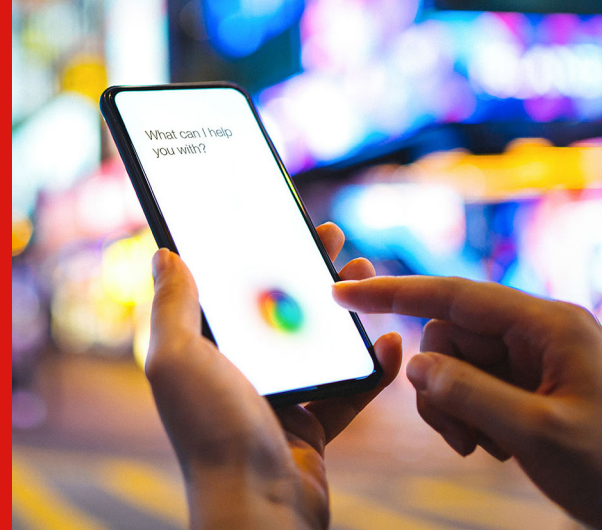




INDUSTRY INSIGHT

Artificial Intelligence.



24 Nov 2023 | **Paul Clark**, Industry Economist | +64 9 336 5656 | +64 21 713 704 | paul.clark@westpac.co.nz

Oh yes, this is the great transformer.

The digital age is likely to be faster, better, and cheaper at creating value than the industrial age and agricultural economies that preceded it. With Artificial Intelligence (AI) set to be a big part of that, we look at how New Zealand firms can adopt this technology and improve their competitiveness.

- AI improves competitiveness which drives greater profitability. It has the potential to increase firm adaptability and responsiveness to changing circumstances, by boosting productivity and delivering a sharper customer focus.
- Adoption in New Zealand lags because there are significant barriers. These range from an inbuilt resistance to change, to the technical challenge of how to integrate AI within existing data and systems architecture. Most firms remain ambivalent about AI and are not pursuing it with urgency.
- Some barriers can be addressed through the appropriate data governance frameworks and process controls; others through partnerships with external vendors. Education though is paramount, be that to demystify what AI is or to alleviate concerns relating to job losses.
- Firms without AI are likely to lose competitiveness. As AI grows in importance, competition and industry rivalry will become more intense.
- AI will reduce barriers to entry and that should level up the competitive playing field. That means smaller and more dynamic firms that fully embrace AI will be better placed to compete head-on with larger businesses that only use AI in specific use cases.

- But larger firms also have advantages. While they may struggle to completely embrace AI, they can still apply it in specific end uses, leveraging off large proprietary data sets to deliver hyper-personalised customer experiences.

Background.

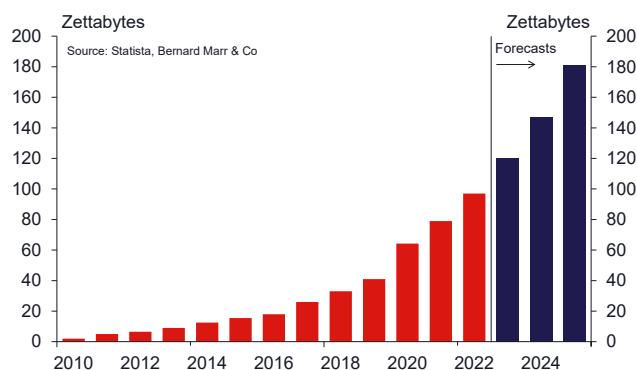
The term “Artificial Intelligence” isn’t new. The groundwork for it began in the early 1900s, but it was only in the 1950s following the publication of Alan Turing’s work, “Computer Machinery and Intelligence” that interest in it started to pick up. Subsequent decades saw periods of rapid development and funding setbacks. However, by the turn of the new millennium, Artificial Intelligence (AI) had started to transition into the mainstream – a trend that was to accelerate in subsequent decades due to the rapid advance in digital technologies, the exponential growth of data, huge leaps in computing power and communications capability, and the move towards open sourcing.

Today.

Today AI is big business. The global AI market was estimated to be worth about US\$454bn in 2022. An industry source suggests that figure will have risen substantially in 2023, with new AI tools having burst on the scene earlier this year. Estimates for New Zealand are far more difficult to pin down, but our understanding is that the amount spent on AI solutions in the local market is somewhere around NZ\$500m.

That though is just the start. By 2032, the global AI market is expected to accelerate to a mind boggling US\$2.6trn, with AI applications set to transform the provision of everything, from transportation and healthcare to new medicines and entertainment, education, retail, and banking services, all of which will be personalised to individual requirements.

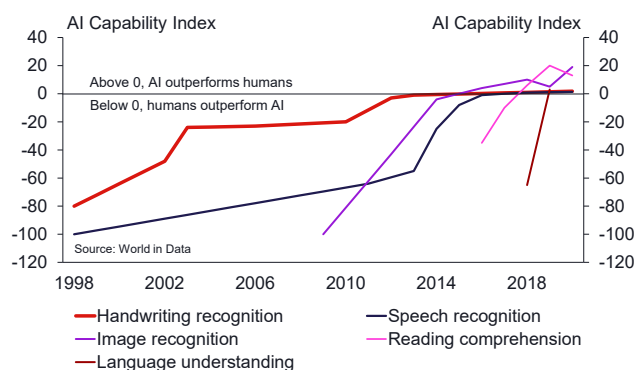
Figure 1: Volume of data created annually



AI defined.

AI is not an easy concept to grasp. Numerous technical definitions exist but we define it simply as the science of making machines think like humans. Practically, AI is about building machines that can perceive what's happening in their environment, recognize objects, contribute to decision making, solve complex problems, learn from past experiences, and imitate patterns. These machines can then be used together with other technologies in a range of end uses, from autonomous vehicles and robots to applications that are able to generate text, images, and videos. Such machines are gaining wider competencies (see Figure 2).

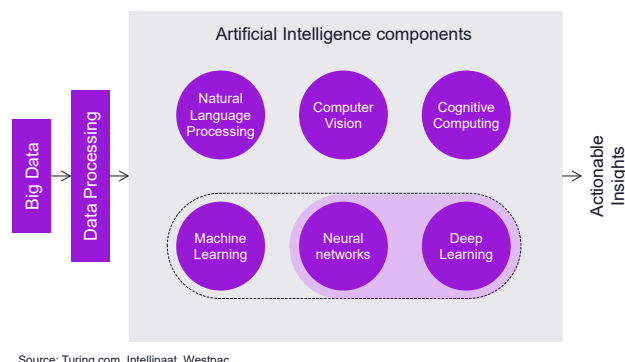
Figure 2: Language and image recognition capabilities



These capabilities depend on a set of inter-related components or technologies. These include machine learning, which refers to the application of statistical techniques to large volumes of data. Also included here is deep learning, which uses a complex structure of layered algorithms or artificial neural networks inspired by the structure of the human brain to deliver a more advanced

form of machine learning. It uses self-learning software algorithms that can train themselves on large data sets to perform tasks like speech and image recognition.

Figure 3: What makes up AI



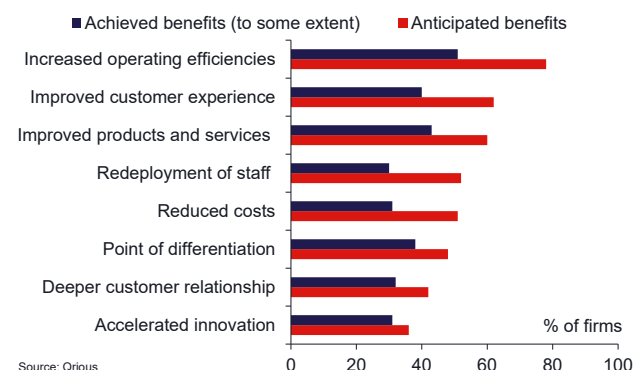
Other AI components include natural language processing (NLP), which refers to algorithms that enable machines to read, understand, interpret, and reply to text or voice data. Similarly, computer vision refers to the ability of algorithms to derive meaningful information from digital images, videos, and other visual inputs — and take actions or make recommendations based on that information.

Finally, there is cognitive computing, which uses sophisticated computer models that leverage off machine learning, deep learning, NLP, and computer vision to mimic human thought processes in complex situations where the answers might be ambiguous or uncertain.

AI is all about the ability of algorithms to interrogate and learn from data.

AI benefits.

Figure 4: Main Benefits of AI



AI provides firms with a tool that improves competitiveness and increases profitability. According to a nationwide survey undertaken by data analytics provider Qrious in 2021, decision makers in businesses, government, and academia were particularly interested in how AI reduces the cost of production, accelerates

innovation, creates a point of differentiation, leads to a better customer experience, and helps deliver products and services that the customer not only wants, but at a time when they want it.

We think there are three ways that AI delivers these benefits:

Increases adaptability and responsiveness.

AI is good at identifying patterns in large and often disparate data sets, allowing firms to detect signals that may previously have gone unnoticed. Earlier decisions can then be taken on risk mitigation measures and earlier actions implemented to seize any opportunities that result.

AI is also good at interpreting these patterns and providing predictions about the future. Firms now have the tools to better understand how their operating environment might change in the future, how customer and supplier relationships may unfold over time, how individual customer preferences could evolve, and what demand for their products and services might look like. At an operational level, these tools can also be used to better predict machine and equipment failure, fluctuations in inventories, and possible bottlenecks that might occur along the entire supply chain. The ability to understand these dynamics is important because they inform decision making at all levels of the firm.

AI helps to inform decision making at all levels of the firm and in so doing boosts its ability to adapt and respond to current and future developments.

Boosts productivity.

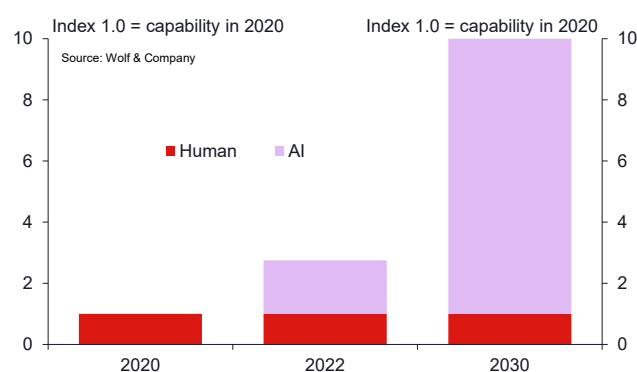
AI also allows firms to do more with fewer resources. According to Accenture, **AI can lift firm level productivity by as much as 40%.**

Productivity gains are possible because AI is so good at detecting patterns in data, interpreting what they mean, and then making predictions about the future. For example, AI's ability to predict future demand for products and services can result in firms making significant changes to their procurement and inventory management practices, which in turn generates operational efficiencies and productivity gains. In similar vein, the ability to predict future equipment maintenance requirements, can significantly reduce downtime, resulting in improved operating efficiencies.

AI also allows firms to make intelligent decisions without the need for continuous human interaction. AI algorithms treat decision making as a science and are well suited for repetitive rules-based tasks, such as data entry, document processing, customer services, inventory management/stock handling, logistics and much more.

Able to operate 24 hours a day, 7 days a week and capable of adapting autonomously to changing circumstance, AI can complete these tasks faster, more efficiently, and with a lower error count than a human worker can. Consider AI-powered Chatbots that have taken over routine customer queries, reducing response times and freeing up customer service representatives so they can handle more complex issues. In similar vein, programmers are now using AI enabled apps, such as Copilot, to code and test software, which frees them up to do other work.

Figure 5: Output of humans & AI on coding tasks



AI's ability to deliver productivity gains doesn't just come from the fact that it does tasks better and faster than humans. It also delivers additional productivity gains because it frees up workers that can potentially be redirected to higher value-added work that cannot be solely done by a machine. Much though depends on whether these workers have the requisite skills and competencies to undertake this work. In an AI driven world, EQ counts just as much as IQ, with a premium on workers who are creative, collaborative, show empathy, and are good communicators.

But that's not all. AI delivers further productivity gains by augmenting the ability of workers who undertake this higher value-added work. For example, AI-powered tools are now being used to facilitate better collaboration and communication between workers by providing real-time translation, automatic transcription, and virtual assistance. That means new ways of working. AI can also be used to analyse individual workloads, meeting patterns, and other factors, to help teams work more efficiently and effectively.

AI delivers productivity gains by changing the factor input mix used to deliver outputs.

This ability of AI to replace, free up and augment workers in the production process has further implications. Indeed, it potentially increases competition, because it replaces a relatively costly factor input like labour with a cheap generic AI app that is free to everyone. That in turn lowers barriers to entry, which encourages new

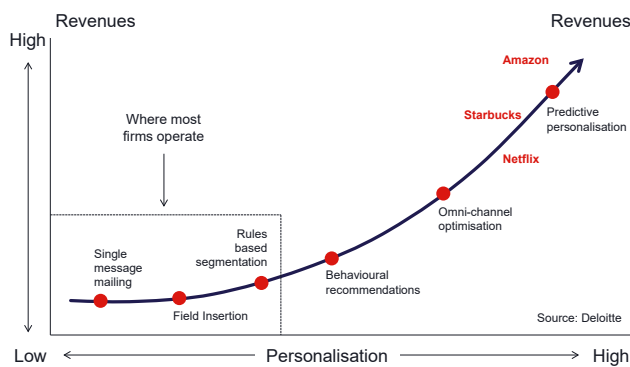
market entrants. It also levels up the competitive playing field within an industry, allowing smaller incumbents to compete more equally with larger players.

AI effectively reduces barriers to entry, allowing smaller firms to compete with larger firms.

Sharpens the focus on the customer.

AI's ability to build a detailed picture of individual customers means that firms can deliver experiences that are both unique and superior, which in turn creates a point of differentiation and a competitive edge. It also opens the possibility of mass customisation, i.e., the delivery of products and services hyper-personalised to individual customer requirements but at scale.

Figure 6: Personalisation of services and revenue potential



There are many examples of where this occurs. For example, in the freight and logistics sectors, firms are now using AI to analyse data and predict future demands. That understanding helps them to provide their customers with faster, more accurate container types and capacity allocations, which also generates supply chain efficiencies.

Firms with access to accurate data can also create a competitive edge using AI enabled chatbots to transform customer relationships from intermittent to continuous. AI's capacity to take in and process massive amounts of data in real time means firms can implement near-instantaneous monitoring capabilities to alert them to issues, queries, and grievances, recommend actions and, in some cases, initiate a response, resulting in a more personalised customer experience.

By analysing the real-time customer data, firms can relevant content related to product and services that they are interested in.

AI adoption.

We may not always be aware of it, but AI is in everyday use. It is in our smartphones, digital voice assistants, smart home devices and in our navigation applications.

It powers up our social media interactions, as well as our streaming services, and is instrumental in many of the games that we play on gaming consoles.

AI can also be found in every sector of the economy, from public to private, from agriculture and manufacturing to services, and everywhere in between. It's used in healthcare to better diagnose illness, delivering treatment plans and medicines increasingly tailored to the individual patients; in the police, where facial recognition is controversially being used to prevent crime and where necessary, pursue perpetrators; and in education, where AI has given rise to new teaching methods. It's even made much-publicised inroads in creative industries, much to the chagrin of those who work in it.

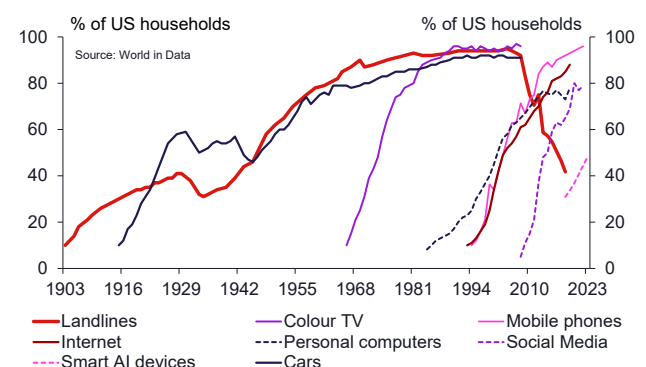
How AI is used.

Examples include Uber, which uses algorithms to better match car rides with customers. Similarly, Amazon uses algorithms to price goods as well as automate many of its warehouse functions. In New Zealand, Molemap uses algorithms and big data to detect skin cancers, while Trademe relies on them to estimate property prices as well as individualise property searches. Meanwhile, Xero is using AI to automate accounting, while pizza chain Domino's has in the past used algorithms to scan and analyse pizza for quality purposes.

Source: Anon

The adoption of some types of AI has been unprecedented. ChatGPT, Open AI's free to use generative AI language model that creates original content in response to user prompts, for example, managed to clock up 1 million users in just 5 days after the launch of version 3.5 in late 2022. By early 2023, its user base had grown to whopping 100 million users, which at the time made it the fastest growing platform in history.

Figure 7: Time taken to reach 1 million users



That's fast even when compared to other technologies previously regarded as being fast growing, such as Instagram and Facebook, both of which took months to get to just 1 million users; even more so when compared to older technologies that literally took decades to come to fruition.

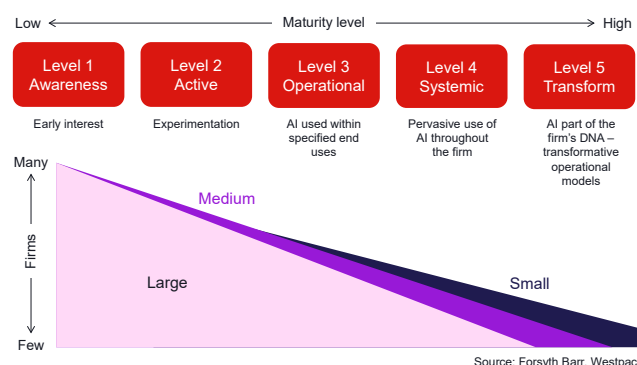
The pace at which newer AI technologies are being adopted easily outstrips that of previous groundbreaking technologies.

Adoption by industry hasn't been quite as dramatic. According to **McKinsey's global survey on AI**, adoption more than doubled between 2017 to 2022, with 50% of businesses using AI in at least one area of their business. Furthermore, the average number of AI components that these businesses use, such as NLP, computer vision and deep learning, has doubled from 1.9 in 2018 to 3.8.

That's a bit higher than that suggested by **IBM's Global AI Adoption Index**, although the direction of travel is the same. According to IBM, 35% of firms worldwide actively deployed AI in 2022 – up from 31% in 2021, with larger firms twice as likely to have deployed AI than their smaller counterparts. In addition, 42% of firms globally stated they were exploring the use of AI, down 43% in 2021.

New Zealand lags in this regard. For example, **in 2021 only 19% of firms in New Zealand had fully embraced AI**. Compare that to 25% in Australia, US, and UK; and 60% in China and India. Most firms are still trying to work out what AI is and/or how to use it. They may even have begun to experiment with it, either by dabbling in AI applications like ChatGPT, BARD or DALL-E, or by running pilot projects and proof-of-concepts. According to Forsyth Barr, small firms in New Zealand generally lean towards optimism when it comes to the impact of AI on their business but remain largely ambivalent and show no real sense of urgency when it comes to pursuing it.

Figure 8: AI maturity profile of New Zealand firms



There are, of course, exceptions. Several industry sources suggest that most large firms in New Zealand are active adopters of AI, but they tend to restrict its application to specific end uses. Examples include Fonterra, the world's largest dairy exporter, which has been trialling an AI platform that uses sensors and AI algorithms to monitor the productivity of cows; and Southern Cross, New Zealand's largest private healthcare provider, which uses an AI powered digital assistant to provide information and deliver a better service to its customers.

There is also a minority of firms for which AI is more instinctive. What sets these mostly small tech-savvy firms

apart is their willingness to put algorithms and big data at the core of their business. For them, AI determines what is produced, how it is produced, for which customer and at what price. Together with technologies such as robotics process engineering and Internet of Things, AI drives the machinery that turns widgets into products. To that end, AI can be regarded as a multiplier on technological progress because it enables other technologies.

Most firms in New Zealand are largely ambivalent and show no real urgency to pursue AI.

Barriers to adoption (and how to address them).

This begs a question. If AI is so good at increasing adaptability and responsiveness, boosting productivity, and sharpening the focus on the customer, why are New Zealand firms so ambivalent about it?

Barriers to AI adoption globally.

- Lack of strategic vision.
- Resistance to change.
- Structural rigidities.
- Disruption caused to day-to-day business operations.
- Cost of AI solutions, which increases as complexity rises.
- Limited in-house AI skills and technology needed for implementation.
- Access to quality structured and unstructured data, within across siloes.
- Ethical concerns relating to privacy and use of data.
- Potential for biased AI results.

Source: Qrious, Statista, Business Tech Weekly

Some of that might have to do with the fact that New Zealand is an isolated country at the bottom of the world. It might also be that most firms in New Zealand are operationally focused and so spend relatively little time on process development.

It's also true though that adopting AI can be a bit of a challenge. Some firms, for example, have an inbuilt resistance to change. Discarding tried and trusted practices built up over many years requires a big change in mindset, which can be hard for some. That is especially so when business owners do not fully understand the potential of AI or where there is reluctance from workers who may feel that their livelihoods are being threatened.

Associated with that is a lack of trust and transparency. For many, AI is effectively a "black box" that can produce biased and sometimes discriminatory results. That's true of course, but much depends on the specific data sets that AI might have been trained on.

And that is before we get to the technical challenge of how to integrate AI within existing data and systems

architecture, which is somewhat complicated by the existence of data silo structures that characterise many larger firms today. According to an industry source, it can often be a challenge making this data available for analysis in the right environment, with clear lineage and controls. In other cases, there may be issues with not having enough data to satisfy AI, especially when there are limitations on data quality because of privacy and security concerns.

Both Qrious and IBM highlight a lack of AI skills and talent as the biggest barrier to AI adoption. That is especially relevant in New Zealand where there are many small operationally focused firms that often lack the required digital wherewithal and technology smarts.

The cost of AI can also be a significant hurdle, especially for customised solutions. According to Qrious, 48% of firms in New Zealand view cost as a major barrier to AI adoption, which may reflect that many firms in New Zealand are smaller, cash constrained operators.

There is also the issue of when to invest given how fast AI is moving, raising the risks of obsolescence. It can take time for AI to bed in and generate sufficient economic value to justify the level of investment that may be required. As AI may not deliver results immediately CEOs are often reluctant to invest.

However, there are actions that firms can take to overcome these barriers to adoption.

In many cases, it's about demystifying what AI is, illustrating its strengths and weaknesses. Education is key, and can be addressed through training courses, seminars, and conferences, and by undertaking pilot projects that demonstrate the various aspects of AI. Alternatively, firms may look to enterprise cloud vendors for information.

This understanding should help to form the basis for developing an AI strategy, with clearly articulated long-term goals and medium-term objectives. That should be done independently before procuring services.

It is also important that firms looking to adopt AI acknowledge that it is not infallible, that it can perpetuate biases, be discriminatory and create privacy issues. To address these challenges, firms should introduce comprehensive data governance frameworks, that set the rules and processes for collecting, storing, and using data. They should also implement data protection measures such as encryption, access control and security audits to address privacy issues. To minimise bias, firms should focus on implementing mitigation measures, covering both technical tools that seek out bias and operational practices such as third-party audits.

With respect to job security, firms that adopt AI need to address workforce impacts through reskilling and continuous learning so that employees can work alongside AI systems. According to an industry source,

emphasising the collaborative nature of AI-human partnership is key to alleviating concerns that workers have. To that end, it's crucial to re-enforce the message that AI primarily augments and enhances human capabilities. According to an industry source, forming a declaration or defining a set of principles that align with a firm's organisational mission/values is becoming an emerging practice.

In so far as integrating AI within existing systems and data infrastructure is concerned, firms must ensure they gain access to integration tools (essentially software) and are able to partner with others who have the requisite skills, knowledge, and support capabilities. Appropriate training of staff and fostering a culture of learning, innovation and collaboration is also important, as is the monitoring and evaluation of performance once integration has been completed.

Access to external skills and competencies will also be important for firms that face in-house shortages. At the same time though, firms should be focusing on developing their own resources through training courses and ongoing learning.

Firms should also consider the productivity gains that AI delivers over an extended period, and weigh that up against the mostly short-term implementation costs. Effectively this means that firms need to consider the benefit-cost ratios when looking to procure AI solutions. One strategy for lowering implementation costs is to start small and expand gradually, although this is often not as easy as it might seem, especially where there is a number of competing end uses, limitations on data availability, and challenges relating to integration. Typically, this would involve selecting a specific end use and launching a pilot program to evaluate its efficacy. One industry source suggested using tools like ChatGPT as a starting point for generating business content on the fly. Partnering with an external AI vendor is another way of lowering deployment costs. In many cases, AI solution providers will sell cheap off-the shelf tools as well as pre-built solutions that can be further customised to meet a firm's unique requirements.

A clear articulation of the rules of use, education and training, and access to skills, knowledge and support capabilities are essential for overcoming barriers to AI adoption.

Competitive dynamics.

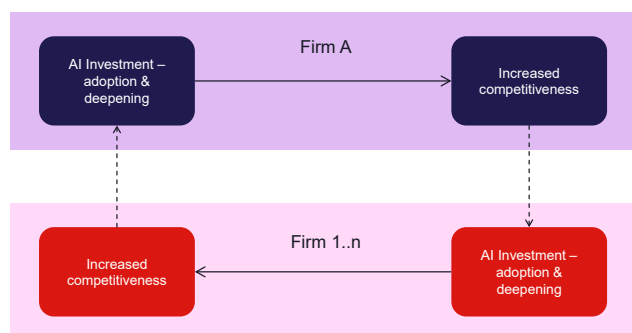
There will be many firms out there that will struggle to overcome these barriers. Most are likely to be small operators fixated on the here and now, having little or no bandwidth for AI. Indeed, in its 2021 report, Qrious suggested that up to 17% of the firms they surveyed in New Zealand would fall into this category. Datacom's

report in 2023, which suggested that 48% of firms in this country have no plans to invest in AI within the next 5 years, seems to back that up.

We think firms that fail to adopt AI are going to lose competitiveness and experience lower returns. Without a unique value proposition, it will become increasingly difficult for those that remain tied to the past to match the productivity gains and increases in product and service quality that those that adopt AI will be able to achieve. However, even those that offer a point of difference are likely to experience a loss of competitiveness because AI can deliver differentiated value through products and services that are hyper-personalised to customer needs. That though may take some time to materialise, mainly because delivering hyper-personalised products and services requires a higher level of AI maturity than is currently present in New Zealand.

That said, it's also likely that an increasing number of firms in New Zealand will manage to overcome some of the barriers that we have highlighted above.

Figure 9: AI investment cycle & increased competitiveness



Source: Westpac

As AI adoption deepens overseas, the competitive benefits of AI become more widely acknowledged, and more powerful AI tools come to the fore, we think more firms in New Zealand will look to AI to gain a competitive edge with increasing momentum. That in turn will spur on a response from slower acting rivals, who will themselves adopt AI to improve their ability to compete. That sets off a virtuous AI investment cycle, which leads to AI being adopted across more and more end uses, resulting in an increase in AI maturity.

A key feature of this AI investment cycle is that it is driven by an ongoing need to maintain a competitive edge. The implication here is that AI is going to intensify competition and generate greater levels of industry rivalry. That competition, however, will not just be about achieving supremacy over traditional rivals. It will also be about competing with new market entrants as well as smaller firms within the same industry that are now able to use low-cost off-the-shelf AI tools to accomplish tasks that might previously have required more costly human workers. And with these firms becoming ever

more AI mature, and as such more likely to embrace AI across their whole business, it is quite possible that we will see a levelling of the competitive playing field, where smaller firms are better able to compete head-on with larger incumbents.

AI potentially lowers barriers to entry by enabling new competitors to develop and produce products more efficiently and cost-effectively.

In this environment, we think larger firms, encumbered by silo structures, defined hierarchies, and legacy systems, could struggle to compete against smaller, more adaptable firms that have scaled up their use of AI and are better able to compete on a more equal footing. That's not to say though that they cannot compete. Indeed, as several industry sources pointed out, these larger firms have competitive advantages of their own, not least of which is having access to huge proprietary data sets as well as the financial resources to develop highly customised AI solutions.

Larger firms facing off against smaller firms that have fully embraced AI have a couple of options open to them. The first is to fully embrace AI to the same extent as their smaller rivals. In an ideal world, that means moving beyond applying AI to selected uses and embedding AI across the breadth of their operations. A survey by the Economist Intelligence Unit in 2020 found, for example, that 50% of bankers globally thought that they needed to adopt AI themselves if they were to fend off the competitive threat posed by tech-driven, non-traditional entrants to the banking sector such as PayPal and ApplePay.

But as shown above, that is likely to be really challenging, particularly for larger firms that have well-defined silo structures that inhibit the effectiveness of AI. Removing these silos requires a complete overhaul of business operations, and that includes the rebuilding of business units on a new, integrated foundation of data, analytics, and AI algorithms. It also means a shift away from the rigid hierarchical structures of the past to flatter structures that encourage the creation of scalable multidisciplinary teams that take on end-to-end accountability for service delivery. Increased collaboration across functional areas not only fosters the exchange of diverse perspectives, skills, and expertise that can leverage off an integrated data-centric architecture, but also a "fast fail" culture that promotes an agile test-and-learn type mindset as well as the empowering of frontline decision making.

A data centric operating architecture affects all value generating activities and thus scales horizontally across the organization.

Perhaps more importantly, the breaking down of silos also unlocks a critical competitive advantage that

most large firms have. And that relates to the massive amounts of proprietary data under their control. By smartly applying enterprise AI solutions, large firms can tap into their unique and/or large data sets to grow value. Having access to a large existing customer base offers a clear advantage, which allows them to not only transform customer relationships from intermittent to continuous through the use of chatbots, but also develop insights that help deliver hyper-personalised customer experiences.

An alternative approach might be to cherry pick and strategically implement AI in end uses where it can make the biggest contribution to business goals. Firms embarking on this journey can start that by integrating AI into existing processes, such as automating standardised processes and/or using AI to analyse the data they must access to deliver insights, inform decision making and adopt a more customer centric approach.

While silo structures and established hierarchies may still limit operational flexibility, the same cannot be said for accessing data, in large part due to software that is able to take data from different repositories across silos. To that end, larger firms that adopt this partial option should be able to develop greater insights, which in turn will help them to compete more effectively.

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