

DANSKE
REVISORER

FSK*

DIGITAL

transformation

Impact of new technologies
on the accounting industry

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1. Executive summary

This report outlines the significance of digitisation to the accounting industry. It describes extensive digitisation themes of particular importance to the industry in the run-up to 2025. Although some may envisage that clients are far from being ready for digitisation and that robotics will not be implemented today or tomorrow, it is key that accounting firms continue to focus on the transition from analogue to digital work processes to ensure that the industry is fully prepared to meet the requirements which are already made by especially major clients and which will definitely be made by all clients in 5-7 years' time. Many major accounting firms are ahead of their clients and are well positioned to cope with a digital world that many – also major – clients have not yet quite embraced. We are in a period of rapid change and in the next few years, the role of many accountants will be to keep pace with the gradual digitisation of clients and help them navigate technologies, systems and data digitisation. This reinforces the position of the accounting industry due to the unique role of accountants, both formally as the representatives of the public interest and in reality due to accountants' position as trusted advisers to the Danish business sector. And the opportunities are practically infinite if accountants are able to import the client's data into their own systems. Conversely, if accountants do not keep pace with the digital development, they will only get a small slice of the pie to be shared with digitally mature software enterprises, which employ millennials to whom geographical location, eye contact and firm handshakes have never played a

decisive role to trust or decisions – and new entrants, such as banks, which could potentially offer clients much cheaper, better, faster and safer bookkeeping and financial and accounting services due to automated processes. Right now we have a burning platform, and all accountants should make sure to adopt a strategy and take quick action to adapt themselves in spite of their potentially rigid partner-based decision structures.

Extensive digitisation should not be understood as ordinary digitisation in the form of different or improved utilisation of digital media like Facebook. Extensive – or radical-transformation should rather be understood as technological innovations mainly in the form of robot software and data analytics which affect the entire enterprise and are implemented due to client expectations of fast, simple and cost-effective services. Accordingly, extensive digitisation should be understood as digital solutions and technologies that involve automated processes and more effective, cost-reducing and value-adding services. These technologies provide competitive advantages and are driven by client demand as well as market competition, that is, competition to supply rapid and inexpensive traditional core services, such as accounting, extended reviews, bookkeeping, compilation, etc., and value-adding advisory services based on thorough knowledge of the industry, specialist knowledge and business acumen. This greatly challenges the existing market and, internally, it will trigger a

transformation of accountants' competencies and work processes.

Based on interviews conducted with Danish accounting firms and other national and international digitised enterprises, researchers and experts and the perusal of state-of-the-art international literature and research reports, we have identified a range of overarching focus areas of particular importance to the industry. In the following, we will distinguish between the very different levels of accounting firms in Denmark and the huge difference between being a tier 3 = small (such as Døssing & Partnere), a tier 2 = medium-sized (such as Beierholm) and a tier 1 = large (such as Deloitte) accounting firm.

We will describe the most recent trends that everybody must relate to and the trends that will emerge in the coming 5-7 years. Throughout the report we mention different development outlooks due partly to the diverging opinions of academic literature and market players and partly to the different outlooks for different technologies and their implementation. An extensive digitisation will not occur all of a sudden, but gradually over a span of years. And the time perspective of major changes varies from 3-5 years to 10 years depending on the perspective taken. This is reflected in the quotations cited in the report. In our opinion, significant trends will emerge in the coming 3-5 years and will have a serious impact in

a 7-10-year perspective. Accordingly, we generally expect to see the most dramatic changes in 5-7 years' time.

Below we have summarised a series of recommendations of various strategic directions and possible positions that may be adopted by the industry and accounting firms.

- **See the 'burning platform' as an opportunity**

Overall, we will present a positive narrative of a range of accounting and bookkeeping routines that can be handled by computer processes and digital data. This will free time and resources, enabling accountants to carry out more value-adding tasks for their clients. The SME segment is facing the biggest threat because user-friendly systems, such as Dinero and Visma, can automate a multitude of tasks, which may have an impact on both small and large accounting firms if they are unable to make similar offers. It is crucial that accountants see this as an opportunity to move up the value chain.

- **Spearhead the digitisation process.** Today, many large and, to some extent, medium-sized accounting firms are at a far more technologically advanced level than their clients, and in order to benefit more from various digitised collaboration processes, client portals and tools, accountants should assume active responsibility

for taking their clients to a higher digital level. For that reason, a far greater number of accountants should be able to offer IT advisory services. That requires a wide range of new skills and implies that IT certification or tech certification will become relevant to many accountants with client contact. Accountants could potentially take on a secondary role as tech advisers to the business sector.

- **Offer new advisory services.** Accountants distinguish themselves and stand out in the advisory market by creating a sense of trust and security for the client and by assuming the position of trusted advisers. This position and legacy must be preserved irrespective of any further easing of the audit obligation that might change the traditional transactions between clients and accountants. Accountants are recommended to use this DNA in new areas, for example for new assurance engagements, data validation, system validation, etc., or for validating identity firms in clients' supply or collaboration chain. In addition, a number of service offerings, such as tax advisory, M&A, corporate finance and business development services, including forecasts, internal controls, internal reporting and performance management (benchmarking, process optimisation and balanced scorecard (BSC)), relate more to strategic advisory services for which accountants could rethink the processes in digitised form.

- **Change the mindset.** Accounting firms should avoid the inertia and resistance to change arising from culture, mindsets, traditions, partner structures, etc. Until now, the industry has witnessed incremental transformations, but is now facing the first real radical transformation since the worksheet was replaced by information technology through extensive digitisation. In this respect, critical mass, innovation funds, investments in development, technology investments, client analytics, cross-sector collaboration on clients and business knowledge sharing, innovation environments, prototype testing, time-to-market strategies and go-to-market plans will be absolute prerequisites for market players seeking to bolster their key market positions.
- **Build technology units and new collaborative relationships with data and IT specialists.** Intense efforts to build new IT skills in relation to robot software, data analytics as well as specialisation in big data and automation of a wide range of corporate processes will be key to the accountants of tomorrow, including the large and medium-sized accounting firms. When the general development moves towards robot-automated accounting processes, new types of employees and specialisations will be required and all accountants will have to realise and show their clients the value of data analytics and prove their understanding of the opportunities and challenges offered by the technology. In that connection, innovation hubs, that is, special units applying

the most recent technology that can disrupt the market, will also be relevant to the large and medium-sized accounting firms.

- **Differentiate on soft skills.** Eventually, technology will become standardised and be something that everybody uses; to a lesser extent, it will differentiate the industry or accounting firms from, for example, the banking, information technology and legal sectors. On the other hand, especially soft skills and close relationships with clients will become even more important. In the more distant future, human intelligence and the ability to distinguish relevant information from less relevant information and to understand clients' businesses and needs in the best possible way will therefore become even more important skills. This also requires that accountants develop such skills and, not least, that this is reflected in educational programmes.
- **Ensure business acumen and technology understanding.** The need for new types of service offerings and advisory services will be evident when bookkeeping is undertaken by robots. This means that accountants will have to act as the most important business adviser – not acting on results from last year's financial statements, but on future risks and opportunities. And at the same time, accountants must be able to boast specialist skills within technology understanding, including machine learning, big data, business intelligence (BI), cybercrime and drones.
- **Let the FSR show the way.** Basically, this is about exerting influence on the framework conditions of the industry as regards the pace of new legislation and standards, etc. It is about exerting continued influence on basic educational programmes to ensure that future accountants are prepared for the new digital reality. This includes all educational programmes from bachelor of commerce (BCom) and bachelor of economics and business administration (BSc) over the FSR's own academy to accounting education programmes, and not least the possibility of continuing education, events and joint initiatives for the industry, such as a joint technology hub. Finally, the FSR must show the way in the transition of the SME sector from the analogue to the digital society.
- **Develop a general vision for the industry.** It is possible to fight back against other major players in the banking and legal sectors and to arm the accounting industry for digitisation by testing a wide range of new digital services. Or put simply; to make Denmark a digital hub especially as regards joint, relevant, non-client-specific standards and solutions and frameworks for legislative ethics requirements placed in the development units of tier 1 and tier 2 accounting firms, which may then use Denmark as best practice and, in that way, involve the rest of the industry.

Overall, extensive digitisation could and should entail changes to the following parameters:



2. Introduction: Accountants' tasks in future

The following scenario will be a reality in 5-7 years:

A customer buys a product and at the same time provides his or her central business register number. The purchase is recorded in the manufacturer's IT system along with relevant information about the transaction, such as product description, price and the customer's business data. The invoice and receipt are automatically transferred to the customer's system as defined in the Central Business Register (CVR), and the intelligent system suggests precisely how the amount should be entered into the accounts. Occasionally, the customer may take a look at any anomalies produced by the system, such as deviation reports. At first glance, the customer may not grasp the problem, but that is less important because the intelligent software robot is able to identify patterns that the human eye cannot perceive across millions of data points. After being validated and approved, the order is filed in the relevant systems and included in books, of which the customer can obtain a good visual real-time overview on his or her dashboard at any time. Digitally processed data will be fed into the system, providing the customer with financial forecasts. Accordingly, the board of directors and the executive board will not be preoccupied with meetings with the accountant about last year's financial statements, which are already a thing of the past. Nor will they be preoccupied with the current state of affairs, which is known by everybody 24/7. However, a data specialist will be summoned to describe the data-based risks and opportunities

in store for the year ahead and specifically whether any liquidity problems are anticipated in the next six months. The current financial statements and the 'annual report' (if one exists), including all direct and indirect taxes, can be auto-generated instantly in numbers and text by robots using natural language generation (NLG) and machine learning software and are automatically sent to the Danish tax authorities, the Danish Business Authority, banks and others requiring insight and certainty. No one needs to be involved as security has already been provided by blockchain technology. The process is practically fully automated.

What will the accountants' tasks be?

2.1 Purpose of the report

The purpose of this report is to build a common understanding of the new business opportunities and challenges created by technological developments for the accounting industry and the future demands made on the accountants and their firms. The report is meant to form the basis of decisions about the best initiatives to take to prepare the accounting industry for the new digital reality and enabling the FSR to support the industry in that process.

The report is also meant to form the basis of fruitful conversations at all levels and in all types of accounting firms. As regards the small firms, the report aims to give them an idea of what is in store and to

inspire them to make important decisions about, for example, the upgrading of skills within niche areas or specialities and being able to support clients with IT systems and platforms. As regards the medium-sized and large firms, the report aims to support them in making additional investments in IT infrastructure and in giving priority to the development funds and focus areas, automation of internal processes, external processes aimed at clients, digital client platforms and/or

market-oriented support tools (data warehouse, business intelligence (BI), benchmark analytics, etc.) and the specialisation in advisory services. And as regards the industry in general, the report aims to contribute to influencing the entire political environment when it comes to regulations and, for example, tax legislation and improved system integration opportunities, including access to registers and public databases, and to rethinking accounting education programmes.



In future, the ability to access client data on intelligent digital platforms will be decisive for our ability to offer clients the most correct and value-adding advisory services, for example by means of predictive analytics. We must be able to tell the restaurant owner: ‘It will be sunny next week. On sunny days you usually double your sales so remember to call in more staff and order additional supplies’.

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

2.2 The digital accountant will be the new normal

Although many clients are far from having converted to fully automated and digital platforms, an increas-

ing number of clients are asking for automated tracking systems offering access to information 24/7 to enable them to continuously monitor all transactions

and balance sheets on user-friendly dashboards.² Such systems are not merely standard items, but are uniquely tailored to the needs of the clients and based on intelligent computer software that continuously learns and adapts to the clients' work processes and new conditions. Digital tools made in user-friendly designs with simple dashboards for mobile devices are able to provide clients with real-time information on transactions and potential

risks and can be integrated with the clients' other IT and communication systems. So CEOs can choose to have the company's key figures read out loud on their mobile phone during their morning run. Accordingly, they will no longer need audited financial statements in May as the accounts will continuously be updated due to fully automated processes, and they will automatically know the final annual results one minute past midnight on 31 December.



The ability to exchange data electronically with the client, for example by uploading data directly to the cloud, has become a hygiene factor. And that development has made things change quickly.

– Henrik Glanz, CEO, Redmark

In general terms, 86% of the tasks performed by a bookkeeper or an accountant can be automated.³ Bookkeeping and accounting are the lines of business to be second-most impacted by the digitisation trend.

As many as 97% of all Swedish jobs in this field are expected to disappear by 2035.⁴ All aspects of an accounting firm will be impacted by extensive digitisation: tasks, skills and the composition of staff.

2 Meyer, 2015 and others

3 Chui, Manyika & Miremadi, 2016

4 Hultman, 2014



The audit has become fully digitised. We have seen rapid developments in the past two years and, right now, data analytics is driving changes at an even higher pace. At EY we see a host of trends, such as artificial intelligence, machine learning, automation and robotics, that will accelerate developments even further.

- Michael Groth Hansen, Partner, EY

The digital accountant will be the new normal. Accordingly, accounting services will change from involving retrospective and reliable financial statements based on manual accounting work to making early risk analyses and assessments using digital and automated services and offering assistance in setting up clients' own intelligent finance and reporting systems. However, the loss of some job functions may be more than offset by other potentially new functions, such

as the opportunity to offer a much wider range of business consulting and financial advisory services, the analysis of large amounts of data in connection with financial control, fact-based decision-making bases and forecasts as well as new types of assurance/attestation engagements. This new opportunity of third-party verifications will be in demand by clients. The digital world will then pave the way for a range of opportunities for the accounting industry in step with



The industry is facing big changes and, unfortunately, many auditors are conservative in nature and are afraid to go outside the normal realms of how we do things.

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University



The accounting industry is in the midst of a perfect storm. At the same time, the industry is under great pressure due to regulatory requirements, limitations on the activities that accountants are allowed to perform, price pressures due to the commoditisation of our core service (audits) and upward pressure on salaries as a result of the war for talent and the declining attractiveness of the profession among the young generation. The only solution right now is to reinvent the delivery model by using new technology that can automate processes and add value for clients.

- Thomas Hofman-Bang, CEO, KPMG

the emergence of new business opportunities and challenges for the clients. We will see accounting-like services in connection with data security, validation and/or support for external suppliers of IT systems and – like now (2018) – compliance with the General Data Protection Regulation (GDPR). However, these third-party verifications will be made with due regard to the fact that the basis of such verifications will be greatly facilitated by blockchain technologies.

It is imperative that everyone sizes up the situation now, to ensure that all members of the accounting industry have the qualifications, skills, mindset and organisational set-up to meet the demands made by clients and the general public on the industry

even today: That bookkeeping and accounting processes, etc., are as smooth, invisible, simple, automatic and user-friendly as possible to ensure that clients do not have to spend time on vouching or ensuring that the VAT and tax accounts are correct. With the use of new technology, it is possible to meet the new standard requirements of clients. This will be a great challenge for the industry, but it also illustrates that the industry has been unable to visualise the value of its traditional core services and to make those services more than just commodities.

The industry is facing the challenge of reinventing the services to be provided, because clients do not know what they want; in their experience, basic accounting

services do not add any value and, therefore, they demand lower prices. Potential employees will demand higher salaries for entering a profession that is struggling with a slightly unsexy image. At the same time, the industry is governed by extensive regulation, and quality requirements are increasing. In other words, the industry is caught in a 'perfect storm'. The data explosion witnessed in recent years has provided a breath of fresh air to the industry, and the opportunities arising in the wake of the digital data society can be exploited by the industry. The solution is technology, both for the handling and coordination of data, process automation and for delivering a low-price accounting product that can add value and improve the client experience and at the same time free resources enabling accountants to sell advisory services.

There will be some crucial battles that at least the large and medium-sized accounting firms will have to fight and win to make sure that they remain successful in 2025. The battles will be fought in the areas of technology, digitisation and cutting-edge services, such as new platforms and automated processes. Critical mass will be a prerequisite for ensuring sufficient financial resources to fund new IT systems and hiring people with the required IT skills – which are also some of the key drivers of the industry consolidation taking place these years. Right now, market players are struggling to be the first ones to deliver the technology and the new services. The battle is being fought both by the Big Four and the rest of the top 10 firms, albeit at a different pace.



Right now, 200-300 mainly registered public accountants cease to practice every year. They typically work at very small accounting firms. Their client portfolios are consolidated into larger audit firms, which are consolidated into even larger firms. Consequently, the large crop of very small accounting firms with perhaps 1-5 employees will soon disappear completely.

- Jesper Koefoed CEO and Country Managing Partner, EY



**It is difficult for a business of our size
to be a first mover.**

- Henrik Glanz, CEO, Redmark

The Big Four in particular use technology to achieve economies of scale and, where possible, introduce major efficiency improvements within accounting, bookkeeping, reporting formats, etc. However, unlike previously, when economies of scale were achieved by hiring many employees, the Big Four can now reap similar benefits by investing in technology and automation of work processes and routines. This battle is also about proximity, skills, excellence in human relationships and, to an increasing extent, excellence in catering for SMEs. The battle is mainly being fought by tier 2 firms – the small and medium-sized players – and an increasing number of players are intensifying their focus on communication and the presentation of services. The two battles are closely interrelated. With the standardisation of digitisation, technology will become a less differentiating factor over time, entailing that the value of human relationships might increase and, thereby, the need for human qualities (soft skills) will be sustained (perhaps

even more than today). As pointed out above, we will also see a shift in the prevailing value chain with new types of offerings, services, business models and advisory services seeing the light of day.

2.3 Accounting firms and client landscape

Accounting firms are typically divided into three categories according to size (tiers 1, 2 and 3). The large international firms (the Big Four) are Deloitte, PwC, EY and KPMG. The Big Four typically have international clients and major corporate clients, such as listed companies, as their premium clients, but they also cater to small and medium-sized clients. They are typically at an advanced stage when it comes to robot technology, automation and new accounting services, which are widely used in their branding efforts. The medium-sized accounting firms include BDO and Beierholm and, depending on how they are grouped, Grant Thornton, Redmark, Baker Tilly, Martinsen, etc. The medium-sized firms typically contend

5 Khare, Stewart & Schatz, 2016; Shermon, 2016

6 Brix & Jakobsen, 2014; Kazaks, Shi & Wilms, 2017; Leifer, 2000; Osterwalder, 2010; Zhu, 2016

7 Lowe, Bierstaker, Janvrin & Jenkins, 2017; Sirois, Marmousez & Simunic, 2016

for the medium-sized SMEs and are currently upgrading their skills to be able to offer more digital services, for example by optimising their IT departments and IT skills. The remainder of the market consists of sole traders and small firms with 5-10 partners. They also cater to the small enterprises and typically offer bookkeeping and reporting services. The small accounting firms have not accomplished much when it comes to digitisation, but are strongly exposed to the threat from accounting software and players like Dinero, Visma, Validis and Billy, which seem able to add great value to the SME market.

Some small firms with mature owners do not want to jump on the digitisation bandwagon. They still prefer to print documents and keep them in binders.

Although the audit obligation no longer applies to many enterprises, they will probably continue to need accounting, bookkeeping and audit assistance for the next 5 years.

However, these clients account for a negligible market share and when they retire, the clientele for 'conventional' accounting tasks will disappear completely. Even today, all (small, medium-sized and large) clients request automated and user-friendly services, which they will also request in future. However, even if they request those services, it is not given that their data and systems are prepared for the type of services that the accounting firms with the most advanced digital platforms are capable of providing.



We will not witness radical digitisation among small clients within the next 5 years. I still have clients who have not embraced the information technology. They are registered for VAT purposes and pay salaries, but they have no information technology. One of my clients does not have Internet access.

- Jonna Roth, Co-owner and Registered Public Accountant, Kappelskov Revision

The client landscape will definitely change and have implications for all accounting firms. Many jobs performed for small clients will be solved by bookkeeping software like e-economic, and that will constitute a major challenge for the tier 3 firms. Most SMEs and major clients will need more data analytics support, advisory services and full-service solutions from their accountant. This will positively challenge the accountants' skills and ability to bring their partner network into play to meet their clients' needs. SMEs are not large-scale buyers of consultancy services and, for the present, accountants can adopt a 'blue ocean' strategy and exploit the infinite opportunities for enhancing their relevance, as long as there is will and business curiosity.

The Big Four do not exclusively focus on the top end of the market (although that end attracts their main focus); they also cater for the SME segment by pursuing strategies based on digital platforms, streamlined audit, bookkeeping and accounting as well as advanced advisory services as the primary services offered to SMEs. The top end tier 2 firms have embraced the digitisation trend for some years through social media platforms, search engine optimisation (SEO) and digital client platforms, and in the past 2 years they have also embraced the digital agenda. They have moved into data analytics, big data, dashboards, data centres/data warehouses and more advanced systems.



We have not yet experienced any radical digital changes in the industry. What we have seen are rather sporadic, incremental changes. But there is a budding trend towards tools that can organise data easily and quickly as data becomes more and more digital. And then we will see an acceleration of the pace of changes.

– Stig Holst Hartwig, CEO, BDO



The current market positions, with the Big Four markedly outpacing the lower layers, will become even more pronounced in future. With the requirements made regarding PIEs and the battle of technology, the large firms will continue to focus on the top end of the market, while the rest will focus on the SME segment. Both groups of firms will contribute to intensified competition in that segment.

Brian Adrian Wessel, Manager of the Centre for the Accountancy Profession of the FSR

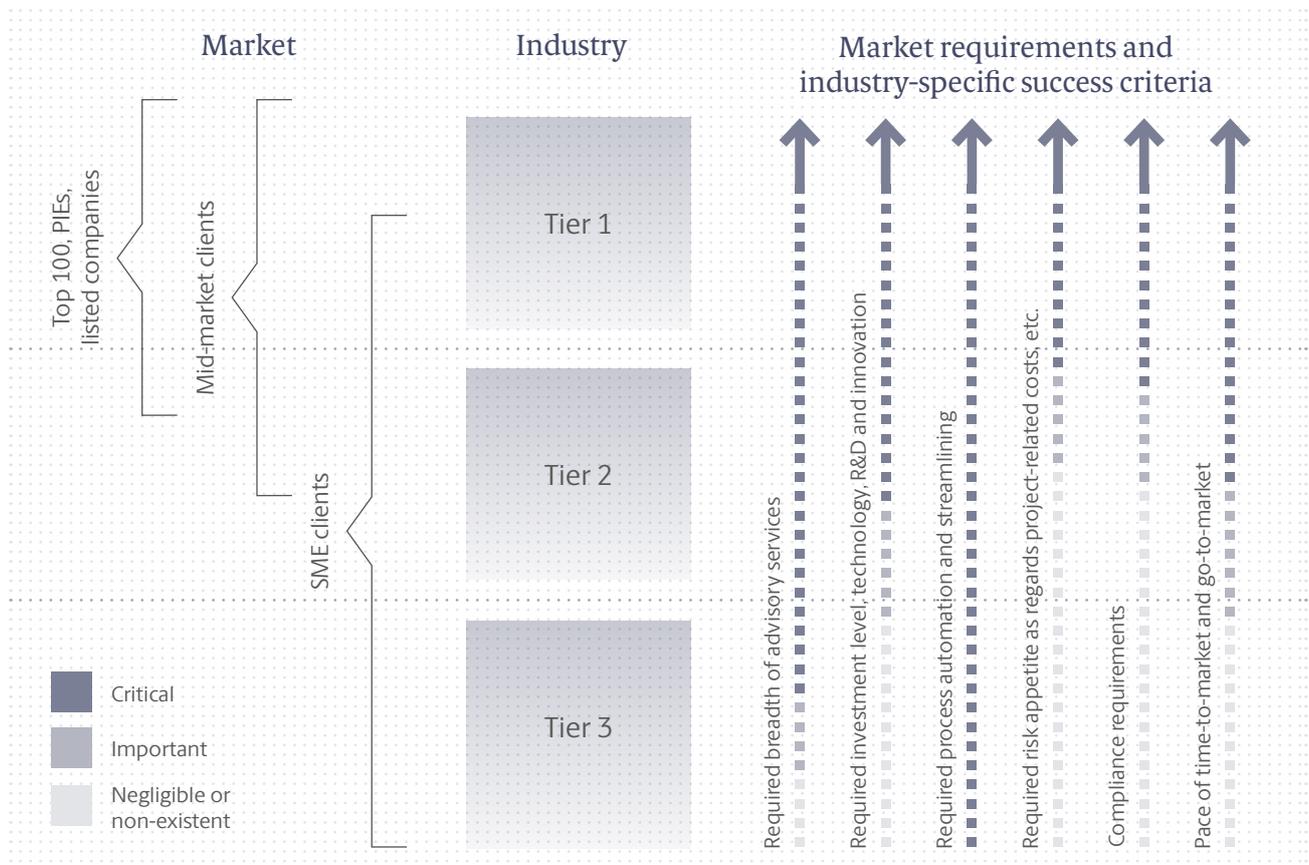


Figure 1. Overview of the three main types of accounting firms (tiers 1, 2 and 3), their focus on clients (illustrated on the far left) and the market requirements faced by the accounting firms some of which are critical (dark blue), some are important (blue) and some are less important (light blue). The arrows indicate what is important to whom.

3. Drivers and development trends in the accounting industry

The technological development is a major driver of the digitisation of the accounting industry, as is also the case in many other industries.⁸ Together with general client expectations and framework conditions that push innovation forward, technological solutions create opportunities for brand new service offerings and automated services.⁹ The technology and the use of the technology by consumers, clients, enterprises and accounting firms have an impact on both the behaviour and expectations and on the processes of the enterprises and the efficiency of accounting firms. Digitisation is a competitive param-

eter which is required to keep pace with the competition and to supply the same services at lower prices. However, extensive digitisation requires critical mass. Accounting firms eager to embrace the technological trend will have to benefit from economies of scale and their network or have the resources to invest in the technology and skills needed. The Big Four are also approaching the start-up scene – like Danske Bank’s Hub – to be close to new ideas and to have the opportunity to be the first to either invest in or to enter into collaboration with, for example, young fintech people with a good idea.



I believe it is important to be in close dialogue with industries such as fintech that devise new solutions. Some solutions are attractive for us as investment targets, and some enterprises are attractive as collaboration partners while others offer inspiration that we can present to our clients.

- Christian Fredensborg Jakobsen, Partner & leder af Assurance, PwC

⁸ Kelly, 2017; Ross, 2017; Schwab, 2017

⁹ Pelkmans & Renda, 2014; Wall, 2014

3.1 General expectations of user-friendliness

Accounting firms operate in the B2B market, but even if their clients are enterprises, they also consist of people with high expectations of client centricity and user-friendliness in general. Digital rethinking is a global mantra, and the accounting industry has the opportunity to take the lead in meeting client needs; needs that have already been identified by the large international organisations, which have set the bar for expectations of user-friendliness, services and client interaction. Technology is driving developments,¹⁰ but most of all it is driving the possibility of meeting client demands and needs in an easier and better way.

The digital development across industries is impacted by a wide range of megatrends driven by social, political, economic and not least technological dynamics.¹¹ Overall, this means that clients now have expectations of services and relationships and of the behaviour of the companies – their ethics and transparency.¹² Accordingly, accounting firms can no longer just concentrate on their own existing products and their own rationality and motives, but have to act in accordance with client expectations today and in the coming 5-7 years.

Today's clients expect to an increasing extent that processes run smoothly and on many types of platforms. The digitisation development has been extremely rapid and, over time, software robots will take over some of these processes, leading to further automation. And clients will expect the high pace, the high degree of accuracy and the low price resulting from process automation.

Most people generally expect that they can perform complex tasks using simple mobile phone apps and other functions.¹³ This approach will spread to corporate contexts, where managers of small and large enterprises will increasingly expect business processes to be similarly catered for. All accounting firms have to adapt to this new reality to mitigate the risk of becoming outpaced by new market players offering simple user interfaces which, based on advanced data analytics, provide valuable visual financial overviews.

Even small Danish accounting firms, with budgets that are nowhere near those of large specialised firms, will experience clients requiring similar services and functionalities. This is also the case with the FSR's own software solution, CaseWare, which is expected by members to offer fancy interface and user-friendly functionalities.

10 Kelly, 2017; Ross, 2017; Schwab, 2017

11 Sammut-Bonnici & Galea, 2015

12 Mason, Mattin, Dumitrescu & Luthy, 2015a

13 Meeker, 2017



A future key focus area for the accounting industry is the ability to develop and reduce our time-to-market. We must dare venture into working with minimum viable products (MVP) to a greater degree to bring our solutions faster to the clients in order to obtain more rapid feedback. And last but not least, we must dare experiment and try off new things!

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

Over time, the search experience on Google, the simplicity and stylish products of Apple, the user-friendly and data-based suggestions of added sales based on the behaviour of thousands of other customers on Amazon, and the targeted posts on Facebook, that precisely match your here-and-now interests revealed to the algorithm by the pauses and clicks you have made in the past 5 minutes, will create the expectation among users, that they ought to have the same functionalities in all contexts.¹⁴ However, the major, international giants are not the only ones putting pressure on the market as regards expectations of user-friendliness and functionality.

In fact, industry-specific solutions, such as Dinero and Billy, are already based on the same client-centric paradigms, which puts pressure on accountants to meet client expectations.

Accordingly, all accounting firms have to compete on online presence and on understanding the user-friendliness of the accounting software that they support clients in using, such as the bookkeeping tools sold to the client, typically to strengthen the relationship with clients who opt out of audit. Clients prefer not to worry about the GDPR, bookkeeping, regulations and IT difficulties and the

14 Hershatter & Epstein, 2010; Riemer et al., 2017; Sacolick, 2017; Taplin, 2017; Tushman & O'Reilly, 2006

compatibility of data sets. Soon, clients will expect a more seamless experience with finance handling and bookkeeping across platforms, authorities (the Danish Business Authority, the tax authorities, the clients' own systems, etc.) and value chain elements. And services must be provided whenever it suits the client, irrespective of time and place. Overall, such expectations are created by general market drivers and will also impact the accountants' processes with clients.

Against that background, it is a paradox that some accountants seem to have come a long way with the application of new gadgets, for example robot vacuum cleaners, semi-automated cars and not least smart phone apps, in their private lives, while in a work context they still perform bookkeeping and accounting using paper-based paradigms and with binders on the shelves and Excel on the computer. That poses a potential risk of being overtaken by other suppliers of digital accounting support.



Immense investments are made globally – driven by the Big Four. But local power of execution will be crucial. Having international digital competencies will not suffice if we cannot really put them into play locally with individual clients. We must be in a position to apply the technology locally and draw attention to the value that digital accounting services add to clients and their stakeholders.

- Thomas Hofman-Bang, CEO, KPMG

15 Kriss, 2014; Kulbyté, 2017; Pulido, Stone & Strevel, 2014; Rawson, Duncan & Jones, 2013; Solomon, 2015

16 Nordic Federation of Public Accountants, 2017

3.1.1 Digitisation and the continued need for soft skills

It should be noted that, although clients inevitably have expectations for system functionality and user-friendliness, it does not imply that client expectations solely concern further digitisation of the interaction with the accountant. In general, client expectations are typically a matter of client centrality and, as a kind of counter-trend, focus on physical, local, face-to-face meetings with people (the accountant). In principle, it is irrelevant that large companies have highly developed skills stored away in IT departments and boast having published many fancy reports on new technology if it is difficult to

bring that knowledge into play in the interaction with the client when the individual accountant must be able to make use of the new knowledge.

In step with the digitisation and automation of many types of services, accountants will increasingly be expected to deliver intimate and personal advisory services and to bring their understanding of the clients' business into play. And the analytical capacity is not per se replaced by, but rather builds on, software robots. Clients will merely expect more advanced solutions and advisory services, which in reality requires that accountants are able to combine their human and professional qualities – their intelligence



The complexity of society will not diminish. Irrespective of our digitisation efforts, owner managers and CEOs will still have an enormous need for advisory services. And close relationships will continue to be of great value in a ‘cold’ digital age – perhaps even more.

– Stig Holst Hartwig, CEO, BDO

17 Bornakke & Due, 2018; Due & Bornakke, 2016; Lindstrom, 2016; Madsbjerg, 2017; T. Wang, 2013



When do you want to sell your enterprise? When do you need to raise a loan or when do you expect to retire? You will only know the answers to those questions if you have personal relationships with clients. Big data will not help you out.

- Jonna Roth, Co-owner and Registered Public Accountant, Kappelskov Revision

and ability to combine common sense, feelings, judgement and analytics – with the opportunities offered by the extensive digitisation. The new requirements for general as well as specific accounting skills in robot interaction are analysed in detail in chapters 4 and 6.

3.2 New competitive landscape for accountants

With digitised and data-driven accounting in demand by clients, a new competitive landscape will emerge. It will be necessary to offer IT technology, new pricing models and add-on services to clients. The market players who control data and transactions and can provide data and data stream security will be the ones to seize the business opportunities. In step with the easing of the audit obligation (112,000 have already opted out), the situation of accountants will automatically change from being that of the preferred advisers

of the business sector – because, among other factors, accountants used to be the critical representatives of the public interest who had to participate once a year – to being advisers of business processes, intelligent systems, etc. Information technology is bound to play a huge role in this new paradigm.

So far, accountants have had a firm grip of the financial data that were subject to control, but lawyers, banks, online financial management systems marketed by new players, such as Visma and Dinero and potential data giants like Google, could penetrate the market. Just a few years ago, clients typically only talked about finances with their accountant, but the market is more open now with both upward and downward pressure.

As mentioned earlier, upward pressures will emerge by new market players penetrating the market, especially

18 <http://www.fsr.dk/Nyheder%20og%20presse/Pressemeddelelser/2017-pressemeddelelser/112000%20virksomheder%20har%20fravalgt%20revision>



The accounting and auditing industry is going through huge changes and disruptions. The clients themselves are forcing the accounting and auditing firms to change. There are clients that are saying ‘we have all these automated processes, all these processes in place, all this data we are collecting and how come you can’t give us more interesting information in our audit?’ And when it comes to advisory ‘how come you can’t help us realize more benefits or do more analytically based risk analysis? How come you can’t identify where our inefficiencies are or where the marketplace is going?’ There are all these demands occurring that you can’t satisfy with the current state of accounting and auditing tools and competencies

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

players like Dinero, Visma, Validis, e-economic, Billy and Bilagscan. The current and future competitive environment takes its starting point in the digitisation of financial and accounting data, the consequences being that new enterprises specialised in software and financial transactions, digital bookkeeping and data analytics have mushroomed. Validis, a cloud-based platform provider, is yet another example of how the relationship between accountants and their

clients is disappearing for the benefit of the client, who can easily obtain fast and inexpensive assurance engagements elsewhere. Generally, fintech, insurtech and regtech are gaining ground. These concepts have seen the light of day because new start-ups have spotted a gap in the market for the development of a wide range of new products and services tailored to the needs of the financial sector; fintech with mobile payments and insurtech with mobile micro tariffing.

However, there is not much talk about audittech and accounttech. Much of the development of regtech focuses on support to enterprises for compliance, that is, compliance with laws and regulations. Soon a crop of start-ups are likely to venture into the accounting industry to a much greater extent than previously.

However, as accountants stand out by already having contact and relations with their clients, the threat against the easily acquired services will not necessarily have to impact the industry to any significant extent if market players adapt in due time and take advantage of existing close accountant-client relationships.



We are beginning to see new market players who seek to penetrate the market with platforms offering automatic performance of audits up to the point where the tests performed are to be reviewed by an accountant before the financial statements are endorsed. The accountant will then act as a sub-contractor who validates the file. Everything will take place digitally and accountants will not meet clients. This type of solution might contribute to disrupting the industry because the new market players will market themselves with inexpensive, fast and efficient solutions. However, the good thing is that we add the human factor to the systems when we differentiate ourselves by expressing our audit in words and making an opinion based on the audit.

- Christian Fredensborg Jakobsen, Partner and Assurance Manager, PwC

The downward pressure is also intensifying, notably from the legal and banking sectors. In the banking sector, we have seen the emergence of fintech solutions such as CrediWire, which helps businesses gain a financial overview, analyse financial statements and benchmark corporate KPIs against market developments in real time, enabling management to share the overview with collaboration partners such as banks, investors, the board of directors or the accountant. An accounting firm might also have developed such a solution. In the legal sector, we have seen fintech solutions for automated document scanning and search (Archii), the development of employment contracts (Legal Desk), support for setting up companies, etc., which are activ-

ities in direct competition with those of the accountant. Although not a threat, even the Danish Business Authority could be viewed as a market penetrator. The Authority is having closer interactions with clients with new systems that facilitate automation, rendering the traditional work of the accountant superfluous.

We are bound to see new solutions for compliance within IT security, personal data protection rules, performance audit, environmental and CSR requirements, rules on bribery and facility payments, new assurance engagements and not least (mobile) platforms for digital accounting in all aspects of the value chain. Support for services other than pure compli-



Last year we started using a software, Validis, that automatically extracts all the data from our clients' accounting systems.

And without any intervention in the process, it delivers an output that is almost complete in the form of a full foundational set of audit work papers. This means that we have the potential to save hundreds of hours of auditor time, depending on the complexity of the engagement.

- James C. Bourke, CPA.CITP, CFF, CGMA, Partner and Managing Director of Advisory Services, Withum



When a large share of the manual work in connection with audit is automated, it will open up a whole new range of opportunities for accountants. They will be given the opportunity to move up the value chain and focus on providing advisory services to clients about the best way to run their enterprises. In my opinion, we should therefore not consider this as a threat.

- Carsten Ingerslev, Head of Department, the Danish Business Authority

ance, where accountants use their analytical knowledge and skills for developing the clients' processes and business foundation, will add value for clients.

All industry players assess – and trust – that, through their role as the representatives of the public interest, accountants are well positioned for the competition for the accounting tasks of the future, such as validating data and ensuring credibility of and confidence in data and systems.¹⁹ The role – and the confidence in that role – constitutes the best barriers to entry, and accountants can place themselves in a good position for the future by offering a wide range of digitised services of trust, adaptability, client contact and business curiosity. When assessments and lending activities

are no longer based on audited financial statements, and when transparency increases through the use of blockchain technology, thereby eliminating the risk of creative accounting and fraud, it will be important to preserve the privileged role of the accountant as a trusted adviser. However, it will be a challenge precisely to define the role of the representative of the public interest, which builds on independence and impartial evaluation, when, for example, the quality stamp of the blockchain beats the accountant's 'assessment' and when an increasing number of services become advisory-specific and, hence, client-specific services. The fact that accountants will play a special role – also in future – is probably an advantage to the branding of audit firms vis-à-vis a very complex field of business advisers.

19 Wilke market research (Signatur – FSR members' magazine), 2017



Creating confidence is the hallmark of the accounting industry. In the future, it will be interesting to see how we can use our ability to create confidence in other contexts than the traditional audit of financial data. The industry should devise new types of services allowing us to create confidence in non-financial KPIs, systems and processes that are essential to our clients' stakeholders.

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

3.3 Framework conditions – a driver

Framework conditions, legislation, procedural and control requirements, etc. are typically presented as obstacles to developments and innovation. However, studies²⁰ show that, overall, the limitations made by framework conditions actually stimulate innovation considerably. Although control and limitations may restrict the individual enterprise and the industry as such, they also create a marked for those who devise creative solutions that make it possible to perform more efficiently within the framework. Regtech is a prime of this.²¹

In fact, extensive digitisation will entail an increase in regulations, making demands on the agility and po-

litical influence of trade associations. It will become necessary to impact regulations and framework conditions by identifying and developing policy proposals of agile regulation as a contribution to the government's digitisation strategy. Old-fashioned micro-management will be challenged by the pace of the technological development and will more often take place based on principles of necessity rather than traditional hard regulation. That makes demands on the impact of the FSR on corporate regulations that strengthen or weaken the core business of accountants. However, reactive thinking does not suffice in respect of adapting to and influencing legislation; there is also a basis for using the conditions as innovation potential.

20 Blind, 2012; Pelkmans & Renda, 2014

21 EY, 2016

The GDPR is a case in point as regards framework conditions that can be transformed into business opportunities. Accounting firms are currently preoccupied with catering to their clients' need for documenting that they comply with the GDPR rules. This means that clients are investing in data and compliance programs and are establishing proactive communication about data ethics based on advisory services provided by their accountants. However, there is a basis for expanding the range of services considerably to

include general compliance to maintain the position as the representative of the public interest and to take up a position of strengthened ethics, increased professional scepticism, required personal maturity, knowledge of human nature and organisational understanding in light of the new digital systems and data utilisation. It also requires adjustments of education programmes and supplementary education in personal data handling requirements for which many accountants are still not professionally prepared.



One of the challenges of digitisation is that it will widen the gap between us and our clients in step with the possibility to handle all tasks electronically. As a consequence, digitalisation will require that we forge even closer relationships with our clients and become better advisers. We must be the trusted adviser whom clients consult when they are faced with challenges. It will be necessary that we focus on the relationship of confidence with clients and that clients find us attentive.

- Henrik Glanz, CEO, Redmark

Digitisation in the industry and among clients will, to a great extent, be based on the digital infrastructure of the public sector in Denmark in Denmark. Just like the XBRL code used for financial reporting. And the access to data through the Danish tax authorities (SKAT) and virk.dk, a public-sector web portal, will be particularly relevant to accounting firms and the opportunities for providing value-adding services to clients, such as benchmark analytics and sector analytics based on industrial classifications. This will make demands on the hook-up of the individual enterprises to digital public-sector systems, combining data across sectors. Accordingly, the type of digitisation applied by accounting firms is of

major importance: Is the accounting tool adapted to Danish legislation? Is it adapted to Danish corporate classes? Those factors will be significant to the efficiency of digital processes and contribution margins, for which reason it is key to closely monitor the public sector digitisation strategy for data coordination and cross-sector data utilisation. Therefore, compliance requirements must also be extended to automated systems, all the way from vouching to tax reporting.

The FSR has a significant part to play as regards to the regulatory framework. This will be examined separately in section 6.1.3



Once the entire process has been digitised, traditional bookkeeping will be rendered superfluous. Then vouching will be automated, and so will the bookkeeping process and the reporting to the authorities. Consequently, accountants must be adept at demonstrating the value of other types of services to clients.

- Bent Dalager, Nordic Head of NewTech and Financial Services and Partner, KPMG



The vision of automatic business reporting is that the bookkeeping and, to a great extent, the annual reporting process will become automated. However, some tasks related to the annual report cannot be automated, for example amortisation, depreciation and provisions. Those tasks will most likely still need the support of accountants.

- Carsten Ingerslev, Head of Department, the Danish Business Authority

4. The technological basis for accounting and other assurance services

We have now entered what is called the fourth industrial revolution or the second machine age. Over the past century, a range of key technological innovations have formed the basis for the changes faced by enterprises due to the digitisation of most processes. Seen in that light, automation is nothing new. For many years, all types of enterprises have attempted to obtain efficiency improvements through process automation. As is well known, the assembly line improved efficiency through automation. The new thing is the way in which automation takes

place through software-based robot technology and the greater consequences of redefining human work tasks. For many years, accounting firms have automated various business processes requiring fewer decision-making capabilities across the value chain. 20 years ago, accounting firms were operated as outright 'accounting factories' where clients handed in boxes of vouchers. Today, it is necessary to focus on the automation of more complex processes by means of more complex technologies to further accelerate developments.



Until 2-3 years ago, accounting methodology was basically the same as when I was a newcomer to the industry in 1985. We used the system-based audit approach and substantive audit procedures with sampling. However, since then the industry has been toppled, especially in regards to data analytics.

- Jesper Koefoed, CEO and Country Managing Partner, EY

22 Schwab, 2017; Brynjolfsson & McAfee, 2014

23 Autor, 2015; Noble, 2017

Action must be taken already now by both enterprises and the industry to ensure a smooth transition from industrial society risks to digital society risks. Many enterprises are trying to predict technological developments. One of the best is Gartner, who publishes an annual hype cycle. Robotics, virtual assistants and the Internet of Things (IoT) are gaining ground because there is much confidence in them without anybody precisely knowing

how the potential will be realised. Conversely, deep learning, machine learning, cognitive computing and blockchain technology have already peaked in the hype cycle and are now moving towards more specific application areas. It goes for all technologies that they will gradually prevail through pilot tests in the next couple of years, and within the next 5-7 years they will become standardised and mainstream.



Technology can do two things: reduce costs and enhance the client experience. Right now we really need both of them to ensure that the accounting industry maintains its role as the preferred adviser.

- Thomas Hofman-Bang, CEO, KPMG

The new technological opportunities relate to two perspectives: (1) Ways in which accounting firms themselves can apply the new technologies to be able to offer better accounting work, broadly speaking, and (2) ways in which accounting firms can sell accounting

and advisory services to clients about the choice of new technology. In the following, we specifically focus on how new technologies can support the traditional accounting work and, to a lesser extent, on the multitude of application opportunities available to clients.

24 Beck, 1992, 2008

25 <http://www.gartner.com/smarterwithgartner/top-trends-in-the-gartner-hype-cycle-for-emerging-technologies-2017/>

4.1 Artificial intelligence and robotics

The most significant technological development of all to the accounting industry is the development of artificial intelligence (AI) and robotics, that is, intelligent software. Today, it is possible to automate routine tasks due to what, in technical terms, is called big data analytics and, in slightly more advanced terms, machine learning, deep learning, cognitive computing and predictive analytics – concepts that have different meanings but, overall, are about how computers (software robots) can be trained to handle fairly complicated work processes and, in a sense, be considered intelligent.²⁶ Automation and artificial intelligence are prerequisites for an expansion of the range of services and the basis of analysis of specific tasks, for example being able to predict the risk of liquidation, etc. The Danish Business Authority is currently developing software robots that are likely to predict the imminent liquidation of an enterprise.²⁷ The model is based on events registered in the Central Business Register (CVR). Events that are registered include date of commencement of trade and change of industries, accountants, CEO or new members on the board of directors. Excep-

tional patterns may indicate that an enterprise is circumventing the rules, is at risk of liquidation or has specific growth potential.

A software robot is computer software that imitates human actions at various levels of complexity depending on the type of software and IT setup. As opposed to 'ordinary' computer actions and algorithms, which are rule-governed and operate on particular application programming interfaces (APIs), software robots operate at the same level as human beings, that is, on the user interface (UI). A software robot then is not a program in for example an administration system (such as ERP) but rather a program that can work in the user interface like human beings.

Software robots form the technological basis of the automation of the accounting process. Overall, they facilitate what in technical terms is called continuous auditing (CA),²⁸ that is, not just audit and accountant activities once a year, but on a continuous basis and with an overall view of all relevant accounting figures.

26 Fadlullah et al., 2017; Issa, Sun & Vasarhelyi, 2016; Schmidhuber, 2015; Sutton, Holt & Arnold, 2016; Yu, Zhuang, He & Shi, 2015

27 <https://alexandra.dk/dk/aktuelt/nyheder/2017/dabai-erhvervsstyrelsen-big-data-vaerktoej>

28 Lins, Schneider & Sunyaev, 2017; Marques & Santos, 2017; Rezaee, Elam & Sharbatoghlie, 2001; Weins, Alm & Wang, 2017



Real-time assurance remains a fairly undeveloped area, but it will be interesting to discover whether, in future, we can spread our assurance services over the year to provide clients with certainty about their financial development. Just as business owners need continuously to monitor their finances, accountants can be envisaged to continuously offer confidence in financial data based on sophisticated IT audits coupled with external data sources and the use of new technologies like artificial intelligence. After all, this will add more value than the traditional accounting process, which typically takes place several months after the balance sheet date and, inherently, is retrospective.

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

The 'continuous' aspect of continuous auditing and reporting refers to the real-time opportunity to verify and share financial information. Not only does it indicate that the integrity of information can be evaluated at a given point in time, it also means that the information can be checked constantly for errors, fraud and inefficiencies. Data analysis can be performed continuously

every hour, day, week, month, etc. Continuous auditing is made up of continuous data assurance (CDA), continuous controls monitoring (CCM) and continuous risk monitoring and assessment (CRMA).²⁹ XBRL, a freely available global standard for data exchange, facilitates the development of continuous auditing modules by providing a way for systems to understand the meaning of

29 Vasarhelyi, 2011

cross-system data tagging.³⁰ Proper use of the XBRL ensures that relevant data gathered from multiple sources is easily comparable and analysa-

ble and, hence, can form part of automated processes. Although the XBRL is a strong standard, it is fairly difficult and costly to use.



The expectation is that the audit is going to shift from an annual or periodic analysis based on a sampling methodology to a process that is not only continuous but also comprehensive in that it covers every single transaction.

- Sean Stein Smith, Assistant Professor, Business and Economics Department, Lehman College, NY

4.1.1 Three generations of software robots

Large international IT corporations like Google and IBM have set the standards for software robots. In May 2017, Google's computer program AlphaGo beat the Chinese Go master; Go is considered to be the most complicated game in the world. And aside from the renowned Watson robot, which won Jeopardy, the robot called Ross, which was developed by IBM, is already used by the legal industry to sift through large amounts of data.³¹

The prospects for automation is that the bulk of data processing is handled by computer processes which are capable of processing both structured and unstructured data by means of machine learning, deep analytics and predictive analytics. Seen from an application perspective, it is basically about more efficient and automated computer processes that can handle data automatically with a view to taking on administrative functions that are currently performed by humans. Overall, this is reflected in three

30 The XBRL format will be elaborated further in section 6.1.2

31 <http://www.rossintelligence.com>

generations of software robots. The point is not that one is better than the other, but that they perform different functions. However, there is a certain hierarchy, as enterprises typically implement the first generation before the second generation, and the second generation before the third generation. Today, all the Big Four have first-generation robots, and it is estimated that second-generation robots will be introduced at various stages of the process in 3-5 years. Third-generation robots are likely to gain ground in the run-up to 2025.³²

4.1.2 First generation: Robotic process automation

Robotic process automation (RPA) is software that can perform the same actions on a computer as human beings within a pre-defined framework. The software can navigate on a screen, open and close programs, make copy/paste, send emails, browse the Internet, etc. Accordingly, it can imitate the actions of employees and integrate applications on the desktop. The advantages of implementing RPA are lower costs, fewer errors,



There is an immense artificial intelligence potential. At one point, PwC set up a working group to analyse 2,500 data sets consisting of 2.5 billion lines. It took the group 50,000 hours. By using AI, the same process took 5 seconds; hence, it is obvious that there is scope for efficiency improvements. The challenge is that it is currently extremely expensive to invest in AI. By and large, it corresponds to building a Formula One car from scratch.

- Christian Fredensborg Jakobsen, Partner and Assurance Manager, PwC

32 The XBRL format will be elaborated further in section 6.1.2

easy and fast implementation and higher employee and client satisfaction. These robots are typically assisted by employees and mainly process structured data that are already available as data sets. The rule-based robot is ideal for handling large volumes of structured data with a low level of complexity. Robots can make accounting tasks more efficient based on a range of pre-defined rules according to which the required procedures

and actions are handled by the algorithm. A wide range of areas offer potential such as IT tasks (assignment of rights, system monitoring), financial tasks (invoice handling, controlling, creditor/debtor management, bookkeeping), administrative tasks (document handling, consolidation and validation, entry of data, case work) and HR tasks (setting up employees, performance ratings, wages and salaries).



Previously, we told our youngest employee to devise a sampling model and try to figure out for which items we should make a statement of balance. But those functions are being automated. We have robots that, in principle, can log in using an employee number and its own email address. It is then capable of sending emails to clients, and when it receives a response, it can handle those emails on its own. However, I still envisage a need for someone to plan, make materiality estimates and be sceptical – even in the distant future.

- Jesper Koefoed, CEO and Country Managing Partner, EY

RPA can be used for control testing of data and accounts, but may also be used to identify open items, send emails to responsible parties, manage follow-ups when due dates are not observed, document remedy status, monitor key risk indicators (KRIs), automate reporting and dashboard activities and make up the basis for evaluating the data quality of systems.³³

Today, RPA accounting robots make spot tests of major clients and calculate the number of audit samples necessary. They are then sent to India, where a large group of employees examine the addressees, the dates and periods and perform the manual work that was previously performed by the accounting firms' young talents. However, accounting robots can also do the work performed by Indians, but much faster, more efficient, cheaper and with fewer errors.

Only few tier 2 accounting firms are in the process of introducing RPA robots, but the Big Four are running a number of limited training sessions of their major clients' huge data sets and are well advanced in this field. The sessions mainly involve transaction analyses for identifying (non-)compliance in the accounts where the total population of millions of transactions are subjected to automated analytics.

4.1.3 Second generation: Cognitive automation and virtual assistants

Not until second-generation software robots does the actual substance of the robot come close to artificial intelligence, thus adding focus on how robots are designed based on machine learning algorithms and theories. Since this type of robot is designed to imitate the human brain, cognitive automation is being mentioned as an opportunity to interpret other data than structured data from internal sources. Where first-generation robots required supervision and mainly assisted employees with routine tasks and well-defined functions, second-generation robots are characterised by being able to perform automated actions on their own once they have been trained to do so.³⁴

In pilot projects carried out by the large accounting firms, employees are helping robots to learn by presenting a number of examples to the robot as input and then programming the robot to understand what the relevant output is. In that way, based on an overall general rule about the relationship between input and output, the robot will be able to learn. The more training, the more precisely the robot's work will be. Supervised learning is when an employee trains a computer to do certain actions based on input. After a certain

33 Bornet, 2017; Bostrom, 2014; Mummigatti, 2017; PricewaterhouseCoopers, 2017; Willcocks, Lacity & Craig, 2017

34 Accenture Consulting, 2017; Pyle & San Jose, 2015; Sato, 2017; Shani, 2017

period of training, the computer can itself perform the action it was taught. Conversely, unsupervised learning is when the computer is programmed to detect data patterns. Unsupervised learning takes place in third-generation robots; we will come back to that below.

Second-generation robots based on machine learning can more than just perform simple rule-based actions, such as closing a case or detecting non-compliant transactions. These robots can scan large amounts of data for patterns that are not discernible to the human eye. This is particularly relevant in risk assessment, business analytics and due diligence, where the basis may be made up of large amounts of data and where robots can identify patterns that humans cannot detect. Another key aspect is the possibility to make predictions. Everybody dreams of and has always dreamt of being able to make predictions – or predictive analytics: to be able to look into the crystal ball and make as precise a risk assessment as possible. This is based on large amounts of both structured and unstructured historical data from all kinds of sources.

Finally, second-generation robots also offer new opportunities of interaction with employees and clients based on a complex language understanding,

so-called natural language processing (NLP), perhaps better known as, for example, IBM's Watson Supercomputer. AI bots are much smarter than simple Chatbots. They are particularly well suited for offering advisory services, the so-called robo-advisers³⁵. NLP consists of natural language generation (NLG) and natural language understanding (NLU).

Where humans make human mistakes, lack overview, may have an off day and cannot work 24/7, robots do not make human errors at all and can work round the clock. They obviously suffer from a series of other limitations as regards data input, linguistic nuances, etc., as is known from Apple's Siri and Amazon's Alexa. Not only are all advisers likely to be replaced by robo-advisers, but robo-advisers will offer much more support in the daily work by means of virtual assistants. Not just as an RPA system, but rather as a more complex algorithm which the employees can talk to and give voice commands to perform specific tasks, such as generating specific types of annual reports viewed from particular angles. Accordingly, by using natural language generation (NLG), an employee can ask a robot to make an analysis and write an annual report using NLG. In the process, the employee's validation will be required and, in this way, the employee will actively interact with the robot.

35 Ahmadi, 2017; Cognizant, 2016; Weisser, 2016



In 1-3 years, it will not be possible to sell annual reports anymore. Where you would previously charge at least DKK 20,000 for an annual report, it will soon be auto-generated. All data will be registered, entered and reported to the authorities. You therefore have to be good at selling other services within control, verification and advisory services.

- Toke Kruse, serial entrepreneur, author and speaker

4.1.4 Third generation: Intelligent automation: self-regulating task handling

These days, large international players focus on third-generation robots which can imitate the way humans work to an even greater extent and perform the tasks much more efficiently, correctly and quickly. Some Danish enterprises are currently testing and implementing this type of robot. The technology is still based on machine learning and predictive analytics, but now has an extra level of deep learning. This means that robots no longer only learn when supervised by an employee, who provides input, but learn on their own and from

their own mistakes; hence the expression intelligent automation. The aim of third-generation robots is to enable unsupervised learning and the application of all types of structured and unstructured data from both internal and external sources. As mentioned above, about a year ago, Google DeepMind's AI program, AlphaGo, defeated the world's number one Go player in the most complicated game in the world simply by teaching itself better ways to play in the process and in real time. Efforts are being made to propagate and apply this type of technology to combine input from many types of data sources and across many processes.

36 Fadlullah et al., 2017; Huang, Huang, Song, & You, 2015; Schmidhuber, 2015; Yu, Zhuang, He & Shi, 2015



We will not see the fully automated audit in my time as an accountant – we are absolutely not there yet. In 10 years' time, the degree of automation will perhaps be close to 50%.

- Jesper Koefoed, CEO and Country Managing Partner, EY

Third-generation robots will be required to make complicated analyses of the many new types of data supplied by drones, wearables, IoT sensors and the somewhat more complicated unstructured data, such as videos and images posted on the Internet or on social media (Facebook, Instagram, etc.). That will require computer vision technologies – a kind of artificial intelligence. Computer vision technology makes it possible to analyse large volumes of videos and images to detect patterns in materials, for example from drone videos, that may be relevant to financial statements and enable accountants to guarantee all types of reports based on trust, also in the future.

Viewed in a third-generation perspective, that is in 5-7 years, software robots will act as personal assistants to accountants. Robots will be able to find and process the information needed through language recognition and access to databases and systems. Robots will no longer just be tailored to a certain well-defined work process, but will be able to work across systems. In consequence, accountants will

be able to ask a robot to generate a certain type of financial or market analysis for use in their advisory services to clients, after which the robot will scan extremely large databases and various types of data and, on that basis, generate visual overviews.

By giving simple commands, employees can make robots perform complex actions involving the opening and closing of many different types of databases as well as writing and editing content. Where employees may tend to work in silos, robots work across and automatically interact with other systems unnoticed. As opposed to the first-generation RPA robots already being used by the Big Four for well-defined analytical tasks, third-generation robots will be the new normal for the large firms in 5-7 years and will form the basis of complete automation of the accounting process. However, this does not imply that all the accountants' work tasks will be fully automated. On the contrary, it implies that many routine tasks will be performed by artificial intelligence, which will support the accountant in their work.

4.1.5 Robots at all stages of the accounting value chain: freeing time and resources

New players penetrating the market and the value chain offering AI solutions that provide clients with much cheaper and better products constitute a threat. The threat is also embodied in the growing

competition in the industry, where the companies that first introduce and automate a wide range of processes to reduce their administrative expenses faster will become competitive. However, there is no quick fix. Enterprises are currently struggling with a series of challenges to be able to realise the potential.

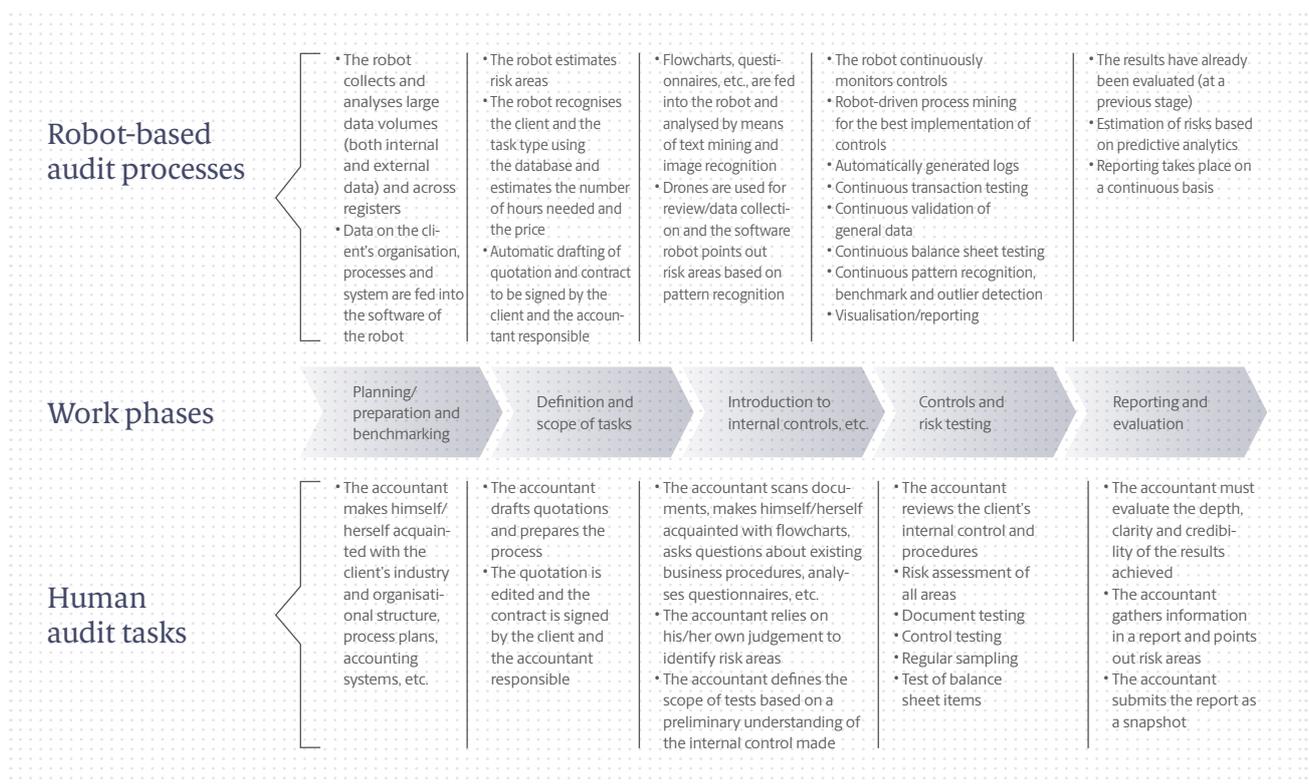


Figure 2. Reinterpretation of figure by Issa, Sun & Vasarhelyi, 2016. The model takes its starting point in typical work tasks and how the interaction between a robot and an employee can strengthen the accounting work.



The real upside of AI is that it is going to allow auditors and their clients to outsource tasks to the AI platform and automate some of the processes that take up a lot of time without adding much value to the client. This means that the auditors can focus on higher level value-adding processes, such as improving internal controls and business management tools instead.

- Sean Stein Smith, Assistant Professor, Business and Economics Department, Lehman College, NY

As regards process management, rushing headlong into an automation project could pose a problem. The important thing is to start off by simple and well-defined work processes and to develop algorithms for precisely the area that is to be automated. There is not one single algorithm that can be used to automate all processes. Once the algorithm has been applied to the data and the work process, the robot can be trained to perform the work tasks. The following model illustrates the overall potential of complete automation of the various stages of work.

4.1.6 Challenges to the implementation of robot technology

Initially, the biggest problems relate to IT systems, legacy and data compatibility. The existing systems must be able to interact with the new software robots, and the data must be of high quality and ap-

plicable by the types of robots implemented. Major clients, the public sector and the Big Four alike are striving to standardise data across the value chain to enable different automation systems to communicate seamlessly. This poses a significant challenge because, in practice, it is not possible to replace an entire system with a new one as it is too expensive and burdensome. Accordingly, ongoing adjustments and system integration as well as highly competent employees will be required.

Automation can reduce the risk of errors. Unlike humans, who may skip a process stage or handle a transaction inconsistently, software robots perform tasks in a standardised manner without any bias or variation, thereby ensuring a high degree of accuracy. However, robot technology may also involve risks if appropriate controls are not in place and monitored. Since robot actions are consistent,

any error arising in the system becomes a systemic and widespread problem in the relevant business process and data set. And if the robot has not been updated to allow for a change in a business process, such an inaccuracy will spread to the rest of the system. This is described by the major accounting firms as one of the biggest practical problems at the moment.

Another and perhaps even more complex problem, because it is out of the hands of the individual firms, is about obtaining data from external sources that can be applied by robots. A huge amount of data is transferred between and processed by enterprises and other players. If the data are not digital or compatible with the systems of the enterprises and if the data are not transferred between systems quickly and efficiently, the benefits of automation will to some extent be eroded because these stakeholders become bottlenecks. This means that even though the accounting firms forge ahead with automation readiness and new technology, it will have little effect if the clients do not follow suit with the creation of digital data. In step with technological developments and the subsequent implementation, the accountants – together with the FSR – will have to ensure that clients are prepared for the digitisation of processes.

Finally, this will present a host of challenges in respect of ethics and common sense. Given that the robots will be capable of suggesting and making decisions as well as pointing out instances of, for example, fraud, the question will be how such decisions are actually motivated. There is no denying that it was what the computer considered reasonable. The confidence in its judgement will be jeopardised. Actually, the robots are explicit ethical agents.³⁸ 'Why was a case closed?', 'Why was one type of fraud detected and not another?', 'Why were these documents taken into account and not the other?', etc. As soon as decisions are made, be they small or large, morals and rationality are at stake.³⁹ And when actions and, hence, also the decision-making power are in the hands of software robots, the industry must be able to justify what is going on, not least advise clients about how to relate to the decisions made by intelligent robots. That will make huge demands on the accountants' insight into information technology in general and the systems they use in particular, and it will especially make demands on the work processes of the accountants in their interaction with software robots, the key factor being the ability to train the algorithms in making ethical decisions while at the same time evaluating, validating and managing the automated decision processes.

38 Moor, 2009

39 Wallach & Allen, 2010; Anderson & Anderson, 2011; Bostrom, 2014

Because if they are just allowed to learn from themselves, software robots can definitely act immorally and make wrong decisions seen from a moral perspective. One example is Microsoft's twitter robot which turned racist overnight. And there are plenty of examples. Anyhow, it may be argued that the decisions are rational, but also that they are discriminatory, disagreeable and immoral and – what may pose an even greater problem – impossible to explain other than by the self-training algorithm of artificial intelligence.

The question then is whether it is possible to make an algorithm responsible for an action? And at an earlier stage: how can artificial intelligence be designed to make legal and not least moral decisions? It is one thing to build compliance into a robot, another is to build in moral sense. Because morals

often deal with dilemmas. A recent typical example is how self-driving cars should behave if they must choose between hitting X number of people or Y number of people. For example, should the car make a turn and wreck itself and the driver, or should it rather hit an elderly couple crossing against a red light? It is a difficult dilemma, but the self-driving car will nonetheless have to make that decision.

Accountants already make a large number of estimates and assessments and are caught in dilemmas where they must make decisions that cannot easily be rationalised in an algorithm. However, when accountants and clients start themselves to design and use artificial intelligence, there will be a growing need for assessing and testing the decisions made by robots. Accordingly, there will be risks as well as new business opportunities.

40 Vincent, 2016

41 A study shows that Google's intelligent advertising algorithm (AdSense) is less likely to show ads for high-income jobs to women. Another study shows that Amazon's Same-Day Delivery service, which makes decisions based on risk assessments, does not serve predominantly black neighbourhoods. A third study shows that the scores made by the risk assessment software used by the US legal system to predict the likelihood of inmate recidivism is only correct in 61% of the cases and that, for example, a black women convicted of a minor offence is much more likely to be caught by the system than a seasoned criminal white male. Ingold & Soper, 2016; Kirchner, 2016

42 A host of examples of similar dilemmas can be found at: <http://moralmachine.mit.edu/>



Today, clients use many systems to run their businesses and they store their data in many different cloud-based services, in-house and in private clouds. With IoT, access to this data will be a lot easier, as everything is stored online. We see this as an opportunity for the auditing business. We can help them by extracting their data, analysing that data and reporting on in a graphically friendly manner so that they can use it for better running their business.

- James C. Bourke, CPA.CITP, CFF, CGMA, Partner and Managing Director of Advisory Services, Withum

4.2 Cloud computing

Put simply, cloud means software that is not stored on a computer but on servers accessed digitally through the Internet. Dropbox is a typical example. In that connection, Software-as-a-Service (SaaS)⁴³ should be mentioned. Most SaaS applications can be used directly in a web browser without requiring any downloads or installations, although some require plugins. SaaS makes it easy for clients to streamline their maintenance and support activities because everything can be managed by suppliers, such as IT providers, or accountants can choose to take a more active approach by focusing on

software, accounting programs and expertise in applications, data compatibility, databases, servers, storage facilities and networks. Bot-as-a-Service is another facility available now. Microsoft Azure⁴⁴ is a cloud computing service providing assistance in the automation of work processes.

Cloud-based bookkeeping and accounting software which is regularly updated and operated using software robots can render, for example, financial statements and a great deal of manual work superfluous. Clients can continuously monitor their finances, entailing that accountants must be able, at an early

43 Appenda, 2017

44 <https://azure.microsoft.com/da-dk/blog/microsoft-azure-announces-industry-s-first-cloud-bot-as-a-service/>

stage, to list risk factors that need to be monitored and assist in setting up and maintaining the system. As a result, accountants' work tasks will also be subject to changes; accountants will no longer have to transfer data from the engine room to management as this is already performed automatically, nor do they need to come back to audit something that, due to blockchains, etc., is already transparent. Intelligent platform-independent and cloud-based systems which are interrelated in ecosystems must be offered and tailored to the individual client and the client's industry.

The industry has now started to offer cloud-based solutions. Where clients used to deliver data in boxes with binders, they now choose to an increasing extent

to deliver data through cloud-based solutions. And all the new software-based enterprises, such as e-economic and Dinero, offer cloud-based solutions with all data being stored in the cloud and the interaction taking place in the cloud. In step with advances in automation, cloud-based services will gain ground as enablers.

4.3 Blockchain

A blockchain is a list of records, called blocks, which contain information and are linked using cryptography. Each block contains a reference to the previous block, a timestamp and a number of transaction data. A blockchain is inherently resistant to modification, and previous transactions cannot disappear. A blockchain should be seen as a transparent list of transactions between parties. It is managed by a



The blockchain technology is a game changer. Combined with blockchains, automated processes provide close to full transparency and can strongly minimise fraud. Once the public sector sets this in motion, we will see a more massive change of the financial sector.

- Toke Kruse, serial entrepreneur, author and speaker



We will probably see blockchain impacting the auditing business within the next three to five years for our large publicly-traded clients. This is something that auditors really have to prepare for by getting up to speed with the technological knowledge. However, it will probably take seven to ten years from now before it really begins to impact the SMEs.

- James C. Bourke, CPA.CITP, CFF, CGMA, Partner and Managing Director of Advisory Services, Withum

person-to-person (P2P) network, which means that computers are connected without having any real centre. Each computer adheres to a protocol for validating new blocks, which provides an extremely high degree of security. Once recorded in a block, a transaction cannot be modified without modifying all subsequent blocks in collaboration with the majority of the network operating the relevant blockchain. Blockchains have enormous potential in the financial sector in general⁴⁵ and for accounting purposes in particular.⁴⁶

Accountants rightly pride themselves for being 'representatives of the public interest', and several

accountants fully believe that the confidence between the accountant and the client is the key element on which their business is based. But it is time for a wake-up call because the blockchain technology may be a more comprehensive and fully developed model that we realise. Admittedly, blockchain experts disagree about when and where the broad-based implementation will take place, but they all agree that the technology will remove most intermediaries. Accountants will be strongly challenged if they are unable to modify the content of the role as intermediary between corporate information and the general public. Blockchains ensure that

45 Gates, 2017; Iansiti & Lakhani, 2017; Mougayar & Buterin, 2016; Swan, 2015; Tapscott & Tapscott, 2016; World Economic Forum & Deloitte, 2016; Yli-Huumo, Ko, Choi, Park & Smolander, 2016

46 Dai & Vasarhelyi, 2017; Kokina, Mancha & Pachamanova, 2017; Rückeshäuser, 2017; Simoyama, Grigg, Bueno & Oliveira, 2017; Y. Wang & Kogan, 2017



An often overlooked feature of blockchain is that, if the company is part of the blockchain network, then they will have real-time access to all the information within that ecosystem. This will enable auditors and their clients to track the flow of information in and out of the company in an ongoing and continuous format – with the ability to verify that the listed information is accurate.

- Sean Stein Smith, Assistant Professor, Business and Economics Department, Lehman College, NY

all transactions are transparent and constructed as a one-way chain preventing the manipulation of data in a previous block. This will enable people who are neither acquainted nor have trust in each other to create a transaction ledger, based on which anything can be traded without the use of ‘reliable’ intermediaries – quickly and largely without any fees. Moreover, the system is transparent, and anyone can make inspections. Blockchains make it possible to set up a general, secure and transparent system reducing fraud and making double-entry bookkeeping redundant. Blockchains also have potential for making it easier for both accountants and clients to look into inventories, supply chain compliance and purchase/sale transactions – and to a great extent this information will be available in real time.

4.4 New, more peripheral technologies (drones, sensor data, IoT, 3D printing and computer vision)

An increasing number of industries are starting to use remote-controlled or unmanned aerial vehicles, or drones, for a wide range of purposes, such as delivery. In certain areas, the Internet giant Amazon, for one, delivers parcels to customers by means of unmanned drones. It is particularly relevant to the accounting industry to consider how drones equipped with cameras and sensors can inspect assets such as buildings or agricultural land to make more efficient valuations and asset write-offs. A drone can efficiently inspect a field, a warehouse or a roof area, and by using sensors, radar technology and camera it can determine

whether the crops are grown as indicated, the size of the area and whether the goods allegedly kept in the warehouse really exist, etc.

Drones can particularly support accountants in stocktaking. Drones are already being used by the Big Four for this purpose, and scientists predict that in future, when drones become the size of small insects, it will be easier to navigate among boxes and cases at even small locations to scan an inventory. This means that the audit process can be expanded from sampling to a test of the entire

inventory without spending more man-hours. Another major benefit is the possibility to perform continuous stocktaking. Drones could therefore play a decisive role in the establishment of continuous auditing, where control and risk assessments are made on an ongoing basis as it becomes possible to obtain a real-time overview of procedures and inventories while at the same time patterns can be analysed and deviations detected due to much larger amounts of data. Accordingly, drones can improve both the volume and quality of the accounting work.



The drone can be seen as an extension of the auditor and it's not very expensive to acquire a drone or two with preloaded software. PwC in Poland has a dedicated drone division. Poland is one of the most advanced countries along with South Africa in regards to drone technology.

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

47 Banker, 2016, cf. Appelbaum & Nehmer

48 Appelbaum & Nehmer, 2017

The Internet of Things (IoT) is another technological development that, to a lesser extent, could have an impact on the accounting industry. The technology covers Internet-connected sensors that can be integrated into 'everything', allowing devices and objects to communicate with each other and exchange data. In future, we will see Internet-connected smart products, smart homes and even smart cities. However, when the number of Internet-connected devices increase, new challenges will emerge in relation to cyber security. The hacking of even small Internet-con-

nected sensors or units in an enterprise can constitute a security risk, just as drones can be exposed to attacks. That will boost the need for improved cyber security, creating new market opportunities for the accounting industry, just as IT accountants currently offer impartial reviews of IT systems, security risk assessments, etc. Cyber risks are discussed below. However, overall, this requires skills. The FSR and some of the technical educational institutions face a major, necessary challenge of upskilling accountants to undertake those jobs.



We already use drones for stocktaking in combination with radar technology. That enables us to make complete inventory tests.

- Michael Groth Hansen, Partner, EY

For several years, another new technology, 3D printing, has been proclaimed to have the potential to start a new industrial revolution because complex production components can be produced quickly and cost-efficiently on the basis of imaging

data. Although the 3D printer has not yet made a significant commercial breakthrough, the technology may prove to have major implications for the accounting industry when/if it really gains ground. 3D printing allows enterprises to manufacture a

large number of goods and individual product components locally and in their entirety. In that way, the value chain will change and enterprises will save both transport time and perhaps also sub-contractors. This could, in turn, entail that fewer enterprises will outsource the manufacturing of their product. If products are printed on demand when needed, enterprises might also be able to reduce their inventories and the capital tied up in those inventories; this could, in principle, take place at the customer's premises. Eventually, this will have implications for the accounting industry because of the impact on VAT, taxes, etc.⁴⁹ VAT is currently imposed on an article or a service each time it is traded, but a shift in the manufacturing and distribution set-up, where customers could ultimately end up printing the products themselves, will complicate and challenge the existing VAT rules. This will require that the authorities introduce new VAT rules to make up for missing revenue. To this end, accountants should start to specialise in the special tax advisory opportunities that could arise in that connection.

3D printing will also challenge the traditional view of the value chain as regards the sale of products. If a customer buys an article and subsequently prints it, is the product sold then a service, an arti-

cle, a licence or a piece of software? The industry will have to address this issue, and similar issues will arise in the area of intellectual property rights; at what point is a right infringed when a product can easily be manufactured and, consequently, copied? This presents another great opportunity for accountants to specialise in advisory services within 3D printing.

The processing and coordination of data from wearables, IoT sensors and complicated unstructured data, like videos and images, require computer vision technologies. Computer vision is a kind of artificial intelligence enabling the analysis of huge volumes of videos and images by detecting patterns in the material.⁵⁰ As mentioned above, the technology is applicable for automated analysis of video recordings made by drones of, for example, agricultural areas or inventories. The computer vision technology is being applied even today by the accounting industry for, among other things, optical character recognition (OCR). OCR is a tool used to convert images or scanned documents into text, enabling computers to make automated analysis of even huge amounts of data, such as contracts, appendices and documents, even if they are saved as images or PDFs when scanned. That will eliminate some of the basic tasks of the indus-

49 3D printing taxation issues and impacts

50 Gao, Wang, Li, Shao & Song, 2017; Philip Chen, Tao & You, 2016



We already use automated tools, including robots, for major client projects and to support internal processes. For example, we use optical character recognition (OCR) tools that can search for key words or particular statements in contracts in PDF format.

We currently run pilot projects using artificial intelligence enabling the computer to suggest actions based on well-known patterns; however, we still use our employees for validation.

- Michael Groth Hansen, Partner, EY

try as it is today and will require that accountants become experts in adapting their services to the new technologies.

4.5 Understanding the opportunities and risks faced by clients

Obviously, digitisation and technological development will not only have implications for the accounting industry. The clients' business activities will be equally – or more – impacted in a wide range of areas. Accordingly, the provision of advisory services to enterprises on the development of their business activities in interaction with new technologies – notably in the SME segment where many enterprises are unable themselves to keep abreast of technological developments – is an obvious business area for the accounting industry.

In the following, we will discuss a few examples from the very long list of other industries that are prone to become affected. Drones and 3D printing will have a decisive impact on the transportation industry because delivery can be made by autonomous drones or be superseded by the end user printing the product. This entails that the value chain of the entire retail sector will become affected. The construction sector will witness full or partial 3D printing of houses and buildings directly on the site at lower prices. Self-driving cars will not only have a bearing on the transportation industry but also on a series of other industries, for example the hotel industry. Because if a car can operate on its own, it could become a moving lounge that you could enter in the evening and then arrive fully rested at a meeting in Stockholm the next morning and have

saved the cost of overnight accommodation. Digital platforms facilitate the framework for a sharing or platform economy for users who share, offer and buy objects or services from each other. The most renowned examples are Uber and Airbnb, but other platforms facilitate services such as borrowing money from private investors (lendingclub.com),

replacing private home networks with joint Wi-Fi networks (fon.com), finding a handyman (handy-hand.dk) or borrowing a car from a neighbour when it is not in use (snappcar.dk). The value chains of a wide range of industries will therefore be affected, and this will offer opportunities for the accounting industry as advisers on business development.



For a mid-market or a smaller firm, the role will be more that of a technology facilitator. The capability to explain new trends and to build out business cases and show examples to their clients is going to be an important competency, as some SMEs will probably not have the time, interest or expertise to understand what the new tools can do for their business without some guidance and expertise.

- Sean Stein Smith, Assistant Professor, Business and Economics Department, Lehman College, NY

5. Advances within data and business intelligence

Data is the gold of our time. As is also the case with other industry trends, there is a dual perspective on data: The first perspective relates to the way in which accounting firms can themselves apply the new technological opportunities of offering data-driven analyses to clients based on, among other things, the establishment of data warehouses in which accounting firms can store large amounts of data in structured form. This requires that accounting firms establish IT skills and a technological set-up to provide those services and mainly applies to large and, to some extent, medium-sized

accounting firms. The second perspective concerns a variety of services relating to the data set-up that clients are about to establish or have already established and which requires that accountants are able to retrieve analytical points from the data set and use them to provide advisory services and to cater for and integrate with, for example, public-sector systems. Basically, the huge amount of data entail that accountants will be able to undertake more and far better types of assurance engagements, a business area that the industry should seek to take control of as soon as possible.⁵¹



Data warehouses offer immense potential. In Denmark, the digitisation of data in publicly available databases is extremely well developed and offers great potential for the industry. We have the data, we have the access, and we have the technology. The clue is to convert all that into insight that can leapfrog the client's enterprise.

- Claus Lykke Sørensen, Digitalisation Manager, Beierholm

51 Santenac & Ball, 2017



Getting away from Excel for example and using more of IDEA or ACL types of software would be a good start for many of the smaller auditing companies. It's one of the lower hanging fruits. Automating controls analysis is another important step. Open source software is yet another level – for example using clustering with R or Python would be good to evaluate which transactions to look at. The firms also need to invest in training of personnel – how people should use these things, what data they need, etc.

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

5.1 Big data

The new access to large amounts of data can replace estimates and minimise the risk of errors. Data can be used directly in financial management systems and provide an opportunity to detect patterns and to identify risks and certain opportunities. In the new accounting systems, existing data sources can be combined with new types of structured data from many other types of external sources such as registers and

databases, but also with new unstructured data sets from, for example, social media,⁵² as it is known from the rating service Mybanker, which combines traditional accounting information with Internet-based data.

Where clients' structured data from internal sources mainly consist of numbers in long Excel spreadsheets with entries, unstructured data are a growing mess of new types of data that are not born in an

51 Appelbaum, Kogan & Vasarhelyi, 2017



The main prerequisite for automated business reporting is to ensure that the data flow and the basic mechanisms are in place. Because once the system is in place, you will know that the output is correct. And that will reduce the need for manual control. Then you can relax the control of the more elementary reporting elements and concentrate more on the processes that add value to the enterprise.

- Carsten Ingerslev, Head of Department, the Danish Business Authority

Excel spreadsheet and are therefore much more difficult to handle. Structured data from internal sources can be complex enough if the filtering compatibility does not allow for any big data analysis across data sets. The use of new types of structured and unstructured data sets from external sources will be on the agenda for the next 3-5 years.

Authorities will have direct access to data in 3-5 years' time due to the huge amounts of data and the new intelligent systems, and accountants will therefore not be the ones to prepare the annual accounts. For that reason, it will be equally important to gather a pool of relevant data for individual clients that accounting firms can apply in their advisory services instead.

5.1.1 Clients' internal data sources

There is a huge discrepancy between the ordinary business day of some clients – with a mixture of digital data, analogue reporting forms, printed documents, binders and digital data siloes not yet systematically applied – and today's opportunities of making big data analysis of existing simple data and, not least, new types of data. Cloud computing and inexpensive data storage facilities have boosted the computer capacity that can effectively be integrated into the audit process.

The combination of big data, advanced analytics and visualisation technologies provides accounting and business insight of significance to how

an audit is planned, performed and delivered. For example, instead of taking transaction samples, the accountant can analyse all income and expenditure items to identify any inconsistencies across the enterprise or any irregularities in connection with specific clients or business units. Much can still be accomplished just by introducing big data analysis of existing structured data from internal sources. Clients' unstructured data from internal sources comprise internal newsletters, text documents, images and videos from the Internet, etc. It remains uncertain whether analyses of such data can add value other than in connection with a comprehensive assessment of an enterprise, such as a due diligence exercise.

5.1.2 Clients' external data sources

It is possible for accounting firms to use structured data from external sources, for example data from external registers, retrieved from public databases, such as municipal data on building permits and data from the Danish Geodata Agency, Statistics Denmark and many other types of databases containing publicly available structured data about clients and clients' customers. When advising clients about their business activities and the financial opportunities, it would be obvious to combine the large amounts of internal financial data with external data to a much greater extent.

However, even more complicated 'new' sources of data, such as data trails from social media (Face-



One of the major challenges is that, although we move fast and come far with the technology, clients also need to be ready. If clients deliver documentation in 'ten ring binders full of documents', it is a bit difficult to automate the accounting process using robots.

- Thomas Hofman-Bang, CEO, KPMG

book, Instagram, Twitter, etc.) are also at play. Very few Danish enterprises use these systematically and in combination with other data sources. The new types of unstructured data comprise written status updates, image sharing, likes of video clips, etc., or, put differently, content that is not initially created as numbers, but carries much significance and can be used to reveal key aspects of a client's press coverage in respect of risk analysis, etc. As mentioned above, this requires fairly complicated computer vision technologies, but Facebook and Google, among others, have already covered a lot of ground in this area.

Data collection and data analytics require strong computer processing power and highly qualified employees. However, it is possible to develop an entirely new understanding of the behaviour and attitudes of clients' customers and what is important to them as regards risk and security. Likewise, it is possible to monitor general trends, emotional states, fashions, etc., that may be relevant to listed companies making semi-real time analyses of status updates, likes and shares on social media and Google's search history. Data retrieved from social media have a weak point, though, in that data validity may be compromised by the volume of, for example, fake profiles and Internet trolls disrupting the image of the digital social world.

The combination of external and internal data is not only relevant when providing advisory services

to clients. It is also important in relation to audits where robot processes can continuously monitor clients' accounts and identify errors, omissions and inconsistencies. If an anomaly is detected, it can now be tested by analysing external data retrieved from the Internet, such as press coverage on financial pages, etc. However, the credibility of this type of data is very low, and auditing standards require that it is possible to validate data and establish that the accounts are correct. With the introduction of industry-specific data analytics models, it will be possible to compare and identify patterns enabling accountants to benchmark clients and clients' key figures against other market players. This will allow accountants to quickly comment on the accuracy and likelihood of estimates, thereby providing assurance, just as they can indicate the demand for certain goods and, on that basis, calculate the need for transportation and what should be kept in stock.

5.2 Data quality and differences between descriptive, predictive and prescriptive analytics

Data can be used at very different levels. Everybody working with data knows that you have to start out at the level matching your skills and data. The first practical problem is to feed data of a sufficiently high quality into the system. Data obtained from scanned documents tend to contain errors that make it difficult for the system to read the data. Digitally generated data do not pose a similar problem, but the data may contain errors that are



The role of the auditor is going to change in the next 3-5 years, I believe, due to two main drivers: First, more and more data is going to be stored in a digital format, which is going to increase the scope and the speed of the audit business going forward. Second, the rise of tools such as AI and blockchain are going to change what the client and the market want, and expect, from the audit.

- Sean Stein Smith, Assistant Professor, Business and Economics department,
Lehman College, NY, Lehman College, NY

carried forward to the rest of the analysis process. The next major problem is to establish systems that allow data to be easily transferred among systems to avoid creating data silos. Once the data set-up is in place, data analytics can be performed.

Many clients are still at the initial stage of setting up proper data systems that allow accountants to make simple descriptive analytics. However, once the data set is ready and free from errors, there will be ample opportunity to move into more advanced analytics like predictive and prescriptive analytics – both based on machine learning and software robots as

described above. Predictive analytics is about predicting movements of data based on pattern recognition and learning. Prescriptive analytics is software robotics based on predictive analytics, which can also outline various potential future scenarios and suggest what actions to take on that basis. It allows a real-time assessment of, for example, key figures and financial standing, which can be illustrated on interactive dashboards. As outlined in the scenario in the introduction, this will enable accountants to meet with clients in future to discuss other subjects than last year's financial statements or the current state of affairs; rather, it will be to assess clients'

risk of liquidity problems six months ahead based on predictive data patterns. This will require that accountants are able to visualise data and transform data into information, knowledge, interpretation

and reflection and, ultimately, a decision-making basis and an assessment of impact. That is to say, from checking reliable numbers of the past to assessing numbers and potential consequences in the future.



Automation and artificial intelligence have only just dawned. Our systems can automatically enter scanned vouchers, so we have already come a long way. Once we have enough high-quality data, we can offer predictive analytics. That will be in 1-3 years.

- Toke Kruse, serial entrepreneur, author and speaker

5.3 Data analytics and business intelligence

Data analytics enables accountants to inspect a complete body of data to a much greater extent, rather than relying on audit sampling based on a fraction of the data available. Against that background, it will be easier to detect fraud and lack of coherence – typical indicators of imminent problems – and it will provide an opportunity to make major improvements, including making more reliable assessments and, hence, minimising the

problems experienced in the wake of the financial crisis. The use of data analytics requires considerable specialist skills to be able to identify the focus of an analysis, collect reliable data and organise data in a meaningful way.

Previously, business intelligence (BI) was mostly based on existing data and calculations, but new data sources, stronger processing power and intelligent algorithms have entirely changed the basis of

BI. Analytics of Things (AoT) based on data from the IoT will see the light of day. Cognitive and predictive analytics as well as machine learning can provide better, faster and more precise results in the BI process. And new, user-friendly platform software will make it easier for clients to retrieve and use results, thereby rendering some of the accountants' advisory services superfluous or more likely transforming them into something else. Combined with the right data analytics, the amount of data could enable accountants to identify and focus on outliers and

exceptions in the data and identify the most risky areas of the business activities.

Nowadays, accountants analyse clients' data, but a few years from now, most large and medium-sized clients will have the skills in-house and an IT set-up that will make it possible for them to perform data analytics – which does not imply that reliable third parties will not be needed for support and data verification. However, as many SMEs will not establish an IT set-up with data analytics for many



Today, companies rely on their auditor to analyse their data because many have invested in the technological tools to do so. But with constant technological development, tools such as Microsoft Power BI create platforms that enable companies to easily extract and understand that data for themselves. So I think that we should be aware that the big data analysis that many audit firms offer their clients might be a temporary business opportunity.

- James C. Bourke, CPA.CITP, CFF, CGMA, Partner and Managing Director of Advisory Services, Withum

years ahead, this mid-sized market offers huge potential going forward. However, that will require that clients accept a higher level of digitisation. Clients provide the data and accounting firms process the data and develop data-based analysis. Accountants can detect patterns by means of analytics and simple robots and, on the basis of visualisation software, accountants can produce very convincing results for clients, demonstrating the value that accountants will otherwise be under pressure to deliver.

5.4 A comprehensive data model

In *Impact of business analytics and enterprise systems on managerial accounting*, Deniz Appelbaum et al. present a possible model for the integration of internal data sources (for example from a structured data base) and external data sources (for example from social media, news, the IoT in unstructured form) combined in a data warehouse with cost and performance measurements based on the more traditional process optimisation and control disciplines. This is then integrated with data analyt-



Small clients need simple, inexpensive bookkeeping systems. That will make their work easier, but it will not offer significant financial gains. Large clients have their own IT systems, but it will take an enormous effort to adapt them to automated systems. The greatest opportunities are in the mid-market.

Clients with 10-200 employees really need smart finance systems to facilitate the bookkeeping and accounting processes.

- Toke Kruse, serial entrepreneur, author and speaker

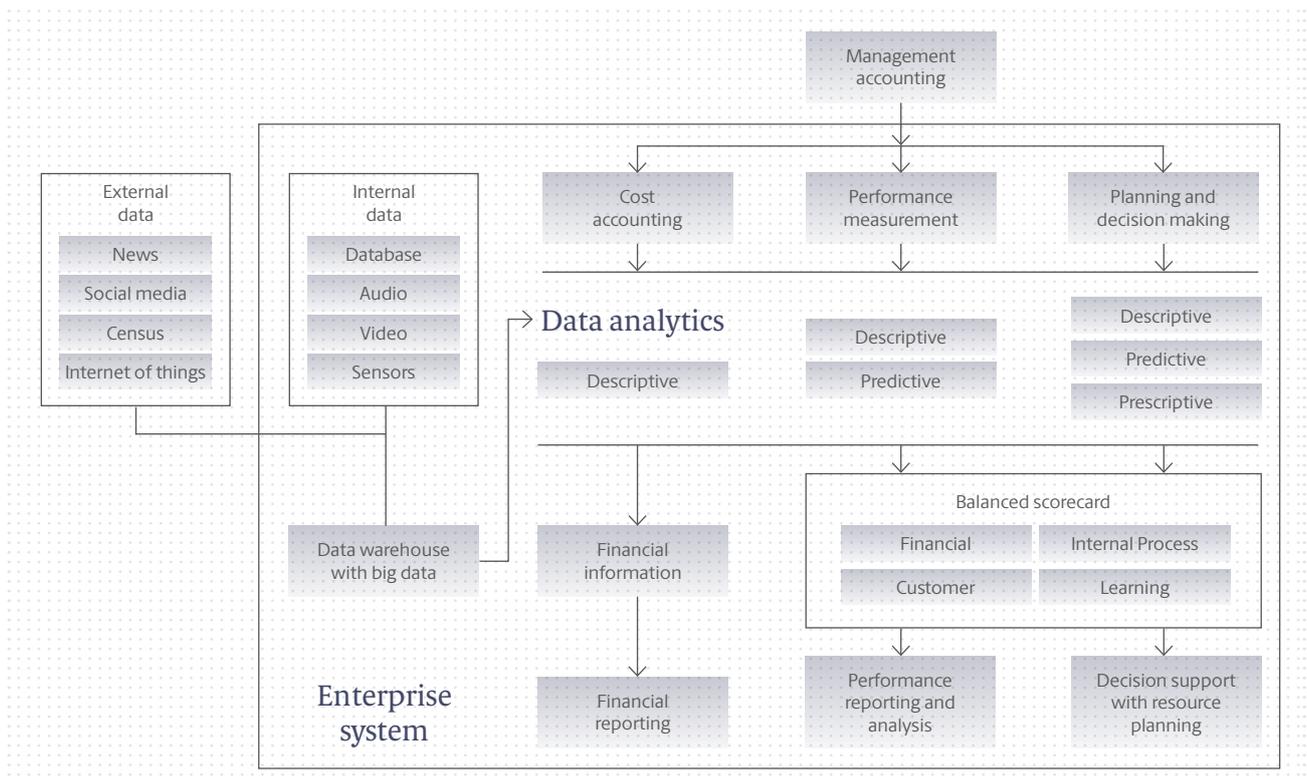


Figure 3. Systematic overview of data flow and application as regards various data types and analytics tools. By Appelbaum et al, 2017c.

ics and the balanced scorecard (BSC) and ends up providing valuable reporting and decision support for management.⁵³

As described in the previous sections, in the near future, many new types of internal and external data are likely to be combined in analytics that can be made

based on descriptive, predictive and prescriptive methods and provide insight into, for example, business intelligence and advisory services at various levels.

By implementing systems and analytics models as part of the audit tools, like those being developed by the Big Four, accountants can, at a fairly early

53 Appelbaum, Kogan, Vasarhelyi & Yan, 2017



One of our focal points is to streamline the work flow of our internal processes. In the ideal world, we receive data from clients which we process digitally into output such as financial statements and audit evidence for clients.

- Jakob Korshøj, Partner & State-Authorised Public Accountant, Vistisen + Lunde

point, be prepared for risks that could arise. As an example, accountants can feed the balance total and other financial and non-financial data from industry-specific, public databases, etc., into the tool. Machine learning, that is training from previous data sets, makes it possible for the accountant to suggest where the risk of significant errors is most acute, for example a prediction that a certain percentage of sales should be earmarked for consolidation on the basis of the client's own numbers compared with numbers from other players in the same industry. Or if, for example, it is predicted that sales will increase or decrease sharply, the system can also make suggestions for production adjustments based on previous audits and other external data fed into the analysis. That will pave the way for better assurance services that support and ensure the quality of the client's estimates and other ac-

counting items and, altogether, significantly reduce the uncertainties.⁵⁴

5.5 Cyber security

Cyber risk and cyber security present a new major challenge – and a huge new market. Irrespective of their level of digitisation, all clients operate in a digital culture with Internet-based technologies and processes. Everyone is vulnerable to cyber attacks and the resultant implications. It is assessed that a large cyber security breach currently represents one of the world's most serious risks,⁵⁵ and that it will also trigger an explosion in corporate expenses. That is unfortunate in a social perspective, but from a commercial perspective it offers opportunities for new advisory services, risk assessments and assurance engagements. It is an entirely new threat arising in the wake of digitisation and, hence, a new business opportunity.

54 Aurstad, 2017

55 EY, 2017; World Economic Forum, 2017

56 Morgan, 2017

Accordingly, there is an increasing need for new services of trust, for example within cyber security. Only few accountants currently boast such skills. The prevalence of cyber attacks and uncertainties about data security are multi-faceted areas in which accountants can support clients in identifying potential threats. As accountants acquire more IT skills, they will also be in a position to offer software and advisory services within security, which are already part of the services offered by the large firms today.

In this context, to support its members, the FSR could introduce relevant continuing education and,

in collaboration with some of the more technical educational institutions, concentrate on equipping accountants to understand and assist in IT set-ups, advisory services and analytics as well as make so-called penetration tests of security systems.

Cyber security is a consequence of the use of the Internet, cloud systems and huge amounts of data, which constitute assets for enterprises and, therefore, are obvious targets for hackers.⁵⁷ The extensive digitisation will boost the value of the digital world through data warehouses, data centres and cloud systems, which represent enormous values – unlike



The more data you have, the more important data security will be. We see market potential here, with the demand for independent data security verification growing in tandem with the increase in data amounts due to features such as the IoT. I am confident that the accounting industry can deliver independent verification of data security, etc.

- Michael Groth Hansen, Partner, EY

57 Cyber Security Benchmark – Denmark, n.d.; Kaplan, Sharma & Weinberg, 2011



You need to have experts on cyber security and offer that as a service to the clients. It's going to be a big thing. A lot of the second level companies are investing heavily in cyber security right now. Every business is looking for assistance in regards to this right now.

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

factory buildings, the value of which gradually decreases because they can quickly be rebuilt using 3D printing. As representatives of the public interest, accountants play a key role in this context. It is widely believed that an accountant's signature boosts confidence in a document.⁵⁸ To most clients, data handling and data security are of decisive importance to their business activities and relate to both cyber security and personal data.

Requirements for assurance engagements from accountants (for example within the field of unemployment funds) about IT security and compliance with the Danish Act on the Processing of Personal Data have already been enacted in special legislation – and more requirements may be made. The Danish Data Protection Agency is responsible for compliance with

legislation, but accountants are needed to assist with assurance engagements. Initially, that will require the development of a new perfect product, such as a genuine cyber security and personal data check, which could optimally be implemented in legislation. The Act also contemplates the introduction of a certification scheme. In this respect, accountants could enter the fray by offering and ensuring the quality of such certification scheme aimed at data processors and data controllers.

From the accounting industry's point of view, the access to data could be seen as a value chain that can be utilised both by way of big data products and services of trust and by way of cyber security services, such as security scans, security/vulnerability tests by means of pressure tests

58 Wilke market research (Signatur – FSR members' magazine), 2017

and assurance engagements about the level of IT security. The Big Four and BDO are all investing in cyber security while the layer beneath the Big Four is holding back on the scaling so far. It is relevant to the small and medium-sized firms to take a position even now as to whether they want to make a strategic commitment to assist clients with data security. It is particularly relevant to the small firms that the FSR takes the lead and assists in influencing the framework conditions and legislation towards, for example, mandatory data maturity

checks and draws attention to and demonstrates the need by presenting cases, etc.

In connection with cyber risk, digitisation of well-known concepts such as identity and access management (IAM) and security information event management (SIEM) will also be relevant. IAM is about managing the access to corporate resources. It is a fundamental element of all information security software and one of the security areas with which users interact the most.



In future, the accounting industry will also act as a watch dog. In step with the increase in and transfer of data, there will be a need for someone assuring that the systems are valid. The accounting industry is in a position to take up the role as quality assurer. The role already exists today as accountants have to provide assurance services in regards to IT systems, but the need for such services will likely increase going forward.

- Jakob Korshøj, Partner & State-Authorised Public Accountant, Vistisen + Lunde

6. Overall consequences of digitisation for accountants and the future role of accountants

The accountant of tomorrow is faced with both indirect and direct requirements due to the ongoing digitisation. Indirect requirements because automation of simple bookkeeping and accounting tasks, which constitute a comprehensive portion of the work carried out particularly at small accounting firms, render those competencies superfluous (and robots perform the tasks flawlessly anyway). Automation reduces the cost of accounting and bookkeeping, and SMEs are now offered those services almost for free by Dinero and others on the condition that their data can be used. Direct requirements because accountants will have to involve information tech-

nology, software systems and robots in their everyday working procedures. Several large accounting firms make use of robotic process automation (RPA), IoT, virtual assistants (VA), artificial intelligence (AI), augmented reality (AR) and big data analytics, and the talent pools of the large firms already comprise an increasingly versatile group of different specialists. The talent pools and human competencies at medium-sized firms are already now changing. IT departments are expanding, and more resources are injected into the business area of information technology in tandem with technological developments and new competitive requirements of digital



BDO Holland has come far along the road of digitisation. Some of their activities have become almost identical to those of an IT company. They have won a supermarket chain with more than 300 stores and do everything for this store. They manage IT, they do the bookkeeping, they do the payroll, they do it all. Then management is given a dashboard, and BDO Holland makes status reports to management, tells management what to consider, what to adjust, etc.

- Stig Holst Hartwig, CEO, BDO



Accountants have indeed made a living by charging hours. And the work came automatically because audits were mandatory. But now that all the bookkeeping has been automated and the statutory audit requirement has been abolished, what work is left for accountants? This is indeed a huge challenge, and accountants now have to go out and prove their worth.

- Toke Kruse, serial entrepreneur, author and public speaker

and efficient processes to generate the notional contribution margin, while taking into consideration the existing partners' propensity to invest.

To most accounting partners, the consequence of the new competency requirements is that they have to focus even more on being professional accounting advisers and less on their audit and compliance functions because the 'easy' processes and tasks become automated. Large and major accounting firms serving the SME segment have ample opportunity to embrace their clients through versatile advisory services because SMEs want a one-stop-shopping accounting and auditing solution – as opposed to large listed companies and public interest entities (PIEs) which usually already have several in-house specialists – and because accountants have an interest in increasing earnings from compilation engagements other than assurance engagements.

6.1 The significance of digitisation to accounting services

If we look at very small enterprises, bookkeeping software like Billy and Dinero have a huge potential. Medium-sized enterprises need more feedback and advice from an accountant regarding all the various financial aspects of running a business. In this context, accountants can offer advice on and assistance with the automation of several processes for their clients' business activities. Advice on the GDPR is a good example of commercial services provided by many accounting firms to the SME segment in 2017. And the market for assistance to enterprises in handling regulation and framework conditions will only continue to grow over time, as will the demand for assistance in setting up and monitoring electronic accounting systems. Moreover, there are innumerable innovative ideas for different review, assurance and related services that accountants can market.

Top-tier enterprises are obviously more developed and more sophisticated compared with smaller enterprises. For that reason, we also see investments by the Big Four in cyber security, big data analytics, RPA, etc. They use such investments to brand themselves, whereas medium-sized accounting firms still have a less comprehensive range of services because small business clients do not demand competencies at that level to the same extent. However, the technological development and the developments in accessibility and utilisation of data will soon drive the demand for more business intelligence, data analytics and predictive analytics competencies in the SME segment. This segment offers development potential for medium-sized and large tier 2 accounting firms if they invest in well-developed software like Python and R and even in social media analytics

software. It obviously also requires high-level IT, data and computer programming competencies. However, a solid focus on analytics as a business segment will improve internal streamlining of invoicing, payroll systems, clocking and HR procedures. At the same time, it will also improve the value of external business support services (personalisation, customer relationship management (CRM), benchmark analytics, predictive analytics/forecasts, etc.). Moreover, a solid focus on big data and analytics will also enable partner accountants to better identify client type and the nature of tasks and determine the pricing.

Digitisation has considerable consequences for internal reporting, management accounting and financial control and for the way that accounting data can be used as a key source of information for supporting a



We previously spent a lot of time just to generate data and make clients' data digital, but the current technological and digital development allows us to spend more time interpreting data and refining and expanding our advisory services.

- Claus Lykke Sørensen, Digitisation Manager, Beierholm



If the Government wanted to introduce automated business reporting, I assume that it could be implemented in 2020-2022. Such a scheme would mainly comprise small enterprises. When it comes to class C and class B enterprises, the financial statements are too complex, and it is not possible to automate the process to any significant extent. This means that the target group can be referred to as ‘small B’.

- Carsten Ingerslev, Head of Department, the Danish Business Authority

client's basis for decisions. New technologies like big data analytics, process mining, predictive analytics and cloud computing play a crucial part in the transformation of management accounting and information systems, and digitisation and technological developments increase the value potential of this field by supporting the decision-making processes.⁵⁹ Financial statements and the reporting and communication of financial and non-financial data to the Danish Business Authority and other external stakeholders are also undergoing substantial digitisation and automation due to the XBRL standard mentioned above, which facilitates electronic data transfer between registers. Automatic business reporting is therefore one of the major challenges to SME accountants.

6.1.1 Consequences for internal reporting, management accounting and financial control

There has been an ongoing development of internal reporting and financial control activities due to the use of a balanced score card (BSC) approach for controls and the operationalisation of business goals.⁶⁰ The digital world with its new technology and new user interfaces and expectations as well as regulation and greater transparency increases the demand for information, including new control variables like sustainability, environmental impact and corporate social responsibility (CSR), which have to be included in the equation made in connection with controls and measurements. Digital processes also determine the way those issues are handled.

59 Corsi, Castellano, Lamboglia & Mancini, 2017

60 Appelbaum, Kogan, Vasarhelyi & Yan, 2017

Organisations are often rich in data and poor in information.⁶¹ There are a lot of unstructured data that may potentially improve the basis for decision of enterprises. The new data processing and data mining techniques described make it possible for enterprises and organisations to use big data to gain a competitive edge. Accountants can make use of big data mining in various ways, including for supply chain analytics, operating process analytics, risk management and the identification of fiddling and deficiencies, to reduce costs and create a competitive advantage. Over time, the audit procedure may become highly automated due to business intelligence and data mining applications, which automatically collect and analyse data, thereby releasing more time for accountants to analyse end results and make strategic recommendations.

The accounting and audit work can be viewed as a number of activities that constitute 100% of the work or a full pie when viewed in combination. Even with the Big Four, most work continues to be performed manually today. A small portion constituting maybe 5% is outsourced to countries with cheaper labour, who perform work characterised as routine tasks, whereas no more than 1-2% of the tasks are performed by robotic process automation, mainly by the use of first-generation

RPA technology. However this slice of the pie will change considerably over the next 5 years.

That will also change the role of accountants: Tomorrow's accountant will spend a greater portion of his or her time giving advice to clients about data infrastructure and analytical setup and accordingly will need new competencies within computer science, computer engineering, etc. Moreover, tomorrow's accountant will also need communicative competencies to be able to translate big data volumes to output like pie charts, heat maps and geocharts that are easily comprehensible for enterprise management. We are already seeing different roll-out strategies for products of this kind among tier 1 and tier 2 firms: Some roll out products to small SME clients as a low-risk test market and move upwards as the product quality increases, whereas others roll out products to large clients demanding that kind of services and subsequently let this know how seep down to large SME clients.

Accounting firms with data analytics, benchmark analysis and data visualisation competencies have almost unlimited potential: By using automated audit procedures, accountants can become analytics advisers to clients and cultivate the fields of customer analytics, client surveys, marketing analytics and even human resource management (HRM) and human capital analytics.

61 Sambhi, 2014



During the past 4-5 years, digitisation has made it feasible to use offshore resources to perform some of our accounting work for Danish clients. This proportion has increased every year. Today about 5% of the hours of accounting work are worked offshore, 94% are worked locally and about 1% are performed automatically by robots. There is no doubt that, in the long run, a larger proportion of the hours of accounting work will be spent abroad or performed by artificial intelligence systems and robots.

- Jesper Koefoed, CEO and Country Managing Partner, EY

6.1.2 Consequences for financial statements, the reporting and third-party products

Financial statements also have to be filed with the authorities in future. They also have to be approved according to the applicable legislation and compiled according to standards. However, the entire financial statements process, the reporting processes and potential third-party products will change, one reason being the adoption of the eXtensible Business Reporting Language (XBRL). It is a digital, open standard language for the communication of financial data. Financial data in XBRL format can be read and processed by a variety of software tools, and the use of this digital language makes the reporting process much more efficient and transparent. The XBRL for-

mat benefits in particular the recipients of financial data, including the Danish Business Authority and agencies like Bisnode, which can transfer data electronically. Like any other language, XBRL has its own fundamental grammar – the XBRL specifications – and a taxonomy. The various elements of electronic financial statements are defined by the taxonomy, and the Danish Business Authority offers a separate taxonomy for financial statements prepared according to the Danish Financial Statements Act (the ÅRL taxonomy) and according to international standards (the IFRS taxonomy). Moreover, where drone technology is used for stocktaking and the valuation of assets like buildings, financial data can be fed directly into the system using XBRL code.



You can record drone-gathered information into a software, a database, into a blockchain, to XBRL or an analytics software, which will analyze the information. But no one knows how this will work, no one – or at least very few - has yet gone through an audit using a drone.

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

Clients have the choice between asking their accountant to prepare digital financial statements and buying a system that can generate financial statements in XBRL format. Accountants assist clients compiling financial statements or advise clients on the implementation of a reporting system. In this context it will be essential to Danish accounting firms and the accounting industry to closely monitor the Danish public data and digitisation strategy and to cooperate on the fairly highly developed digital data infrastructure. The purpose is to exploit potential business opportunities through streamlining and by adding value to clients by performing benchmarking analytics for SME and mid-market clients.

6.1.3 Consequences of impact on framework conditions

Small accounting firms in particular have untapped potential for utilising data and creating business on top of the digital infrastructure in Denmark. Accounting data are accessible in the Central Business Register (CVR), and they have been free of charge since they were made freely available in 2014. The Payment Services Directive II (PSD2) opens up for access to payment services data, too. It is obvious that it requires analytical power and data processing competencies for which investments are needed, but the initial barriers to data access and data processing are quite low. Accordingly, the digital world is open to everybody within the accounting industry,

and it is mainly a question of whether competencies and mindsets will prevent the individual accounting firm from launching a digitisation process and offering data-driven audit, assurance and advisory services. It is therefore essential that that industry assumes a joint responsibility for supporting the digitisation of SMEs. It must be an objective and a political ambition that the FSR can benefit from advancing as a trade association.

In that context, it will be essential to the FSR to promote its intermediate ambition that as much data from the Central Business Register as possible become available free of charge to make it possible for its members to use the data for supporting the basis for decision and growth of Danish enterprises. Automatic business reporting is one area in which the FSR can promote the enlargement of the knowledge base of the Danish society and make it



The accounting industry has to stay updated about new platforms and systems to be able to advise clients and form the right strategic alliances. We have strategic alliances with different companies to be able to offer optimal solutions to our clients. In this way we can continue to add value to clients.

We believe that we should continue to pursue this model rather than having everything in-house. It is essential that we are aware of our competencies, but also that we know our constraints – for that reason, strategic alliances are essential.

- Jakob Korshøj, Partner and State-Authorised Public Accountant, Vistisen + Lunde

accessible to Danish enterprises, thereby enhancing accountants' growth-supporting advisory services to the SME segment in particular.

Authorities play a major role in creating framework conditions supporting a high degree of confidence to make it possible for us as a nation to utilise the potential of a strong digital infrastructure. Requirements of enterprises' data security and assurance engagements related to money laundering, corruption and fraud may become necessary in a digital global world. The accounting industry will also come to play a crucial role as a trustworthy provider of assurance services relating to cyber security, money laundering, non-financial KPIs, CSR, corruption, etc. Imagination is the only limit to the potential of new types of certificates and assurance services in the

digital world. However, legislators have to notice and understand the threats caused by the digital world to enterprises and society as such. The FSR may play a role in articulating those threats and thereby influence relevant legislation.

Regulation may also be disrupted by technology, and we see examples that major technology-driven enterprises and industries have to take the lead by a code of conduct to fix standards for the dilemmas caused by the digital world and not yet taken into consideration in legislation. It is very crucial that the applicable framework conditions and the national and international rules must abide by the standards developed by the large global organisations, but unfortunately this process has a long lead time. It may take 3-6 years to revise an audit or account-



It is essential that the supervisory authorities follow the ongoing development. It is crucial that they are part of the journey of innovative audits and the development of new methods that are not yet embodied in auditing standards.

- Jesper Koefoed, CEO and Country Managing Partner, EY



In my assessment, the main future role of accountants will be to validate many different types of data. Due to the great value of data, the future will be much more about data analytics in all aspects of business operations for both internal and external use and the optimisation of business processes. Also internal reporting and management accounting will become more prominent tasks. To be concrete, it is all about validating data on an ongoing basis, viewing analytics against performance benchmarks and automating business processes.

- Tem Vester Schnell Christiansen, Manager, Ri

ing standard. Correspondingly, the Danish Act on Approved Auditors and Audit Firms and the control functions of the supervisory authorities have been adapted to the new possibilities afforded by technology within financial statements and control. There is a big risk that the accounting firms which have taken the lead within digitisation, that is, the Big Four and the top tier 2 firms, may end up developing new methods on the basis of old rules that have not been adapted to the digital world. For example, how can supervisory authorities verify that a robot performs work in the right manner? Questions like this one show a need for pressure from the entire industry for legislation and standards.

6.1.4 Consequences for advisory services like data analytics, data- and cyber security

Extensive digitisation makes it possible to transfer focus from reactive case management to proactive risk assessment, in which context completely new services and business models also become apparent. So far, accountants have excelled in descriptive analytics based on historical data, but major progress is being made within data analytics due to the amount of data and the technological development, allowing accountants to advise on financial control and business development based on analytic insight. It is even possible to predict and prescribe the next step that a client should take based on



Small accounting firms need to grow in future. We have 25 staff members in our firm today, but we probably have to expand considerably. Because that will make us big enough to attract competencies within pensions, insurance, financing, etc. It will be hard for us to do that if we maintain our current size.

- Louis Strøm, Registered Public Accountant, Baagøe Schou

predictive and prescriptive analytics. The technology is available, but it is implemented only slowly.⁶²

There are various possibilities of new services involving digital processes or products. An example is a client who wants to market itself by its good IT processes, high IT security and good governance. An accountant may help such a client by performing assurance engagements, giving advice and issuing reports. Accounting firms may also focus on developing strong IT departments, which can validate client data in addition to performing internal data analytics. Services involving data analytics will become much more common, which also implies that all accountants must be able to use the tools when interacting with clients. It will become particularly important not to show the data used, but dynamic visual illustrations

of data and flows. There will also be an increasing need for offering compliance analytics and advice to clients to ensure compliance with legislation, in particular legislation on the processing of personal data. Moreover, advice on and assistance in the prevention of cyber attacks will become a huge market. In general, there is an expectation that even though the major accounting firms will take a clear lead in all aspects of audit and advisory services involving data, the medium-sized firms will be better equipped to stand out by having deep knowledge of specific industries and personal competencies that may be reflected in expert knowledge within a client's line of business. The very small accounting firms cannot do very much in this respect, unless they focus on niches and the establishment of broad collaboration with others.

6.2 Transformation of value chains, business models and customer journeys

The accounting industry has seen considerable consolidation in that small accounting firms have been acquired by medium-sized firms, medium-sized firms have merged and the Big Four have acquired medium-sized firms. According to the players in the industry, this is only the beginning. The consolidation will continue until there are hardly any small accounting firms with 1-10 staff members left, but only the huge Big Four and an underlying group of medium-sized firms. This process will also contribute to a fundamen-

tal transformation of the value chain. The Big Four caused a significant change in audit practices 2-3 years ago by becoming more data-driven, and this process will continue at a very high pace with the implementation of second- and third-generation robotics. According to an analysis made by the major accounting firms themselves, technology and investments in digital systems and IT/data competencies constitute the only solution to the cross-pressure between the pressure on prices from clients and the increasing demand for quality and compliance in connection with the preparation of financial statements.



The technological development will have an impact on the way that we are organised internally in the future. We will see ever greater centralisation of certain tasks at specialist and service delivery centres, where work will be streamlined and undergo automation due to new technologies like robotics and AI. That will take us far away from the current scenario with accountants who can do everything.

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

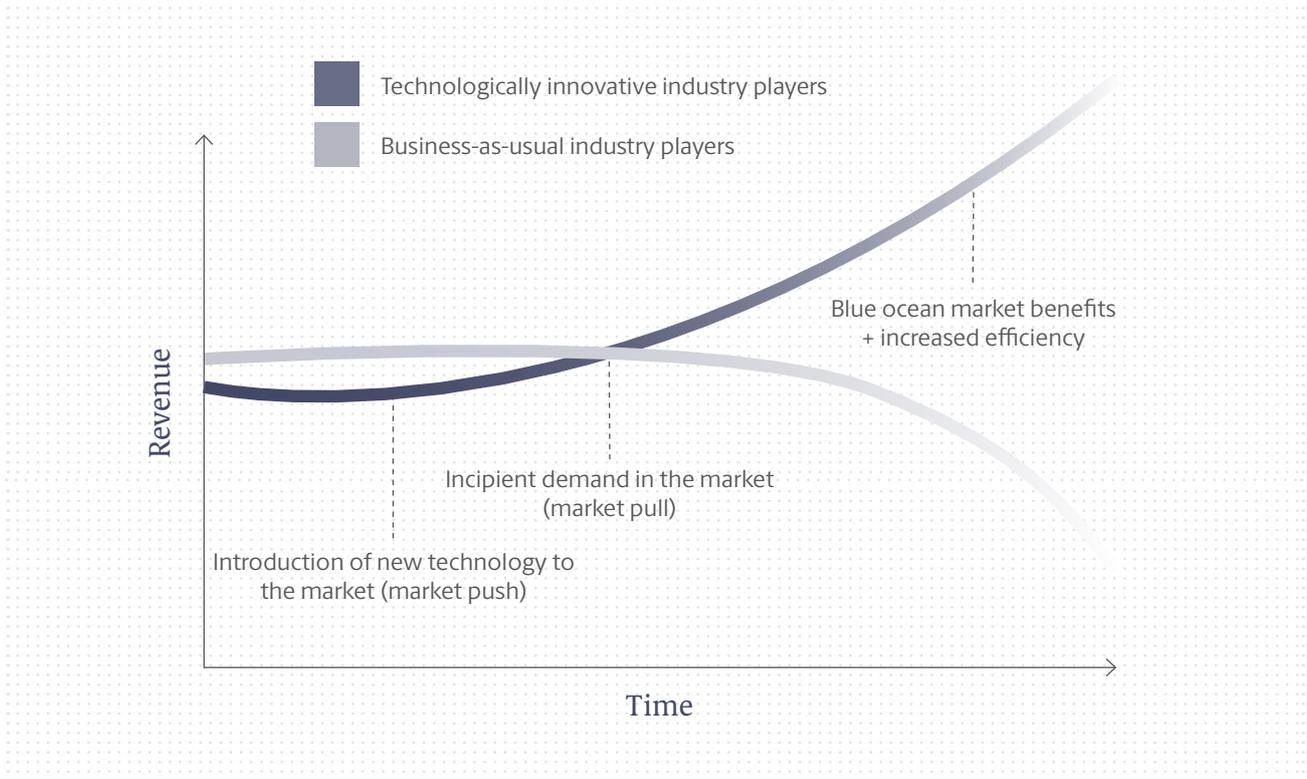


Figure 4. Simple model of the development in accountants' readiness for extensive digitisation. Initially, digitisation may not offer a financial benefit because of the necessary investments. However, those ready for technology will boost revenue over time, whereas the others will experience a downward curve.

6.2.1 Pressure on the value chain

The value chain has 3 main challenges: (1) Challenges to elements of the value chain lead to competition or collaboration in connection with bookkeeping and the new digital services. (2) The industry will lose

market shares to substituting (international) players such as e-economic or other electronic accounting systems. (3) The value chain is expanded with new service options such as risk assessment and risk analysis rather than financial reporting or health and

insurance advice, or similar options of relevance to clients, owner managers or others.

The value chain faces bottom-up pressure from fintech and digital-first enterprises such as Dinero, CrediWire, Billy, Visma and e-conomic, which take clients all the way from bookkeeping to the filing of validated financial statements with the Danish Business Authority. Various new start-ups emerge in consequence of

the PSD2. The start-ups challenge particularly banks, but also win market shares that would otherwise have been attractive to accountants, which is the case with software like CrediWire. Thus, the industry will be forced up the value chain towards the provision of advisory services to the financial sector. Accordingly, the threat assessment paints a gloomy picture as banks, management and IT consultants, and law firms also want a bite of the same cake.



There is currently a crop of new, small third-party fintech firms which supply small advanced services to supplement the audit process. I believe that we will see a lot more of those firms popping up.

- Bent Dalager, Nordic Head of NewTech and Financial Services and Partner, KPMG

If they really wanted, huge international players like Google could also go for a share of the accounting market. However, due to the low earnings potential and the individual complexity of the market, it is hardly interesting compared with the other market opportunities of those players. Among the potential newcomers, the banks are particularly interesting

as they already have access to enterprises' data and transactions, and they also have an interest in business in that field, for which reason it would be obvious for them to expand their value chain to include accounting. Law firms just need to arm themselves with financial competencies (such as Masters of Science in Business Administration and Commercial



Pretty much any firm that is involved in an advisory capacity, i.e. any sort of consulting firm, could take advantage of the massive increase in digitally available data, and the need of managements and their shareholders to understand what this information means to their business to offer services and reporting tools and analytics instead of these firms going to their accountants for this kind of information.

- Sean Stein Smith, Assistant Professor, Business and Economics department, Lehman College, NY

Laws) and develop stronger focus on digitisation to constitute a real competitive threat to and offer a substitution for accountants' fiscal advisory services. Again, it is most obvious for the big law firms to include this service. In this field, the battle is all about who has the closest relationship with the client. To accountants, the ability to introduce clients to experts and specialists becomes a necessity to an even greater extent to cement the client relationship to have strong barriers to new competition.

Accountants therefore also need skills to carry out a wider variety of assurance engagements and issue other reports than merely audit reports. These markets are already undergoing development (tax control, verification of procedures involving personal data, performance audit standards, etc.). It is likely that certain assurance engagements will be carried

out by use of blockchain technology in future – without any involvement of human accountants. That will make entirely new demands of employees: They will have to undertake not just traditional audit work, but also need to have a deep business sense and client proximity. That is very crucial also in light of the fact that an increasing number of small and medium-sized enterprises opt out of audit.

The expansion of digitisation activities also makes it possible to offer more help to small clients who face the requirement of making electronic filings with public authorities, but do not want to familiarise themselves with the digital field. Several SME owners may, however, give other players than accountants the responsibility for making data analytics and providing validation assistance for non-automated processes.

Accordingly, accounting firms can choose several ways to offer services at various levels of the value chain. They can either expand their own competencies across the board to be able to meet intruders and challengers with fierce competition. That position can be assumed only by the Big Four. Or – what is a more relevant option to medium-sized firms – they can choose their battles carefully and focus on limited strategic areas. One way to handle the pressure on the value chain posed by new players is to set up collaboration with other players who can assist with data analytics, cyber security, etc.

6.2.2 Customer journey analytics

While the value chain is being broken down and new players are winning market shares within specialised fields or are being absorbed by major enterprises, we also see an extension of the value chain. These days, more companies are able to make the necessary changes to their services and products. This includes the shift of focus from existing products to the client's perspective and experience.



I believe that in 5 years' time, I have gone from spending 60% to maybe 20% of my time doing audits. In future, I will be my clients' man, having closer dialogues with clients.

They will no longer just receive one phone call a year; rather they will receive several calls, and they will be invited to events that are relevant to them. Being the owner of a company myself, this is what I would appreciate.

- Louis Strøm, Registered Public Accountant, Baagøe Schou

Accounting firms can offer assistance for clients' (B2C) customer journey analytics. The Big Four in particular arm themselves with in-house competencies, for example through the acquisition of other consultancy firms. However, accounting firms also need to be better at mapping their clients' journeys within the field of accounting services (B2B). This mapping is in focus below.

In general, it is about a shift from mainly focusing on their own existing valuing chain to viewing a value chain from the client's perspective, in other words: the customer journey.⁶³ For that process, it is obvious that it is beneficial to assume the customer journey perspective to determine precisely clients' touch points and pain points relative to the practises and advisory services of accounting firms.



In 2016, 112,000 enterprises opted not to have an audit. As several processes are automated in future, a large proportion of the traditional services will disappear. Advisory services related to business development may become very popular in the future. Many SMEs are managed by owner-managers who might not have the relevant network themselves and who might not have received any previous support for business development. They constitute a huge potential to the accounting industry.

- Henrik Glanz, CEO, Redmark

63 Lemon & Verhoef, 2016



Accounting firms may find it difficult to carry out all business development internally. First there is always the issue of the prioritisation of resources, and it is my assessment that we also need far more external inspiration for our industry. We therefore need to have more courage to forge external partnerships and enter into collaboration and development with both existing enterprises and start-ups. That will accelerate our innovative skills, ensure agility and a shorter time to market.

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

The crucial element is awareness of clients' wishes and the company's touch points with clients, often through a partner, to be able to create relevant services. There will obviously be great variations depending on whether the clients are small or large. These differences in actual needs and actual behaviour can be mapped through customer journey analytics. When competition becomes fiercer through the use of specialised services and advice and more clients stop ordering assurance services and reports automatically, it will also become necessary for accounting firms to market themselves and to develop closer relationships with clients to solve their day-to-day challenges. A mapping of clients' real behaviour

and actual touch points will also make it possible for accountants to determine how they can attract the attention of clients at an earlier stage and accordingly become and also remain the preferred adviser. An analysis can be based on qualitative methods, but to an increasing extent analyses are based on data analytics of client behaviour to identify profitable clients' purchase and service journeys and upselling potential at relevant touch points based on data rather than the partner accountant's gut feeling.

The new services require new competencies. This is definitely relevant to the large firms, but in a few years it will also apply to medium-sized accounting

firms. The industry has always focused on the services they could provide based on standards and within the audit scope and less on the actual demands of clients and users, such as security against fraud, corruption and money laundering. Many expect such services from accountants, but throughout the history of accountancy, accountants have refused to provide such services by claiming that they were outside the audit scope. Due to the technological development, accountants also have to start looking towards new business models based on clients' wishes.

Rather than having their own products as the main focus, they have to focus on potential services to a much greater extent. As a matter of fact, this is how it has always been, and theories published in the past 10 years have confirmed this approach.⁶⁴ Competition has become even fiercer within extended reviews, reviews and assistance, particularly after the bottom of the market disappeared due to the abolition of the audit obligation. Products are never about the products as such, but always about underlying issues.⁶⁵ Insurance is not about policies, but about personal safety. And audit is not about financial statements, but about financial security. The many methods and procedures are merely means to the goal. It is easy to come up with other means, also within the framework

set out by regulations. The moral is, however, that progressive enterprises are client-centric. They pay attention to the ways that they can meet their clients' needs and not the product that was once the one and only useful solution, although it might not necessarily continue to be that forever and for everyone.

6.2.3 New types of services based on the position as a representative of the public interest

When they face pressure from the market, accountants must also be able to offer other very specific services. This report has listed several proposals, which are mainly about the provision of data analytics and additional advisory services, particularly advice on commercial and financial risks and the financial outlook of enterprises. It becomes particularly relevant to offer information and cyber security and to advise on personal data. Focus will increase on the need to describe considerable commercial and financial risks, mainly based on advanced big data analytics. This also means that accountants have to provide input to the outlook of their clients' businesses in addition to interim and annual financial reports. Accountants must also be able to give advice on procedures and initiatives aiming to prevent tax evasion and money laundering and to provide

64 Følstad et al., 2013; Lowenstein, 2014; Mason et al., 2015a; Meyer & Schwager, 2007a; Morey, Forbath & Schoop, 2015; Pine & Gilmore, 1999

65 Jordan, 2012; Leonard-Barton, Rayport & Harvard Business School, 1997



There are a tremendous number of opportunities out there for the accounting and audit field going forward over the next 3-5 years, but there will also be a tremendous amount of turmoil, as the accounting industry has to pivot and adapt and educate themselves to new tools and platforms. They have to figure out new business cases. If the accounting firms won't do that, someone else will.

- Sean Stein Smith, Assistant Professor, Business and Economics department, Lehman College, NY

assurance services and reports on good corporate governance as well as support to clients for the configuration of data systems and the development of administrative financial procedures.⁶⁶

Added to this are various options that expand the value chain and rethink the business model of audit and advisory services to comprise accounting aspects of legal, insurance and financial advisory services, including corporate finance, governance, public-private partnerships (PPPs), M&A, forecasting and predictive analytics, balanced score cards (BSCs) driven by business intelligence (BI), cyber security, CSR and sustainability/circular economy, and maybe even health care advisory services.

In principle, imagination and strategic focus are the only limits to the services that accountants can offer to explicitly build on the strong brand of the preferred adviser and the right to put a signature that conveys confidence and safety, even in a way that differs entirely from that of other management consultants and industry-specific consultants from law firms or banks. It is no doubt a strength for accountants in their capacity as auditors to have the position as representatives of the public interest, and they could utilise this position far better. Particularly for being more outgoing and for taking clients' new needs as the starting point. The purpose of this approach is not that accountants should compete on equal terms with other consultants,

66 Wilke Markedsanalyse (Signatur – medlemsmagasin for FSR) (Wilke Market Analysis published in the FSR members' magazine), 2017

but that they should adapt and offer services that build on the particular status and expertise that the other players in the market associate with auditors in their position as representatives of the public interest. The fact that accountants are subject to authority supervision is a guarantee of the unique independence and quality of accountants' work that no other consultants can boast.

In consequence of this development, generalist accountants are replaced to an increasing extent by specialist consultants, and generalist accounting firms will be converted to specialist accounting firms. We have already seen consolidations among the Big Four, which now prefer to acquire firms specialising in cyber security, marketing analytics or technology rather than to acquire generalist



In step with the data explosion, we will also see much greater focus on confidence in data. Accountants have always had the expertise to validate data, and this will unlock many new opportunities. It extends far beyond financial reporting. Many peer-to-peer solutions have been invented (like Trustpilot and Trip Advisor). They deliver validation and accordingly confidence, which is really what is the core of our profession, so we could indeed deliver such services. However, there are also opportunities at the core of our profession (financial data validation): real time validation, identity validation, etc.

- Bent Dalager, Nordic Head of NewTech and Financial Services and Partner, KPMG

accounting firms and their client portfolios. To mention an example, Deloitte has acquired 42 Associates to strengthen its unit for strategy consulting and Digicure to strengthen its competencies in the cyber security field. It is to be expected that this type of corporate consolidation of specialists will also be seen among large Danish accounting firms in the tier below the Big Four, which are also

undergoing a consolidation wave. This development will have an impact on the competencies made available and the traditional accountant's ability to identify client needs and pair clients with the right specialists with competencies to solve the individual client's needs. The range of specialist services must be expanded to make it possible to cement the client relationship.



Accounting firms have to specialise much more in the future as compared with today. Both internally at our firms, where we need to attract new competencies within information technology, strategy and management. And among accounting firms, as we have to be clearer on our profiles and what we are not.

- Henrik Glanz, CEO, Redmark

The new services also require new specialists focusing on financial law, insurance and financial advisory services, and perhaps a full-service consultancy concept comprising an in-house doctor caring about health and well-being. A concept of care. We have seen that development in particular at consulting

engineering companies like Orbicon in connection with healthcare and working environment. However, large and medium-sized accounting firms also focus on those concepts, which involve analytics used as the basis for political decisions and strategies, impact assessment of scenarios related to new concepts and



Accountants are close to their clients and have a unique position as trusted adviser. Therefore, it is highly likely that our future role will be to help clients navigate among supplier solutions and options within digitisation and automation. We will have a sub-role as a kind of tech advisers.

- Claus Lykke Sørensen, Digitisation Manager, Beierholm

organisational structures, cost analytics, rate and price calculations, the launch of development projects concerning concepts, interdisciplinarity, competencies, operations and organisational structures, interdisciplinary collaboration and interface analysis, tender process control, verification tenders, etc.

It is possible to introduce and sell new services by offensively pointing to societal deficiencies that can be remedied by services such as tax control and insolvency proceedings, identifying new things in the market that may give rise to confidence services, preparing analytics identifying commercial benefits to clients, lobbying for the introduction of legislation that makes new services mandatory (for example assurance services), and advocating the introduction of a codex stipulating who may provide advisory services within specific fields such as taxation.

6.2.4 Advisory services to new types of enterprises (circular economy, sharing economy and person-to-person (P2P))

The new Internet economy also gives rise to new digital business models, and such businesses will face various new challenges for which accountants can offer assistance. New market specialist advisory services therefore open up in tandem with the development of digital business models. These services are provided on the basis of know-how about the very same subjects. As already mentioned, a sharing or platform economy is a financial system in which the users share, offer and buy items or services from other users on a common platform, thereby optimising the utilisation of any given capacity as Uber and Airbnb do.⁶⁷ A common feature of those financial systems is that they are driven by an ever increasing dynamic user lifestyle rather than

67 Kelly, 2017; Mason, Mattin, Dumitrescu & Luthy, 2015; Ross, 2017

the ownership lifestyle of most consumers today, which is a trend that seems only to accelerate in future.⁶⁸ Moreover, the sharing economy services challenge many of the existing accounting models. The sharing economy multiplies the complexity of user situations, which may render the audit process more difficult. However, another consequence is that challenges require more complex audit solutions, which opens up for greater involvement of accountants. Again this entails accounting and legislative challenges. Basically, it means that accountants should be able to assist due to their fundamental business sense and insight into new trends.

6.2.5 Advice on information technology, legacy systems and cybercrime

IT set-up and cybercrime are major issues in which accountants are skilled. It is fairly easy to talk about all the new smart technologies. However, the challenges become real when existing IT systems are not ready to handle new data, advanced software robots and the commutation between enterprises and authorities. Most often the IT legacy, which is the existing IT set-up, is a large, heavy system developed in several steps by different suppliers and applying different technologies. This is also a problem to many accounting firms, but to an even greater extent to clients. The accountant of tomorrow has to under-

stand more than just the client's business; he or she must also have a fundamental insight into IT systems and the optimum design of automatic cloud-based bookkeeping systems and the technologies applied. It makes new demands for competencies, spanning from familiarity with spreadsheets to data capture/handling/evaluation. Many accountants need continuing education within this field.

Data security and the risk of cybercrime, hacker attacks, (industrial) espionage, malware and ransomware constitute a rapidly increasing risk to both enterprises and private individuals. It is the estimate of A.P. Moller-Maersk that the costs of the ransomware attack against the organisation in June 2017 will total between DKK 1.3bn and DKK 1.9bn. At world-level, the estimated costs attributable to cybercrime in the period 2012 to 2015 totalled between USD 112bn and more than USD 400bn according to a McKinsey report.⁶⁹ Cyber defence becomes increasingly important as more and more processes become digital and left in the hands of computers. Since enterprises already have a lot of confidential and sensitive data on both enterprises and private individuals, the focus on their own security will increase, and new demands will be made for data security within the accounting industry. However, this reality will also open up for new advi-

68 PricewaterhouseCoopers, 2016; Ravi, 2016

69 Jordan, 2012; Leonard-Barton, Rayport & Harvard Business School, 1997

sory services. Firms within the accounting industry are expected to have such competencies in-house or establish a regular strategic collaboration with other players which have those competencies, so that together they can provide the relevant services to clients.

6.2.6 Client centrisms and client empowerment

To put it boldly: Previously we saw a trend among accountants to lean back and wait for clients to bring their financial statements and ask for evalua-

tion, validation and audit. And then charge a fee that was seldom challenged. Clients no longer come in the same way, and accountants are facing a strong price pressure. There is no doubt that this will also lead to greater focus on clients and their needs as described in the section on customer journey analytics. There have also been specific examples that have, strangely enough, not yet had an impact. If this situation is compared with that of the banks, to mention an example, their front-office processes have become digital by the use of mobile services with user-friendly interfaces based on the tradition



At EY we currently have about 25 employees in a Nordic hub tasked with retrieving data, ensuring uniform data and refining algorithms, robots, custom analytics, etc. It started out being almost a ‘garage project’ which involved 2-3 staff members. However, since our organisation has been willing to adapt and has craved for making use of new analytics, the unit has grown to have 25 employees today, and we expect to double the staff over the next 12-18 months.

- Michael Groth, Partner, EY



We are dedicated to creating a digital mindset and an innovative environment in our firm. We give this high priority, and we invest, for example by allocating resources for inviting staff members to internal competitions, training sessions and workshops at which they are offered the opportunity to play with huge data sets and new tools to develop useful everyday solutions. Solutions that may contribute to making everyday tasks easier, while also offering new business opportunities. To mention an example: We had two young employees who combined data from different systems to find the data stored in the hotel industry that hotels need to be aware of when the new General Data Protection Regulation enters into force. Our suggestions were very well received by the industry.

- Christian Fredensborg Jakobsen, Partner and Assurance Manager, PwC

created by American services (such as Facebook) that are used by everybody today. New software like Billy is based on the same logic, and it puts extreme pressure on the market. The fundamental approach is that clients like being able to do things themselves rapidly and on their mobile devices –

not least to save money. Systems just need to be user-friendly and offer a wide range of automated processes. As soon as a digital banking solution (such as MobilePay) with 24/7 account updates is launched, it will be beneficial to the industry if it is a solution owned by the accounting industry.

6.3 Radical organisational transformation of mindset

6.3.1 Agility, creativity and an MVP mindset

Companies with dedicated focus on developments have also welcomed new innovation methods that were previously uncommon in the accounting industry. Rather than focusing on heavy long-term processes, agility, iterative processes and the development of minimum viable products (MVP)⁷⁰ also form part of the reality of tomorrow's accountants. Major firms in particular have acted in consequence of this development and have set up laboratories/hubs for special teams to focus on quickly developing new digital products and processes and make

quick tests. To mention an example, Deloitte has a team of researchers in San Francisco who focus exclusively on disruption. The staff of these hubs have profiles that have never previously been teamed up together. This also means that the basis of recruitment must become much wider than today. The Big Four have focus units in Denmark and Scandinavia.

However, the need for innovation and product development puts accountants in a dilemma between being agile, innovative and having a short time-to-market of new services while at the same time having to live up to clients' expectations of stable and secure operations. It is also about attracting new competencies, and therefore several account-



The big four are trying to seem very ahead on these new technologies, and they're ahead on the advisory side, but they're actually lacking on the engagement side and assurance side. The reason is that it's very competitive.

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

70 Kelly, 2017; Mason, Mattin, Dumitrescu & Luthy, 2015; Ross, 2017



We have to be innovative; but we should not only ask clients what they want. Because they do not always know. Instead we have to surround ourselves with the brightest people and be able to meet clients' deepest needs, which they might not even be able to express themselves. We do that by investigating the technological possibilities, particularly robotics.

- Bent Dalager, Nordic Head of NewTech and Financial Services and Partner, KPMG

ing firms will, to a certain extent, face a dilemma in future regarding their permanent identity and their employee branding.

Many accountants have used creativity to guide clients through myriads of rules and obstacles that they have encountered in connection with their business operations. However, they have done so as external auditors and not as business strategy advisers. When describing an accountant's role, most people usually come to think of audit, financial statements and figures. It is necessary to expand the scope of the innovation process to include new business model and services.

Tier 1 and few tier 2 firms work strategically with development environments and incentives to further creativity and innovation performance combined with detailed knowledge about markets and clients from

partner accountants, the accounting department and the marketing department to develop go-to-market plans for new products. The IT and HR departments also have essential support functions in this innovation process. However, the industry is divided when it comes to how much and how to listen to clients in connection with the innovation process. Tier 1 firms copy the innovation strategies of the big innovative companies and innovate on the basis of existing technological opportunities that may 'potentially' satisfy a need. On the contrary, tier 2 firms are highly aware of client analyses and surveys and attempt to tailor simple low-hanging fruits for the SME market. Due to their economies of scale, tier 1 firms have the innovative advantage that they can tolerate an unprofitable market penetration period at an early stage of a new product that clients are not ready to pay for. Tier 1 players can endure an unprofitable period until clients catch sight of the product and create a market

pull for the product. In this way tier 1 firms gain clear blue-ocean benefits as compared with tier 2 and 3 firms, which pursue a more follower-like innovation strategy according to which safe and tested products are launched in well-known markets to satisfy defined needs. The benefit of their innovation strategy is that it carries a low risk. The drawback is that clients do not develop, and tier 2 and 3 firms therefore risk that tier 1 firms will also win the large SME clients who come to appreciate the value of the new services. In the early phase of a new product introduction when tier

1 firms have the experience of selling a potentially high-value product at a low price to the market, those accounting firms are forced to concurrently implement internal automation to streamline activities and increase the contribution margin. At the same time they develop their skills in using machine learning and data analytics, and these skills can be used to offer services that add more value to clients. In other words, their innovation processes are market-driven, but in an entirely different manner than with tier 2 firms and to a small extent also with tier 3 firms.



I believe that the major challenge to many players in the industry is to dare test new solutions. We must have courage to make mistakes, even in a partner-owned firm.

- Christian Fredensborg Jakobsen, Partner and Assurance Manager, PwC

Several tier 1 and tier 2 firms apply pilot testing to quickly test new tools and products and, if they fail, to improve them and re-test them. It is challenging to implement this fail-fast culture in the accounting industry due to its traditional zero-error culture. Accountants are used to having to guarantee and assure the infallibility of information, but

the use of minimum viable products (MVP) and innovation will be a barrier that accountants have to overcome if product developments and accordingly competitiveness and added value are to keep up with client needs, the technological development and competition. If you want to develop, you also have to fail.

6.3.2 Challenges to firms caused by the partner incentive model

Even though it is entirely unavoidable for accounting firms to undergo a comprehensive digital transition process and a transformation of their way of doing accounting business, it is far from certain that it will be a straightforward transition process. The

partnership model has inherent structural problems that will affect the small and some medium-sized firms. Resistance to change is quite well described in organisational literature. However, challenges applicable specifically to accountants have also been pointed out. Partners of small and medium-sized firms have a propensity to not understand technol-

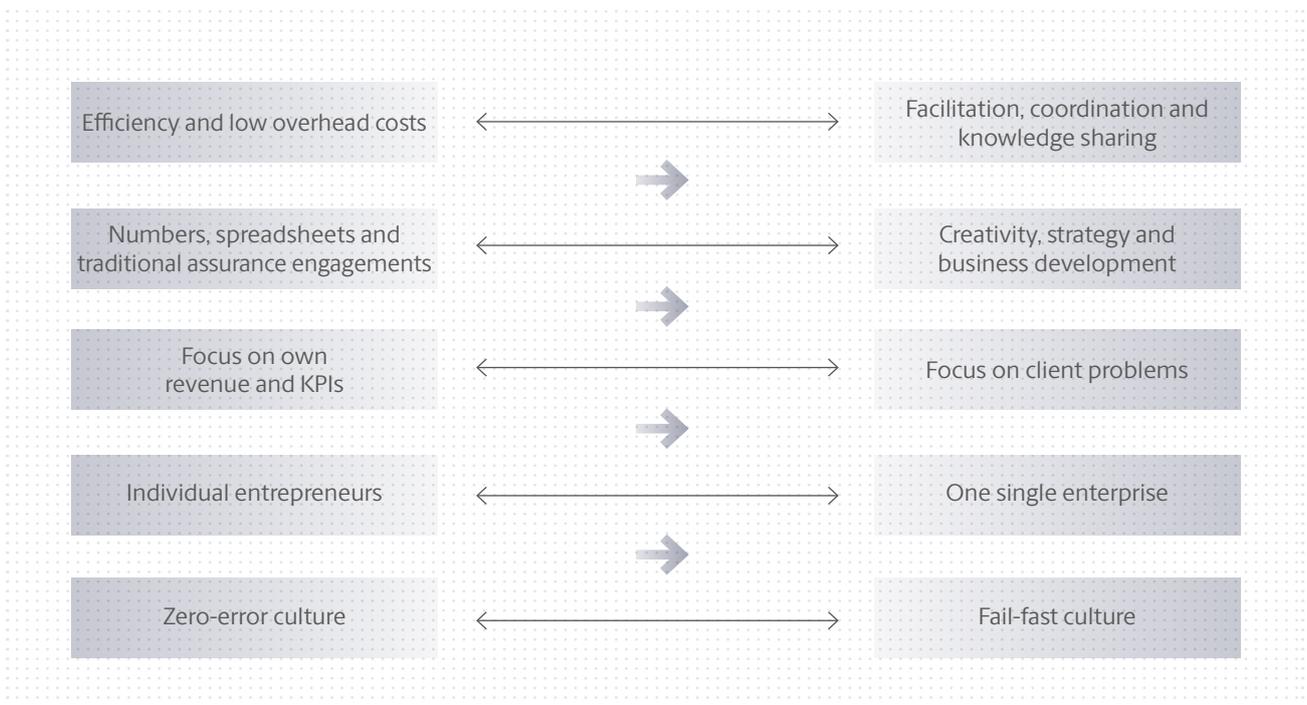


Figure 5. In general, accountants have to move a bit from the left side of the figure to the right.



Although it has been tested, much of the software that will be rolled out over the next couple of years will have errors or limitations that will not make all clients happy. That is part of the game: Innovation/new solutions/systems often have errors. As accountants we are used to drawing a double underline under balanced results and to validating and guaranteeing that information is correct. It is hard to accept errors when the traditional role has been to ensure no errors. We need to find a solution to the challenge of combining the zero-tolerance approach of professional accountants with the roll-out of new systems and the use of new technology in order to pursue the technological potential.

- Stig Holst Hartwig, CEO, BDO

ogy entirely and to believe that it will not have any major impact on their clients and their field of work for the period until their retirement. For that reason they have no fundamental self-interest in making the necessary strategic decisions on digitisation, and accordingly they do not want to fund the required large investments in information technology and competency improvements. A shared culture and shared values as well as hard financial incentives

and soft appreciative incentives are the tools required to transform a partnership business into a business model that is resilient in the digital world. The Big Four do not face the same severe structural challenges as they have already made the choice of pursuing the path of digitisation and advisory services. However, according to their own representatives, it may be just as hard for accountants' clients to implement and apply those services.

6.4 New accountancy competencies

Due to the new working methods and working conditions, accountants have to learn how to apply new business models (including IT-based models), business procedures, analytics, risk, strategy, value chain analytics, processes and product development, blurring of sectoral boundaries, etc. And they need to have a bet-

ter understanding of and be skilled in applying data analytics and information technology, machine learning (pattern recognition), IT auditing, the IT environment, IT systems and the use of information technology, control environment/systems, personal data, cyber security and accounting systems. At the same time, it is necessary to understand and interact with clients' data



To many firms, the major challenge may turn out to be their composition of partners. It is common among firms to have quite a few old partners and maybe some young ones who have just been admitted into partnership. Old partners often focus primarily on taking out profits from the firm, whereas young partners are more inclined to invest, for example in new solutions and new technology, because they take a long-term approach. That is a challenge to the industry. In future, it is necessary to focus much more on development, particularly at partner level.

- Louis Strøm, Registered Public Accountant, Baagøe Schou



When digital transformation is a burning platform, some will get away safe and sound, others will get burned. Due to the financial model of minor partner companies, they have to be severely burned before they start to move. Even the big firms find it hard to make implementations because of reluctant partners who find that particularly their clients are not there yet.

- Jesper Jarlbæk, Chairman of the Danish Business Angels (DanBAN)
and former Managing Partner, Deloitte

and IT systems. We have different views of the way that the interaction between machines and humans will change in step with the technological development and digitisation. However, quite a few tasks will shift from being interaction between accountants and clients to being accountants' interaction with robots and clients' interaction with robots through computer interfaces. At the same time, a need will emerge for the monitoring and handling of errors, changes in plans and more complex and unstructured tasks. In general, the technological development will give rise

to a change in tasks and the competencies required of accountants – but also of their clients, who must be trained in making use of the new systems.

The technological development will continue and the level of digitisation will increase with all accounting firms and all clients (although at different pace). The long-term consequence is that the value of digital, IT and data competencies will decline relatively, and one day they might become a must-have minimum standard. For that reason, the need

73 Kelly, 2017; Mason, Mattin, Dumitrescu & Luthy, 2015; Ross, 2017

for soft and social skills in connection with advisory services will increase even further in future as they will become the decisive differentiation parameters. We will also see an increased need for human presence to avoid a future that is entirely driven by digital processes. Clients need real humans as their

advisers. Increased digitisation may potentially also lead to a greater physical distance to clients. Accountants therefore have to find new ways to ensure their presence with clients. Accountants need proximity, human skills and knowledge of the trade to retain clients and give advice 'all the way around'.



We have to admit that competency improvements are needed when the traditional services disappear. The digitisation makes it imperative for us to improve IT skills and become better at mapping potential ways of product development together with clients.

- Henrik Glanz, CEO, Redmark

Therefore, the digital era will also call for the revitalisation of all other activity fields of a WW accounting firms that cannot be made digital: human resource management (HRM), the service culture, values, the management culture and branding, which only

become more and more important in the long run. These are also the fields in which accounting firms can create unique value, stand out from others and create an edge over competitors that they cannot just copy the following day.

74 Research Committee of The Institute of Chartered Accountants of Scotland (ICAS), 2016



We must be able to advise clients about the existing platforms, systems and software. We must assume the role of co-ordinators and advisers when clients are about to implement new systems and integrate data from old systems. We usually know clients' ERP software better than themselves, and we know their preferred business procedures. The accounting industry has great potential if we advise clients about those matters.

- Jakob Korshøj, Partner and State-Authorised Public Accountant, Vistisen + Lunde

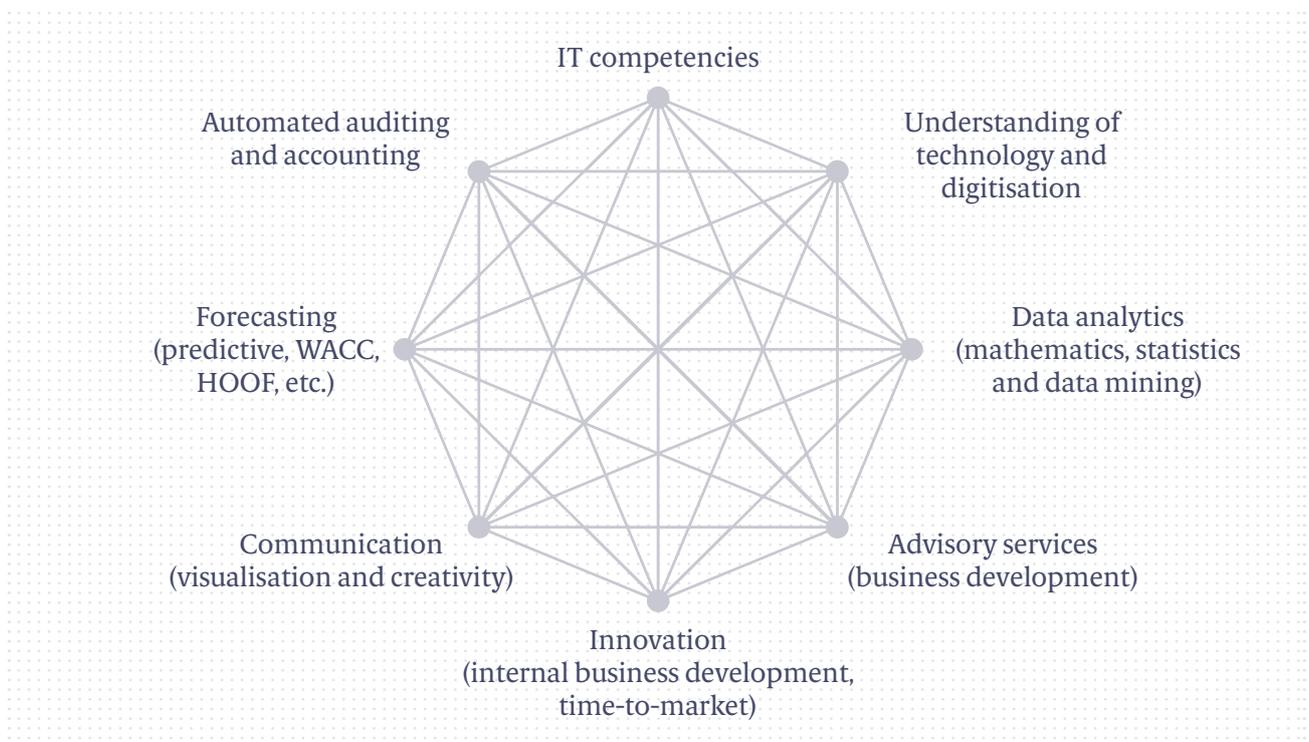


Figure 6. Diagram of new types of competencies that accountants are expected to have as well. No accountant can or is expected to get a high score on all parameters, but at least the big accounting firms should have a full range of accounting qualifications.

The major accounting firms have for a long time been dedicated to an extension of the range of competencies, such as an understanding of different industries. To mention an example: PwC offers the possibility of meeting with a former city manager and a former social worker at the initial client meeting. Due to the extensive digitisation, several players of the industry have now started to look beyond the industry when headhunting new talents. Accordingly, it is a consequence of the digitisation that for a long time managers have challenged the conventional perception of sectors when recruiting new

staff members. One example is that they are now hiring programmers, software developers and user experience (UX) designers. Accountants must be able to apply new methods for existing tasks. One consequence is that they are required to develop new qualifications within the understanding of electronic accounting and auditing tools and processes, big data and analytics. Accountants need to have an understanding at a commercial level and with an application approach without exactly becoming programmers. At the same time, new assignments are being introduced, the consequence being that other



Competencies constitute a challenge. Few accountants skilled in information technology, typically specially trained IT accountants, do not suffice. All accountants must be comfortable talking about and providing services adapted to a digital context. That is particularly challenging to senior accountants, as they often need a new mindset and competency improvements. However, it is also highly challenging to the educational institutions as they have not adapted in tandem with developments. And it can only take too long to adapt.

- Thomas Hofman-Bang, CEO, KPMG



We have been used to having a very homogenous group of employees in the accounting industry. However, in the future we will need more people who specialise in innovation, business development, digitisation, data processing, analytics, etc. That will be crucial to keep up to speed with developments. It will also rub off on the accountancy study programme at which it becomes necessary to focus attention on new competencies.

- Christian Lehmann Nielsen, Audit Innovation Leader, Deloitte

graduates than individuals with an MSc in Business Economics and Auditing should be allowed to sit for the examination to become public accountants.

6.5 Requirements of new educational profiles

The study programmes must offer students an insight into digitisation trends, technological developments and new business models, and value chains as well as new types of risk, transformation processes, etc. affecting accountancy activities. They must learn how to apply new business models (including models based on information technology), business procedures, analytics, risk, strategy, value chain analytics, processors and product development, the blurring of sectoral boundaries, etc. And

they need to have a better understanding of and be skilled in applying data analytics and information technology, machine learning (pattern recognition), IT auditing, IT environment, IT systems and the use of information technology, control environment/systems, personal data, cyber security and accounting systems.

At the same time, a need emerges for having the ability to understand and interact with corporate data and IT systems at enterprises, and there is a need for monitoring and handling errors, changes in plans and more complex and unstructured tasks. In general, the technological development will give rise to a change in tasks and the competencies required

of accountants – but also of their clients, who must be trained in making use of the new systems. It is very crucial that students enrolled in these programmes are introduced to those subjects and are given the opportunity to study them while at school. In consequence, the educational programme has to be made more flexible. One way of achieving

flexibility is by striking a different balance between the examination to become a public accountant and the continuing education offered to accountants. Accordingly, the examination should have more focus on the core tasks that accountants are expected to solve by use of their new competencies (also to make it possible for other graduates than individuals



Today we mainly recruit individuals with an MSc in Business Economics and Auditing. Those who graduate today have basically been taught the same subjects as I was taught before my graduation in 1989. Students ought to be taught more information technology and data analytics. Accountants need not have the skills for programming a robot, but they need to understand data analytics, master and navigate new technologies. At the same time, we are now recruiting new staff among a wider group of people, especially individuals with a more technical profile who are educated within science, technology, engineering or mathematics (STEM subjects); and we will see an expansion of this staff group in future.

- Jesper Koefoed, CEO and Country Managing Partner, EY

awarded an MSc in Business Economics and Auditing to sit for the examination to become state-authorised public accountants).

Tier 1 and tier 2 firms point to a need for a basic undergraduate programme. Persons with an undergraduate degree subsequently have to specialise either through a traineeship or a specialising track at graduate level. As already mentioned, the basic level of IT competencies should also be raised so that all accountants must have earned a certificate in IT user skills or a certificate in information technology. The problem is that this is anything but a quick fix, and the industry needs the competencies now; the technological development will not wait.

Accountants must also use continuing education more progressively to remain updated on accounting, commercial issues and the technical/digital development, but also to make it possible for the individual accountant to specialise. The study programmes have hardly changed in the past 20-30 years; still students must be given an insight into digitisation trends, technological developments and new business models and value chains as well as new types of risk, transformation processes, etc. affecting accounting activities.

It is also necessary to change focus at the educational institutions from learning by heart to project work, casework and traineeships. Software robots

are not yet highly advanced, but in a couple of years they can more than calculate; they will also be able to give answers to many questions, and many operations will be automated. The purpose of study programmes will therefore no longer be to train students in making calculations, preparing financial statements and adjacent subjects, rather students should focus to a much greater extent on strategic insight. Core competencies within economic and accounting flows, taxation and fundamental company law continue to be relevant, but in future these competencies have to be viewed as elements of interactive learning processes and of ongoing project work and casework. Traineeships offer the most relevant learning. Therefore, it is necessary to consider the length of the study programme relative to the length of the traineeship and balance those elements more carefully and take into account the specialisation that accountant trainees make during their education and training. It is necessary for the whole industry to join forces and authorise the FSR to take initiatives that may influence the schools of higher education to focus more on technological skills.

7. Potential directions for accounting firms

The accounting industry has a very unique position in Danish trade and industry. Accountants are as significant to the Danish economy as general practitioners to our health. Accountants are more than advisers; they provide assurance of the correctness of data and of the reliability of financial and other results creating our future. People therefore listen attentively to accountants, and this position obliges. It also offers a huge potential for taking Danish trade and industry into the digital age if the opportunity is seized. This applies to both small and large enterprises, traditional and young challengers. It is necessary to consider all kinds of programmes to develop Denmark. However, the individuals who actually see hundred thousands of enterprises from the inside and who are in fact taken seriously are accountants.

Denmark is characterised by taking the digital lead. Danish legislation is rather open, as is also the Danish data culture (compared with that of countries like Germany), and the public sector is at an advanced stage of digitisation of several financial systems and data filing systems. As a matter of fact the advanced public sector digitisation is putting certain pressure on Danish SMEs. Denmark is a small country with a homogeneous culture. The country has a robust digital infrastructure, a highly devel-

oped IT infrastructure and accordingly access to fast cloud servers and a population of enterprise managers who are generally very focused on digitisation and have high IT competencies. Moreover, a lot of data are already digital.⁷⁵ For those reasons, Denmark has generally very good prospects of being a front runner in an extensive digitisation, and there is every reason for the accounting industry to take the lead and connect to the Government's vision of Denmark as a digital front runner.⁷⁶

Even though the Big Four are international players and rooted in the USA, the home of glittery reports on digitisation and technology, they may not constitute the first context in which innovative functions like fully automated processes are in fact implemented with clients. Many accountants have described how a lot of paper is being carried around at their headquarters in the USA. A possibility is to make an overall strategic initiative for the entire accounting industry in Denmark or in all the Nordic countries which would directly challenge the other major players of the banking and legal sectors and not least arm the accounting industry for digitisation by testing a wide range of new digital services. Or put simply, to make Denmark a digital hub focusing on joint, relevant, non-client-specific standards and solutions and frameworks for statutory ethics requirements and

75 European Commission, 2016; European Commission, 2017

76 Digitalt Vækstpanel (the Digital Growth Panel), 2017

located in close proximity to the development units of tier 1 and tier 2 accounting firms, which could then use Denmark as best practice and, in that way, serve as the engine pulling the rest of the industry.

Denmark has great potential in becoming the global innovation hub of the accounting industry. We have all the qualities that make it feasible for the accounting industry to undertake and undergo an extensive digitisation. However, capital and talents are more scarce resources in a small country. In this respect, the industry and in particular the Big Four, including upper tier 2 firms, could act together and utilise this digital front-runner position, for example to support the establishment of a best-practice data and digitisation hub that could attract investments and highly-skilled staff from international networks. The front-runner position would also make it possible to apply and widen out the new data-driven and digital services to the upper and lower SME markets, which continue to have a great unresolved digital potential, thereby strengthening the decision-making basis and facilitating enterprise growth.

In any case, the accounting firms with the intention of embracing the technological trend need to take advantage of economies of scale, an international network, volumes and financial strength (the Big Four) or otherwise collaborate well with other stakeholders about the services they cannot offer themselves. Accounting firms can basically go digital in 4 different ways:

1. Make their own activities digital (internal streamlining)
2. Offer systems to clients (such as portals and tools) (providers)
3. Optimise their process cooperation with clients on data analytics, etc. (client contact)
4. Give advice to clients on precautions against risks like cyber risks (products)

To accounting firms this means that there can be 3 focus areas for the next 5 years:

- The development of their own analytical competencies relating to new technology and, in particular, a body for the collection and application of data that can form the basis of analytics, advisory services and recommendations. The main players are large and medium-sized firms. It is a prerequisite that they develop the relevant systems and make them even more intelligent.
- The sale and/or servicing of platforms that clients can use for their own audits as well as services related to particular challenges such as outliers and errors. It is a prerequisite that they understand the systems and can provide advice on the systems.
- Expansion of the product portfolio towards other types of assurance engagements and advisory services. It is a requirement that they are innovative to earn the status of preferred adviser. In this respect, the FSR can and must play a part. Accounting firms have a stronger foothold in the market if they have common standards for new assurance engagements.



I think there's going to be a shrinkage in the small and midsize firm marketplace eventually. Because the large players will dominate (USA). And you need to think ahead about that. Are the clients going to survive in the long run if they're not technologically sophisticated?

- Deniz Appelbaum, PhD, Assistant Professor, Accounting and Finance Department,
Feliciano School of Business & Montclair State University

7.1 Examples of best practice for tier 1 firms

- Invest in technology and develop go-to-market strategy to enhance clients' execution of relevant business technology
- Analyse customer journeys and offer broader services and products. Develop data warehouse architecture competencies to support clients' business intelligence
- Establish cooperation with new players specialising, for example, in artificial intelligence (AI) and machine learning in connection with document scanning
- Develop dashboards, real-time tracking and predictive analytics (and even more important: Maintain a test market)
- Have the fastest time to market: Develop the fastest process from idea generation over pilot testing to go-to-market plan
- Invest in drone technology for stocktaking

7.2 Examples of best practice for tier 2 firms

- Use the close links with SME clients to cement the client relationship by providing as many relevant services as possible
- Implement trial-and-error/fast-fail processes and pursue a culture of betterment. Get more innovation, new services, pilot testing and short time-to-market
- Have transparent reporting of both client portfolios and the leads created by the individual partners across the firm. Reward lead referrals thorough financial and soft incentives and align the culture and values to make an organisation that delivers the best results to clients and not the best rewards to partners
- Make an analysis of clients and investigate the need for technologically supported advisory services among SMEs and mid-market enterprises
- Obtain consent for and develop benchmark models based on the internal database in XBRL format for use in connection with advisory services to clients

- Make partners have the courage to use new solutions (culture, incentives, learn to use)
- Invest in big data software (for example R and Python and social media analytics tools), data and process mining tools, and in education and competencies in using the software and tools for advisory services. For example integrated with balanced score cards (BSC)
- Give employees simple training in asking clients the right questions and becoming curious about their activities to identify new needs and match solutions to their needs
- Create an innovative culture through (1) mandatory courses, (2) idea competitions and rewards for ideas (particularly among young employees with a digital mindset) and (3) a large-scale financial development pool
- Map competencies and weaknesses (no competencies), define competency gaps in weak fields and either establish cooperation with new players specialising in, for example, artificial intelligence (AI) and machine learning in connection with document scanning, or develop the relevant competencies in-house
- Develop predictive analytics competencies and systems
- Use client data to identify new client needs combined with knowledge sharing and collaboration models across functional units and specialists/ specialist teams
- Invest in audit robots to be able to take part in the competition for audit, accounting and assurance

engagements and deliver services at competitive prices, and streamline activities to put focus on advisory services

- Consolidate businesses to create entities with new expert units (lawyers, finance, investment advisers, etc.)
- Automate processes using existing software

7.3 Examples of best practice for tier 3 firms

Accountants with many years left on the labour market who work for very small firms ought to look for ways to increase their competencies, improve their field of specialisation and collaborate with other enterprises to be able to better match clients' needs. Some of the recommendations are:

- Use the close links with SME clients to cement the client relationship by providing as many relevant services as possible
- Identify a few positions in the value chain (for example user interfaces, client contact and services, or lead identification), intensify endeavours and achieve unique differentiation
- Expand the value chain to include personal legal advice, personal financial advice, and financial and insurance advice provided together with other players
- Pursue a clear niche focus strategy by aiming at a very specific small industry
- Utilise in a better way existing options of free access to publicly available data like the Central Business Register (CVR). Develop on top more data-driven advisory services and offer clients business devel-

opment advice based on benchmarking analytics. If combined with focused industry knowledge that makes it possible to advise clients on best practice within their specific industry, this approach can be a strong, value-adding asset

7.4 The future role of FSR - Danish Auditors

It is paramount for the FSR to ensure that all accountants in Denmark are offered the necessary education and competency development and that the extensive digitisation and requisite transformation are considered a comprehensive challenge. Currently, focus is required, and later on also an ongoing effort, to maintain the aim of ensuring that the industry will also be based on professionalism, competencies, ethics and credibility in future. Therefore, the aggregate mixture of competencies within the industry must be up-to-date. It will be essential to have the potential to influence regulations and frameworks to facilitate the activities of accountants in a digital world, to make visible what the accounting industry offers, to develop and promote new reporting methods, to offer courses and continuing education focusing on digitisation, to promote the accountant's role in automated reporting of accounting and fiscal data in future, to facilitate the sharing of knowledge on technical products and solutions like CaseWare, to render visible specific technologies and to position accountants as experts on data and technology.

The future accounting industry should be characterised by its ability to offer confidence in digital busi-

ness data, support Danish trade and industry with valid business data and to be the preferred supplier of business data and data analytics to enterprises. Looking onward, it is likely that accountants could choose as their defined line of specialisation to become an IT and business process accountant, a risk accountant, a tax accountant or a finance accountant. It is also likely that the industry will be centred around a common business economics field with business/technology convergence and in which all advisers and possibly also all employees working with future value creation have a common hub of competencies and professional knowledge as well as a mutual perception of identity and career structure under the common umbrella of political lobbyism and regulation.

It is therefore unavoidable that the extensive digitisation will influence accountants' self-perception and identity. The core of that identity (as representatives of the public interest) is accountants' ability to use words that carry more weight than those of other consultants. And that will continue to be a major asset in the digital world. In future, accountants have to market themselves as experts in business creation transformation projects – without having a statutory preferential position. That will topple the accounting environment, in this case the FSR. First and foremost by inviting into the field far more competencies and accordingly also several new players. This includes the acquisition of enterprises and the employment of a substantial

number of data analysts and IT business developers by accounting firms. If these members were to become those generating the largest earnings and values, would it then not be right to include them in the landscape of the accounting industry? The advisory competencies of the large firms already comprise a broad range of teams composed of as many different profiles as micro and macro economists, tax and marketing experts, UX designers and data specialists recruited in direct competition with a broad range of IT management companies spanning from McKinsey to Netcompany.

The advisory services provided to medium-sized and niche enterprises will have to be adapted and industry-focused to a much greater extent. It is more important to offer specific skills (such as transfer pricing) and to be familiar with the financial and value flows of a specific industry and have a digital understanding of its customer journeys (be it sea logistics or bicycle imports) than to master accounting in general. In this segment, accounting will change from being the point of admission – today adding up to more than 50% of revenue – to constituting a much smaller proportion of revenue and accordingly of the self-perception at those accounting firms. From an objective perspective, an accountant who can reprogramme and adapt an SME client's bookkeeping software will have greater value than an accounting partner who used to create value by performing assurance engagements on financial statements that are today already

considered to give a fair representation due to the blockchain technology applied. Therefore, if the title of accountant is to continue to represent any value, which it ought to, then it must be reinvented. Because confidence is also based on the entire digital set-up, not just because a single person has graduated as an MSc in Business Economics and Auditing and has subsequently been awarded the title of partner.

Thereby, the joint landscape of accountants and accounting houses will change. The landscape has already changed very quickly from being a profession of registered and state-authorised public accountants (version 1.0) towards an industry landscape of large and small accounting houses fighting for common framework conditions for audit quality and more advisory services and assurance engagements (version 2.0). Now it will be overlaid by a landscape or network of all suppliers or firms creating software or offering advisory services in the large market of financial or commercial services for trade and industry (version 3.0). They could span from tech start-ups over finance automation and tax advisory companies to cybercrime firms and drone certifying corporations and not least a number of new partners and competitors within the full range of advisory and verification services.

One of the consequence to the trade association of accountants is that the FSR will have to represent a multifaceted array of interests. From being the link

to the public use of data and services to defining the framework and ethics for verifications, etc. At the same time, it could also unify more interests and alliances. New university studies with data-related components adapted to the new conditions could be created at universities from Aalborg University in Northern Jutland to the Danish Technical University North of Copenhagen. Analytics could also be made about subjects like the digitisation readiness of the Danish business sector, which would be conducted together with think tanks and digitisation-ready trade associations spanning from IDA, the Danish Society of Engineers, to the Danish Chamber of Commerce, and from Finance Denmark, a business association for banks, to the hub of the HK, a union of salaried employees. An option is to enter into media collaborations to profile trusted advisory service providers in a range of media from the financial newspaper Børsen to the web media Bootstrapping. In the end, the essential discussion to be taken by the FSR is not whether in-house accountants or external auditors are the right members of the association, but whether it should not be so that everybody whose job it is to improve growth and the financial situation of Danish enterprises from start-ups over SMEs to international enterprises should be under the network umbrella.

An extensive digitisation is an extremely hot burning platform in the industry, and it fits almost too well to the potential options offered by digitisation and automation. Large companies have taken action

based on the burning platform in the last couple of years, but many medium-sized and very many small enterprises are still feeling too comfortable to sense the heat. This report will hopefully push forward the good budding processes to move the industry even further from talking to taking action and thereby make the industry better equipped with strong businesses that will make Denmark a first mover in this field and will make accounting firms the first ones to take in all the new prospects.

8. List of respondents

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The authors and the comission to write the report

The assignment to write this report was comissioned by the FSR to identify how the prospect of extensive digitisation is perceived by members of the association and by national and international experts. The report aims to create a common understanding of future developments and prospects in the industry and to serve as the basis for a debate intended to identify the future initiatives that the

FSR is to take to create the best platform for the digitisation of accounting firms. The report builds on interviews with representatives of the accounting industry and experts. It is also based on team members' expert knowledge and a comprehensive overview of technological developments and business strategies. Nextwork, an innovation company, was tasked with writing the report. The authors are:



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