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Susan Sheldrick

University of Melbourne, susie.sheldrick@unimelb.edu.au

Shanton Chang

The University of Melbourne, shanton.chang@unimelb.edu.au

Sherah Kurnia

University of Melbourne, sherahk@unimelb.edu.au

Dana McKay

RMIT, danamckay@gmail.com

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Across the Great Digital Divide: Investigating the Impact of AI on Rural SMEs

Completed Research Paper

Susan Sheldrick

School of Computer and Information Systems, University of Melbourne
Melbourne, Australia
susie.sheldrick@unimelb.edu.au

Prof Shanton Chang

School of Computer and Information Systems, University of Melbourne
Melbourne, Australia
shanton.chang@unimelb.edu.au

Sherah Kurnia

School of Computer and Information Systems, University of Melbourne
Melbourne, Australia
sherahk@unimelb.edu.au

Dr Dana McKay

School of Computing Technologies, RMIT University
Melbourne, Australia
dana.mckay@rmit.edu.au

Abstract

Rural SMEs are generally at a digital disadvantage due to their size and location. The addition of AI to many business processes has the potential to minimize the existing divide. However, without access to this technology and its responsible usage, Rural SMEs could be placed at a more significant disadvantage. To understand the current situation we conducted interviews with Rural SMEs and related stakeholders. This paper draws on Activity Theory to develop a holistic understanding of the influence AI is having on the business processes of rural SMEs. We also consider the role of AI in terms of the existing digital divide frameworks, as well as the newly proposed fourth wave that captures the novel forms of disadvantage AI can perpetuate.

Keywords: AI, the digital divide, rural, SMEs, activity theory

Introduction

Rural small and medium enterprises (SMEs) are incredibly important within the Australian landscape. In addition to the economic output, they provide jobs to the local workforce (Commonwealth Parliament n.d.) and service the needs of the regional communities where it is unfeasible for larger organizations to do so (Nicholls and Orsmond 2015). However, rural SMEs in Australia experience digital disadvantage due to their organizational size and geographical location (Standing et al. 2003). Studies have repeatedly shown that rural areas score lower than their urban counterparts with regards to digital access affordability and ability (Thomas et al. 2021). Additionally, SMEs are often digitally disadvantaged due to resourcing (Hansen and Bøgh 2021). Yet due to their significant role in their local communities there is interest in supporting their digital transformation and journey (Australian Government and Department of Industry, Science, Energy and Resources 2021).

The digital divide is a multi-disciplinary field of research that broadly refers to the gap between the haves and have nots with regards to ICTs (Riggins and Dewan 2005). Since its inception in the mid 1990's, the digital divide has evolved to represent three waves – access, ability and outcomes. As the field has

expanded, scholars have investigated the digital divide through branches such as the waves of digital divide, who is being impacted, the technology and characteristics influencing the divide (Van Dijk 2019).

Digital technologies, in particular Artificial Intelligence (AI) have the potential to narrow the divide (Sheldrick et al. 2022). For the purposes of this paper, we draw upon the following definition of AI compiled by the European Commission High Level Expert Group on Artificial Intelligence:

“Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions.”(AI HLEG 2019).

Automation and precision methods have allowed the agricultural industry to improve yield and lower costs such as labor and fertilizers. These developments have also led to an increase in high-skill employment opportunities (Rotz et al. 2019). AI is giving smaller organizations the opportunity to undertake business operations that may have been unfeasible in the past. For example, bookkeeping tool Xero uses AI to reduce manual data entry as well as provide forecasting and planning tools (Xero 2021), while Facebook allows businesses of all sizes to advertise through targeted marketing (Meta n.d.). These tools are available for small businesses in all locations and they can be especially useful given the lack of services in regional areas.

Along with the benefits, it is also important to assess the potential harms that may arise such as unrepresentative data resulting in bias negatively affecting businesses and communities. With agriculture, there is the risk of digital farming solutions exacerbating the gap between small and large farms, with large organizations having the resources to invest in cost-saving digital solutions (Rotz et al. 2019). With the digital divide already likely to impact rural SMEs due to their location and organizational size, there is currently limited understanding of whether AI will reduce the divide or widen it further. Therefore, the research question addressed in this study is:

RQ How does AI impact rural SMEs?

To answer the research question, we conducted a qualitative study, with 16 participants recruited to represent rural SMEs as well as related stakeholders. Activity Theory takes a holistic approach to the study of Socio-Technical systems, accounting for the influence the subjects' context has on the process (Allen et al. 2011). With Activity Theory selected as our theoretical lens, we are able to look at various perspectives to glean a comprehensive understanding of how AI impacts the digital divide for the subjects. Our study indicates that there is an appetite for advanced technologies such as AI, but there are significant barriers to their adoption and meaningful use. In the next section, we evaluate the literature on digital divide, highlighting the three waves to see how they help us understand the impact of AI on rural communities and whether it is sufficient and exploring the newly proposed fourth wave of the digital divide that centers on the novel harms AI can perpetrate. We then explain our methodology before presenting the key findings of the study and reflecting them on the relevant literature. Finally, the study is concluded by outlining study limitations and proposing future research.

AI and the Digital Divide in Rural SMEs

As Emerging technologies such as AI continue to be embedded into business, and everyday life, it is important to investigate the impact these technologies are having on small business from an ethical and social perspective (Crawford et al. 2016). In addition to the economic and market benefits of technology adoption by rural SME's there are also community benefits such as increased capability (Standing et al. 2003). While their economic contribution nationally is modest, locally owned SMEs contribute to a sustained and vibrant local fabric by providing employment and through wealth distribution (Hettihewa

and Wright 2018). Their importance is compounded by the services they provide locally which can be unfeasible for large organizations (Nicholls and Orsmond 2015).

In addition to the important role they play in their communities, rural SMEs are an interesting subject for our study as they are likely to experience the digital divide on two fronts – their location and organizational size. The urban-rural divide has remained a feature of digital divide research since its inception in the mid 1990s (NITA 1995). In Australia people in non-urban locations are scoring lower on the digital inclusion index than their urban counterparts, a trend that is likely that this will continue as AI is embedded further into our daily technology (Thomas et al. 2020). Furthermore, a digital divide is considered between SMEs and larger organizations, with adoption lag, limited resources and lack of technical expertise commonly cited as causes (Riggins and Dewan 2005). A concern and influence in the digital divide for SMEs is that emerging technology is often not designed for their needs and capabilities. AI systems designed for larger organizations need to be more accessible for SME's, keeping in mind fewer resources and knowledge is available (Hansen and Bøgh 2021). AI focused digital divide literature has predicted that existing factors affecting digital divide are likely to affect AI digital divide (Carter et al. 2020).

The types of AI functions available to Rural SMEs vary from general applications of AI available to SMEs to industry specific applications such as in agriculture. Table 1. provides an indication of the types of AI systems that were discussed and used by rural SMEs drawing on system classifications from the Human Technology Institute (Solomon and Davis 2023).

AI Systems	Examples
Recommender systems	Search engines, social media advertising,
Advanced analytics	Point of sale systems, industry specific analytics programs
Robotic process automation	Precision agriculture
Computer vision	Sorting produce in agriculture
Generative AI	Generative content creators
Table 1: Examples of AI systems	

The established three waves of digital divide are still applicable to AI in rural SMEs. Questions of access, ability, and outcomes still need to be explored with regards to AI, particularly when issues still exist with technology that is needed for AI, for example, internet access. The third wave of digital divide appreciated that individuals and organizations can still be interacting with digital technologies and have a negative outcome. In previous waves it was positive if technology users had access and ability, negative if not. The third wave – people can have access and ability and still have negative outcomes. What is important to note is that all three waves are applied under the assumption that there is a degree of user awareness that they are interacting with technology.

AI is often ubiquitous and opaque, having been integrated into many everyday products and applications without users necessarily being aware of its deployment (Eslami et al. 2019). AI has even been found to inflict personalized harm on individuals without them even interacting with decision making system (Asaro 2019). There have been suggestions of a new wave of digital divide concerning AI, Automated Decision Making, and Algorithms (Carter et al. 2020; Kitsara 2022; Lutz 2019; Yu 2020). These works highlight the fact that there is something about AI that generates a new form of disadvantage not reflected in previous frameworks. We have begun to explore the notion of a new wave of digital divide that accounts for AI having novel implications as a technology, and therefore the potential to perpetrate novel forms of disadvantage (Sheldrick et al. 2022). This new wave encompasses three components – awareness, agency and amplification.

Awareness: With previous technologies, such as the internet, people were aware if they were or were not interacting with the technology (Yu 2020). However, with AI this is not the case. Many users are unaware of both its presences and influence in common platforms and applications with a 2020 Norwegian study on algorithms found no to low awareness in 61% of respondents (Gran et al. 2020). As a component of the fourth wave of the digital divide awareness addresses the inconspicuous form that AI takes in modern technology.

Agency: With awareness of interacting with a system comes agency, knowing what the system is doing and being able to choose to interact or not. AI introduces new challenges for agency. Drawing on the AI Ethics principles of transparency, contestability and accountability (Jobin et al. 2019), agency explores how automated decisions are presented to the user and the avenues available for questioning. AI can be adopted into decision making processes as a cost cutting measure, and consequently can lead to the organization minimizing channels for questioning (Park and Humphry 2019). This component also considers the human-machine relationship in terms of automation bias and human autonomy. Agency in the context of the AI divide is further fueled by the exploitation of power discrepancies such as when organizations utilize AI systems to manage their human workforce (Williams et al. 2022).

Amplification: The final component of the fourth wave of digital divide is amplification. A benefit of AI is its ability to work at scale. However, this also means AI has the ability to disadvantage at scale too. AI poses the opportunity to make thousands of decisions in a second and operate faster than a human operator would. Nonetheless, by operating at such speed and efficiency, issues are also produced at speed and with alarming efficiency (Crawford 2021).

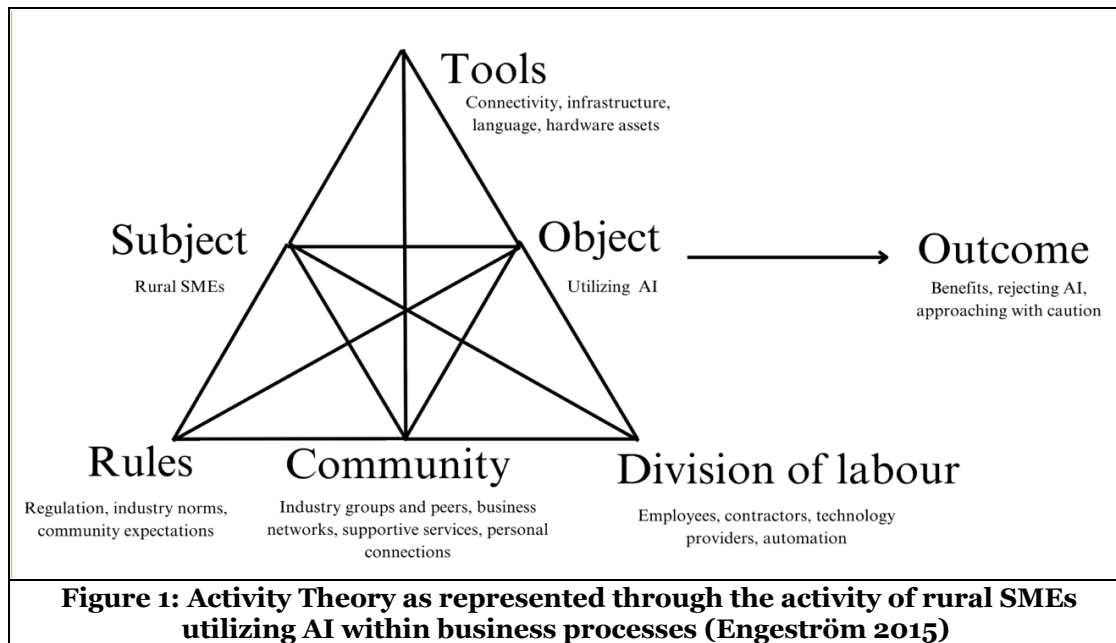
Due to relatively low availability of resources and expertise and their small size SMEs are affected by the digital divide (Riggins & Dewan 2005), however it is not clear how AI will disrupt this situation. To investigate how the digital divide is in turn impacted by advanced technologies such as AI, we designed a qualitative study, using Activity Theory (AT) as the theoretical lens. Below we review AT and its suitability to the study.

Theoretical Framework: Activity Theory

Activity theory has been chosen as the theoretical lens for this study. The flexible structure and applicability to socio-technical systems (Allen et al. 2011) have been widely utilized in Information Systems research. Given the ubiquitous nature of AI, the ability to draw upon the perspectives of related stakeholders through AT ensured a comprehensive account was recorded. It was anticipated that many rural SMEs would be unable to identify the full extent to which they were utilizing AI within their organizations and as such would only provide a limited perspective if they were to be the sole source of data. By using AT, the perspectives of related stakeholders were able to be included.

Evolving from its genesis in early 20th century psychology, using Engstrom's iteration- activity theory provides a wholistic framework in evaluating the factors influencing the subject performing a task (subject – object). The subject is the focus of the research, and the object/objective is the motivating factor - what the subject is wanting to do. Tools, also known as artifacts, are mediators – things that are required to enable the subject to achieve the object. The subject-object-tools system for the first triangle encapsulates the principle of mediation, a principle of AT and foundation to Vygotsky's work (Engeström 2015). In our activity system, the subjects are rural SMEs.

Importantly, AT appreciates that the activity does not occur in isolation but is influenced by the context and background of the subject and so engagement with rules, community and the division of labor are included. Rules refer to the norms, social conventions, laws and regulations that govern how the activity takes place. Community considers the environment of the activity. Division of labor is concerned with who is doing the work to achieve the task (Crawford and Hasan 2006; Engeström 2015). In this paper the term subject is used in the AT context, whereby we refer to Rural SMEs rather than the interview participants.



The digital divide phenomenon is systemic with a range of variables impacting how individuals, organizations and regions are impacted. Activity theory (AT) offers a useful theoretical framework to explore and clarify the impact AI is having on rural SMEs. Activity Theory in Information Systems research allows for a holistic investigation into the activity being undertaken by the subjects of the study (Crawford & Hasan 2006). By understanding that activities take place within a complex socio-technical system, the internal and external influences can be considered to provide a more holistic understanding of the activity (Allen et al. 2011). For the purposes of this study the Activity under analysis is the utilization of AI in business processes.

Research Method

This study was designed from the outset to utilize qualitative methodology in line with many other studies of the digital divide (Van Dijk 2019). Deploying qualitative methods allows the nuance in the phenomena to be explored. This is imperative given that digital exclusions are experienced differently even by similar groups (Ewing et al. 2015). The research technique selected was semi structured interviews, to allow for the data to be collected along selected themes but with the flexibility to delve deeper on compelling points as they arise (Blandford n.d.). This was important with regard to interviewing small businesses about their use of AI as many had limited awareness of AI in their business processes. By deploying semi structured interviews we could explore the subjects' experience with AI tools without being limited by their understanding of the technology.

Recruitment

Participants were recruited in-person through conference attendance, patronage of local businesses or through the researcher's professional network. Cold emails were also sent to prospective participants but yielded no results without an in-person connection. Focusing on the holistic nature of AT, we recruited participants that could represent factors in AT beyond the subject, by that we mean we ensured that the study included the perspectives of technology providers, rule makers and providers of support services for SMEs. This feeds into the multi-voicedness of AT and was useful given the opaqueness of AI, which as discussed in the findings meant that the subjects were not able to identify all the AI that was embedded in their business processes.

As we are using AT terminology in this paper it is important to note that subjects do not exclusively relate to interview participants. For the study, the subject is rural SMEs. Interview participants include rural SMEs as well as stakeholders such as service providers and technology companies that can offer an additional perspective to the phenomena investigated. Interview participants from SMEs were owners or managers and were required to have decision making responsibilities with regards to the use of technologies that encompassed AI. As a result, even if they were not responsible for the day-to-day operation of the technology discussed, they were in a position to evaluate its effectiveness within the organization. Where the interview participants were representing alternative perspectives such as from technology companies or service providers, the researchers qualified that they were able to competently talk to the experience of rural SMEs by discussing their customer base and experiences prior to the interview. Specific industries were not targeted, but agriculture was frequently discussed given the number of agricultural SMEs present in rural Australia. Table 2 indicated the breakdown of interview participants to their role in the activity system.

Role in the activity system	Industries represented	Participants
Subject	Agriculture, aquaculture, hospitality, retail, creative industries	P.1, P.2, P.5, P.7, P.8, P.9, P.10, P.13
Tools	Agriculture technology, connectivity, financial services, business support services	P.3, P.4, P.15, P.16
Community	Local government, academia	P.6, P. 11, P.12, P.14
Table 2: Research participants and their relationship to the Activity System		

Data gathering

Participants were informed of the purpose of the study and given consent form to sign in person or online. The interviews took place in person where possible or over Zoom as required, taking between 30-60 minutes. The interviews were semi structured, with a list of questions for the interviewer to draw on, but the flexibility to interrogate further points of interest as they were brought up by the participant. This also allowed the questions to be appropriately altered to center on the subject i.e., not looking for the financial services manager’s understanding of AI, but the understanding of their clients being rural SMEs. The aim was to gain an understanding of the AI used by the subjects and their understanding of the benefits and issues.

Table 3 lists the main research themes explored through the interviews with an example of the types of questions asked.

Research theme	Example Question
Understanding the impacts of advanced technology on the subject	Can you tell me about the technologies that you use and how they are related to AI?
Understanding the savviness of the subject with respect to advanced technologies	How do you protect your data and privacy online?
How the subjects experience the digital divide	Can you tell me if you feel your access to technology is different here compared to the city?
AI possibilities in rural locations.	How might AI be of value to the main industries in your area?
Table 3: Research themes and sample questions	

Analysis

The interviews were recorded and transcribed with the assistance of the Microsoft word transcription tool. The automated transcriptions were poor and required significant corrections. The transcriptions and interviewer notes were read numerous times, analyzed and coded using a general inductive method (Yin 2016). After the initial inductive coding, AT was used as the theoretical lens to guide the data analysis and identify key insights through interpretation of the AT nodes and principles. The digital divide frameworks were also considered through the analysis. Table 4 provides a sample of the coding process.

Quote	Open coding	Digital divide themes	AT Themes
“I would never buy anything until I've seen it work.” P. 13	See in action, trialability	Access	Role of community
“They will want you to come out and see it. They won't just sing the praises, they will want you to come and see it- whatever the new thing is” P. 12	Show off new ‘toys’, demonstration,	Outcomes	Role of community
“I speak to people I do know and trust already, so I don't just go with randoms” P5	Relationships, trust, cross industry network	Outcomes, awareness, ability	Division of Labor, role of community
“We've tried a couple of them and they didn't really seem to make our operations much easier. So we do it with a whiteboard.” (P. 1)	Openness to try, rejection of the technology, unsuitable, evaluation	Outcomes, ability	Outcomes
“look yeah, but I, I know what the numbers mean going in, I certainly don't want to hand it all into a black box to see what comes out without me being able to question” (P. 14)	Questioning, concern,	Agency, awareness, ability	Outcomes
Table 4: Sample of coding process			

Findings

Our findings are presented in line with selected nodes of activity theory, including community, tools, outcomes, and division of labor. These nodes were selected on the basis of their relevance to our interview results and the research question.

The role of community in facilitating the use of AI

In this study, community was found to be a diverse and extensive group that included industry groups, industry peers, wider business networks, services that support business processes - accountants, banks, personal/social connections. We found that this wide community played an influential role in the uptake and usage of advanced technologies such as AI systems.

Trust is an important consideration in the adoption of technology. Two ways trust was identified in the study was through seeing the tool AI product or process in action or by seeking referral from a trusted connection in their community. While not all technologies discussed feature AI, it does indicate the importance of community in the exposure the subject has to a product and how this feeds into the adoption of technology. *“Again, you know neighbors, farmers, associations and probably talking to horticulturists, who are generally younger and abreast of the advances more than I am. Field days, That sort of things important.” P. 13.* In order to see the technology in action, community events such as Agricultural field days and industry group excursions were noted, however seeing a ‘mate’ with the technology going about the activity was quite effective. *“I would never buy anything until I've seen it work.” P. 13*

From a community aspect, especially if it is a prized new acquisition, the subject was keen to 'show off' the tool to other members of the community such as with peers in the same industry, social connections and professional connections such as with those in financial services. *"They will want you to come out and see it. They won't just sing the praises, they will want you to come and see it- what ever the new thing is"* P. 12

For a subject to trust another member of the community, they don't necessarily have to be from the same industry. It is helpful for them to be solving or having sold a similar problem, which within rural communities can be effect subjects regardless of industry such as connectivity. *"I speak to people I do know and trust already, so I don't just go with randoms"* P5. P5 goes to connections in a different industry that they trust. The industry is different, but there are similarities in installing digital equipment in rural locations, so they find these connections provide useful information.

The subjects expressed the importance of firsthand experience with a new product or process, and who it is that is validating the benefits. The importance of the community in innovation adoption extends to the adoption of AI enabled products and processes.

The role of Tools in enabling or hindering the utilization of AI

In AT, tools play the critical role of enabling the subject to achieve the objective. Our research highlighted the tension that inadequate tools placed on the activity system and how that impacts the objective.

Connectivity or access to the internet was a major theme throughout the study. While this is unsurprising given the study looks at rural SMEs, the impact of connectivity on the tools utilized by the subjects was of interest. While AI can operate offline, for the general business tools commonly used by Rural SMEs the AI features were dependent on regular internet connection. A frequent issue raised was intermittent connectivity and how it can put a stop to business activities - collecting revenue, marketing, even core business functions. For example, the rise of contactless payments necessitates a degree of connectivity, but when there are issues with the internet connection the subject may struggle to collect revenue from their customers. *"... if the Internet goes down, we lose our cash register pretty much... Without that (internet) we have no register because it runs online"* (P. 7& 8). In this example, the act of processing payment would not be AI dependent. However, while the point of sales system is not operating, the subject would also not be able to access other business tools such as live analytics and received online orders. Troubleshooting the connectivity issues also takes labor away from other business enhancing tasks.

In addition, insufficient and unreliable internet connectivity can lead subjects to self-exclude from the use or adoption of AI related functions. The research found that subjects would dismiss potential AI processes on the basis of connectivity. This can be especially concerning when considering how AI has the potential to help businesses operate more efficiently. Furthermore, not all AI products require the same level of connectivity, as a technology provider explained their product can be effective over low frequency, yet operating under the assumption that a stronger connection is required, potential customer self-exclude. *"a lot of people automatically would dismiss you 'cause they think they don't have phone reception, which you don't necessarily need. Well, it though, makes you see things they think they don't have phone connection, when in fact connectivity It's complex, but there's a lot more possibilities for."* (P.3)

Division of Labor – who is responsible?

Our data found three minor yet significant findings from the division of labor perspective concerning who is upskilling the subject, the role of automation and who within the organization is driving the utilization of AI.

Our study found that the role of training or education would be filled by a variety of interested parties. Technology providers spoke of educating the subject on wider aspects to technology that were related to their product. Other service providers were also key in developing the subject's skill set beyond the scope of

the traditional service on offer. *“post sale support that we need to provide. And but that's not just with our technology, but it's almost helping train around not just our applications or products that that's helping train and digital literacy in in general. So that and, say, using Webinar tools for example. And then it would be saving bookmarks on a computer, understanding how to download a CSV file if they wanted to pull data there from their device.” P. 3.* This also exposed a vulnerability to the subjects in relying on the suppliers and technology providers as a provider of general technology education. *“There's a much better pool than people assume, so there's a lot of people who have had like amazing careers in global companies sometimes, and they've moved out to regional areas for personal reasons.... So it's a case of discovering those people and getting them to engage with local communities.” P16*

The study uncovered the use of AI to do tasks that were previously performed by humans. The use of technology for automating tasks is not a new concept, however it is interesting to consider this through the lens of activity theory and include Automation as a division of labor. The task has not been eliminated but the human involvement has been eliminated or reduced. *“Facebook has also Changed the way their algorithm is. So instead of targeting an audience yourself, it's artificial as well. So it you know, finds those trends and does it all for you.” P. 8.* *“Yeah, so it does everything for me. So I work mainly on the website and whenever I put new products on the website it automatically throws that into a Facebook Post and it's got all the relevant information in. That post that's got, you know, stock levels of sizes and prices and a link straight to it” P 8*

There is variability in who is driving the activity within the business. While the decision making may fall to an owner or manager, the drive to procure the technology may come from junior members of the organizations. While this can align with digital divide literature where by older users are more likely to be digitally excluded than younger users (Van Dijk 2019), it may be more effective to see this as an opportunity. *“It can be difficult because often you may have young people in the organization that can see the value in it, they want to adopt it, but they'll need sign off from the owner, parent or manager that may not be as well versed with tech or had a bad experience, and they can often block the sale.” P. 3*

Rules mediating usage of AI

As the subjects represented in the data draw from different industries, a broad set of rules govern the state of play for the activities under investigation. Industry bodies can set many of the norms for small businesses, particularly in industries that dominate rural areas such as in agriculture. Industry bodies can set the market standard, advocate for the interests of their members as well as provide a unified 'body' that smaller producers can benefit from. As industries are increasingly dependent on advanced technologies that utilize AI, Rural SMEs who are unable to for fill the requirements may have access to the best market conditions. *“But there's another form of connectivity that I think is emerging as a key driver of adoption and that is the connectedness of the production system. So if I'm a small to medium enterprise and I'm for example in the trading carbon/ biodiversity/ greenhouse gas reporting that's going into some other hyper reporting mechanism like it could be a food producer using my farm for scope through reporting for example, if I'm if my farm is connected that way there are there are extra incentives for me being able to record and upload an exchange data in order to meet my reporting and reward obligations.” (P 14)*

Outcomes of utilizing AI by rural SMEs

In addressing the research question, “How does AI impact rural SMEs?”, the findings surrounding the outcomes of the activity demonstrated the range in which rural SMEs experience AI. Generally, we found these experiences could categorized as Enjoying the benefits of AI assistance, taking a caution approach to AI, rebelling against the technology, and reverting back to previous non-AI processes.

Enjoying the benefits of AI assistance: The study found that there were instances of Rural SMEs adopting AI and enjoying the benefits that they bring. Benefits that were listed included peace of mind, reduced costs, improved profitability, reduced inputs and saved time. *“Yeah, so it does everything for me. So I work mainly on the website and whenever I put new products on the website it automatically throws*

that into a Facebook Post and it's got all the relevant information in. That post that's got, you know, stock levels of sizes and prices and a link straight to it" (P. 8)

The study also revealed that the subjects were able to use AI to complete tasks that in previous years would have been beyond their resources. This included personalized advertising, content creation and promotion, data analytics and automation. *"basically you wouldn't have a business without it because it's just all Instagram and Facebook and which most of its unpaid so it's been a huge saving in that area."* (P. 9)

Taking a cautious approach to AI: There were subjects who took a cautious approach to adopting AI enabled technology. We found two main perspectives with regards to this – one that was concerned about data sovereignty and the other whose understanding of AI lead them to be cautious.

From our research data ownership was not an issue for all subjects, or at least in the ways in which data was discussed. There were others though, who recognized the value of their organizations data and were showing a degree of agency with respect to how it input and who had ownership. This is interesting, because as some subjects are pushing back and not blindly accepting general terms and conditions, they are creating a space for an alternative approach. *"we want to be really clear about what the data ownership is and we want to be in control of that. And that's the first small examples where producers are starting to flex their muscles a little bit ago 'OK hang on there is another way of doing this'"* (P. 15)

In the groups that were cautions about adopting AI technologies, an interesting point that arose was that subjects that would be considered "early adopters or innovators" were questioning the technology as were the skeptics that are generally wary of new innovations. *"look yeah, but I, I know what the numbers mean going in, I certainly don't want to hand it all into a black box to see what comes out without me being able to question" (P. 14)*

Rebelling against technology: A reoccurring theme that arose in the interviews was our study participants taking measures to protect themselves against a threat that wasn't necessarily a threat they needed to be concerned with. *"I think people are afraid of the wrong things like in terms of cyber security, for example I've had situations where say, a small business owner was afraid of giving their phone number to a technology company because they were afraid of getting spam calls and they didn't understand that like 2 factor authentication is actually the best way to protect the security of your account" (P. 16)*

This is interesting as it shows a degree of awareness of the issues surrounding technology – hacks, personal data being used, what data you are giving up. However, this is something the providers have noticed with caution or questioning this in regard to products or services the provider deems safe. It shows a difficulty in tech education and demonstrates the need for users to develop a skill set in discerning what makes an applicable and/ or appropriate. The concern shows and awareness to the issues and a sense of agency. It also highlights the complexity in these modern systems.

Reverting to previous non-AI processes: The research showed instances where an SME willingly tried AI in a process but reverted back to the previous ways of doing a task. Importantly, this indicates strong motivation and willingness in the subject to try new innovations but also to evaluate if they are actually going to improve their business operations. In this instance, P.1 referred to software specially designed for their industry, however they felt that given their size, being a small enterprise, it was not worth the time and cost to fully use. *"We've tried a couple of them and they didn't really seem to make our operations much easier. So we do it with a whiteboard."* (P. 1)

Discussion

The interviews produced a rich data set detailing the experiences of the subject, rural SMEs, in utilizing AI within their business processes. We now discuss the findings through the lens of The Digital Divide along side Activity Theory. What we also found is that the existing digital divide frameworks do not capture the

novel forms of disadvantage that AI can perpetuate compared to the other forms of ICT on which they are based. We explore the concept of the fourth wave that we have introduced in previous work

Contrary to our earlier assumption regarding lack of awareness of AI applications among rural SMEs, our study found evidence indicating their understanding of what AI is and the awareness of its presence within business processes. Rural SMEs demonstrated the most in depth understanding of AI through social media marketing. They could articulate the impact of algorithms on their marketing efforts and identify the steps that have been automated since they began using social media marketing tools. Subjects in agriculture were able to identify different forms of AI that were being used in their industry, or even by larger players in their particular field of agriculture. However, rural SMEs were not aware of the application of AI in other aspects of the business such as in bookkeeping software which they confirmed they used. Information seeking digital tools such as social media and search engines were also discussed with our study participants, but they did not demonstrate an understanding that AI was impacting the information being presented to them.

The role of community in the utilization of AI: A significant finding from the study was the importance of community in the activity studied. This marries nicely with the social constructivism roots of AT. Vygotsky, the soviet psychologist credited with creating the theory found in his work the importance and influence of our social circles and wider community on our learning. Of particular interest is how AI technologies influenced and were influenced by communities. For some, AI enabled the community to grow –customer bases, suppliers, supporting businesses were all found to be enhanced by digital technology. Of note was the ability for these technologies to enable the participants to grow their support network of industry peers. Farmers on twitter were mentioned, as well as Facebook groups for a subject in an industry that was not well populated in their area.

The influence the wider community brings to rural SMEs should not be underestimated but those working in the space. Government, industry and the communities themselves have an interest in the responsible usage of AI by rural SMEs. In developing policy and programs to support this, the wider community in which the SME operates needs to not only be considered but be included in the design and implementation of such endeavors.

Tools and the access divide: As discussed previously, tools are seen in the activity system as a moderator, things that the subject draws upon through the task to reach the object. Our findings highlighted how in rural Australia the digital infrastructure is hindering rather than enabling the subject in utilizing AI indicating that the first wave of the digital divide, access remains an issue.

Across all interviews internet connectivity was discussed with rural SMEs. While the internet is not AI reliant, we would argue that without adequate connectivity rural SMEs are hindered in their ability to utilize AI to their benefit. When we look at the AI products that are being used by subjects, many operate over an internet connection such as Canva, Facebook and Xero. Even if a program can be downloaded and operated offline, most support and troubleshooting options require internet access. Many Internet of Things products, especially in agriculture, rely on connectivity to send data in order to be effective. With all this in mind, many common AI processes that we have found to be used by the subjects in our study require internet connectivity.

Apart from basic connectivity, there is also the issue of reliability and strength of the connection, both of which are noted to be an ongoing issue for rural areas. If an SME is located in an area with access issues, they are likely to have impaired access to the AI applications that rely on consistent or strong data connections, which likewise limits an SMEs access to the benefits such applications can offer. Connectivity is more complex than having internet or not, but this is not a concept that is readily understood by all users. Consequently, the connectivity issue can lead users to self-exclude from technologies that could operate effectively on the minimal access that is available. For example, while the connection may not support video streaming it may be sufficient for basic sensor data to be transmitted from the field to farm office.

Without access to basic digital services, it is difficult to imagine someone taking advantage of the benefits that AI can provide. As indicated in our findings, internet connectivity was a reoccurring theme through the study with issues of internet access and quality discussed in each interview. Improving the connectivity for rural communities remains an issue in Australia in general (Thomas et. al. 2021). We address this issue specifically with regards to AI. The ways in which many of the SMEs included in the study used AI were heavily reliant on internet connection. This may be in downloading the application, finding information on how to use it or in the operations itself. As it is those that experience an access divide will undoubtedly experience an AI divide in much the same way.

There is also an affordability aspect to access that needs to be considered. The AI solutions discussed through the study mostly centered on off the shelf solutions or those already imbedded within the tools being used. However, with regards to access and affordability custom AI solutions need to be considered in the discussion. Most off the shelf AI solutions are designed for large enterprises or research purposes (Hansen et al. 2020). Creating an AI tool still requires significant investment when considering the data, development capability and the computational power required to develop. Despite having unique factors that necessitate a custom AI model, the affordability of developing one could be out of the range of many rural SMEs (Silverpond 2018).

Consequently, the access divide still exists for rural SMEs limiting their ability to utilize the benefits that can be derived from usage of AI tools in their business activities.

The second wave of the digital divide

As our findings indicate, rural SMEs have a varied appetite and skill set concerning AI. The ubiquity of AI in common tools means that subjects are utilizing AI without the need for specific 'AI Skills' as opposed to digital skills. This then to the question of who is doing the upskilling and who is responsible for it. Our study found that the upskilling comes from a range of sources through the activity of performing the business process - technology providers reported that onboarding subjects often resulted in teaching the subjects skills beyond what was required to use their product or software.

That then raises the question as to who is responsible for upskilling rural SMEs? Providers are often providing additional upskilling in addition to training the subject on their product, but this is generally ad hoc and sporadic. Related government departments or government funded programs are available for rural SMEs but these tend to center around general digital tools rather than the AI specific skills.

When it comes to the deeper technical expertise of developing AI solutions, technology and modern infrastructure can mean that this is occurring outside of the rural areas. Common business tools that are not rural specific are created by teams in urban areas – Xero's headquarters are in Melbourne, Canva's Sydney; Meta's global headquarters are in Silicon Valley with its Australian office in Sydney for client services, not building products (Shead 2019). There are smaller companies based in rural Australia that are developing advanced technology solutions to the issues faced by our subjects and to capitalize on opportunities available. While there is a presence of these companies in rural Australia, some of the deep technological expertise is 'fly in, fly out'. This can limit the wider community benefits of such skills being available in the area.

Technology overcoming the digital divide (Outcomes)

Moving on to evaluate the study in terms the third wave for the digital divide, outcomes, it is heartening to discuss how rural SMEs are utilizing AI to overcome aspects of the divide. The most evident form of this was through social media marketing which enabled rural SMEs to target their efforts towards tailored audiences. Furthermore, much of this process is being automated providing saving resources for the organizations. The subjects were able to identify the impact social media targeting had on helping them to target their customers and the impact the timing of certain content had. It was acknowledged the cost barrier that would have existed using traditional marketing methods such as print, televisions and radio

marketing. Furthermore, the targeting opportunities facilitated by AI in social media marketing enable the SME to reach their ideal customers in a cost effective and time efficient method.

Social media was also identified as a research tool for subjects. For subjects in creative fields, social media was cited as helping stay across trends without leaving their geographical area or financially subscribing to a media organization. In addition to the accounts they actively focused, AI utilized in AI recommendation algorithms would be including other similar content in social media feeds. This was of particular interest when considering the impact of international trends on some subjects, not only minimizing the urban-rural divide but also assisting research for relevant trends occurring internationally. From an access perspective, these tools can be accessed on common devices provided the subject had internet connectivity.

In addition to trends, social media and video content more broadly was mentioned as a research source for subjects. The nature of rural living can mean there is a reduced opportunity to physically attend a retail outlet to see the equipment in person. Recommendation and search algorithms make it easier for subjects to access information on equipment, view their performance over video and read reviews from other users. Again, this can be accessed on many common devices provided the subject has connectivity.

However, having considered the ways in which AI is impacting rural SMEs through the traditional digital divide waves, it is evident that there are novel forms of disadvantage that the AI is perpetuating that the previous waves were not conceptualized to address. We have explored the notion of a fourth wave of digital divide in our previous work (Sheldrick et al. 2022), which contributes to variations of an AI or Algorithm divide as discussed scholars (Carter et al. 2020; Kitsara 2022; Lutz 2019; Yu 2020). We will now explore the fourth wave in relation to this study through awareness, agency and amplification.

Awareness of AI

As has been mentioned earlier, we hypothesized that there would be a limited understanding by the subjects with regard to their awareness to the AI already in use and impacting their organizations. We found this to be partially the case in the interviews. Most notably was the awareness of AI through social media algorithms. Subjects were also aware of AI developments in larger organizations within their industry or in major local industries, in particular agriculture.

However, there were many instances of technology containing AI utilized by the subjects that they did not identify as being AI enabled. While it could be argued that a subject should not be required to identify all instances of AI interaction within their business operations, there are areas of concern that would be of particular note to the subjects to be aware of.

An issue that can arise here is who is delivering the information and upskilling the subjects. All the participants representing technology companies were very much situated within the community and have the best intentions for their clients. However this uncovers a vulnerability whereby we are relying on the intentions of the technology providers to do the right thing by their users and customers. Pragmatically, we cannot expect technology providers to deliver the upskilling in a way that increases the subjects awareness of the various issues relating to the AI divide.

Human Agency

Our study showed that there was an awareness of issues surrounding AI such as Cybersecurity, hacking and data sovereignty. With regards to cyber security, subjects were reported to have rejected 2 factor authentication to minimize spam calls without realizing the objective is to protect their data. This shows a concern and interest in protecting their digital assets, but an undeveloped understanding of what the risks are and how to best ensure protection. Data ownership was a concern for subjects, particularly in the agricultural space. An interesting insight from the research was what was happening when the subjects recognized the value of their data and were investigating different approaches to the regular terms and conditions. The data was collected prior to a number of high profile data hacks in Australia where millions

of current and former customers of first a telecommunications provider, then a major medical insurance provider were impacted (Bachmann and Ahmed 2022). In light of the exposure these incidents received, it would be of interest to measure how attitudes may have changed.

As covered above there is vulnerability in relying on technology providers to upskill the subjects. This relates to the agency front. If the provider is doing the general upskilling, are they really likely to uncover the ways that the system may benefit the tech company over the subject? This feeds into the current emphasis on the user to protect themselves. The emphasis is on the user protecting themselves rather than on technology companies making technology safer for the user. In considering this issue from an Activity Theory perspective, the rules node could be particularly effective. Worldwide, the regulation of AI is a hotly debated topic however headway is being made through the EU AI Act. In Australia, the Privacy Act is under review aiming to address protection in the digital world while balancing the need for innovation (Australian Government Attorney-General's Department 2022). A part of reforming regulation in the digital space needs to consider the agency of users. Ideally in ways that promote the digital welfare of the users, but also in terms of how they can rectify.

AI provides unique opportunities for industries in rural areas that can struggle to attract labor. Automation opportunities within agriculture were discussed through the study. Automation of tasks such as harvesting produce offers the opportunity to replace or minimize physically taxing, low skilled and short-term work done by humans. While caution is needed in considering the replacement of human workers, an investigative piece Harvey et al (2022) found that the worker shortage in rural Australia left many growers with no choice but leave reduce on their trees to rot due to an inadequate workforce being available. Additionally, while automation can impact the low skilled seasonal positions a shift can be seen to additional long term higher skilled and higher paid roles for the local community (Rotz et al. 2019).

Amplification of existing inequalities

Ironically, the transcription of the interview data provided the clearest example of rural Australia not being considered in the development of AI systems. The transcription tool, available in a common word processor, struggled not only with the accents but also the vernacular and jargon. While this use case was more impactful on the research team rather than rural SMEs it raises the question of if these businesses and the people who operate them are represented in the data that AI is trained upon. Perhaps even more critical, is if rural SMEs are adequately represented in the data that decision making algorithms will be trained on? Hettihewa & Wright (2018) found that there are significant differences between urban and regional small businesses, in particular that regional small businesses had a higher rate of survivorship consequently having a lower credit risk than those in urban settings. Should a loaning institution deploy algorithms to decide the amount and terms of financing a regional small business, not considering the factors like these could amplify the disadvantage these businesses already face.

Conclusion

In this paper, we present our findings from our research investigating the impact of AI on the digital divide for rural SMEs. Using a qualitative approach, we interviewed 16 participants that included rural SMEs as well as related stakeholders. This allowed us to take an Activity Theory lens to the data and develop an understanding of the phenomena that featured multiple perspectives. Crucially, this also informed the study of tools that the subjects were not necessarily aware utilized AI.

Our results show that there is a range of experiences and appetites for the usage of AI in the subjects. This supports the notion that the digital divide cannot be solved by any single blanket policy. Universally, connectivity continues to be a major issue with rural digital divide. When we consider how much modern business operations rely on connection to reliable and adequate internet it is worrisome that this continues to plague SMEs in rural areas. When we consider how many common AI applications rely on internet connectivity to operate effectively, the connectivity issue undoubtedly has a negative effect on rural SMEs adoption of AI. As participant 7 stated "what else are we missing out on"

Despite the digital divide, our study found a ready appetite for tools with utilizing AI. Subjects were enthusiastic when discussing the ease and reach that social media marketing allows even those who had little awareness of the impact of AI on their particular organization were able to talk to interesting innovations in related fields, seeing the benefits they were generating.

The concept of a fourth wave of the digital divide that focuses on the novel disadvantage AI can generate was explored through the data analysis. While awareness and agency were touched on, it was difficult with the scope of this study to investigate whether AI was amplifying the existing disadvantage that can be experienced by rural SMEs.

One of the major limitations of this study was getting a detailed ‘under the hood’ understanding of the AI impacting rural small businesses. As we covered in the discussion, we hypothesized that there is potential for our subjects to be negatively impacted by AI through misrepresentation in automated decision making systems but there is no work we can draw from regarding this at the present moment.

A question that arose within the research team was how industry plays a part in the digital divide for rural SMEs. More specifically, an area for future research could center on the differences experienced by rural SMEs in industries that are prolific in regional areas (for example agriculture) and those that are less common in rural areas particularly if they are expected to be competitive with their urban counterparts (for example creative industries).

The principles of universal design guide creators to producing products that by considering a range of abilities are accessible to all. Much like ramps into buildings benefit users beyond those with mobility issues, we propose there would be value in technology designers and AI engineers producing products that consider the challenges of rural SMEs. We hypothesize that this would provide wider benefits for all users.

References

- AI HLEG, H. L. E. G. on A. I. 2019. “A Definition of Artificial Intelligence: Main Capabilities and Scientific Disciplines |,” , April 8. (<https://digital-strategy.ec.europa.eu/en/library/definition-artificial-intelligence-main-capabilities-and-scientific-disciplines>).
- Allen, D., Karanasios, S., and Slavova, M. 2011. “Working with Activity Theory: Context, Technology, and Information Behavior,” *Journal of the American Society for Information Science and Technology* (62:4), pp. 776–788. (<https://doi.org/10.1002/asi.21441>).
- Asaro, P. M. 2019. “AI Ethics in Predictive Policing: From Models of Threat to an Ethics of Care,” *IEEE Technology and Society Magazine* (38:2), pp. 40–53. (<https://doi.org/10.1109/MTS.2019.2915154>).
- Australian Government Attorney-General’s Department. 2022. “Privacy Act Review Report 2022.”
- Australian Government and Department of Industry, Science, Energy and Resources. 2021. *Australia’s AI Action Plan*.
- Bachmann, S.-D. (Dov), and Ahmed, M. 2022. “If Your Data Was Stolen in the Optus and Medibank Hacks, You Should Probably Check Your Credit Score,” *ABC News*. (<https://www.abc.net.au/news/2022-11-03/data-breaches-check-your-credit-score-track-cyber-criminals/101608276>).
- Blandford, A. (n.d.). “Semi-Structured Qualitative Studies,” in *He Encyclopedia of Human-Computer Interaction*, Interaction Design Foundation. (<https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/semi-structured-qualitative-studies>).
- Carter, L., Liu, D., and Cantrell, C. 2020. “Exploring the Intersection of the Digital Divide and Artificial Intelligence: A Hermeneutic Literature Review,” *AIS Transactions on Human-Computer Interaction* (12:4), pp. 253–275. (<https://doi.org/10.17705/1thci.00138>).
- Commonwealth Parliament. (n.d.). “Introduction - The Importance of Small Business,” Text. (https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Completed_inquiries/pre1996/q_balance/report/b01, accessed June 9, 2020).
- Crawford, K. 2021. *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*, New Haven: Yale University Press.

- Crawford, K., and Hasan, H. M. 2006. "Demonstrations of the Activity Theory Framework for Research in IS," *Australasian Journal of Information Systems* (13:2), pp. 49–68.
- Crawford, K., Whittaker, M., Elish, M. C., Barocas, S., Plasek, A., and Ferryman, K. 2016. "AI Now 2016 Report." (https://ainowinstitute.org/AI_Now_2016_Report.html).
- Engeström, Y. 2015. *Learning by Expanding*, Cambridge University Press.
- Eslami, M., Vaccaro, K., Lee, M. K., Elazari Bar On, A., Gilbert, E., and Karahalios, K. 2019. "User Attitudes towards Algorithmic Opacity and Transparency in Online Reviewing Platforms," in *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, New York, NY, USA: Association for Computing Machinery, pp. 1–14. (<https://doi.org/10.1145/3290605.3300724>).
- Ewing, S., Rennie, E., and Thomas, J. 2015. "Broadband Policy and Rural and Cultural Divides in Australia," in *Digital Divides: The New Challenges and Opportunities of e-Inclusion*, pp. 107–124. (<https://doi.org/10.1201/b17986>).
- Gran, A.-B., Booth, P., and Bucher, T. 2020. "To Be or Not to Be Algorithm Aware: A Question of a New Digital Divide?," *Information, Communication & Society* (0:0), Routledge, pp. 1–18. (<https://doi.org/10.1080/1369118X.2020.1736124>).
- Hansen, E. B., and Bøgh, S. 2021. "Artificial Intelligence and Internet of Things in Small and Medium-Sized Enterprises: A Survey," *Journal of Manufacturing Systems* (58), *Digital Twin towards Smart Manufacturing and Industry 4.0*, pp. 362–372. (<https://doi.org/10.1016/j.jmsy.2020.08.009>).
- Hansen, E. B., Iftikhar, N., and Bøgh, S. 2020. "Concept of Easy-to-Use Versatile Artificial Intelligence in Industrial Small & Medium-Sized Enterprises," *Procedia Manufacturing* (51), *30th International Conference on Flexible Automation and Intelligent Manufacturing (FAIM2021)*, pp. 1146–1152. (<https://doi.org/10.1016/j.promfg.2020.10.161>).
- Harvey, A., Donaldson, A., and Zillman, S. 2022. "'Difficult to Sleep at Night': Fruit Left to Rot, Healthcare Staff at Breaking Point amid Worker Shortage," *ABC News*. (<https://www.abc.net.au/news/2022-10-17/worker-shortage-griffith-four-corners/100071304>).
- Hettihewa, S., and Wright, C. 2018. *Nature and Importance of Small Business in Regional Australia, with a Contrast to Studies of Urban Small Businesses*.
- Jobin, A., Ienca, M., and Vayena, E. 2019. "The Global Landscape of AI Ethics Guidelines," *Nature Machine Intelligence* (1:9), pp. 389–399. (<https://doi.org/10.1038/s42256-019-0088-2>).
- Kitsara, I. 2022. "Artificial Intelligence and the Digital Divide: From an Innovation Perspective," in *Platforms and Artificial Intelligence : The Next Generation of Competences, Progress in IS*, A. Bounfour (ed.), Cham: Springer International Publishing, pp. 245–265. (https://doi.org/10.1007/978-3-030-90192-9_12).
- Lutz, C. 2019. "Digital Inequalities in the Age of Artificial Intelligence and Big Data," *Human Behavior and Emerging Technologies* (1:2), pp. 141–148. (<https://doi.org/10.1002/hbe2.140>).
- Meta. (n.d.). "Facebook Ads Best Ways to Advertise Small Businesses," *Meta for Business*. (<https://en-gb.facebook.com/business/small-business/advertise/facebook-ads-tips>, accessed August 16, 2022).
- Nicholls, S., and Orsmond, D. 2015. *The Economic Trends, Challenges and Behaviour of Small Businesses in Australia | Conference – 2015*. (<https://www.rba.gov.au/publications/confs/2015/nicholls-orsmond.html>).
- NITA. 1995. "FALLING THROUGH THE NET: A Survey of the 'Have Nots' in Rural and Urban America," *National Telecommunications and Information Administration, United States Department of Commerce, Washington, DC*. (<https://www.ntia.doc.gov/ntiahome/fallingthru.html>).
- Park, S., and Humphry, J. 2019. "Exclusion by Design: Intersections of Social, Digital and Data Exclusion," *Information, Communication & Society* (22:7), Routledge, pp. 934–953. (<https://doi.org/10.1080/1369118X.2019.1606266>).
- Riggins, F., and Dewan, S. 2005. "The Digital Divide: Current and Future Research Directions," *J. Assoc. Inf. Syst.* (<https://doi.org/10.17705/1JAIS.00074>).
- Rotz, S., Gravely, E., Mosby, I., Duncan, E., Finnis, E., Horgan, M., LeBlanc, J., Martin, R., Neufeld, H. T., Nixon, A., Pant, L., Shalla, V., and Fraser, E. 2019. "Automated Pastures and the Digital Divide: How Agricultural Technologies Are Shaping Labour and Rural Communities," *Journal of Rural Studies* (68), pp. 112–122. (<https://doi.org/10.1016/j.jrurstud.2019.01.023>).
- Shead, S. 2019. "Inside Australia's Facebook HQ," *Australian Financial Review*, , March 7. (<https://www.afr.com/technology/first-look-what-its-like-inside-australias-facebook-hq-in-sydney-20190308-h1c4zw>, accessed March 5, 2023).

- Sheldrick, S., Chang, S., and McKay, D. 2022. "The Road to (Gundag)AI" Investigating the Impact of AI on Regional and Remote SMEs, presented at the Pacific Asia Conference on Information Systems 2022, , July 5, 9 pages.
- Silverpond. 2018. "AI Catching Wildlife Poachers." (<https://silverpond.com.au/case-studies/wildlife-protection-solutions/>).
- Solomon, L., and Davis, N. 2023. "The State of AI Governance in Australia," Human Technology Institute, May. (<https://www.uts.edu.au/media/563631>).
- Standing, C., Sims, I., Stockdale, R., and Wassenaar, A. 2003. "Can E-Marketplaces Bridge the Digital Divide?," in *Organizational Information Systems in the Context of Globalization*, IFIP – The International Federation for Information Processing, M. Korpela, R. Montealegre, and A. Poulymenakou (eds.), Boston, MA: Springer US, pp. 339–353. (https://doi.org/10.1007/978-0-387-35695-2_21).
- Thomas, J., Barraket, J., Parkinson, S., and Et Al. 2021. "Measuring Australia's Digital Divide: The Australian Digital Inclusion Index 2021," RMIT University. (<https://doi.org/10.25916/PHGW-B725>).
- Thomas, J., Barraket, J., Wilson, C. K., Holcombe-James, I., Kennedy, J., Rennie, E., Ewing, S., and MacDonald, T. 2020. *Measuring Australia's Digital Divide: The Australian Digital Inclusion Index 2020*, RMIT University. (<https://doi.org/10.25916/5F6EB9949C832>).
- Van Dijk, J. A. G. M. 2019. *The Digital Divide*.
- Williams, A., Miceli, M., and Gebru, T. 2022. *The Exploited Labor Behind Artificial Intelligence*. (<https://www.noemamag.com/the-exploited-labor-behind-artificial-intelligence>).
- Xero. 2021. "Xero Reaches Milestone in AI Strategy with Machine Learning-Powered Predictions," Xero. (<https://www.xero.com/au/media-releases/xero-reaches-milestone-in-ai-strategy-with-ml-predictions/>, accessed August 13, 2022).
- Yin, R. K. 2016. *Qualitative Research from Start to Finish*, (Second edition.), New York: Guilford Press.
- Yu, P. K. 2020. "The Algorithmic Divide and Equality in the Age of Artificial Intelligence," *FLORIDA LAW REVIEW* (72), p. 60.