Horizon Scanning Series

The Effective and Ethical Development of Artificial Intelligence: An Opportunity to Improve Our Wellbeing

Artificial Intelligence: A Brief Overview of Use and Potential in Financial Services

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Artificial Intelligence

A brief overview of use and potential in financial services

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Summary overview of the sector and the role artificial intelligence may have

Technological developments have always played an integrative role within the deployment of financial services. Within the past decade the emergence of FinTech has been creating a cohort of novel and innovative offerings leveraging technological breakthroughs that enable an evolutionary transformation on business models, business processes, value chain restructuring, along with, redefinition of new waves of value creation and value capture strategies (Chui *et al*., 2015), generating both opportunities and challenges, especially within a highly-regulated and fiercely competitive landscape (He *et al*., 2017). Moreover, the adoption of open, collaborative, distributed and network innovation approaches has led towards the opening up of the innovation lifecycle providing numerous opportunities for active technological exploration within this new FinTech area, leading to combinations that would normally be perceived as totally unrelated (Salampasis, 2015).

In this context, a very interesting umbrella of approaches is being led by the gradual introduction and adoption of data-focused technologies and in particular AI-enabled (artificial intelligence) tools within the core functionalities of the financial services sector translating them into new services, products and processes with potentially transformational or even disruptive outcomes (Makridakis, 2017). These approaches have been mainly encouraged by the exponential growth of large sets of customer data (Dewhurst and Willmott, 2014), along with, big data and cloud computing. This analytical complexity is paving the way towards the need for automated support in terms of better data-driven decision-making processes (identification of sophisticated inferences and patterns within data), customer-centricity in terms of enhanced personalized customer service and engagement, improved compliance and maximized operational efficiency, facilitating the development of intelligent financial services via new models, architectures and systems.

In simple terms, Artificial Intelligence (and its key sub-categories of Machine and Deep Learning), contrary to natural or human intelligence, is the machine-executed cognitive and

intellectual potentialities displayed and demonstrated by non-human forms of life that tend to show learning, "common-sense" reasoning, problem-solving and, in general, human-mind processing capabilities simulating certain attributes of human thinking and biological evolution. These processes are based on complex computational and algorithmic combinations, along with, statistical and mathematical models, that can enhance themselves by learning through existing and new heuristics (without necessarily being programmed) and adapting themselves to new data, while demonstrating massive combinational and combinatorial capabilities. These capabilities aim at substituting, supplementing and amplifying practically all tasks that are currently being performed by humans (Markidakis, 2017) generating a new paradigm shift in terms of redefining the current customer-financial service provider relationship, along with, issues of governance, ethics and trust (Rahnama, 2018).

IDC predicts that worldwide revenues from the adoption of such cognitive systems across multiple industries will experience an increase from $8 billion in 2016 to over $47 billion in 2020 (IDC, 2016). Furthermore, by 2030, global GDP could increase by 14%, or $15.7 trillion because of AI with $1.2 trillion extra economic growth forecasted GDP gains in Oceania (PwC, 2017a). In addition, over $1 trillion of today's financial services cost structure could be replaced by machine learning and AI by 2030 according to the 2018 Augmented Finance and Machine Intelligence report. Accenture estimates that AI will add $1.2 trillion in value to the financial industry by 2035 (Purdy and Daugherty, 2017). The 2017 Accenture Banking Technology Vision report concludes that in the next stage of AI adoption, banks will use AI to help understand the intentions and emotions of customers to enable better interactions (Mcintyre *et al*., 2017). Gartner (2018) has forecasted 25% of customer service and support operations will integrate virtual customer assistant (VCA) or chatbot technology across engagement channels by 2020. Moreover, according to the 2017 TechEmergence consensus poll, smart assistants and chatbots will become the primary consumer AI applications over the next five years (Faggella, 2017). However, despite the euphoria created around AI, financial institutions are faced with numerous challenges in terms of taking advantage of the benefits of AI in a timely manner (Capgemini, 2018). Such challenges include budgetary, regulatory, data quality and resource limitations in AI implementation.

Within this exponentially growing landscape extant academic research is still at an embryonic level with only a handful of peer-reviewed articles published in various outlets exploring different angles of AI; let alone far less within the financial services industry. The majority of published information is based on non-systematic approaches and mostly on use cases. In this context, this lack of research creates a blue ocean for empirical research explorations and investigations on the role AI is meant to play within the financial services sector and the different segments involved within this such important industry for the worldwide economy.

Current and recent advancements in this area both locally and internationally: a rapidly-emerging ecosystem

The emergence of FinTechs has encouraged, among others, the experimentation and gradual adoption of numerous AI applications within the financial services industry and in particular within the segments of Capital Market, Consumer Banking, Insurance and Portfolio Management. Some applications have already created a solid footprint; however, numerous areas still remain relatively undeveloped:

- Algorithmic stock trading and high frequency trading (Back Office)

- Automated fraud detection, risk management and regulatory compliance; anti-money laundering and anti-terrorist financing compliance monitoring (Middle Office)
- Robo-advisory in Wealth Management providing portfolio management and investment advice services
- Risk and Credit Assessment (Back Office)
- New generation of customer engagement through intelligent telephone agents, avatars, AI-powered 'chatbots', machine-learning robots, humanoids, smart/voice-activated virtual cognitive assistants and voice biometrics/voice recognition technology (Front Office)
- Personalized and insightful online customer-service via analytics-driven recommendation engines (with tailored recommendations and advice) and real-time automated processes
- Real-time Authentication and Integrated Biometrics (Front Office)
- Intelligent and predictive cybersecurity monitoring and response systems

The landscape of artificial intelligence in financial services: selected use cases in Australia and abroad

Financial services play a foundational part of the services economy (Hatzakis *et al.*, 2010). In Australia, financial services is the largest industry at 10.4% of the national economy's total GVA and $2.8 trillion funds under management, along with, being Australia's largest employer, providing jobs for 416.500 people in 2016 (FSC and UBS, 2017).

The Australian Securities and Investments Commission has acknowledged the worldwide cross-industry emergence of artificial intelligence and machine learning stressing the importance of understanding the ways these technologies can be adopted by the regulators (Hendry, 2018). Moreover, nearly 60% of Australian-based institutional investors and asset managers are actively expecting meaningful adoption of AI technologies for institutional financial services within the next two years (Northern Trust, 2018).

Below are some examples of uses/trends of AI in financial services. Due to the brevity of this report not all uses have been covered. Additional uses include AI/Machine Learning-enabled trading, impacts on fund management and superannuation management.

Banking

The banking sector remains within the epicenter of disruption over the next five years (PwC, 2017b) experiencing constant pressure from FinTechs. This narrative is providing numerous opportunities for banks to explore emerging technologies, while, rethinking corporate strategies, evaluating potential partnerships and paving the way towards a "genuine transformation" of the industry itself (Manning, 2018). In relation to the adoption of AI tools banks still take a cautious approach despite top-down mandates for AI incorporation into processes, products and services (Noonan, 2018). In principle, banks are exploring ways to incorporate AI as follows: a) chatbots and virtual personal assistants, b) customer profiling, c) streamlining processes, d) identification of patterns or anomalies in transactions (Anti-Money Laundering and fraud). These exploratory and experimental norms lead banks towards seeking to gain a competitive advantage by meeting customer needs (better instruments and value), improving customer experience, improving compliance and security, changing internal organizational structures and moving towards the creation of innovative digital banking experiences. The potential value of AI in banking has been estimated approx. in the range of

$0.2-$0.3 trillion (aggregate dollar impact) and in the range of 2.5-5.2% of industry revenues (Chui *et al.*, 2018).

The four major Australian banks are in the process of adopting AI tools in line with worldwide developments within the sector. Commonwealth Bank of Australia with the "Ceba" Chatbot is able to assist customers with more than 200 banking tasks, incl. card activation, checking account balance, making payments, getting cardless cash (CBA, 2018). In the same line, the National Bank of Australia has introduced the Digital Virtual Banker, which based on thousands of real-life customer enquiries is able to answer approx. 200 questions (NAB, 2017). The ANZ Banking Group has created biometric voice capability with technology company Nuance to allow customers to bank by talking to the app (Eyers, 2018). In the same context, the Westpac Banking Corp is working with local start-up Hyper Anna using AI to conduct data analytics and visualization.

Wealth Management

Robo-advice has the potential to provide cost-effective investment advice to community members with relatively low levels of wealth, helping them to make more informed financial decisions (Australian Government, 2016). In Australia, digital financial advisers, incl. Ignition Direct, Acorns Australia and SuperEd are providing automated online financial and investment advice. Firms incl. Schwab, Betterment and Wealthfront, integrate machine learning to provide wealth management services in efficient and engaging ways. Moreover, a number of 'socially conscious' robo or digital (automated) investment advisor platforms incl. Betterment, Wealthfront, Motif, Earthfolio, OpenInvest, M1 Finance, Passed Pawn Advisors, Hedgeable, Prophecy, Stash, TIAA Personal Portfolio, Wealthsimple, Swell and Grow Invest have emerged within a competitive SRI marketplace providing different values-based investing tools and investment portfolios built around SRI investing strategies (Salampasis, 2017).

ASIC is providing guidance on the need for a financial services license for the provision of financial advice and requires an understanding of algorithms used (ASIC, 2016). Explaining how and why specific advice has been provided is possible with the current rule-based systems. Artificial intelligence systems using machine learning will be more like a blackbox with limited ability to understand the reasoning behind specific advice raising regulatory issues and concerns of whether advice is in the customers' interest.

Wealth management is experiencing transformational changes. Advisory services are embedded within a human to human interaction and robo-advising will potentially augment the existing value chain leading to the creation of a hybrid advisory model for complex investment portfolios. AI will be able to help wealth managers contextualize financial decisions in terms of helping their clients reach better-informed decision. Therefore, the fundamental question is not about either or but together for … (Salampasis *et al.*, 2017).

Insurance

Artificial intelligence and machine learning is being used in the insurance industry to provide customer onboarding, experience and service through chatbots, platforms and carriers, identify attractive customer segments (coverage personalization), behavioral policy pricing, process claims settlements in a faster and more customized way and identify potential fraud (Marr, 2017). The potential value of AI in insurance has been estimated approx. in the range of $0.1-$0.3 trillion (aggregate dollar impact) and in the range of 3.2-7.1% of industry revenues (Chui *et al.*, 2018).

What are the gaps in Australia/New Zealand (e.g. around skills, training, infrastructure, regulation) as it relates to AI (and how this may compare internationally)

Consistent with international jurisdictions artificial intelligence and specifically machine learning are in an exploratory stage in Australia. Successful implementation will require a range of new skills and enhanced capabilities in others. These include:

- Management understanding of the fundamentals, opportunities, pre-requisites and risks of artificial intelligence. Not all managers in financial services need to be experts in artificial intelligence but many will need basic knowledge what can achieved and how and to potentially to manage both artificial and human intelligence within processes.
- Technical skills in developing artificial intelligence solutions and/or evaluating external suppliers' solutions and in training systems. While projects will likely pair AI and financial services experts, there will be a demand for those with an understanding of both.
- Technical skills in developing/ redesigning systems to collect, cleanse and store data required to enable systems to learn and to enable classification of data instances.
- Front line and back office skills for staff whose roles will be augmented by AI in the use of and interfacing with the technology.

Developing these skills will require specific training. Training in the basics of AI, machine learning and implications for financial services needs to be provided to managers and staff within financial services. Significant training is required in detailed development and machine learning training skills for technical experts. Clearly, we will need a significant increase in AI strategists and technicians.

Regulators will need to continue to develop skills in AI and machine learning to enable risks to be identified and mitigated through regulatory changes. Regulation will need to consider the 'black box' nature of outcomes from machine learning. This includes how financial planners will be able to demonstrate that financial advice was in the clients' interests, that responsible lending practices were followed and that client groups were not discriminated against through machine learning from historic data.

What will the next 10 years bring for Australia/New Zealand (i.e. where do you see the field heading and what opportunities or risks will this provide to AI)

The nature of financial services as a data driven industry, constant growth in data available, advances in technology and policy changes, such as Open Banking, will likely see a transformation in how services are developed and delivered and how transactions are processed. Previously mentioned forecasts of potential savings across financial services industries in a 10 to 20-year timeframe may emerge. The ability to access cost effective financial planning through AI solutions and to access and analyze personal financial information and transact through multiple channels and tools will improve the ability of consumers to manage their money and the convenience of doing so. Insights through machine learning will enable providers to develop innovative products and services meeting the individual needs of customers and to target those customers with offers.

Opportunities are likely to emerge for innovative Australian companies to be at the forefront of this migration to artificial intelligence in financial services with benefits for the industry and

country. These benefits come with risks. These risks include the potential that advice and decisions issued through the 'black box' are not in the clients' interest or discriminate against customer groups. There is also an industry and company risk that skills in AI and machine learning as well as deep customer related data become the main competitive factors in financial services. This could see the continued expansion of big tech companies, such as Google, Facebook, Amazon and WeChat into financial services, potentially disrupting current Australian institutions with implications for the whole sector.

What resources and actions will be required to realize this potential (e.g. by government, industry, the education sector, and by individuals)

To realize the potential opportunities for AI and machine learning in financial services in Australia resources and actions are required at all levels. For government we need to augment current innovation and fintech policies to encourage the development of technical skills and products and to commercialize and export these. The Australian Government announced almost $30 million of spending in the main budget to build the AI/Machine Learning capabilities of Australian organizations and workers. Other countries are not standing still, China, for example, has prioritized the development of Artificial Intelligence. Government and regulators will need to keep up with developments and address potential ethical and privacy concerns through legislation and regulation.

Industry players will need to keep exploring and refining the use of artificial intelligence, they will need to continue to monitor the actions of global peers and competitors, activities in other segments and research. They will need to keep upskilling staff, invest in updating staff skills, along with, creating impactful learning environments that facilitate learning-on-the-job while nurturing both corporate and individual growth.

The education sector has a role to play in continuing to develop, expand, update and deliver quality education and research in evolving artificial intelligence/machine learning technologies, techniques and use cases. It is important for the education system to be able to provide on-going professional development ensuring adaptability and resilience in top-quality workforce. Strong partnerships between education institutions and industry are likely to be important to strengthen the AI capabilities of both. Knowledge of the field needs to be broadened beyond developing technical experts. A basic understanding of artificial intelligence needs to be built into business, banking and finance degrees to enable knowledge to enter and progress up in financial institutions to understand the opportunities, limitations and risks associated with it. Executive education has a role in continuously upskilling the current and emerging crop of executives and managers to enable knowledgeable decisions about exploring, implementing and refining AI, along with, developing interpersonal and creative skills, decision-making and executional capabilities and information synthesis (Salampasis and Mention, 2018).

Individuals in financial services will need to continue to upskill with emerging technologies. This may include actively seeking roles on related projects, attending in-house training, seeking out short courses on line or gaining further qualifications towards building STEM-related capabilities. Opportunities are likely to emerge for those who understand and can work with the technology but for many who cannot automation will potentially limit their future in the industry. In this context, comprehensive collaboration among industry, government, education and individuals is required.

AI and Machine Learning are likely to create significant opportunities and challenges within financial services. How Australian industry, government, regulators, educational institutions and workers respond will impact whether Australia benefits to the full extent of this opportunity.

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