



The State of AI

Suitability of AI solutions for Australian Organisations

Acknowledgement of Country

We would like to acknowledge the Ngunnawal and Ngambri peoples, the traditional custodians of the Canberra region where this report was created.

In the spirit of reconciliation, we acknowledge the Traditional Custodians of country throughout Australia and their connections to land, sea, and community. We pay our respect to their elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

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Preface

After decades of research and development, Artificial Intelligence (AI) is finally touching an ever-growing number of technologies in everybody's lives, and it's just getting started. From virtual personal assistants in our mobile phones, to fully automated manufacturing of goods, AI has become a well-established technology in the last years.

AI could contribute up to US\$ 15.7 trillion to the global economy by 2030,¹ and A\$ 315 billion to the Australian economy by 2028.² Because of the potential of AI to change the world this process is becoming to be known as the "AI Revolution".^{3,4} Artificial intelligence is prone to accelerate the next wave of digital disruption, and organisations are preparing for it now. Early adopting firms are already seeing real-life benefits, making it clear that other organisations will need to follow this trend in their digital transformation.

There is a widespread view among many countries in the world that AI will help boost the industry and increase productivity among workers to achieve competitive advantages in different markets. In the past few years, 14 of the most advanced economies in the world have invested over US\$ 86 Billion in AI programs and initiatives.⁵ Governments and international bodies, such as the European Union (EU)⁶ and the Organisation for Economic Cooperation and Development (OECD)⁷ are starting to create recommendations and guidelines to lead the development of AI. These efforts are likely to be influential for AI at the global scale.

The growing demand for data and AI technologies could be a growth opportunity for Australia's own digital industries. Australian organisations could build upon existing strengths and develop new digital products and services.

Overall, there is evidence⁵ of growing development and adoption of AI technologies in Australian organisations, building strong AI capability across the country. Recent advances in algorithms, the proliferation of digital datasets and improvements in computing capabilities have come together to create a new type of AI for enterprises and organisations. Nearly all organisations have an ever-growing mountain of data, and AI provides the means to analyse this resource at scale.

However, the journey of adopting AI is unique for each organisation. We asked industry representatives and subject matter experts (SME) about the challenges and opportunities of using AI in their organisations and what could be changed to increase adoption of AI by Australian organisations. They were selected to cover different perspectives including education, industry, and government. Despite their diverse backgrounds, strong themes emerged: the need to create a culture of innovation, secure executive and top management support, provide means to safeguard data, among others.

In this report we focus on the adoption of Artificial Intelligence and Machine Learning by organisations in Australia. It is a starting point and a snapshot to understand the current state of adoption, as well as drivers and challenges that organisations encounter during this process. Further research would be needed to grasp a complete understanding of adoption of AI, including other AI techniques such as Computer Vision, Natural Language Processing, Robotics, and others.

Adoption of AI by organisations can offer significant gains, failing to do so might risk organisations to missing the opportunity to be part of the next wave of digital innovation. Many organisations will have to accelerate their digital transformation journey, whilst others will have to start it. By working together, organisations and AI developers, can ensure a successful deployment of AI strategies to ensure an increasing adoption of AI by Australian organisations.

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“AI is already being used to solve challenging problems in health, welfare, safety, environment, energy, infrastructure, transport, education and other sectors”

CSIRO Data 61

Executive Summary

Artificial Intelligence (AI) is a collective term for computer systems that can sense their environment, think, learn, and take action in response to what they're sensing and their objectives. Microsoft defines AI as the ability of machines to analyse images, comprehend speech, interact in natural ways, and make predictions using data, and Machine Learning (ML) as an AI technique that uses mathematical algorithms to create predictive models.

AI could contribute up to US\$ 15.7 trillion to the global economy by 2030,¹ and A\$ 315 billion to the Australian economy by 2028.² The economic opportunity is great.

Recent advances in algorithms, the proliferation of digital datasets and improvements in computing capabilities have come together to speed up the adoption of AI by organisations. Many early adopters are already seeing real-life benefits of adopting AI in their digital transformation journey. However, AI adoption outside of the tech sector is at an early, often experimental stage.

Current State of AI Adoption

We interviewed three representatives and subject matter experts from industry, education, and government spaces. Through engaging with them we were able to grasp an understanding of their adoption journey, including challenges and strengths. A summary of our findings is:

- Applications of AI are diversifying. Whilst some organisations are focusing in adopting AI in support

processes, such as data analytics and knowledge extraction, others are experimenting with predictive behaviour models and automation of repetitive tasks.

- Projects with executive or top management support are more likely to succeed and being deployed to the entire organisation. A solid business case aligned with the organisation's strategy proved to be useful to engage top executives in the adoption journey.
- Organisations are creating processes and policies to collect data needed to create AI solutions. Data governance, security, and privacy are topics that organisations take in consideration when developing their data and AI strategies.
- When creating AI solutions, organisations take a comprehensive stakeholder view, from top executives to end-users, in all stages of designing, developing, and deploying an AI solution within the organisation. They also are taking into account cultural, social, and technological aspects of the solutions.
- In order to achieve a successful adoption of AI, organisations are upskilling their people, from top executives to developers and end-users. This ensures not only that there are enough people with the correct skillsets to develop and deploy AI but also that there is a common understanding of what AI means in the organisation.

- Usage of Out-of-the-box solutions is getting stronger. It is in part possible due to the ease with which AI solutions can be created by end-users. Citizen development poses a new challenge in terms of governance and support if organisations are to deploy citizen developments to scale.
- COVID-19 presented an opportunity to rethink the way AI is developed in organisations, from reimagining the way organisations work to creating new ways of engaging with stakeholders. As a consequence of COVID-19 restrictions some organisations are considering innovative solutions to emerging challenges, such as predictive models for missing data and the future of certain industries, including education and healthcare.
- Edge computing is making a debut in Australia, especially in highly specialised industries, such as mining and manufacturing. Edge computing can also be applied in remote areas with limited or null connectivity. Industries adopting Edge computing models are taking in consideration governance, security, and support of AI models and computing modules.
- Rapid prototyping, iterations and feedback loops proved to be successful in the adoption process. Engaging involved stakeholders during the iterations also helps to solve conflicts before the solutions is deployed. Retraining the models also help to maintain fair and accurate predictions.

Recommendations for Organisations

In the context of AI and its adoption, the term AI-readiness assess the level of preparation of an organisation to implement changes in technologies

related to AI. This term includes five categories of factors that impact an organisation's AI-readiness: Strategic Alignment, Resources, Knowledge, Culture, and Data. Based on our research, we grouped a series of recommendations for organisations wanting to adopt AI.

1. Develop an AI Strategy:

Organisations should develop an AI strategy to bring added value to the organisation. This strategy also should include risks and mitigation procedures. Lastly, executives should show their support to AI led initiatives within the organisation.

2. Allocate Resources: Organisations should strategically allocate financial budget and personnel to support AI projects. Internal developers should be aware of existing limitations of IT infrastructure and should it need to be upscaled, be compatible with the existing stack. Lastly, organisations should create governance and support capabilities for scaling AI solutions to the entire organisation

3. Build the Knowledge: Awareness building initiatives should be aimed to all the organisation, from top executives to end-users. It's also helpful to manage expectations of what to expect with newly created AI solutions. Organisations should also include upskilling their people in their strategic plan.

4. Create an AI Culture: Organisations should enable collaborative work linked to the capability of AI solutions to work across different teams and areas of the organisation. Executive support can also mean creating an environment to support innovation within the organisation which can lead to adoption of AI and related technologies.

5. Be aware of Data: To ensure a correct and standardised access to data, organisations need to work internally, as well as with external partners and providers. The success of an AI solution is tightly linked to the quality of data available, therefore constant evaluation of data sources is required. Lastly, organisations should ensure an adequate governance of data. Data governance might include data flows and lineage, data sources and provenance, consistent data definitions, and adequate metadata management.

Recommendations for AI Developers

In most cases, a correct adoption of AI depends equally in the organisation as well as the developers of AI. This is why representatives interviewed shared their thoughts on how they believe AI developers can help organisations wanting to adopt AI. A summary of these recommendations is:

- Take advantage of the momentum built by the relationship with the organisation. Build an ecosystem or technology stack in which AI is adopted naturally.
- Work together with the organisation to develop skills needed to adopt AI. Working in a synergy with the organisation can help leverage their capability and adoption of AI.
- Develop flexible use-cases. Finding use-cases to bring added value to the organisation can be challenging. On the other hand, out-of-the-box solutions are becoming increasingly strong and flexible to rapidly be adapted and deployed.
- Improve Australian-centred use-cases. Experts agree that more Australia-focused datasets and solutions will

help the adoption of AI by Australian organisations. There is an opportunity to capture Australian diversity in AI technologies.

- Edge computing and citizen developers can become hard to maintain. There is an increasing concern about having the right tools to maintain, support, and govern these technologies once they are scaled to the entire organisation.

Indeed, there is currently no silver bullet that addresses all of these issues, but organisations should investigate the advantages of adopting AI, develop their AI strategy and work together with AI developers to ensure a successful adoption of AI. In addition, AI providers have the opportunity to continue developing and delivering market-aware solutions that will expand the adoption of AI by organisations. Finally, both actors should work together to ensure a safe, secure, and responsible deployment of AI solutions.



What is AI?

In our broad definition, AI is a collective term for computer systems that can sense their environment, think, learn, and take action in response to what they're sensing and their objectives. Forms of AI in use today include digital assistants, chatbots and machine learning amongst others. Consumers are using AI when interacting with voice assistants, taking recommendations of movies to watch, connecting with people through social media, and others.

Organisations are also making use of AI, with use cases ranging from fraud protection for credit cards, automated operations in mining industries, protection and rehabilitation of national parks, faster and advanced diagnostic of diseases such as cancer, and a myriad of different use-cases adapted to their needs.⁸

AI, in the broader sense, includes Natural Language Processing, Computer Vision, Machine Learning, Robotics, Knowledge Representation and other scientific fields⁹ (Figure 1).

Machine Learning (ML) is generally defined as the ability of machines to simulate human learning.¹⁰ In a practical definition, ML makes predictions based on mathematical models that are improved over time.¹¹ Computer Vision (CV) trains algorithms to come up with computational models of human vision system.¹² Natural Language Processing (NLP) is concerned with the interaction between computers and human language.¹³

For the purpose of this report we utilised Microsoft's definition of AI, as the ability of machines to analyse images, comprehend speech, interact in natural ways, and make predictions using data, and ML as an AI technique that uses mathematical algorithms to create predictive models.¹⁴

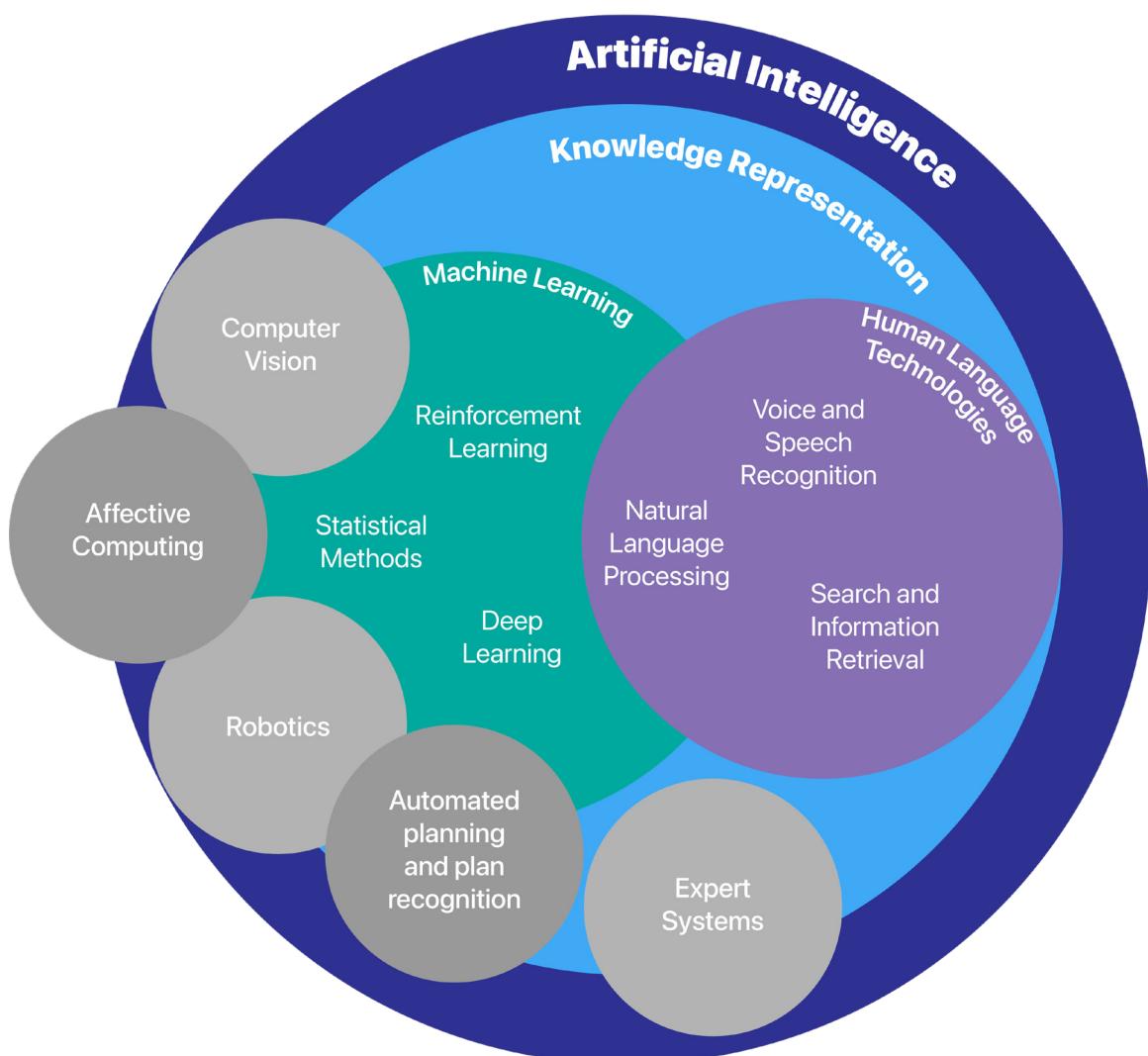


Figure 1: AI methods and techniques

**AI is the ability of machines
to analyse images,
comprehend speech,
interact in natural ways,
and make predictions using
data.**



Introduction

Artificial Intelligence is a general-purpose technology with the potential to be applied across the Australian and global economy, almost in every industry. Because of this, AI is considered one of the most important innovations of our time, even drawing a parallel with the invention of steam engine, electricity, and the internet.^{15,16} In the rapidly growing economic environment of these days, AI could contribute up to US\$ 15.7 trillion to the global economy by 2030,¹ and A\$ 315 billion to the Australian economy by 2028.² Because of the potential of AI to change the world this process is becoming to be known as the "AI Revolution".^{3,4} Artificial intelligence is prone to accelerate the next wave of digital disruption, and organisations are preparing for it now. Early adopting firms are already seeing real-life benefits, making it clear that other organisations will need to follow this trend in their digital transformation.

The adoption of AI by organisations in Australia is described as a driver of the economic recovery after the COVID-19 Pandemic.⁸ This process presents a number of challenges that must be addressed by organisations to fully adopt AI. The relevance of AI technologies in the local context, developing the expertise required to adopt AI and understand its benefits, and translating research to business applications are just some of them. These challenges are experienced not only by businesses but also by governments and agencies wanting to adopt AI technologies. Thus, both the adoption process and the growing interest in AI are the motivations to investigate the challenges of adopting AI at an organisational level.* Based on their characteristics, businesses, governments, and agencies are classified as organisations. Since organisations are formed by individuals, adoption of technology at an individual level also impacts the adoption of technology at an organisational level. However, this research is focused on organisations rather than individuals. This study aims to understand how the AI available today impacts an organisation's readiness to adopt AI. In other words, how organisations perceive the offering of AI as a match for their needs and what challenges are they facing during the adoption process.

To explore this question, we draw on three theoretical frameworks related to the adoption of technology and innovations at an organisational level. The literature regarding adoption of innovations has been subject of different changes, starting from being a generalised model of how

*We define "organisation" following American communication theorist and sociologist Everett Rogers, who defines an organisation as "a stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labour".¹⁷ Other academic sources also use the term "Firm" to refer to organisations.¹⁸⁻²⁰

innovation is transmitted across individuals and organisations, to be carefully adapted to the specific needs of the AI adoption in an organisation. For a more detailed description of the theoretical groundwork of this report, see Annex 1: Theoretical foundation. This report also draws on interviews with industry and government representatives to identify how their organisations have faced challenges in their adoption journey, and their thoughts on the adaption of AI to suit their needs. Our interviews also included emergent issues, such as the impact of the COVID-19 pandemic in their adoption process. Finally, we also tracked and analysed publicly available documents discussing adoption of AI, innovative projects using AI, and technical documentation of Microsoft's AI solutions.

The adoption journey of AI is unique for each organisation in Australia, as well as the challenges that they will face. Nevertheless, there are common steps that can be generalised. With this report we aim to show some of the common issues, strengths, and challenges that organisations and developers of AI can tackle together to ensure a seamless adoption of AI, and a correct journey through their digital transformation.

An integral view of AI in organisations

Across Australia, organisations are starting to realise the potential of AI to improve their processes. Successful adoption of AI is an integral part of an organisation's digital transformation. Organisations taking a comprehensive approach to AI have been better positioned to generate major competitive advantages. Through our research we were able to understand how organisations have included AI in their processes and what challenges they had to overcome to successfully deploy AI-based solutions. We interviewed three representatives from the education, government, and industry spaces, who shared the challenges they faced during their adoption journey. We rely in a comparative analysis, contrasting their experiences and extracting value from interviews. Ultimately, these insights are helpful to build an AI-readiness model.

AI Projects with active executive support are more likely to succeed.

Top management support is also one of the key factors described by the theoretical frameworks and the Microsoft Enterprise AI guidelines. Related to this, a solid business case is necessary to ensure that a project can ensure executive support. In previous research²¹ this was stated as a challenge that organisations need to take into account when developing their AI strategy. However, once a project is successfully deployed, it opens the door for feedback loops where more AI projects are likely to be supported by the organisations. In words of one of the interviewed representatives, "Once people get hold of a new [AI] system, they will undoubtedly go to « If you can do that, can you do this? ». These newly created feedback loops are consistent with Microsoft's AI Enterprise Planning,²² in which they anticipate that the number of AI solutions in production will increase once the AI strategy is successful. By considering AI in business cases and scenarios, organisations were able to include AI as part of their strategic development. Data-driven decision-making is also being consistently applied by organisations, as described by the AI-Readiness Framework. Data-driven decision-making can change the organisation's strategy to include AI as a key component. As one of our respondents described, "We've changed the strategic thought process of our organisation through data science and advanced analytics". On the other hand, organisations must be aware that using certain technology will not solve all their problems but rather it can be part of their strategy. A comprehensive strategy won't guarantee success on its own but does make it easier to add value with a well-defined problem definition and strategies to address it.

Applications of AI are getting more and more diverse. When asked about the organisational or functional areas in which they are using AI, respondents in our study shared that their organisations are using AI in areas such as customer service, IT, and other functional divisions. When diving into specifics of the projects in which organisations are using AI, we can understand the diversity of use cases. These range from advanced analytics, data science, and document processing to knowledge extraction, predictive behaviour models, and automation of industry operations. When compared to global trends²³, we find similarities with highly specialised sectors, such as healthcare and mining, being more prone to include AI in their research and development (R&D) strategy, as opposed to financial services, education, or government.

How important is Data Governance?

26%

of global organisations
have considered or have
implemented formal data
governance measures²¹

100%

of respondent organisations
have data governance
measures in place

Availability of data and datasets is one of the principal topics described as a challenge by previous research and reports.^{8,21,23} Organisations have created processes to gather the data necessary to train or deploy AI solutions. Related to this, respondents shared that their organisations have created processes and guidelines to ensure adequate security, privacy, and governance of data. Data quality is directly related to the performance of AI solutions and, to become leaders in their space, organisations have to ensure that data quality is consistent across their data silos. Otherwise, the performance of their AI processes can be compromised, which can affect organisational and business effectiveness, growth, and, ultimately, customer or user experience. In contrast to global trends, where nearly 75% of organisations using AI do not consider data governance as a priority,²¹ 100% of the representatives interviewed shared that data governance is a requirement for developing AI solutions in their organisations by either having data governance groups, policies, or steering mechanisms. Privacy and security are also key priorities in their organisations, and interviewees considered that their policies are aligned with local regulations.

Stakeholder involvement is a must-have, according to respondents. Organisations shared that in their experience, projects that were created with an End-User mindset were more likely to succeed in being adopted. This means engaging with stakeholders in the design, development, and deployment of a solution and taking into account cultural, social, and technological aspects. End-User engagement is part of both Microsoft's AI Enterprise Planning and the AI-Readiness frameworks described in Appendix 1: Theoretical Foundation, as a component of building an organisational culture in which AI development can be deployed for all areas within the organisation. Engaging with stakeholders at all steps can also help to fine-tune the AI or ML model, and make sure that outputs or predictions are accurate. Although some of these projects are still proof-of-concept (PoC), organisations are planning ahead and thinking in what implications will exist when deployed to the whole organisation. An example of this is explainability of the model outcomes. Explainability in this case, does not refer to the ability of an organisation to explain the AI or ML Model, but rather to being able to understand and explain to End-Users the reasons for which using an AI tool is more convenient for them, and also why the outcome of the model is aligned with what they were expecting. Lastly, biases must be addressed at all stages of the adoption process. An example of this comes from one of our respondents, Zanne Van Wyk from the Catholic Dioceses of Maitland-Newcastle, who, when designing a knowledge extraction model for hundreds of documents, had to avoid using domain-specific words (such as church, priest, nun, etc) in order to achieve accurate results. Since the desired outcomes of this solution included arranging word and phrases by order of appearance, words that were common among the desired audience had to be treated as bias. Otherwise, the output of the model would be skewed due to domain-specific words appearing in considerable numbers across all the documents. This ensured that the output of the model included valuable knowledge from all the documents and was understandable by the audience. When acknowledging biases in all stages, organisations can ensure that their models are understandable and usable by more stakeholders, as well as treating them fairly.

Upskilling people in AI is a challenge of adopting AI, being listed in the top 3 barriers for adopting AI.²³ Australia is not exempted from this and CSIRO's Data 61 estimates that the Australian market will need to train and educate more people to meet the current and future operational needs of the industry.⁵ Representatives interviewed shared this concern. Whilst there is a growing interest in developing AI-specific skills, they shared that the rapidly changing environment of AI can be a challenge when training and upskilling their people. They are, however, drawing on the training offerings by AI developers as a complement to their own in-house training, and creating learning paths for people interested in AI and other related technologies, such as data science, analytics, and cloud technologies.

Out-of-the-box solutions are considered by organisations as an alternative to building custom made AI models. Interviewed representatives shared that they are considering providing end-users with tools, such as Power Platform and ChatBot builder, to empower them and engaging in the adoption of AI. In words of one of the interviewed representatives, "The out-of-the-box solutions that are available through cloud services are advanced and provide a cost-effective way to build, deploy, and solve a business problem as opposed to building a fully customised AI or ML model". Citizen development*, on the other hand, is an emerging topic in terms of support and governance, when thinking of deploying the tools at scale. Being able to understand the needs of support for the potential dozens or hundreds different end-user-made models or bots, is a topic that organisations will need to take into account when deciding to use these tools.

"The out-of-the-box solutions that are available through cloud services are advanced and provide a cost-effective way to build, deploy, and solve a business problem as opposed to building a fully customised AI or ML model."

Representative of the industry sector

* Citizen development—the creation of business applications and features by the employees who use them (end-users). We use Microsoft's definition of Citizen Developers.²⁴

In terms of the impact of the COVID-19 Pandemic, the interviewed representatives agree that there was little to no disruption in the adoption process. This can be explained in part due to the current situation in Australia but also because the functional area in which adoption of AI sits is prone to be moved to hybrid or flexible work. According to the World Trend Index 2021²⁵, flexible work is here to stay and the talent landscape has fundamentally shifted. Respondents shared that their teams welcomed the ability of having the option of a flexible or hybrid workplace. On the other hand, highly specialised industries, such as mining or manufacturing, experienced disruptions to their adoption process, partly because of being unable to work in-site or engage with stakeholders. Whilst this represented a disruption in their workflows, they were able to overcome the difficulties of working remotely. Respondents believe that, in the future, AI based processes, as a consequence of the disruptions caused by COVID-19, will free employees from making repetitive simple tasks, giving them the opportunity to focus on strategic processes.

Deploying AI models to the final node, also known as Edge Computing,* whilst it is still an area in research, highly specialised industries see this as an opportunity to provide faster and more accurate AI and ML models when compared to cloud-based models. High speed camera modules pre-loaded with adequate computer vision models can help to increase safety and security in mining and manufacturing sites. Edge computing can also be applied in remote areas with limited or null connectivity in which an adequate operation of cloud-based AI would be inviable. Our research suggests that industries adopting Edge computing models, must take in consideration governance and protection of AI models, as well as emerging topics related to computing modules, such as physical protection and security of operators.

Rapid prototyping, iterations and feedback loops are proven to be successful. In order to build real-life use cases, organisations had to experiment with AI tools whilst deploying them in production. By engaging stakeholders and end-users in the process, using feedback loops and iterative design, AI solutions are more likely to add business value and not get stuck in perpetual research. Since AI solutions need continuous monitoring, as they are subject to performance degradation or create inaccurate predictions, using iterations and feedback loops proved to be useful when supporting and managing AI models. AI solutions deployed to production might need to be retrained, to ensure that predictions are fair and reproducible.

*Edge Computing, Final Node Computing or Internet of Things (IoT) describes devices with processing capabilities which perform processes and calculations in-site as opposed to cloud-enabled devices, which must be connected to Internet (The Cloud) to work appropriately. Microsoft definition of Edge Computing.²⁶



Going Forward

What can organisations do to improve their AI adoption process?

The path to AI or ML is not always straight forward. Organisations will have different motivations and drivers to adopt AI. Some of them will be driven by reducing costs of operations, improve customer interactions, or improve security in the workplace. Whatever the path, organisations should ask "What is the business value of bringing AI to the organisation?". This question helps executives and decision-makers better understand why AI matters.

In the context of AI and its adoption, the term AI-readiness assess the level of preparation of an organisation to implement changes in technologies related to AI. This term includes five key categories of factors impacting the AI readiness of an organisation. Just as Microsoft specifies, the success of an AI strategy is not merely due to having the right technology but rather a synergy between people, processes, and technology,²² AI-readiness also relies in building relationships among its components. Based on our research, we grouped a series of recommendations into these categories.

Develop an AI Strategy

Executive support is crucial for successfully adopting AI. Top management support signals the relevance of AI in the organisation's strategy and encourage AI initiatives within the organisation. Executives and managers should also ensure that the ecosystem of organisation's partners, suppliers and stakeholders understand and trust their AI strategy and ideally take the necessary measures to take advantage of it.

In line with what AI developers recommend, organisations have to create a strategic and systematic way of approaching AI. This will ensure not only that the organisation does not become a laggard in terms of AI. A laggard, in this case, refers not only to those organisations not wanting to adopt AI but also to those organisations adopting these technologies in pockets and often stuck in proof-of-concepts.

It is critical that senior leadership teams understand the unique risks that AI risks, articulate the risk appetite, and embed governance considerations in the AI adoption strategy. Executives should also make sure that adopting AI aligns with the organisation's strategy, and the motivations behind adopting AI are not solely based on the fear of missing out the opportunity to include AI.

Allocate Resources

Resources include financial budget, human resources, and IT infrastructure. Organisations should strategically allocate financial budget and personnel to support the overcoming of initial obstacles and uncertainty.

Organisations wanting to adopt AI should include in their IT infrastructure enough resources to support the eventual deployment of AI solutions. AI solutions, on the other hand, should be developed within the restrictions of the Organisation's IT infrastructure and, in case it needs to be upscaled, ensure that it is aligned and compatible with the existing technologies.

Should the organisation choose to enable end-users with Citizen Development capabilities, it is recommended to include or create models of governance and support when deploying Citizen-created solutions to scale.

Build the Knowledge

It is necessary to develop awareness of AI to end-users. This ensures that end-users have an adequate understanding of AI and its capabilities. It's also helpful to manage expectations of what to expect with newly created AI solutions. Aligned with this people in charge of deploying AI should make sure that there is an adequate understanding of the outcomes or predictions of the deployed AI solutions.

Organisations should provide the means to upskill people wanting to improve their understanding of AI. AI providers and developers can offer help with training and upskilling of developers and end-users. Our research suggest that organisations are already taking advantage of the momentum built by adopting related technologies to create training plans that include AI and its capabilities. Organisations should include upskilling their people in their strategic plan.

Create an AI Culture

Organisations need to create the culture or appropriately modify the existing culture within the organisation to ensure a seamlessly adoption of their AI solutions. This relates to collaborative work and change management, linked to the capability of AI solutions to work across different teams and areas of the organisation. Implementing AI across an organisation requires enough flexibility and collaboration with cross-functional teams, all supported by ethical standards and governance within the team, as well as from top management level.

Executive support can also mean creating an environment to support innovation related not only to AI but also to other related technologies or processes. Past research¹⁷ suggest that organisations with well-defined innovation departments are more likely to success in adopting technology or innovations in all departments of the organisation. On the other hand, whilst Start-Ups and small organisations may not have a well-defined innovation department, their rapid changing work environment might also help to successfully adopt new innovations in the whole organisation.

Be aware of Data

To support cross-functional teams, organisations need to work internally, as well as externally, to ensure a correct and standardised data availability and accessibility. Organisations also might want to work with external partners, providers, and AI developers to ensure a mutual understanding, in terms of capability and standards, for scaling their AI-solutions.

The success of an AI solution is tightly linked to the quality of data available. Organisations wanting to adopt AI should make sure that their data sources are constantly evaluated to ensure a level of quality of the data required by their AI solutions. When the data comes from internal sources, a cross-functional team or standardised procedures are required. Should the AI processes rely on external data, organisations might want to engage with their data providers to ensure the required level of data quality.

Lastly, organisations should create policies and procedures to ensure there is an adequate governance of data cross all steps of creating an AI

solution. Data governance might include data flows and lineage, data sources and provenance, consistent data definitions, and adequate metadata management.

This list of recommendations is not exhaustive, and organisations might want to refer to other frameworks or sources of AI-readiness before making a decision. Notable examples of related frameworks include Microsoft Adoption Framework¹⁴, the AI-readiness²⁷ model, the Diffusion of Innovations¹⁷ model, among others.



Going Forward

What can AI developers do to help organisations adopting AI?

In most cases, a correct adoption of AI depends equally in the organisation as well as the developers of AI. Representatives interviewed shared their experiences and they agreed that the adoption of AI in their organisations was accomplished as a consequence of a working synergy between their organisations and the developer of AI, in this case, Microsoft. They also shared some of the strategies that worked for them and how can AI developers help other organisations. We have listed some of their experiences, as well as some points in which AI developers can improve.

Take advantage of the momentum built by the relationship with the organisation. Interviewed representatives agreed that they were able to adopt AI as a consequence of having more related technologies from a specific AI provider. However, this does not mean that just because organisations are using a given technology or AI provider, they will use their solutions, but rather an opportunity to build an ecosystem and technology stack in which AI can be adopted naturally. A solid ecosystem or technology stack can act as a feedback loop in which organisation and AI provider work together to adopt and adapt more solutions.

Upskilling people is another opportunity area to deliver solutions. Interviewees shared that they were able to benefit from training plans for specific solutions and products from AI providers. These training plans will help to make sure that there's a mature understanding of AI and its enabling technologies, from top executives to end-users. The new AI workforce will need to meet operational requirements of many industries, working in a synergy with the organisation can help leverage their capability and adoption of AI.

Develop more relatable or flexible use-cases. Although interviewees understand that a level of adaption is needed to meet specific requirements of their organisations, they shared their desires to see more use-cases which will help them to easily spot the areas in which AI can bring added value to their organisations. On the other hand, interviewed representatives shared that the out-of-the-box solutions are becoming increasingly strong and flexible to be adapted and deployed rapidly.

Develop Australia-centred use-cases. Interviewees developed solutions using data from within their organisations. However, there is a general concern across industry and government experts,^{2,5,8} regarding the small number of datasets and use-cases for Australian-specific markets or solutions. There is an opportunity to embed Australian diversity in AI technologies.

Edge computing and citizen developers were the areas in which interviewees shared their concerns when scaling to the entire organisation. They think ensuring a correct governance and support schemes will be challenges to come when these technologies mature. AI providers should support different initiatives from the organisations, as well as from AI providers, to manage and govern these technologies.

Indeed, we believe that it is the distinctiveness of every organisation's use cases that will help them to rapidly innovate and gain a competitive advantage in your marketplace. However, we also believe that building a synergy between organisations and AI providers will be beneficial to all involved stakeholders and will ultimately lead to a rapidly adoption of AI.

| Conclusion

After decades of experimenting and development, AI is set to drive profound changes in the global economy. We are already seeing examples of real-life business benefits for early adopting organisations. However, adoption of AI technologies remains largely at an experimental stage. Early adopting organisations are driven by the desire to increase revenue, reduce costs, and improve consumers' experience. These organisations have momentum and support from the top of the organisation as well as from the AI developers they are working with.

As our analysis underlines, the challenges that Australian organisations are facing are not broadly different from the challenges that companies are encountering worldwide. This means that Australian organisations can benefit of the existing offering of AI without compromising its performance. Out-of-the box solutions have consistently improved over the last years to offer a cost-effective way of employing AI. However, for applications that require custom made AI or ML models, organisations might encounter different challenges related to accessing Australian-centred AI solutions. AI developers will have to work together with organisations to provide feasible solutions that ensure all involved actors can access the benefits of utilising AI.

Adoption of AI has the potential to generate benefits across the economy, allowing for the same product or service to be delivered for less and be better tailored for consumers' needs, as stated by the Australian Government.⁸ To ensure that Australian organisations achieve the full benefit of AI and digital innovation, we will need to better understand and develop a new perspective of digital success. For many organisations this will mean accelerating their digital transformation journey, whilst for others this will mean further building the right environment for effective adoption, upskilling people, and improving top management support. Working together, AI developers and organisations can develop actions that will result in increasing the AI-readiness and the adoption of AI by organisations.

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Appendix 1: Theoretical Foundation

With AI being a technological innovation,²⁷ the literature on adoption of technology innovations provides a starting point to guide this research. Adoption refers to the decision to use an innovation, such as products, services, processes, technologies.²⁸ Research on organisational readiness emphasises readiness as a necessary precursor for organisational change, such as AI adoption. We use two widely used frameworks regarding the adoption of innovation: The Diffusion of Innovations (DOI) theory and the Technology-Organization-Environment (TOE) framework. In this section, we combine the term AI readiness, as proposed by Alsheibani, Cheung & Messom,¹⁸ with both frameworks used to analyse the adoption of technology at an organisational level.

Innovation and technology adoption

This study aims to use the literature of Information Systems (IS) and Information Technology (IT) adoption to analyse the adoption of AI at an organisational level. There are a number of theories and frameworks that can be applied to understand the adoption of IS; a small number of these are focused on the adoption of technology.¹⁹ At an organisational level, the most used frameworks include the DOI theory,¹⁷ and the TOE framework.²⁹ Institutional Theory and the Iacobou, Benbasat & Dexter³⁰ model are also used together with the TOE framework in a number of studies. Both models, the DOI theory and the TOE framework, are similarly applied to analyse the adoption of new innovations at an organisational level.¹⁸

The DOI is a theory of 'how, why, and at what rate new ideas and technology spread'.¹⁷ At an individual level, the DOI theory presents the willingness of individuals to adopt innovation as a normal distribution over time. Segmenting this distribution subdivides the individuals into five different categories, from earliest to later adopters: innovators, early adopters, early majority, late majority, and laggards.¹⁷ Organisations adopting an innovation also fall into one of these five categories, depending on how soon or late they adopt the innovation. DOI theory associates the rate of adoption of innovations with five perceived attributes: *relative advantage*, refers to the perceived benefits of the innovation compared to current procedures, including economic profitability, and competitive advantages; *compatibility*, refers to the ability of the innovation to co-exist with current values, procedures, and tools; *complexity*, refers to the difficulty of learning and operating the innovation; *triability*, refers to the ability of the innovation to be tested;

observability, refers to the ability of the results of the innovation to be visible to others. At an organisational level, the DOI theory also describes the adoption of innovations as a more complex process depending on individual characteristics from the leaders as well as internal and external characteristics of the organisation.¹⁷ Internal organisational characteristics include *centralization*, the degree to which power and control are concentrated in few individuals; *complexity*, the degree to which members of the organisation possess a high level of expertise and knowledge; *formalisation*, the degree to which an organisation prioritise following rules and procedures; *interconnectedness*, the level of personal networks among the members of an organisation; *organisational slack*, the number of available resources in an organisation to perform or adopt innovations. On the other hand, external characteristics include the openness of the system, which can be translated to the environment in which the organisation works. The literature shows that the DOI theory has a solid theoretical foundation and has been used to study a variety of IS innovations and.³¹

The TOE framework is used to identify the factors that influence the adoption of innovation. Tornatzky & Fleischner²⁹ found that decisions to adopt innovations at an organisational level are influenced not only by technological aspects but also by organisational and environmental factors. The TOE framework analyses the process of adoption innovation from three different contexts: **Technological, Organisational, and Environmental.** **Technological** context refers to the characteristics and availability of both internal, including current practices and equipment, and external technologies. **Organisational** context refers to characteristics of the organisation such as scope, size, management, communication processes, slack. **Environmental** context describes the scene in which the organisation operates, including industry characteristics, market structure, competitors, suppliers, customers, and regulations. This framework is similar to DOI theory, in which individual characteristics and internal and external characteristics of the organisation play are drivers for the adoption of innovation, and some authors¹⁹ consider it better able to explain the adoption of innovations. The TOE framework adds the environment as a new and important component. The environmental context presents opportunities as well as constraints for adoption of innovation. The TOE framework has been widely applied to a number of empirical studies in various IS and IT domains. Previous research^{18,19,27,32-34} suggest that the TOE framework is suitable to investigate innovations at an organisational level.

e-readiness and AI-readiness

Research regarding AI adoption either at an individual or organisational level utilise the term e-readiness to assess the capability of an individual or organisation to adopt new technologies.²⁷ Since its conception, the term e-readiness has been the subject of different transformations, from describing the capability of a country to benefit from e-innovations²⁰ to defining digital readiness as the extent to which organisations are ready to

make use of digital technologies and developments.³⁵ Previous research^{27,36} classifies AI as a digital technology making it possible to apply the concept of e-readiness to its study.

In the context of AI and its adoption, Alsheibani, Cheung and Messom¹⁸ propose the term AI-readiness to assess the level of preparation in organisations to implement changes involving applications and technologies related to AI. This term is explored through the lens of the TOE framework. *Table 1* shows the different factors proposed to perform research on the adoption of AI. The proposed framework is based on the TOE Framework. It is, however, based on assumptions from previous experiences and practice from related research areas. In the Technological Context, *Relative Advantage* refers to the perceived benefits of adopting AI; *Compatibility* refers to the affinity of AI business case and the strategies existing in the organisation. In the Organisational Context, *Top Management Support* refers to the engagement of a top-level leader for the implementation of AI; *Organisation Size* links the influence of the organisation with the AI-readiness of the organisation; *Resources* refer to technologic and human resources that impact AI-readiness. In the Environmental Context, *Competitive Pressure* refers to the perceived threat of losing advantage as a consequence of not adopting AI; *Government Regulatory Issues* include government policies and assistance to encourage the adoption of AI.

AI Readiness

Context	Technological Context	Organisational Context	Environmental Context
Factors	Relative Advantage Compatibility	Top Management Support Organisation Size Resources	Competitive Pressure Government Regulations

Table 1 - TOE Framework as a conceptual basis for AI-Readiness¹⁸

Pumplun, Tauchert and Heidt³³ use the framework proposed by Alsheibani et al.¹⁸ to perform qualitative research regarding those factors. In their research, they propose an expanded framework in which they include new factors specific to AI. New factors in the Organisational context include *Culture*, as an umbrella term that includes change management, values from employees, and innovation within the organisation; *Organisational Structure*, which is directly related to culture, refers to the procedures and ways of knowledge transfer within an organisation. In the Environmental Context, new factors include, *Industry Requirements*, which are related to the interaction with the environment and other organisations within

the same industry; *Customer readiness*, refers to the knowledge and acceptance of the customer base, particularly for Business to Consumer (B2C) organisations. A summary of this extended framework is presented in Table 2.

AI Readiness

Context	Technological Context	Organisational Context	Environmental Context
Factors	Relative Advantage	Top Management Support	Competitive Pressure
	Compatibility	Organisation Size Resources	Government Regulations
Additional Factors	-	Culture	Industry Requirements
		Organisational Structure	Customer Readiness
		Data	

Table 2 – Extended framework to include AI-Specific factors³³

Jöhnk, Weißert and Wyrtki²⁷, on the other hand, proposed a new framework that, although based on the TOE framework, presents a new approach to judge the AI-Readiness of an organisation. In comparison to the TOE Framework, which divides technological, organisational, and environmental contexts, the new framework integrates them and presents five different categories of factors that impact the AI-readiness of an organisation (Table 3). Strategic Alignment includes *AI-business potentials*, which describes the fitness and compatibility of an organisation towards AI; *Customer AI Readiness*, refers to the acceptance of customers towards using AI-based solutions; *Top Management Support*, refers to the support to commence AI initiatives from top-level leaders; *AI-Process Fit*, describes the compatibility between the strategy of an organisation and its process to increase AI-readiness; *Data-Driven Decision-Making*, refers to the practice of using insights based on data to make decisions instead of "gut feeling". The Resources category includes *Financial Budget*, which refers to financial resources that an organisation assigns to AI initiatives; *Personnel*, includes human resources and their expertise towards AI; *IT Infrastructure*, which has to be aligned with the requirements for AI and Data Processing. The Knowledge category includes *AI Awareness* which relates to the understanding and comprehension of AI functions; *Upskilling* refers to the creation of AI-specific skills and expertise for an adequate implementation of AI; *AI Ethics* is a compendium of novel methods to prevent unethical

and biased outcomes of AI. The Culture category includes *Innovativeness* which includes experimentation, risk-taking, and problem-solving skills that are necessary to initiate change in a rapidly changing environment; *Collaborative work*, refers to the multidisciplinary work that AI specialist and IT departments actively perform to adopt AI; *Change Management*, refers to the processes that an organisation has in place to reduce misconceptions of AI. Finally, the Data category includes *Data Availability*, refers to the different amounts and type of data that are necessary to train and test AI models; *Data Quality* is a term used to describe the suitability of data, in terms of quality and relevance, for the AI models; *Data Accessibility* describes the pipelines through which a model can access data quickly and easily; *Data Flow* facilitates the implementation and maintenance of AI models once they are adopted. All five categories and their factors describe an organisational model to develop AI-readiness. This framework can also be utilised to analyse the current AI-readiness of an organisation. However, given the unique characteristics of AI adoption, this framework can also be utilised to assess the individual categories of AI-readiness. This might be useful for organisations to develop strategies as to how to improve their adoption strategies.

AI Readiness

Categories	Strategic Alignment	Resources	Knowledge	Culture	Data
Factors					
AI-business potentials	Financial budget		AI Awareness	Innovativeness	Data availability
Customer AI readiness	Personnel		Upskilling	Collaborative Work	Data quality
Top Management Support	IT Infrastructure		AI Ethics	Change Management	Data accessibility
AI-Process fit					Data flow
Data-driven decision-making					

Table 3 - AI Readiness framework²⁷

Another way of looking at adoption of AI comes from Microsoft.²² Microsoft developed a framework to guide organisations wanting to adopt AI. This framework includes five strategic imperatives: *AI Strategy*, refers to the need for using a systematic approach when deciding to adopt AI; *AI Culture*, describes the organisational need to enable flexibility, cross-team collaboration, and data-driven environments that will aid the adoption of

AI; *Responsible AI*, refers to the principles that Microsoft recognises as guidelines of using AI: *fairness, reliability and safety, privacy and security, inclusiveness, transparency, and accountability*; *Scale AI*, includes developing AI at all levels of the organisation, from top management to end-users; *AI for business users*, describes the need of deploying AI solutions for every day users, not only for scientists and researchers; *AI Technology for leaders*, describes the awareness from leaders to adopt AI in their organisations and be part of the disruption caused by AI.

Enterprise AI

Strategic Imperative	Description
AI Strategy	Systematic approach to AI
AI Culture	Organisational changes to support AI
Responsible AI	Microsoft principles of using AI: fairness, reliability and safety, privacy and security, inclusiveness, transparency, and accountability
Scale AI	Awareness of AI at all levels of the organisation
AI for business users	AI solutions built for end-users
AI technology for leaders	Awareness for leaders to adopt AI

Table 4 - Microsoft Enterprise AI framework²²

When comparing and contrasting all frameworks previously described certain trends emerge:

1. Strategy is common to all frameworks. Although the TOE and Pumplun et al. frameworks do not explicitly list Strategy as a component, they list Top Management support as necessary to achieve a successful adoption of AI.
2. Culture is common to all frameworks. This showcases the importance of developing an organisational culture that welcomes and encourages innovations and new solutions.
3. Data is included in the AI-readiness framework by Pumplun et al., Jöhnk et al. However, Data is not explicitly included in Microsoft's Enterprise AI framework. Responsible AI might include the factors described as Data in the AI-readiness frameworks.
4. AI Awareness from the AI-readiness framework by Jöhnk et al., is equivalent to Scale AI in the Enterprise AI framework by Microsoft. Both include the need of developing an organisation-wide understanding of AI. The Enterprise AI framework also include, under the AI technology

for leaders Strategic Imperative, the awareness for leaders to be part of the disruption caused by adopting AI in their organisations.

On the other hand, key differences are:

1. The Enterprise AI framework by Microsoft include emerging topics in its Responsible AI Strategic Imperative. This is relevant for current applications of AI, and aligned with local, regional, and global regulations.^{6,7}
2. Compared to the AI-readiness by Jöhnk et al., the Enterprise AI framework does not explicitly include building skills as a necessary step in adopting AI. However, building a relevant skillset is needed when adopting a disruptive technology.
3. The Enterprise AI framework is the only one including AI for business users as a key component when adopting AI. Although AI Awareness, present in the Jöhnk et al. framework might include end users, being explicit about the target of potential AI solutions might have a positive impact in the adoption of AI.

In sum, research so far provides a solid theoretical groundwork for analysing the adoption of AI at an organisational level. However, there are room for incorporating other factors that might affect the level of AI-readiness of an organisation. For this research, security, the COVID-19 pandemic, and the impact of the offering of AI were considered to be included in the methodology. By doing this, we aimed to understand how the AI available today impacts an organisation's readiness to adopt AI. In other words, how organisations perceive the offering of AI as a match for their needs and what challenges are they facing during the adoption process.

Appendix 2: Methodology

The aim of this project is to expand the current state of research regarding adoption of AI by Australian organisations. To provide a thoroughly understanding of it, we decided to use a qualitative approach. Through engaging subject matter experts (SME) and representatives from different organisations we aimed to get an integral view of the challenges, barriers, as well as drivers of AI adoption in their organisations. The organisations are part of Microsoft customers, either directly or through one of Microsoft Partners. They were selected based on one or more of the following characteristics: 1- They showed interest in adopting AI or ML, 2- They have started to implement AI or ML, 3- They created a Proof-of-Concept (POC) based on AI or ML, or 4- They successfully implemented AI or ML. We aimed to have different perspectives from different organisational contexts. Microsoft helped to identify potential participants and conducted a preliminary introductions, previous to interviewing them.

The main source of information is qualitative interviews with the three selected SME, conducted in a semi-structured way. These SME represent perspectives from industry, government, and education spaces. They offered different points of view regarding the adoption process with different challenges and barriers, as well as different adoption journeys.

The Interviews were divided in three main parts, in addition to basic information about the organisation and their background: 1- Context and understanding of AI and ML, 2- Challenges of adopting AI, and 3- Organisational efforts to adopt AI. These three parts were informed by the theoretical foundation of this project and resulted in a list of main topics:

- Perceived opportunity of incorporating AI/ML Solutions
- Technical readiness of the organisation
- Datasets and data governance
- Work and business environment
- COVID-19 and its impact in adopting these solutions
- Suitability of AI and ML offerings

The interviews were conducted through Microsoft teams on 8th April 2021, 26th April 2021 and 28th April 2021, and lasted in average 45 minutes. Each interview was transcribed using Microsoft Teams built-in transcription capability and exported to a text document. Transcriptions of the interviews were analysed using nVivo 12 Pro, where coding was performed. 16 codes emerged which led the analysis of this report.

These codes represent the topics that were common to all three SMEs and are: **1- AI-Based processes**, describes the alignment of the organisational strategy with the applications of AI in their organisations; **2- Business case to adopt AI**, represents the need for a business case to be developed prior to adopting AI, in other words, how does AI brings value to the organisation; **3- Data-based decision-making**, describes the application of AI and data science to aid decision makers support projects within the organisation; **4- Stakeholder involvement** is related to the need of engaging with all stakeholders involved in the project, from the executive or manager supporting the project to the end-user who will use the project every day; **5- Value frictions** shows the potential value frictions among stakeholders involved in the project; **6- Momentum built by AI providers**, showcases the ease with which AI can be adopted once there are enough additional projects related to AI, this could be data science, analytics, or other; **7- Scalability and supportability of AI** describes the need for building enough support and scale structures aiming to deploy AI solutions to the entire organisation. It also showcases the need for AI solutions to be created within the restrictions in place within the organisation's IT infrastructure; **8- Offering of AI**, showcases the impact of the current offering of AI, described as the tools and methods available to be used by the organisation to create AI solutions. It also describes the compatibility of such offering with the existing IT infrastructure and knowledge within the organisation; **9- End-user engagement** relates to the need of involving end-users, this is, the people who will use the AI solutions, in all steps of the development process. It also describes acknowledging potential biases and cultural topics in the development process; **10- Upskilling the team** describes the need to create additional skillsets for people developing and using AI solutions. It also describes the ease of access to training materials from the AI developers if they are available to the organisation; **11- Impediments of adoption by end-users** showcases the potential cultural and social aspects that might impact the adoption of AI solutions by the end-users. This includes awareness of AI, explainability of the outcomes of using an AI solution, among others; **12- Innovation department within the organisation** describes how the changes in culture can create a specific innovation department within the organisation which would be in charge of creating and deploying AI-based solutions to the entire organisation; **13- Data governance**, relates to creating or supporting initiatives and policies regarding governance and ownership of data; **14- Data quality and access** describes the need to having continuous control of the quality of data fed to AI models. It also describes the flows of data, from the creation of datasets to proper disposal of outdated datasets; **15- Data privacy and security** includes internal policies of access and control, as well as complying with regulations either at a local, regional, or global level; **16- Standardising data** describes the need to create procedures to create standardised datasets within the organisation as well as engaging with partners and providers to ensure a correct delivery of

data from external sources. When comparing the 16 codes with the AI-readiness framework described in Appendix 1: Theoretical framework, we encountered similarities among them, which are showcased in the following matrix:

AI Readiness		Categories	Strategic Alignment	Resources	Knowledge	Culture	Data
Codes							
	AI-Based processes Business case to adopt AI Data-based decision-making Stakeholder involvement Value frictions		Momentum built by the AI providers Scalability and supportability of AI Offering of AI	End-user engagement Upskilling the team Offering of AI	Impediments of adoption by end-users Innovation department within the organisation End-user engagement	Data governance Data quality and access Data security and privacy Standardising data	

Table 5 - Codes from interviews relating to the AI-Readiness framework

These 16 topics represent an overlap between the AI-Readiness framework, the Enterprise AI Framework by Microsoft and the experience of representatives when adopting AI in their organisations. It is, however, a snapshot of the entire Australian AI ecosystem. For a more comprehensive understanding of the state of AI adoption, further research is needed, including other types of organisations, consumers, and the impact of individuals in the pace at which organisations adopt AI based solutions.

