



## AI, Data Analytics and the Professions

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**Abstract** Advances in artificial intelligence (AI) and data analytics are having a transformative effect on how work is performed. Research suggests that such technologies will wholly displace some professions while fundamentally changing where professionals expend time and effort in their day-to-day roles. The legal and accounting professions in particular are being transformed by AI and data analytics. This chapter discusses the nature of professions, the shift in use of AI and data analytics from process-oriented activities to knowledge-oriented activities, and how the legal and accounting professions are responding.

**Keywords** Professions • Artificial intelligence • Data analytics

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### 3.1 INTRODUCTION

Much has been written in recent years about the threat posed by technology to traditional professional roles, with some alarming assertions that many professional roles are set to be replaced by a dizzying array of digital technologies. The reality is much more nuanced. Indeed, many aspects of the work of professionals will be subject to major change in the coming years in keeping with the broader digital transformation of society. We can be certain that these developments, incorporating technological innovations and new ways of working, will have a profound effect on the institutional arrangements and social processes of those working within the professions. This chapter explores how communities of organisations within the field of professional services, and specifically lawyers and accountants, are responding to the changes posed by the proliferation of digital technology. Following a discussion on the nature of ‘professions’ and how they have evolved in response to economic, technological and social changes, we discuss how artificial intelligence (AI) and data analytics are impacting two professions, law and accounting. This provides a basis for re-imagining the Future of Work in the professions in the context of current and future challenges.

### 3.2 PROFESSIONS: AN OVERVIEW

It is broadly accepted that modern *professions* are recognised as organised groups of individuals who do different things (task differentiation or specialisation), in different workplaces, for different clients (client differentiation). Professional practices may be understood as “embodied, materially mediated arrays of human activity centrally organised around shared practical understanding” (Schatzki, 2001, p. 2). In turn, Professionalism is more difficult to describe but should not be perceived simply as “the software that goes with the hardware of an actual profession” (Burns, 2019, p. 50). *Professionalism* focuses on the conduct, qualities and behaviours that characterise a profession. It acknowledges that professional practitioners often find themselves in ambiguous, ill-defined, unprecedented situations for which existing theories and models of practice may not immediately guide them and where significant judgement is required (Schon, 1983).

To appropriately understand the impact of current technological challenges, it is first necessary to examine the characteristics of professions.

Professions may be described as occupational groupings organised around an identifiable proprietary corpus of theoretical or abstract knowledge or technique. The work professionals do is “esoteric, complex and discretionary in character” (Freidson, 1994, p. 200), focused on the provision of customised, knowledge-based services to a client base, where the professionals maintain control over client selection. Professional association enhances the status, authority and credibility of members and the collective professions. Without this association, the designation is devalued and the purpose of having a professional status is defeated (Eraut, 1994). Extensive levels of individual autonomy are prevalent within professional practice, coupled with relatively low levels of managerial authority and intervention (Empson et al., 2015). This involves judgement, reflexivity, flexibility and creativity in the application of the specialist corpus of knowledge (Blomgren & Waks, 2015). Individual professionals are also deemed capable of self-regulation, controlling themselves by co-operative, collective means. Professions and professionals exhibit a shared concrete and unique culture, which incorporates a rhetoric involving a series of values, norms, meanings, symbols, attitudes, perspectives and behaviours common to members of the particular profession (Brock et al., 2014). Hager and Hodkinson (2011) discuss the concept of a tacit ladder, where novices may ultimately progress from lower rungs to become accomplished expert professionals at the top, through immersion into established and skilful participation within a community of practice.

Research by the World Economic Forum (WEF) (2018, 2020) suggests that clusters within professions will be wholly displaced and others will spend increased time “on tasks related to communicating and interacting” rather than on tasks that were previously conceived as core information-generating tasks (WEF, 2018, p. 15). The overall viability of some professions is currently under threat: two such professions highlighted are law and accounting. The recent democratisation of information and knowledge has led to some non-law businesses offering legal services. The profession’s chief response to date has been to deconstruct its tasks and to engage non-professionals, for example paralegals, who have a lower cost base to complete more routine tasks or to outsource to offshore lower cost providers (Susskind, 2013). Similarly, as technology has facilitated the distribution of accounting information allowing non-specialists to complete accounting tasks, some have suggested that further technological developments might lead to accountant roles becoming entirely redundant (Frey & Osborne, 2017). Yet, we have seen an increase in accounting roles, with accounting

professionals spending more time interpreting and communicating rather than preparing a growing volume of data. This trend however masks the fact that many accounting professionals have had to augment their training and transition to new roles (Bessen, 2018).

It is clear that technological advances have forced re-examination of the production, supply and “servicification” of professional expertise (Baldwin, 2016). The traditional template of professions is progressively unbundling and reforming in new ways (Boussard, 2018). Such changes will propel professions to change more radically than ever before as they respond to the challenges posed by technological innovations (Susskind, 2021; Susskind & Susskind, 2015).

### 3.3 THE ENDURING TECHNOLOGICAL REVOLUTION

IBM’s first mainframe computer in 1952 signalled the beginning of technological advances which have impacted all of society. Roles and functions across almost all areas of the workforce have adapted in response to each stage of technological advancement (Bessen, 2018). However, the velocity of these developments has increased exponentially and the escalating fusion of technologies has become a key driver of change in professional roles and practices. AI and data analytics have particularly captured the attention of academics and practitioners in the past two decades. Both legal and accounting professionals increasingly seek to harness their potential in order to enhance the value of their professional contribution. Other technologies have, of course, affected aspects of work within the fields of law and accounting. For example, blockchain has the capacity to democratise access to legal services through smart contracts and robotic process automation (RPA) has automated many of the repetitive transaction process-oriented tasks traditionally carried out by humans (Cooper et al., 2019). However, it is AI and analytics which are having a profound impact on each of these professions.

#### 3.3.1 *Artificial Intelligence*

AI is a vast field encompassing the systemising of activities traditionally associated with human intelligence such as planning, learning, reasoning, logic, problem solving, knowledge representation, perception, manipulation, and even social intelligence and creativity (Frey & Osborne, 2017). Russell and Norvig (2010) distil the various definitions of AI into four

<p style="text-align: center;"><b>Systems that think like humans</b></p> <p><i>For example, how to automate activities traditionally associated with human thinking such as decision-making, problem solving, learning (Bellman 1978)</i></p>	<p style="text-align: center;"><b>Systems that think rationally</b></p> <p><i>For example, how to use computational models to make it possible to perceive, reason and act (Winston 1992)</i></p>
<p style="text-align: center;"><b>Systems that act like humans</b></p> <p><i>For example, how to make computers do things which, at the moment, people are better at (Rich and Knight 1991)</i></p>	<p style="text-align: center;"><b>Systems that act rationally</b></p> <p><i>For example, how to design intelligent agents (Poole et al 1998)</i></p>

**Fig. 3.1** Goals of artificial intelligence (adapted from Russell & Norvig, 2010)

categories which really represent the key goals of AI, as depicted in Fig. 3.1.

AI applications in the top two boxes are concerned with thought process and reasoning while those in the bottom boxes address behaviour. AI applications on the left seek to emulate human performance while those on the right endeavour to produce ideal outcomes. The difference between human (on the left) and rational (on the right) in Russell and Norvig’s (2010) typology is really a distinction between imperfect and perfect. AI applications in the left boxes are simply seeking to do things as well as humans can do, using natural language processing, knowledge representation, automated reasoning and machine learning. These AI aspects resonate with the professional—how applications using machine learning, deep learning and data mining can be used to solve the kinds of problems traditionally solved by humans, and moreover, how they improve themselves each time they solve a problem. Early versions of AI concentrated on *simulating* human intelligence, focusing on one task at a time. It was predicated on the prescriptive programming of specific inputs and was incapable of “thinking” beyond specific processing. Machine learning marked the start of significant progress in *replicating* human intelligence, allowing machines to automatically learn from past data

without the need to be explicitly programmed. These systems learn to do their jobs and advance based on experience, much like a human professional.

### 3.3.2 *Data Analytics*

Data is a corporate asset (Brown et al., 2011) and effective management and analytics of data has become critical to establishing and maintaining competitive advantage (Bughin et al., 2011). Data analytics presents opportunities to access increasing volumes of new information from a variety of sources. The term “small data” refers to data which are small enough in terms of volume to be readily accessible and comprehensible for human comprehension while the shift towards “big data” reflects the voluminous information flows emerging from today’s data-driven society. Arguably, analytics itself has not changed significantly—statistics, regression, classification models and hypothesis testing have been around for decades. What has changed is the exponential growth in available data together with a huge increase in computing power available to process it (Liebowitz, 2020). Many organisations have expanded the scope of their information systems from traditional internal data processing to automated data capture connecting businesses to suppliers, affiliates, consumers and clients on a real-time basis. The much expanded availability of data is propelling companies to use large-scale analytics to make decisions (Merendino et al., 2018), innovate (Wu et al., 2020) and navigate crises (Henke et al., 2020). If they are to retain their privileged professional position, lawyers and accountants must navigate this expanded data ecosystem, requiring them to bridge the gap between themselves and the IT department, specifically, the data scientist, the emerging custodian of the growing wealth of organisational data.

The ability of AI and machine learning to automate work, combined with the growing prevalence of big data and the use of smart big data analytics, elevates the true potential of digital technology to replace human endeavour (Loebbecke & Picot, 2015). Together, they are already eroding aspects of professional work and changing the nature and content of professional jobs, through both automation and innovation.

### 3.4 THE IMPACT OF AI AND DATA ANALYTICS ON THE LEGAL AND ACCOUNTING PROFESSIONS

Technology was initially utilised in process-oriented activities, but its growing prevalence in the knowledge sector is forcing professionals to rethink how they engage with their roles (Chiu et al., 2016). The extent of the impact of some technological advances and their associated implications for the two highlighted professions—legal and accounting—is now examined.

#### 3.4.1 *Legal Profession*

Many large clients are challenging the status quo of large legal firms, establishing their own inhouse legal departments or selecting alternative providers, including Big 4 professional services firms who provide multi-disciplinary services. These providers are evolving at a pace faster than many law firms and placing an increasing reliance on technology to provide a more efficient and cheaper service, core considerations for many consumers of legal services. In addition, the law is, in some instances, being operated by individual lay consumers. These alternative operations are often based on analyses of big data repositories of publicly available legal provisions and precedents, most of which can be accessed online at no or little cost. They allow the efficient handling of unstructured legal information and the situating of legal issues in the context of pertinent precedent (Alarie et al., 2017). These include Docracy and Neolata Logic which comprise open collections of legal agreements and Westlaw, a database of searchable content including case law, news, legal journals, commentary, current awareness alerts and materials specific to jurisdictions. AI systems are also well established within the legal profession. Expert AI systems which had previously been the domain of legal professionals have now become available to non-specialists, largely operating on a commercial footing. These enable non-specialists to examine complex issues and model possible outcomes. International law firm Allen & Overy provides a diagnostic expert system tool which can contend with complex multi-jurisdictional issues. Elsewhere, CaseCrunch allows users to predict legal decisions based on case precedent. Both of these have outperformed many experienced human legal specialist challengers. Such tools can broaden expertise, empower users and provide greater access to justice and more value to clients (Alarie et al., 2017).

However, the legal profession has proved relatively cautious in adopting technology. This is not wholly unexpected, given the importance of the law to the functioning of society. The pervasiveness of big data and AI capabilities could have serious implications should ‘herding’ behaviours evidenced in the financial sector prior to the crash of 2008 become the norm within the legal domain (Ayres & Mitts, 2015). Big data systems have a propensity to increasingly rely on “self-reinforcing informational cascades” (Devins et al., 2017, p. 361). Yet, the law is not objectively based on black and white rules or on scientific assumptions. Given that society is constantly evolving and that regulations are continuously being updated in differing spheres, the law too must continuously and substantively evolve. It must remain open to interpretation as its application may vary in different contexts. Suggestions that the law can be a centralised big data repository do not permit this variation or adaptivity. Given their possibilities to replicate human intelligence, it is more difficult to assess the repercussions of reliance on AI tools and techniques. AI is undoubtedly continuing to advance the evolution of the law and the manner in which legal services are provided, by substituting existing processes to change the way legal knowledge is produced and consumed. It remains to be seen whether it may actually revolutionise it (Alarie et al., 2017)—for example lead to personalisation of law i.e. the tailoring of law to individual circumstances.

### 3.4.2 *Accounting Profession*

The accounting profession encapsulates a multitude of roles involving the provision of financial-focused information to inform decision-making. These roles fall into two main categories—accountants in business and accountants in practice. Accountants in business have historically embraced change and enhanced their skill sets in response to changes in technology (Bromwich & Bhimani, 1989, 2009). Today, a variety of “off the shelf” software packages are available to smaller organisations with which they can record and report accounting transactions for their businesses—for example Quikbooks, Sage, etc.—while larger entities work with software developers to build customised systems which integrate the various operating components of the organisation—for example SAP, Oracle, etc. Accountants have been dealing with increasing volumes of data for decades. Data analytics simply offers further opportunities in this area. Potential benefits include greater efficiencies around managing datasets,



more sophisticated exception reporting in relation to controls and risks, and improved decision-making resulting from enhanced predictive modelling (ICAEW, 2014). Big data also provides a host of opportunities for accountants in practice. Firms are increasingly investing in audit-related technology, which is a game changer in terms of how audits of the future will be conducted. The capacity of data analytics facilitates auditor assessment of entire populations of transactions, effectively putting an end to sampling and the audit risk associated with it (Earley, 2015).

AI knowledge-based systems have been used in accounting since the 1990s. The pattern recognition ability of data mining combined with the predictive power of machine learning is used in cost estimation, forecasting, pricing and financial analysis (Karaca, 2021; Nielsen, 2020; Pakšiová & Oriskóová, 2020). AI systems are used by accountants in practice to enhance judgement accuracy. Key benefits include the reduction of over-auditing, improved management of audit risk and achieving more accurate audit conclusions more quickly (Brazel & Agoglia, 2007). In this way, AI applications may lead to enhanced trust in the audit process (Alles & Gray, 2020). AI also supports the progression towards more continuous, real-time auditing with increased forward-looking information (Moll & Yigitbasioglu, 2019).

It is clear that the accounting profession has embraced technology. With regard to data analytics and AI, some caution however is urged. It is acknowledged that while big data may act as a catalyst for transitioning accountants' roles, many accounting tasks are not easily automatable (Richins et al., 2017). Accumulating data is easy. Arguably, analysing data is also relatively easy. Effectively incorporating this data into an organisation's internal accounting procedures and practices requires proactive effort. This also necessitates education at a professional level in developing a stronger skill set in the techniques and technologies of big data in combination with the accountant's natural analytical skills (Chua & Lawson, 2015). In turn, AI undoubtedly enables accounting professionals to focus on higher level and more lucrative analysis, increasing efficiencies, improving judgement quality and reducing human error (Mosteanu & Faccia, 2020). However, the use of algorithms to make decisions does pose some questions about the extent to which accounting professionals versus the algorithms can be held accountable for ultimate outcomes in business or on audits (Court, 2015).

### 3.5 RE-IMAGINING THE FUTURE OF WORK OF PROFESSIONALS

Professions play a key role in the implementation and operation of digital technologies in increasingly complex organisational settings. As they engage with these tools and techniques, they must be mindful that they are facilitating the programming of autonomous working tools and techniques to take over certain areas of activity and simultaneously creating new routines and work processes (Leitner-Hanetseder et al., 2021). However, digital technology brings with it serious challenges. But instead of framing these challenges as “inadequacies” or “failings”, it may be more helpful to conceptualise digital technology as a disruption—a shift within the organisational field which each profession must acknowledge and respond to. Furthermore, new technology types are bringing about often subtle but far-reaching changes in the roles, identities and workflows of professionals within their given organisational field.

#### 3.5.1 *Technological Disruption*

Let’s revisit some of the key characteristics of professions outlined in Sect. 3.2 and consider their importance in the context of the disruptive technology discussed in Sect. 3.3. Professionals possess a body of proprietary knowledge or skill, and their power resides in their continued possession of that knowledge or skill as well as their control over who acquires it through admittance and continuing association with the profession. In addition, their status, authority and credibility are tied into a type of quality assurance which engenders a sense of trust and protects the public interest. What happens to this sense of trust in a profession increasingly enacted through AI? AI technology learns how to do its job better based on experience without the need to be repeatedly reprogrammed. It behaves independently of human oversight, responding to its environment and interacting with other technologies—learning, evolving and ultimately becoming further removed from its initial human design. It is questionable as to whether consumers of professional services will retain the same trust in a profession if the work is being carried out by technology that is becoming increasingly intelligent, autonomous and removed from human effort. If trust is to remain a cornerstone of what it means to be a professional, surely this will impose limits on the extent to which technologies such as AI can pervade professional services.

Staying with some of the key characteristics discussed in Sect. 3.2, professionals use judgement, flexibility and creativity in applying their specialist knowledge to specific and unique concerns and contexts. Yes, we have an exponential increase in data flows emerging from today's data-driven society, and certainly, technological solutions are critical in effectively capturing, mining and analysing the right data for every situation. But professionals offer advice and guidance having internalised their particular clients' determinants of a successful outcome. In this way, data is just one of several inputs into a decision-making process. Data analytics can certainly facilitate the nuanced and complex interrogation of data and machine learning can make predictions by categorising and sorting data and picking out patterns. But turning these analyses into professional advice and guidance requires the reflexive consideration of a combination of creative, intellectual and practical factors. This demands flexibility, reflexivity and judgement, which, so far, remain beyond the scope of technological solutions.

### 3.5.2 *The Professional's Evolving Organisational Field*

We cannot deny that professions are changing. The landscape within which professionals function is transforming, and while the issues discussed in the previous section might impose some parameters on the extent of change, technology is of course driving an ongoing redefining of the norms, values and beliefs to which professionals subscribe. This chapter allowed us to explore how organisational field members' (i.e., professionals) behaviours and roles are evolving in a gradual, almost unconscious way (Wooten & Hoffman, 2016).

We have seen throughout this chapter that changes within professions reflect broader changes in the business environment. Professions have traditionally traded on lofty attributes such as integrity, honesty and respect. However, the business models around these professionals have been forced to evolve, giving way to a more commercial focus dominated by an increasingly competitive professional services market which is as compelled as any industry to reduce its cost base and protect profit margins. This brings with it an obligation to ensure that regulation keeps pace with technological development (Kend & Nguyen, 2020). This changing professional services marketplace is evident, for example, in the growth in non-law businesses providing legal services and numerous 'off the shelf' accounting software packages. Technology is facilitating the automation and

commoditisation of more routinised procedural tasks—disrupting current practices and at the same time creating new areas of competency. Those professionals who have taken a proactive approach and embraced new technologies at this level have thrived, and their increasing ability to deal with data and automate routine services has enabled them to widen their offerings, for example the shift of large accountancy firms to professional services firms (Shaffer et al., 2020). Within the legal sector, the shift is more gradual.

As discussed earlier in this chapter, novice professionals learn the fundamental aspects of their role carrying out basic routine tasks before ultimately progressing up the “tacit ladder” as they broaden their knowledge base and expand their skill set (Hager & Hodkinson, 2011, p. 64). If these routine tasks become increasingly automated, it begs the question “where do novice professionals learn the basics?” Perhaps they are playing a role in this automation process, creating in themselves a new area of technological competency which can be built on as their professional careers progress.

### 3.6 CHALLENGES AHEAD

Technology is becoming increasingly important and is driving the transformation and reconfiguration of knowledge, processes and offerings within professions. New specialist roles are emerging, including data curator and data analyst roles, to contend with the expanding data ecosystem, to harness content and to create pioneering solutions (Moll & Yigitbasioglu, 2019; WEF, 2018). Professionals face increasing pressure to develop competencies to bridge the gap between themselves and data analysts (Leitner-Hanetseder et al., 2021). This raises questions as to which further aspects of human work will and/or should be transferred to machines and which aspects will and/or should remain human-centric (Feeny, 2021; Walsh et al., 2019). It is important to remember that much of modern professional practice may not be facilitated by predetermined rules and decision trees but involves the ethics, identities and qualities of the individual professionals who deal with unique, uncertain, complex and ever-changing circumstances which necessitate a capacity to make creative professional judgements (Schon, 1983). Therefore, while human judgement will undoubtedly be further supplemented by technological advancement, it should not be replaced by an algorithm. Professions must be vigilant in developing the required skills, practices, competences and processes to remain relevant and add value (Moll & Yigitbasioglu, 2019). Individual

professionals must continue to apply autonomy and reflexive consideration of practical, creative, and intellectual perspectives, as well as retain the capacity to form independent judgements which encompass changing particulars and contexts. They must remain accountable for the consequences, intended or otherwise, of their decisions (Court, 2015; Murphy & Rocchi, 2020). The key cornerstones of what it is to be a professional—that proprietary body of knowledge, trust, serving the public interest—have endured since the inception of professions hundreds of years ago and will continue to endure. Disruptive digital technologies simply represent the next stage in the lifecycle of professions. Professions must focus their renewed model around the changing environment, perhaps taking a leaf out of the tech companies’ books. Tech companies are changing and adapting every day. Change in professional environments comes much more slowly, which is too slow for the world as it is now. What is currently a redefining of their role may be something more drastic in decades to come if relatively modest changes are not made now.

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