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New technology and desired skills of early career accountants

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New technology and desired skills of early career accountants

Structured abstract

Purpose

Technological advances have led to accounting roles shifting from transaction focused tasks to using data generated by technology to inform stakeholder strategies, resulting in changing skill requirements. This study investigates how early career accountants (ECAs) and organisations value different skills among ECAs, how technology is impacting on these skills, and the preparedness of ECAs for future technological work in different organisational settings.

Design/methodology/approach

The research adopted a multi-stakeholder, mixed-method approach, surveying 315 ECAs and 175 managers/recruiters and interviewing 10 from each group. The sample drew from different industry sectors and organisation types in Australia, with all states represented.

Findings

There was broad agreement among ECAs and managers on requisite skills for technology. Most ECAs and managers believed new technology is influencing the skills required in accounting, yet the impact was considered greater among ECAs and effects varied by organisational setting. Overall, the research did not support ECAs as 'digital natives' and illuminated the importance of exposure to technology, a change mindset and lifelong learning to better prepare them for new technology.

Originality

This study makes an important contribution to understanding how and why skills for success in accounting are evolving in the context of new technology, and how prepared ECAs are for technology, from both their own and managers/recruiters' perspectives. It highlights the need for greater dialogue, benchmarking, and evaluation of performance in technology-related

skills among new accountants and their managers. Further, it identifies areas where ECAs would most benefit from targeted support, aiding personal career success and organisational competitiveness.

Introduction

The accounting profession has experienced significant changes in its adoption and use of new technology (Qasim and Kharbat, 2020), driven by trends in – for example – intelligent automation, blockchain, big data, and cloud-based software (Bhimani and Willcocks, 2014; Kokina *et al.*, 2017; Kotb *et al.*, 2019). Indeed, new technology is considered one of the greatest business challenges for accountants in public practice (CPA Australia, 2019) and is placing substantial demands on the profession (Hoiberg, 1999; Salijeni *et al.*, 2019). This includes the automation of many tasks traditionally performed by early career accountants (ECAs) and an increasing focus on how accountants acquire, analyse, and interpret data to inform organisational decision-making (Kotb *et al.*, 2019; Moll and Yigitbasioglu, 2019). Although new technology has created concern for job losses in the profession (CA ANZ, 2017; Kotb *et al.*, 2019), it is widely recognised as a catalyst for innovation, empowering the accounting profession rather than destabilising it (Richins *et al.*, 2017).

Accountants, especially ECAs, are now expected to have the expertise and skills to manipulate big data (Brink and Stoel, 2019), be able to use and leverage emergent technologies, and have a thorough understanding of how they interact with, and potentially change, existing accounting knowledge and standards. As machines can undertake routine and repetitive tasks, they enable the profession to leverage opportunities for greater cost effectiveness and efficiency (Forbes, 2017). Further, they allow accountants to perform higher level duties (Goh *et al.*, 2019), creating a shift in accounting roles from transaction focused work to analytics, consultation, and strategy formulation (Lawson, 2019).

Against this backdrop, there has been considerable attention to the preparedness of accounting graduates for contemporary work, the skills most needed, and surplus and gaps in higher education provision (for example, De Lange *et al.*, 2006; Wells *et al.*, 2009; Botes and Sharma, 2017; Kotb *et al.*, 2019). Employee skill development and deployment contributes to

an individual's human capital, which is one way of highlighting valued differences among those in the labour force (Becker, 1964). In addition to technical skills and knowledge, important skills include communication, critical thinking, teamwork, and analytical skills (Kavanagh and Drennan, 2008; De Villiers, 2021). These are critical for the contemporary accountant who often has wide intra-organisational networks and provides an important link between cross-functional teams and different levels of seniority (Daff and Jack, 2018).

University efforts to foster these skills in emerging accountants focus on active and problem-based learning which encourages collaboration, analysis, and reflection (van Mourik and Wilkin, 2019), authentic learning where students engage with industry in the curriculum, and integrative learning where they reflect on capability and self-development (Dean *et al.*, 2020). Universities' success, however, is impacted by crowded curricula, accreditation requirements, and expertise for innovative and effective teaching (Jackson and Meek, 2021). Consequently, stakeholders remain concerned that accounting graduate talent is not keeping pace with labour market demands, thereby highlighting a divergence between graduate skills and employer expectations (De Villiers, 2021; Jackling and De Lange, 2009; Freeman and Wells, 2015; van Mourik and Wilkin, 2019).

Previous studies on the impact of technological trends on required skills in the accounting profession (for example, Brink and Stoel, 2019; Qasim and Kharbat, 2020) provide important insights yet are limited in clarifying how technology changes the work of accountants across different settings (Moll and Yigitbasioglu, 2019). This is despite the importance of industry practitioners maintaining their organisational and professional currency (Deloitte, 2017). While some work has examined the different skills which organisations seek and value among ECAs because of new technology, less attention has been given to technology preparedness among ECAs, and from the employer perspective. Our study bridges this gap by examining preparedness for the demands of new technology in diverse organisational settings,

using a mixed-method and multi-stakeholder approach. This research is important because if graduate accountants are not sufficiently meeting the requirements of new technology, their capacity to become productive employees may negatively impact on firm competitiveness (Barney, 1991). Further, inadequately developed skills can negatively impact on labour market opportunities over the working career (van der Heijden, 2002), hindering personal career success.

The paper first reviews literature related to requisite skills in accounting, and the impact of technology, followed by an outline of methodology and presentation of findings. These are discussed, along with concluding comments that include directions for future research.

Background review

Technology is among several drivers of recent change in the accounting profession, including globalisation, offshoring/outsourcing, intense competition, new business models and climate change (Freeman and Wells, 2015). New technology can be classified in many ways and our study considers the broad impact of a range of technologies, rather than requisite skills for a particular technology. Examples of new technologies include: robotic process automation (the use of bots to carry out well-defined tasks, such as payroll, accounts payable/receivable, and conducting audits); blockchain (peer-to-peer technology for providing shared, secure digital ledgers – such as contracts and asset registers – which can be continuously updated and tracked); and artificial intelligence and data analytics (the use of machine learning/statistics which analyses and classifies data through logical reasoning, algorithms and imitating human cognitive processes, enabling forecasting and estimating to inform decision-making). Our review considers the changing role of accountants from technological trends, the associated changes in skill demands, and how well prepared ECAs are for new technology.

Changing role of accountants

The accounting profession recognises the importance of technological advance for success, particularly for creating flexible working environments, enhancing communication and engagement with clients, and improving efficiency and quality (CPA Australia, 2019). Failing to keep pace with trends in disruptive technologies can pose significant challenges for organisational growth and competitiveness (Zimmerman, 2015).

For work roles, automation has meant that many tasks traditionally completed by entry-level accountants have been substituted by more highly skilled responsibilities, such as optimising capital, improving processes and controlling costs, requiring analysis, problem-solving and decision-making (Huerta and Jensen, 2017). Automation has created flatter organisation structures with less staff undertaking lower-level activities (CPA Australia, 2019). Consequently, ECA roles no longer comprise solely transaction focused tasks, but span data acquisition and interpretation, and consultation with clients to advise on ways to enhance their businesses. For established accountants, their role has transitioned from ‘bean counter’ to ‘strategic counsel’ (Blackline, 2020), increasingly working in cross-functional teams which require expert knowledge, business acumen and professional judgement far earlier in their careers than before (Davern *et al.*, 2019). Further, there is increased value placed on specialist knowledge, such as environmental, social and governance issues (Siegrist *et al.*, 2020), as part of the provision of business advisory services.

The key to leveraging the benefits of new technology is having appropriately skilled employees who are agile and responsive to emergent trends. However, research shows that many accounting organisations struggle to source the talent they need due to technical or ‘softer’ skill deficiencies (see Bressler and Pence, 2019). The pool of potential recruits has also contracted due to falling numbers of university accounting students, leading to a 40 per cent reduction in the average number of applicants for advertised accounting vacancies (CPA

Australia, 2019). To build capacity, accounting organisations are increasingly looking outside the profession (Sage, 2019) and offering flexible work and appealing remuneration packages (CA ANZ, 2017). This leads us to explore the requisite skill demands of those transitioning to, and in the early career stage of, this evolving profession.

Requisite skills and new technologies

Aligning with predictions that accounting's desired skill set will change by 2025 (World Economic Forum, 2018), more than three-quarters of accountants believe the skills required for practice are evolving (CPA Australia, 2019). Requisite skills have generated much debate, particularly with respect to how these skills are obtained and the extent to which they meet employer expectations (De Lange *et al.*, 2006; Jackling and De Lange, 2009; Bui and Porter, 2010; Freeman and Wells, 2015). The accounting profession is concerned that graduate talent is not adequately skilled for evolving labour market demands, including the adoption of relevant technologies (CPA Australia, 2019). Jackson *et al.* (2020) is one example of a framework of skills considered crucial for future work (see Table I). It is broadly oriented to graduating business students, aligning well with the broader nature of contemporary accounting roles.

[Table I]

Drawing on Jackson *et al.*'s (2020) *data and technology* skill cluster, ECAs need to be digitally literate. This means they can collect, analyse and manage high volumes of data, and transform it into accurate and useful information to inform decision-making and client advice and strategy (Brink and Stoel, 2019; Goh *et al.*, 2019; Salijeni *et al.*, 2019). This includes mastery of machine learning, ideally extending to developing and testing models, auditing algorithms, and competency in programming, data modelling and database management (Pan *et al.*, 2019; Singh and Ng, 2019). ECAs are also expected to be able to embed intelligent

automation technologies which can generate consistent, reliable and fast data that allows for seamless and accurate reporting (Davern *et al.*, 2019), informed problem-solving and optimal workflow processes (Blackline, 2020; KPMG, 2018). Being able to understand and oversee technologies relating to vision, sound and text - such as the use of virtual agents for digital chat support, helpdesks, social media and compliance - will also increase speed and efficiency in the profession (Goh *et al.*, 2019).

Effective use of blockchain will enable ECAs to conduct safe, real-time transactions without an intermediary, reducing time and costs (Deloitte, 2017), and promoting standardisation, verification, privacy and accountability (CA ANZ, 2017; Dai and Vasarhelyi, 2017). Auditors should be able to administer and oversee functions in a private blockchain and arbitrate any disputes between shared users, verifying the trigger of smart contracts or assessing the robustness of the blockchain platform. Mastery of cloud-based software is also important among ECAs, allowing them to share data, work, and resources across multiple devices and work collaboratively with others and their clients.

Technological change has also promoted the importance of other skills in Jackson *et al.*'s (2020) framework. Accountants need to collaborate, work as a team and motivate others to achieve common goals (EY, 2018), making Jackson *et al.*'s (2020) *working effectively with others* cluster one of the most important skills in accounting (CA ANZ, 2017). ECAs must work with management and cross-functional co-workers on interpreting data and communicating what it means for the organisation (Pan *et al.*, 2019), as well as listening to clients and asking questions (Hood, 2020). Relatedly, accountants are expected to have the confidence and capability to influence and persuade, even when first entering the profession (ACCA, 2016; Chaplin, 2017).

For *communicating effectively with others* (see Table I), significant volumes of data generate information which needs to be clearly articulated, orally and in writing, across teams,

management, and clients and through multiple channels (Brink and Stoel, 2019; Hood 2020). *Self-awareness*, particularly through reflection, is fundamental for effective collaboration and communication, and delivering on clients' needs (Psaila, 2018). Given the importance of new technology, accountants must embrace lifelong learning, continually renewing their skills to align with cutting-edge practice (Plant *et al.*, 2017). Accounting requires strong analytical skills (Lawson *et al.*, 2014), scenario analysis and contingency planning to enable professional judgement, evidenced in the threshold capabilities for accounting education (AACSB, 2018). More than three-quarters of top 100 Accounting firms therefore cited *critical thinking* as a leading skill set for the profession (CA ANZ, 2019).

Being creative means accountants can draw on data and technology to fill in gaps and generate financially sound solutions for complex *problem-solving* (Brink and Stoel, 2019; CA ANZ, 2017). For *enterprise*, a positive mindset that is open to technological change can enact growth and innovation (KPMG, 2018), while flexibility and curiosity are critical for continuously seeking new ways of doing things (Accenture, 2018; O'Connell *et al.*, 2015). Although agility and adaptability may come with experience, organisations can nonetheless encourage flexible thinking among their workers (CA ANZ, 2017).

Emotional intelligence is fundamental for *self-management*, enabling empathy in challenging situations and when collaborating with others (De Villiers, 2021). Resilience and confidence are other important aspects of this skill cluster, aiding ECAs to manage change amid rapidly evolving technology (Accenture, 2018). For *responsibility and accountability*, ethical behaviour, accountability and integrity underpin the accounting profession (Adler and Liyanarachchi, 2020) and the automation of transaction focused tasks has meant a greater focus on understanding, evaluating, and reporting on social issues, such as sustainability and environmental management (O'Connell *et al.*, 2015). Finally, accountants must demonstrate *professionalism*, including building relationships with clients, working autonomously and

motivating team members (Blackline, 2020). We believe the future-oriented focus of the Jackson *et al.* (2020) framework is suitable to help understand how technology might impact the skill requirements of ECAs. The following sub-section considers how prepared emergent accountants are with respect to these skill demands.

Preparedness for new technology

It is apparent that new technologies are transforming labour market requirements, leading to gaps between accounting employers needs and higher education provision on requisite skills (for example, Watty *et al.* 2016). Although technological literacy is the most highly desired skill among new accountants (Sage, 2019) and preparing graduating students for new technologies is considered integral to undergraduate accounting curricula (AACSB, 2018; Qasim and Kharbat, 2020), it remains the top skill gap in the profession (ACCA, 2016). Collaborative and communication skills, commercial awareness, and wider sector knowledge are also considered integral to contemporary work yet are underdeveloped in accountants (ACCA, 2016; CPA Australia, 2019). Further, thinking for themselves and demonstrating initiative is expected of entry-level accountants, yet sometimes hindered by highly prescribed university curriculum (O'Connell *et al.*, 2015).

Notably, demand for skills may vary by accounting area and organisational setting, such as communication, task management and relationship building being critical for small organisations compared with using latest technologies in larger firms (CA ANZ, 2017). What this discussion collectively highlights is the need to adapt to the demands of new technology and its wider implications for accounting practice. Not doing so will likely see the continuation of the skills or expectations gap between different stakeholders (see Freeman and Wells, 2015), thereby undermining the productivity of both ECAs and their organisations.

Given the described context of evolving technology and the purported lack of technology-related, requisite skills for those new to the accounting profession, we posed the following two research questions. First, how has technology influenced the skills requirements of accountants? Second, how prepared are ECAs for the demands of new technology and how does this vary, if at all, by organisation setting. We now turn to describe the methodology of our study.

Methods

Participants

Table II summarises the characteristics of the 315 ECAs and 175 managers/recruiters who participated in the study. Participants were based across Australia with all states represented. ECAs were classed as having an undergraduate degree of any type and working in an accounting role for between one and five years. This was deemed appropriate for our focus on how technology was impacting on graduates performing accounting work and their preparedness for this work. This range is broadly consistent but slightly wider in scope than Wells *et al.*, (2009) who examined accounting graduates with three to five years' experience. In their case, however, this reflected the 'high performance' focus and institutional setting of their study (p. 416) which was different from our emphasis.

Managers were those who supervised, managed, or recruited ECAs, including new graduates. Males comprised approximately 60 per cent of both samples and over 60 per cent of ECAs were aged above 30 years. Even having completed an undergraduate degree and accrued the maximum threshold of five years of accounting experience, this suggests many had transitioned into accounting from an earlier career. ECAs were largely based in financial accounting, followed by management accounting. Most ECAs and managers/recruiters were from the private sector and almost double the number of managers were based in Big Four

firms than ECAs. Organisation size is classified by number of employees; noting that the classification of organisation size can vary between and sometimes within countries.

[Tables II and III]

Procedures

A survey panel provider recruited 305 ECAs and 165 managers, gathering online survey data over a four-week period between March and April 2020. Purposive sampling was used to ensure compliance with the definition of an ECA (degree holder and one to five years in the profession) and representation from different organisation settings. During the same period, an additional 10 ECAs and 10 managers participated in a virtual interview where they responded to the survey questions (later added to the two survey samples) and additional open questions for deeper insights into the impact of technological trends. Interviews of approximately one hour in duration were recorded and professionally transcribed by a third-party provider. The research team drew on graduate accounting alumni to source early career interviewees, and industry partners known to their respective Business Schools to identify manager interviewees. This purposive sampling approach ensured representation from different sectors, organisation types and geographical regions. Importantly, interviewees were not known to the interviewer.

Measures

Both survey and interview respondents were initially provided with a brief overview of example technological trends (robotic process automation, blockchain, artificial intelligence and data analytics) to ensure shared understanding of the term ‘new technology’. A series of closed questions on demographic, study and work characteristics were used to screen respondents and evaluate variations across both groups (summarised in Table II). The survey

instrument was piloted to ensure clarity of understanding among a small number of academic accounting colleagues with prior industry experience.

To address the first research question, managers and early career interviewees were asked: 'What skills do you believe are needed to succeed in your profession?', followed by 'In what way(s), if any, does technology change these skills needed to succeed?' Both survey respondents and interviewees were then asked: 'Please indicate the extent to which you believe technology changes the skills needed to succeed in your profession', using a five-point Likert scale (no change at all [1], minor change [2], some change [3], moderate change [4], and significant change [5]).

For the second research question, ECA interviewees were asked: 'How prepared do you feel for the impact of technology?', and Managers: 'How prepared do you feel ECAs are for the impact of technology?'. Further, ECA survey respondents and interviewees were asked: 'In terms of your own skills, how prepared do you feel for the impact of technology?' Similarly, manager survey respondents and interviewees were asked: 'How prepared do you believe early-career accountants are for the impact of technology?'. For these two questions, both groups rated their responses on a five-point Likert scale (not prepared at all [1], slightly prepared [2], somewhat prepared [3], mostly prepared [4], and very prepared [5]).

Analysis

Quantitative survey data were used to examine the perceived impact of technology on skills and ECAs' preparedness for technology, along with variations by organisation setting. Data were analysed using descriptive techniques (counts, percentages, means and standard deviations) in SPSS 24.0. Differences in means were examined using independent samples t-tests ($\alpha=.05$) when comparing ECA and manager ratings. One-Way Analysis of Variance (ANOVA) was used to compare means across multiple groups (e.g., organisation setting). Preliminary analysis ensured the assumptions for t-tests and ANOVA were met. Skewness and

kurtosis were far within the accepted thresholds of 3 and 10 respectively (Kline, 1998), suggesting normality among variables, and insignificant Levene test statistics ($\alpha=.05$) were reported, suggesting equal variances across groups.

For the first research question, interview data were coded using Jackson *et al.*'s (2020) framework (see Table I) to understand prioritised skills. This deductive approach was considered appropriate given the framework's established and comprehensive nature, supported by additional skills not being raised during interviews. To examine how skills are impacted by technology, and ECAs' preparedness for technology, interview responses were thematically analysed by one research team member using manual inductive coding techniques to establish a framework of themes, a common approach in qualitative analysis (Thomas, 2006). Themes were recorded in Microsoft Excel and checked by another team member with any identified differences discussed until consensus was reached. To enhance rigour (Merriam, 1995), an audit trail of encountered issues was retained during qualitative analysis then reviewed and acted upon where needed. Quotes from the interviews are included to illuminate relevant themes, annotated as ECA for early career accountants and M for manager respondents.

Results

We first present the survey results, and then move to the interview findings. Interpretation of results, in the context of earlier research, forms part of the later 'Discussion and implications' section.

Impact of new technology on requisite skills in accounting

Both ECAs and managers strongly believed that technology changes the skills needed by ECAs (see Table IV). In fact, 72 per cent of ECAs felt technology either moderately or significantly

changed required skills, compared with 60 per cent of managers. Less than 10 per cent of both groups felt there was only minor change or no change at all. Independent samples t-test ($\alpha=.05$) confirmed that the average change rating was significantly higher among ECAs (3.94) than managers (3.72), $t(488)=2.597, p=.010$.

[Table IV]

One-way ANOVA ($\alpha=.05$) was then used to evaluate differences in perceptions across organisation settings. Results revealed differing manager perceptions by setting, $F(5, 169)=4.435, p=.001$. Tukey post-hoc analysis showed those from large private sector organisations assigned significantly higher ratings than managers based in medium-sized private organisations ($p=.009$) and the Big Four ($p=.001$). A significant ANOVA was also reported for ECAs, $F(5, 308)=3.529, p=.004$. Post-hoc analysis showed those ECAs from large private organisations assigned higher ratings than from small businesses ($p=.047$) and public sector agencies ($p=.012$). Further, those from the Big Four assigned higher ratings than those based in the public sector ($p=.045$).

Preparedness for new technology

Table V indicates that both the managers and ECAs themselves believed ECAs to be reasonably prepared for the impact of technology. Fifty-one per cent of managers believed ECAs were mostly or very prepared, compared with 63 per cent of the accountants themselves. Independent samples t-test ($\alpha=.05$) confirmed that average ratings were significantly higher among ECAs (3.75) than managers (3.48), $t(488)=3.076, p=.002$. Just over 10 per cent of both groups shared the view that ECAs were only slightly or not prepared at all.

[Table V]

One-way ANOVA indicated manager perceptions varied by organisation setting, $F(5, 169)=3.747, p=.003$. Tukey post-hoc analysis revealed that managers from start-

up/micro/small private organisations assigned significantly higher ratings to ECA preparedness than those from medium ($p=.039$) and large private organisations ($p=.038$), and the Big Four ($p=.054$). There were also reported significant variations for ECAs across organisation settings, $F(5, 308)=2.940, p=.013$. Post-hoc analysis showed a lower mean rating among those ECAs from public sector agencies than medium private ($p=.045$), large private ($p=.008$), and Big Four ($p=.054$) organisations.

Requisite skills for accounting

We now present the findings from discussions with the 10 ECA and 10 Manager interviewees. Table VI summarises the skills considered by ECAs and manager interviewees as important for succeeding in the profession. Skills were interpreted against Jackson *et al.*'s framework, a count provided for each to indicate their relative importance across the interviewee groups. The table shows relative convergence between both groups with no more than a variance of two counts across all skills. It also reveals three skills that were considered more important than the others: *data and technology*, *communicating effectively*, and *problem solving*.

[Table VI]

Regarding *data and technology*, both groups emphasised the need for digital literacy, particularly being able to use and quickly familiarise with different types, and latest versions, of accounting and Microsoft Office software, especially Excel. Understanding and using apps, and how to protect against phishing and hacking, was valuable. Both groups felt understanding and overseeing data processing and automated systems was essential for data integrity and knowing how to best perform their roles, one manager stating, 'actually understanding the process and what's happening with that information is going to be critical for the young accountants that are emerging in the future' (M10). Technological skills were also considered important for labour market success, for example, 'it will give us a competitive advantage if

we know more about technology. That's why ... I improve my skills to understand more about different kinds of technology or accounting software' (ECA4). Further, one manager stated, 'I'm always trying to get the grads to understand that they will get a leg up in a very competitive market ... about artificial intelligence' (M8).

Communicating effectively was also considered a crucial skill by many managers and ECA interviewees, particularly engaging effectively with clients, co-workers, and senior management. One ECA observed, 'you have new platforms of communication ... It's not just face-to-face but we need to know how to communicate clearly and directly over our email or whatever platform that we are using so we are actually trying to get the result that we want' (ECA10). However, there were noted challenges with certain platforms for communication with one ECA observing, 'there's a lot of accountants that I have personally worked with, and even some graduates, that did not under any circumstances want to even pick up a phone to ring a client' (ECA8).

Problem solving was also important to approximately one-half of both interviewee groups with a particular emphasis on adding value through analytical skills and a critical mindset to inform decision-making. One ECA commented, '[we] need more problem-solving skills, and thinking outside the box ... we are no longer just accountants, we're more advisors now' (ECA3). Another stated, 'In order to succeed, you need analytics and those sorts of things that can actually benefit a client. We're not adding any value by just data entry, that's not helpful, that can be done with automation' (ECA8). One manager observed, 'I am trying to envisage what an accountant might look like in 5-10 years' time, and really, I think it's going to be centred around providing advice, and interpreting data, more than it ever has in the past ... understanding what the technology is doing, and the outputs that it's producing and how to interpret that is going to be the core to the profession' (M10).

Aspects of *professionalism*, namely time management, efficiency, and relationship building, were considered important by some ECA and manager interviewees. Drive was also emphasised, with one manager stating, ‘you’re bringing work ethic to everything that you do: you’re coming with a real sense of purpose’ (M6). A similar number of managers valued adaptability, curiosity, and initiative from the *enterprise* skills cluster, evidenced by commentary such as, ‘if you’re able to demonstrate your ability to change ... very quickly and be a change agent or champion, management will always see you favourably’ (M7).

To a lesser extent, *working effectively with others*, particularly social intelligence and task collaboration; and *enterprise* skills, especially adaptability and showing initiative were highlighted. Interestingly, *responsibility and accountability* and being able to *work effectively with others* were noted as important by only one manager. The former was not noted as an important skill for success by any of the ECA interviewees, with the latter highlighted by three ECAs. Importantly, other than for *data and technology* where familiarity with software and systems varied across work areas, there were no evident patterns in skill priorities by organisation setting, suggesting these skills are considered generic requirements for ECAs.

How technology has changed requisite skills

Building on the survey results for the extent to which technology is changing requisite skills, interviewees considered how technology was influential. Five themes emerged, summarised in Table VII, and were relatively consistent across both groups. First, there was greater pressure to understand new technology, including awareness of software and emerging technologies. One manager observed, ‘Now employers are saying ‘I don’t care about the accounting, [ECAs] can learn that; they need to come to us with IT skills ... But the problem is when you say, ‘IT skills, what do you mean?’ I think it’s someone who understands technology’ (M5). This familiarisation included accountants being able to identify ways to automate for efficiency and

embed technologies to enhance workflows. One ECA stated, ‘if we are using data analytics to look at activities then we will need new knowledge of how these platforms operate and how we can actually use them to provide solutions, and what solutions are we actually going to get from using these platforms?’ (ECA10).

[Table VII]

Second, and equally important across the two groups, was the shift to increasing value from new technology stemming from a greater call for analytics, data interpretation, and problem solving. For example, ‘a lot of repetitive and simple procedures done in my work are being automated ... now I will be moving away from those simpler tasks to more complex tasks. This complex work obviously has its own set of demands and skills required’ (ECA10). Challenges with this were also recognised, ‘I feel like new juniors coming in, definitely would struggle. They would have to do a completely different job to what was currently required. And I guess all the basic junior level processing, and data entry is going to change if you get bots, and automation, and all that’ (ECA3).

Third, building interpersonal skills has become essential, particularly communicating effectively with clients and in different ways. This call for people skills was seen as more important among managers. One commented, ‘the ability to dissect and be able to present financial information to people in a way that they can understand and is useful for them to use. If [ECAs] can’t use the information to make decisions, there’s not a lot of point’ (M10). Fourth, as accounting knowledge and standards must underpin technology, both ECAs and managers acknowledged the importance of staying abreast of how accounting standards can be applied in contexts with new, complex technologies. Finally, both groups commented on the need for self-development, ensuring skills currency and fine-tuning research capabilities to assist their workplace learning.

Sense of preparedness for technology

Of the ten ECA interviewees, eight felt prepared for the impact of technology, aligning with the survey results. This preparedness was largely determined by exposure to technology at work, ‘the Big Four ... their drive towards innovation and the exposure that you get is quite massive, so you kind of understand the fusion that exists between the profession and the innovative practices’ (ECA1). Other important factors were being adaptable and open to change, as well as proactivity with learning new technologies. For example, ‘you need to have an open mindset that yes, you don’t know how to do it, but you should learn how to do it’ (ECA5).

Reflecting the survey results, managers were less assured that ECAs were prepared for emergent technology. Several felt that daily life exposure to technology, such as using apps and smart phones, had helped ECAs to appreciate the speed of change and made them more open to it. They also felt that universities provided them with broad insight into the nature and importance of technological trends and gave some exposure to learning and using relevant software training as part of the curriculum. This did not, however, sufficiently prepare them as entry-level accountants and many did not fully grasp the impact technology could have, or was having, on job roles and their future careers: ‘they’re not understanding the full scope of what this technology can mean in the future’ (M10). Managers saw a critical need for prospective accountants to gain exposure to technology through work experience and for on-the-job training and development opportunities once in the workplace. There was also wide agreement on the importance of a positive attitude to learning by ECAs among manager interviewees.

Discussion and implications

Numerous studies have previously investigated the development of accounting skills from the perspective of different stakeholders – students, early career accountants and employers (for

example, Kavanagh and Drennan, 2008; Jackling and De Lange, 2009; Bui and Porter, 2010). Such research has often identified a gap between employer expectations and higher education provision, including finding ways to mitigate this gap (Freeman and Wells, 2015) with emphasis on shared responsibility among universities, employers and professional associations (Jackling and De Lange, 2009). The present research echoes several of the skills previously identified as important by ECAs and managers. However, our primary focus was to investigate the role of new technologies on accounting skills, reflected in our two research questions: (1) how has technology influenced the skills requirements of accountants; and (2) how prepared are ECAs for the demands of technology and how does this vary, if at all, by organisation setting?

In terms of the first research question, the majority of both ECAs and managers believed new technology influenced the skills required in accounting, yet the impact was considered greater among ECAs. Clearly, those newer to the profession are feeling the effects of technological trends and the demands being placed on the skills needed to successfully undertake their work. The perceived impact of technology varied by organisation setting, with effects felt more acutely by ECAs and managers in larger, private sector organisations (and including the Big Four only for ECAs). This likely reflects the greater rate of engagement with new technologies (robotic process automation, blockchain, and artificial intelligence and data analytics) in many large, private organisations (Haller and Siedschlag, 2011). ECAs in public sector agencies and smaller organisations appeared more protected from the impact of new technology on their skills. Consequently, this could mean reduced career mobility by ECAs across organisation settings, at least where technological skills are regarded as more (or less) paramount.

ECA and manager perceptions on how technology impacts on the skills required of new accountants highlight areas for targeted professional development so ECAs can succeed in their

roles (and future career). ECAs must be digitally literate, understanding how new technologies work and ways they can be embedded to improve workflows and processes. Consistent with other research (De Villiers, 2021), the accountants' role has shifted to strategic advisor to clients and internal stakeholders, requiring professional judgement, a holistic understanding of business operations, rather than excellence in simply 'managing the numbers'. They must also visualise and consider ways that complex technology may underpin and drive the application of accounting standards in different settings and scenarios. Appreciation of the important role of communication along with the centrality of lifelong learning, have also become essential.

In our investigations of the impact of technology on requisite skills, we identified similarities in ECA and manager perspectives on what skills are important in accounting. Both groups clearly recognised the value of skills in *data and technology* and their critical value for career sustainability. The emphasis on effective *communication, problem solving*, and aspects of *professionalism* broadly support recent studies exploring evolving skill requirements in accountancy from the fourth industrial revolution (for example, Howcroft, 2017) and highlight the shift from transaction focused tasks to developing relationships to understand stakeholder needs, solving complex problems, and communicating value-add solutions to stakeholders (Smith, 2017). The relatively limited emphasis on *working effectively with others* defies the accountant's important role as a key collaborator and communicator across functional areas and hierarchies (Kastberg and Siverbo, 2016) and may undermine the future capacity of accountants to successfully operate as business advisers. The lack of mention of ethical behaviour in the *responsibility and accountability* cluster also raises concerns given its close association with disruptive technologies which are heavily used by the profession (Marrone and Hazelton, 2019; De Villiers, 2021).

Findings for the second research question showed there were stronger perceptions of ECAs' preparedness for new technologies among the ECAs themselves, compared to the

managers. Clearly, there is a need for more evaluation and dialogue on performance in technology-related skills among new accountants and their managers, along with required support and pathways for improvement. This may be provided by internal training within organisations, and/or supplemented by targeted support from professional associations, such as micro-credentials on data analytics and programming. This is particularly important in medium/larger private organisations, including the Big Four, where managers felt those in the early stages of their accounting careers were less prepared for technology. This is most likely due to the pressure to master, coordinate and then leverage a significant flow of emergent technologies. This development, however, also needs to be encouraged among those ECAs in public sector agencies and small businesses, typically organisation settings less exposed to new technology due to differing organisational needs and resource capacity. ECAs in these settings perceived themselves are far less prepared for technology than other organisations.

Both ECAs and managers agreed that exposure to new technology played a significant role in how prepared ECAs felt for the demands of technology, along with being a proactive learner, open to change, adaptable and confident. This consensus between the two groups is encouraging and highlights important foci for universities which may not always be able to provide exposure to latest technologies, but are positioned to foster agency, lifelong learning, and an innovative mindset among accounting students (see Plant *et al.*, 2017). Co-creating and collaborating with industry, and/or professional associations, to develop authentic curricula and provide work-integrated learning opportunities, such as internships, field tours or project-based learning where students are exposed to emergent technologies in diverse settings, would be highly beneficial. De Villiers (2021) provides some guiding principles on how to develop students and ECAs so they are prepared for automation and artificial intelligence.

Managers' concerns that those entering the profession did not sufficiently appreciate the influence of technological trends on the role of accountants resonates with documented

graduate skill gaps and universities' inadequate predictions of labour market needs (Pennington and Stanford, 2019). It represents an important opportunity for universities to educate students on evolving skill requirements, industry expectations and forecasted change for the future, including developing interpersonal skills that complement technology (see Deloitte, 2019). Looking ahead, there is strong evidence that professional associations recognise the profound effects of technology on the skills needed in the accounting profession. For example, the recently released 'CPA Evolution Model Curriculum' (AICPA & NASBA, 2021) is expected to transform CPA program content to provide accounting students with industry-standard skills, including those related to technology. Further, CA ANZ and CPA Australia's (2022) latest accreditation guidelines require university Accounting courses to embed content on how information and communications technology can impact on organisations, and how it supports data analysis, decision-making, risk management and business systems and processes.

Conclusion

This study has examined how new technologies are impacting accounting skills and ECAs' preparedness for these technologies. We utilised a multi-stakeholder, mixed-method approach, surveying 315 ECAs and 175 managers/recruiters (including interviewing 10 from each group). While there has been much attention to how technology is changing the accounting industry, our study makes an important contribution to understanding how and why skills in the profession are evolving, and how prepared are ECAs, many of whom have experienced the automation of traditional tasks, for new technology, from their own and managers' perspectives.

Findings do not support ECAs as 'digital natives' and new accountants' exposure to technology does not necessarily mean they are able to use and leverage technology to industry standards. Although exposure to new technology is likely to enhance the positional advantage

of ECAs in future labour market changes (Becker, 1964), it is negatively associated with vulnerability and feelings of unpreparedness. Meanwhile, those ECAs less exposed to latest technologies, such as in public sector agencies and small businesses, are more confident in their preparedness for technology yet most likely underprepared. This is problematic when they might later try to transition to larger, private organisations more committed to the rapid use and embedding of emergent technologies.

These findings collectively suggest that more attention and resources are needed to adequately prepare future ECAs across diverse organisational settings for the demands of new technology. The study also serves to pinpoint specific skill areas where ECAs most need development if they are to better leverage the value of new technology. The study signals an important opportunity for university providers, employers, and professional associations to identify ways, ideally in partnership, to better develop technology-related skills among aspiring and current ECAs. Importantly, enhancing digital capability among ECAs is critical for their own career sustainability (Bowles *et al.*, 2020) and for the success of organisations and the profession more broadly (CPA Australia, 2021).

The study's use of qualitative and quantitative data from two different groups (ECAs and managers) across Australia, provides rich insights into the impact of technology and some cautious support for generalisation of findings. However, a research design which had allowed greater attention to how perspectives vary with respect to an individual's own developmental journey and career trajectory might have enhanced our understanding of how to prepare for technology. For example, we did not assess whether an ECA with one year in an accounting role as opposed to five years in an accounting role had different perceptions about the impact of, nor their preparedness for, new technologies. This more fine-grained analysis in the future might provide additional insights. Given the important role of universities as educators and trainers of ECAs, extending the study to examine the educators' perspective would further

strengthen our understanding of changing skill requirements. In addition, greater exploration of nuances in required skills and preparedness for different types of new technology (intelligent automation, blockchain, cloud-based software), and across the diverse areas of accounting practice (such as financial and management accounting), also provides an important area for future research.

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Table I. Professional skills framework (from Jackson *et al.*, 2020)

Skill	Behaviour	
Data and technology	Numeracy	Read and analyse numerical data and apply it to a given context.
	Digital literacy	Select, use and leverage appropriate technology to address diverse tasks and problems.
	Using data Information management	Be able to interpret data and use it in an informed way. Retrieve, interpret, evaluate and appropriately use information in a range of digital and printed formats.
Working effectively with others	Task collaboration	Contribute constructively to group tasks through collaborative communication, problem solving, discussion and planning, on and offline and within agreed timelines.
	Team working	Operate within, and contribute to, a respectful, supportive and cooperative group climate.
	Social intelligence	Acknowledge the complex emotions and viewpoints of others and respond sensitively and appropriately.
	Cultural and diversity awareness	Work proactively and appropriately with people from diverse groups.
	Negotiation	Actively listen and demonstrate empathy when putting forward one's perspective to achieve a common goal.
Communicating effectively	Conflict resolution	Address contentious issues and matters of conflict with key stakeholders in a constructive and appropriate manner.
	Verbal communication	Communicate orally in a clear and professional manner which is appropriately varied according to different audiences and seniority levels.
	Giving and receiving feedback	Seek, give and receive feedback appropriately and constructively.
	Public speaking	Speak publicly with confidence and in a style appropriate to the audience.
	Meeting participation	Participate constructively in meetings.
Self-awareness	Non-verbal communication	Recognise and respond appropriately to non-verbal cues.
	Written communication	Communicate in a clear, structured and professional manner using written formats most appropriate for the target audience.
	Self-reflection	Reflect on and evaluate personal practices, values, strengths and weaknesses in the workplace.
	Self-development	Actively seek, monitor and evaluate sustainable opportunities for personal and professional learning.
	Career self-management	Develop meaningful and realistic career goals and pathways for achieving them in light of changing labour market conditions and disruptions to industry.
	Personal brand	Develop and promote own personal brand which reflects personal values and clearly articulates strengths, capabilities and achievements.

Thinking critically	Conceptualisation	Recognise and interpret patterns and concepts in documents and scenarios to understand the 'bigger' picture.
	Evaluation	Objectively analyse and make judgements on key points in a range of documents and scenarios.
Problem Solving	Reasoning	Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions.
	Analysing and diagnosing	Analyse facts and circumstances and ask the right questions to diagnose problems.
	Creativity	Develop a range of solutions using lateral and creative thinking.
	Decision making	Make appropriate and timely decisions, in light of available information, in sensitive and complex situations.
Enterprise	Innovation	Initiate and support change and add value by embracing new ideas and showing ingenuity and creativity in addressing challenges and problems.
	Initiative	Take action unprompted to achieve agreed goals.
	Adaptability	Adaptable to change and demonstrates flexibility in approach to all aspects of work.
Self-management	Self-efficacy	Be self-confident in dealing with the challenges that employment and life present.
	Resilience	Persevere and retain effectiveness under pressure or when things go wrong.
	Work/life balance	Ability to maintain well-being and a productive balance of work and life.
	Emotional intelligence	Recognise own emotions and regulate and adapt to environment or common goals.
Responsibility and accountability	Social responsibility	Behave in a manner which is sustainable and consistent with company policy and/or broader community values.
	Personal accountability	Accept responsibility for own decisions, actions and work outcomes.
	Ethical behaviour	Behave in accordance with relevant professional standards, values and codes of conduct.
	Commercial awareness	Recognise different organisational structures, industries and sectors and the importance of adapting behaviour and attitudes to varying missions, operations, culture, policies and systems.
Professionalism	Efficiency	Achieve prescribed goals and outcomes in a timely and resourceful manner.
	Autonomy	Complete tasks in a self-directed manner in the absence of supervision.
	Time management	Manage one's own time effectively to accomplish goals.
	Relationship building	Able to initiate and engage in appropriate conversation, build networks and differentiate between personal friendships and collegial relationships.
	Drive	Go beyond the call of duty by pitching in, including undertaking menial tasks, as required by the business.
	Goal and task management	Set, maintain and consistently act upon achievable goals, prioritised tasks, plans and schedules.

Table II. Summary of survey participant characteristics

Variable	Sub-groups	ECAs		Managers	
		<i>N</i>	%	<i>N</i>	%
Gender	Male	193	61.3	101	57.7
	Female	120	38.1	73	41.7
	Transgender	1	0.3	0	0
	Non-binary	1	0.3	1	0.6
Age	<29 years	113	35.9		
	30-39 years	143	45.4		
	40+ years	59	18.7		
Area of Accounting	Management accounting	54	17.1		
	Financial accounting	168	53.5		
	Risk/Audit/Assurance	37	11.7		
	Corporate/Commercial finance	25	7.9		
	Tax	18	5.7		
	Other	13	4.1		
Work Setting	Small private business (0-49 employees)	45	14.3	14	8.0
	Medium private business (50-149 employees)	86	27.3	44	25.1
	Large private business (150+ employees)	84	26.7	38	21.8
	Public sector organisation	25	7.9	6	3.4
	Not-for-profit organisation	7	2.2	6	3.4
	Big Four (Deloitte, EY, KPMG, PwC)	68	21.6	67	38.3
Position within organisation	Proprietor			8	4.6
	Director			25	14.3
	Executive Manager			29	16.6
	Line Manager			28	16.0
	Human Resources Manager/Coordinator			81	46.2
	Other			4	2.3

Table III. Summary of interview participant characteristics

Variable	Sub-groups	ECAs		Managers	
		<i>N</i>	%	<i>N</i>	%
Gender	Male	6	60	6	60
	Female	4	40	4	40
Age	<29 years	7	70	0	0
	30-39 years	3	30	4	40
	40+ years	0	0	6	60
Area of Accounting	Management accounting	2	20		
	Financial accounting	1	10		
	Risk/Audit/Assurance	4	40		
	Corporate/Commercial finance	0	0		
	Tax	3	3		
	Other	0	0		
Work Setting	Small private business (0-49 employees)	0	0	1	10
	Medium private business (50-149 employees)	5	50	4	40
	Large private business (150+ employees)	2	20	2	20
	Public sector organisation	1	10	0	0
	Not-for-profit organisation	0	0	1	10
	Big Four (Deloitte, EY, KPMG, PwC)	2	20	2	20
Position within organisation	Proprietor			4	40
	Director			3	30
	Executive Manager			1	10
	Line Manager			1	10
	Human Resources Manager/Coordinator			1	10
	Other				

Table IV. Impact of new technology on requisite skills in accounting

	No change at all		Minor change		Some change		Moderate change		Significant change		<i>M</i>	<i>SD</i>
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>		
ECAs	4	1.3	16	5.1	67	21.3	135	42.9	93	29.5	3.94	.908
Managers	2	1.1	12	6.9	56	32.0	68	38.9	37	21.1	3.72	.914

Table V. ECA preparedness for impact of new technology

	Not prepared at all		Slightly prepared		Somewhat prepared		Mostly prepared		Very prepared		<i>M</i>	<i>SD</i>
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>		
ECAs	5	1.6	27	8.6	85	27.0	122	38.7	76	24.1	3.75	.969
Managers	3	1.7	18	10.3	65	37.1	70	40.0	19	10.9	3.48	.883

Table VI. Skills to succeed in the accounting profession

Skill	Manager (n=10)	ECA (n=10)
Data and technology	8	8
Working effectively with others	1	3
Communicating effectively	6	6
Self-awareness	0	1
Thinking critically	0	0
Problem Solving	6	5
Enterprise	4	2
Self-management	0	0
Responsibility and accountability	1	0
Professionalism	3	4

Table VII. Impact of new technology on requisite skills

Theme	Manager (n=10)	ECA (n=10)
Familiarity with emergent technology	6	4
Effective use of new technologies to add value	4	6
Interpersonal skills to leverage technology	5	2
Application of accounting standards using technology	2	2
Self-development to learn technology	1	2