed across organisational silos and knowledge domains. Although innovation is typically thought of as quick, technological capability and absorptive capacity typically take a longer time to develop. Innovation is both shaped by an organisation’s internal technological capability and its organisational culture, as well as by the pressure from the external environment to surface better ideas, make better arrangements and to find more appropriate solutions.

### **MOVING FROM FIRM INNOVATION TO INNOVATION SYSTEMS**

While innovation is typically thought of in the context of organisations, or at the level of a group of related technologies, an innovation systems perspective is more holistic and considers factors beyond the events or activities that enables innovative efforts.

An innovation system can be defined as “the network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies” (Freeman, 1987:1). It has also been argued that the structure of production and the institutional set-up are the two most important dimensions that jointly define an innovation system (Lundvall, 1992:10). Innovation systems are often seen as evolutionary (Nelson and Winter, 1982), and when economic growth and technological change are seen as integral to how the innovation system operates (Nelson, 2015; Romer and Link, 2008; Nelson and Winder, 2002).

The innovation system approach spells out the interactive nature and “learning by doing” process of the various components of inventions, research, technical change, learning and innovation (Freeman and Soete, 2009; Soete, Verspagen and Ter Weel, 2009).

Innovation systems are key to developing capabilities inside a country (Kraemer-Mbula (2011):4), and draw on the use of tacit knowledge and the informal ways

in which ideas are shared. The country context is therefore important because it impacts on how organisations use knowledge as well as how the public and private sector interact on these issues. This approach includes the type and learning-oriented quality of interlinkages between certain business clusters, associations, non-government organisations, unions, universities, R&D institutions and political and policy structures. The focus has also been argued by some to be on the “problem-solving” nature of innovation (Elder and Fagerberg, 2016), which potentially makes innovation a relevant force for dealing with important social and economic issues.

It is important to note that different perspectives on innovation systems place a different emphasis on spatial elements and on engagement with parts of a much larger system. The national innovation systems logic is dominant in South Africa since the adoption of the Science and Technology Whitepaper in late 1996 (DACST, 1996) and a revised Whitepaper on Science, Technology and Innovation in 2019 (DST, 2019). The dtic’s Industrial Competitiveness and Growth division is organised around vertical and horizontal sectors and industries, and therefore the kind of innovations and learning that can happen within and between industries are important to pay attention to. However, due to the disruptive nature of technological changes originating from other knowledge domains and industries, the dtic should also maintain a transversal or cross-cutting perspective on the changes taking place in the economy.

In many countries, the responsibility for innovation policy increasingly spans several ministries and government levels, and frequently involves non-state actors (Elder and Fagerberg, 2016:16). Innovation policy is seen as an important cross-cutting approach to solving social, environmental and local issues on topics such as climate change, water scarcity, unemployment, rapid urbanisation, quality of life and technological convergence.

While the mandate to steer the national innovation system rests with Department of Science and Innovation (DSI), many of the structural issues, economic incentives, trade opportunities and elements of the technological and innovative capability depend on policy coherence, close co-operation and collaboration with other departments including the dtic, Department of Higher Education and Training, Department of Public Enterprises, Department of Small Business Development and Department of Employment and Labour.

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Effective governance of innovation systems also depends on partnerships with leading local companies, civil society, labour, and international organisations. An effective innovation policy is one that provides direction to a firm's innovation efforts, and that is credible and not subject to frequent, unpredictable changes. This policy direction creates incentives, reduces risks, raises interest, and mobilises resources. Understood in this way, innovation policy may be a powerful tool for transforming the South African economy.

### **IS THERE A ROLE FOR THE DTIC IN INNOVATION PROMOTION?**

Industrial policy and innovation policy are intertwined, yet they are often not discussed at the same time. These policies are interdependent in that they aim to transform the structure of the economy. For instance, South Africa's Ten-Year Innovation Plan (2008-2018) had the objective of transforming South Africa into a knowledge economy. Over the same period, the dtic implemented several iterations of the Industrial Policy Action Plan to support investments in productive capacity, skills and increased local manufacturing capabilities.

This inter-relation between industrial and innovation policy requires that a broader perspective is needed on innovation which, as noted, is understood as the introduction of new solutions in response to problems and challenges, or opportunities that arise in social and/or economic environments (Elder and Fagerberg, 2016:16). This approach means that innovation is recognised as being about more than new products, processes or patents. Innovation is also about improving on what exists, absorbing new ideas from beyond the firm or the industry, recombining new and old ideas, and learning from developments in other domains, industries or technologies. Innovation is important in both high-tech and in low-tech industries, in cities and rural areas, in the private but also in the public and civil sectors.

To turn an invention<sup>1</sup> into an innovation, a firm typically needs to combine several different types of knowledge, capabilities, skills and resources from within the organisation and the external environment (Schumpeter, 1997). The challenge for governments is to figure out how to ensure that entrepreneurs,

innovators and decision-makers are encouraged to keep on searching for better combinations, or for ways to combine new ideas with existing (known) knowledge and technology modules.

Programmes in the dtic, such as the Manufacturing Competitiveness Enhancement Programme (MCEP); Support Programme for Industrial Innovation (SPII); Technology and Human Resource for Industry Programme (THRIP); National Cleaner Production Centre (NCPC) and Information and Communication Technology (ICT) Hubs in townships encourage this kind of innovation through combinations. For instance, MCEP provides a working capital facility that aims to assist manufacturing companies with working capital, and provides finance to black industrialists for the acquisition of plant and equipment; SPII provided a grant for the development of innovative products and/or processes; THRIP fostered closer collaboration between leading companies and researchers in Higher Education Institutions. NCPC is supporting innovation in energy efficiency. The pilot model for the ICT Hubs in South Africa Townships programme aims to establish access to connectivity, data and access to the digital economy, and is supported by the Township Investment Fund.

Even in low-tech industries, innovation takes place, and the economic effects may be large (see for instance Von Tunzelmann and Acha, 2005). It is possible that many innovations go unnoticed because people do not consider replacing a 40-year old furnace with a refurbished second-hand furnace that is 15 years old as innovative. However, replacing a critical technology (like a furnace) with a newer technology will most likely demand organisational, supplier and other process innovations. The act of replacing a critical component in a larger production system could result in new market opportunities, new product developments and further investments.

Moreover, the term innovation may also be used for changes that are new to the local context, even if the contribution to the global knowledge frontier is negligible. In this broader perspective, innovation – the attempt to try out new or improved products, processes, or combinations of doing things – is an aspect of most, if not all, economic activities. Thus, innovation could include imitating what works elsewhere, or integrating an idea from another context into the local environment, irrespective of how “modern” or advanced the improvement is. Innovation does not always follow research, but it can sometimes start from copying what works elsewhere or solving a problem in a new way. This is one of the reasons why innovation can sometimes be catalysed

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<sup>1</sup> A popular distinction is that inventions are new to the world, while innovations are new to the context. An invention does not have to be an entirely novel idea, it could also be a minor improvement on an existing idea. However, for an invention to have effect, it must be implemented through innovations.

*While many innovations can be linked to well-funded research programmes, funding is not a pre-condition for innovation. A lack of resources, for example, could stimulate people to innovate.*

through technology demonstration or the provision of technology extension services to help companies identify opportunities for upgrading and further innovation.

While many innovations can be linked to well-funded research programmes, funding is not a pre-condition for innovation. A lack of resources, for example, could stimulate people to innovate. Firms usually innovate because they believe there is a commercial benefit to the effort that outweighs the costs and risks. This commercial benefit could be measured in terms of return on investment or profits, but it could also be about cost saving, resource optimisation, solving a recurring problem or responding to the demands of a customer. Often increased competition, changes in market structure or shifts in market demand, changes in input prices and availability, or changes in technological performance also affect the incentive to innovate. In most cases, innovation requires taking, or at least managing, risks to overcome some form of uncertainty. As a result, firms with low capital or tied-up resources are less likely to innovate, but this also depends on the context, the industry and the required changes.

Key questions for the dtic in its approach to innovation policy are:

- Is it innovation in a narrow sense, e.g. new products, processes and so on? or,
- Does it also include the diffusion and use of innovations? (Fagerberg, 2013:14).

The latter case (i.e. a broad perspective) sees innovation contributing to changes in the economy and production systems. The narrow perspective, i.e. not including diffusion and use, would not only exclude what matters most economically but also make it more difficult to understand the innovation dynamics.

This argument is important in the South African context, especially regarding threats of technological disruption caused by frontier technologies included under the broad banner of Fourth Industrial Revolution technologies. This requires a view on whether a sector is:

- Promoting the development of solutions at product or process level;
- Ensuring that local producers are exposed to global technologies so that they can upgrade processes, form new networks or absorb new insights from the frontier into their current operations; and
- Using unique local circumstances and comparative advantages to develop unique local solutions and adaptations that may be relevant in the region or globally.

The diffusion of new technologies in a sector also requires that co-ordination failures, market concentration, and search and discovery costs are overcome in creative ways. This becomes challenging in industries in which there are huge gaps between the market and technology leaders and the rest of the industry, or when public sector and private sector collaboration and dialogue is weak or hardly exists.

## IMPLICATIONS

The implications of the analysis for the dtic are:

1. Technological change remains an important and core part of industrial policy. This requires the dtic and its sector desks to engage with the issues of why firms need to innovate, and the need for effective innovation systems.
2. An understanding is required of how industries learn about new technological capabilities. It may even be necessary for the dtic to support the introduction of new technologies. While some technologies can be disseminated through technology transfer mechanisms (e.g. from a university to a firm), smaller or lagging regions may benefit more from technology extension or access to scarce and specialised technology through a different mechanism (should such institutional capabilities not be available).
3. Disruptive innovations can affect whole industries and regions. The dtic would therefore need to pay attention to both sectoral or industry-level technological shifts, while also considering transversal technological shifts that affects many industries and sectors.
4. The frontier technologies surrounding what has been termed by some as the fourth industrial revolution pose a risk for firms and industries. It requires familiarity with the different technologies and the need to identify specific areas in which technology platforms may be required when digital technologies are disrupting the existing supply chains or production processes, and when upgrading by firms is required.
5. The DSI is emphasising and funding the narrower focus for innovation that usually originates in research laboratories. While it is an effective use of public funds and approach for institutions in catalysing research-intensive innovation this approach may differ from the broader innovation approach required by the dtic (i.e. in supporting a change to the structure of the economy, and improvements in productivity, diversity and employment). The DSI approach remains relevant and important in areas in which South Africa wants to build strong future positions, such as

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advanced manufacturing, materials science and the bioeconomy. The dtic has supported its broader focus on innovation through several incentives and programmes that encourage technology development and application collaboration between academia and industry. However, this does not necessarily foster problem solving, market development or technological learning, nor does it overcome co-ordination, search and discovery costs.

6. Private firms do not always have the in-house capacity to manage innovation and technological change. Both the dtic and DSI require institutions that are capable of supporting firms with innovation and the absorption of different type of technologies, as well as technological support as a public good or broader industry application.
7. Dealing with contextual innovation issues remains important and relevant. However, while certain innovations and technological capabilities can be addressed in the short term (for instance within a year), some capabilities might take longer to develop (innovation is cumulative). Therefore, the dtic programmes would need to provide support over different time horizons.
8. It is risky to assume that most large firms are globally competitive and able to master new technologies. Path dependence combined with sunk investments might make it hard for such companies to switch technologies or exit certain markets. The assumption that small firms are more technological savvy and able to compete against incumbents is also risky. An innovation policy must consider existing enterprises, potential new enterprises, and international entrants. The incentives to upgrade, compete and grow are different, and so are these three.
9. Certain types of innovations can be measured by quantifiable indicators, such as patents, research investment and research outputs, while other kinds of innovations are much harder to quantify, such as problems solved, technology demonstration or evaluations conducted, prototypes or design alternatives tried, simulations completed, or new markets entered. These require a different set of measures or indicators that record increased technological capability over time, the steady modernisation of industry, increased exports of more complex products, structural change, and participation in regional and global value chains. A more complex set of measures are therefore required that record the effect of innovation on trade, investment, and the structural changes in the economy.

## CONCLUSION

Innovation in the private sector can be catalysed by innovation in the public sector and through public sector institutions and support instruments. Creating innovative public goods, fostering creative collaborations around challenges or opportunities, supporting diffusion of innovative products or simply improving service delivery by means of technology can inspire investment in the private sector, while also reducing costs and creating opportunities.

The dtic's core role in industrial policy requires an active engagement in and support of innovation, particularly as it pertains to problem solving, conducting experiments, trying new combinations, and developing new applications or platforms.

The DSI has the responsibility to co-ordinate the national system of innovation. The system of innovation is broad with several departments, public programmes, and industry bodies that have an interest in its effectiveness in supporting structural change. As part of this framework, the dtic can use its industrial policy instruments to support the development of technological capability, as well as improving the co-ordination between the public sector and the private sector. There is therefore an important role for sector masterplans and other engagement platforms to strengthen technological capabilities. The promotion of innovations is not always about research, as innovation can also be fostered by, for example, promoting investments into areas in which technological competence is lacking, or by ensuring that more successful enterprises invest in developing globally competitive supply chains and physical and institutional infrastructure.

While companies receive fast feedbacks from markets, and are therefore constantly under pressure to adapt, supporting institutions, technology transfer projects and research and development institutions might not have the same pressures. Technologies, particularly those associated with the fourth industrial revolution, are changing exponentially, and global technology leaders are rapidly creating new markets based on fast feedback from their clients. It means that publicly funded organisations and programmes might be prone to more risks with disruption, and that regulators might fall behind in creating the correct legislative environment for new markets and institutions to emerge. The dtic, and sector desks, therefore, play a key role in ensuring that industry has access to a broad range of institutions that can assist companies to absorb new ideas, integrate or experiment with new technology, overcome

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co-ordination costs and reduce the costs of catching up.

Current localisation efforts require investing in local manufacturing capability and leveraging public procurement. Effective localisation requires globally competitive companies and technologies that can unlock both local and regional markets. Further, effective use of unique local technologies should provide scope to unlock local and regional challenges while creating new economic opportunities and investments. Often a lack of specifications or a lack of market intelligence can be addressed by improving public and private collaboration and co-investment. Instruments like technology road mapping can contribute to a focused public-private collaboration.

Last, the dtic should be cautious in how it engages with and promotes specific technological solutions, especially those at the technological frontier. Rather, the dtic has a role to play in encourage learning, experimentation and technology demonstration across a broad range of technologies.

A range of international good practices exists on how to support that collaboration – particularly in clusters, value chains and supply chains. These examples show how large and small firms across sectors along with researchers, policymakers and investors are able to work together on product, process, business models and regulatory frameworks to strengthen their manufacturing sector.

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