General perception of Artificial Intelligence and impacts on the financial sector in Finland

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Abstract

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With the expansion of the Internet, digitization and big data, the Artificial intelligence (AI) has quickly become a topic of discussion and attention for the business community, directly influencing decision-makers, stakeholders, consultants, researchers as well as citizens too.

Hence, Artificial intelligence (AI) has an irreversible impact on our lives and on our organizations. While the many uses allow for better inclusion of users and access to goods and services, more effective government and more efficient businesses, they, like all new technologies, raise questions and mistrust, particularly in terms of data protection and personal life, labour market structure, social and geographical disparities, inequality, unemployment and many other areas.

In order to analyse the general perception of AI in Finland and to determine its possible impact on the financial sector, I propose to conduct a study in two main parts.

In a first theoretical part, I will review the different proposed definitions of intelligence and of AI available to this day, and will outline the challenges and opportunities on the economy and the society. At this level, I will examine the state of the AI in the world, in Europe and Finland.

In a second part, I plan to conduct a survey with a representative sample of citizens and the large public in order to try to find the general public/citizen's perceptions of the progress of AI in Finland. More particularly its impact and influences on services and relations with and in the Financial sector: services / products, jobs, hiring, training and therefore collect proposals to improve the use of AI in the relations between companies and their customers, companies and their social partners, citizens and administrations as a result.

At the end of this research-based thesis, I will present some key findings of this survey and the main conclusions regarding AI in Finland and it´s impacts on the financial industry, as well as recommendations to pursue the ongoing technological movement and help get familiar with it for a more sustainable and responsible business conduct.

Keywords
Intelligence - Artificial intelligence - Machine learning - Ethics - Robotic- Banking - Insurance

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1. Introduction

In the last few years, Artificial Intelligence (AI) has quickly become a topic of discussion and attention for the business community, decision makers, consultants, researchers and citizens. This renewed interest was evident after the great progress made in the various fields related to IA and as a result of the success achieved by machines (Deep Blue, Watson, Alpha GO...)

AI has also become a source of anxiety and questioning about its impact on relations between companies and their customers, on work organization and on social relations.

AI holds the potential to increase productivity and build cost-effective, impactful solutions in numerous sectors.

Research has estimated that AI could double annual economic growth rates by 2035 for developed countries.

The AI also addresses issues related to data protection, Cybersecurity, employment and training.

Because of the interest of this subject and the relevance of the banking and insurance sectors in the Finnish economy, I propose to devote my thesis to general perception of AI and its challenges on the financial sector in Finland.

AI has an irreversible impact on our lives and on our organizations. While the many uses allow for better inclusion of users and access to goods and services, more effective government and more efficient businesses, they, like all new technologies, raise questions and mistrust, particularly in terms of data protection and personal life, labor market structure, social and geographical disparities, inequality, unemployment and many other areas.

The issues that will be discussed include:

What does the literature say about the Intelligence and Artificial Intelligence?
What does the literature say about the impact of this revolution on societies and economies and in particular on the financial sector?
Is there a real understanding of the importance of AI in the economy, society and the education system?

How far does AI affect and will impact the financial sector in Finland?

Will the AI affect the sector's relationships with its environment and stakeholders (customers, union, workforce, government?

Will the AI have an impact on the efficiency of the government's, on the skills and content of training courses and on security and privacy?

In a **first theoretical part**, I will review the different definitions of AI, its impact on the economy and the society.

At this level, I will examine the state of the AI in the world, in Europe and Finland. In this section, I will present also the main characteristics of the financial sector in Finland, which is the focus of my work because of its importance in the economy and because of the multiple implications of AI in its activity.

In a **second part**, I will conduct an online survey focused on the large public. The exploitation of the data collected and the analysis of the results of these survey, will allow me to present the main findings and to discuss the results.

2. The concept of Artificial Intelligence

Firstly, it isappropriate to define the context in which the concept of Artificial Intelligence is evolving to explore this compelling leap in technological advancement and the anticipated impact on modern business worldwide and particularly in Finland.

In Homo Deus, A Brief History of Tomorrow, **Yuval Noah Harari** (2015) argues, "humanity is at the brink of a new evolutionary era". One element of this new era is the accelerating technological development that **Klaus Schwab** (2017) has called the Fourth Industrial Revolution (4IR), and described as "the confluence of technological breakthroughs, covering wide-ranging fields such as Artificial Intelligence, robotics, Internet of things, autonomous vehicles, nanotechnology, biotechnology, energy storage, and quantum computing".
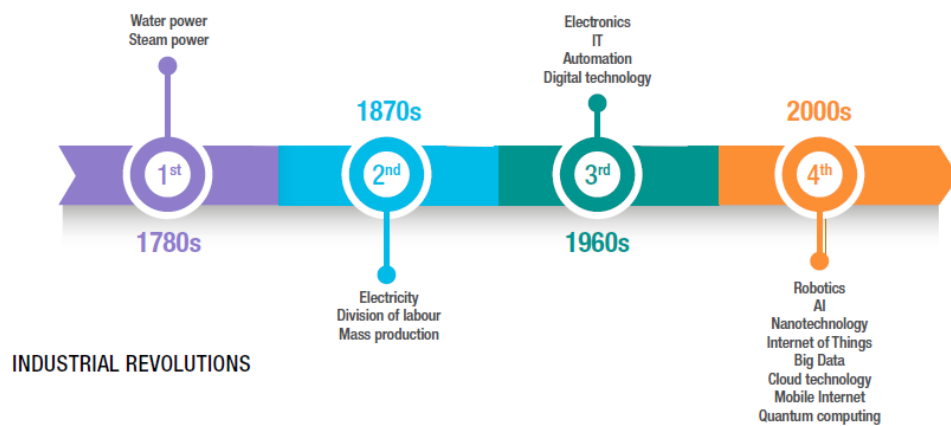

Figure 1: industrial revolution, Schwab (2017, Page11)

Before the Fourth Industrial Revolution, the world has gone through three major technological phases: the first between 1780 and 1870 with the construction of factories, steam engines and railways. The second from 1870 to 1960 with the launch of aviation, electricity, telephone and automobiles and the third begins in 1960 with new technologies (Electronics, IT, Automation, Digital technology).

Klaus Schwab (2017) in the "Fourth Industrial Revolution" starts with: what it means, and how to respond to the current state of AI stating, "It's all around us, from self-driving cars and drones to virtual assistants and software that translate or invest".

This progress has been "driven by exponential increase in computing power and by the availability of vast amounts of data".

The Fourth Industrial Revolution based on the gathering and combination of technologies (unlike the third revolution who was mainly based on digitization) have a great potential to affect not only the business sphere, but in a broader way governments as well as people themselves.

If this revolution "has the potential to raise global income levels and improve the quality of life for populations around the world", nevertheless it is also argued that it can be a source of great inequality, particularly, in "it's potential to disrupt labor market" (Klaus Schwab).

Before going into detail on the impact of AI on the financial services in Finland, which is the direction I undertook, in order to give a glimpse of the potential of the latest applications of this ever-expanding technology. I will first try to present and review the definitions broadly accepted and currently proposed by specialist academics, experts, and global organizations before accurately grounding the situation of AI at the global, regional and local level for a complete overview.

2.1 Definition of intelligence and Artificial Intelligence

Before defining Artificial Intelligence, it would be useful to propose some definitions of the notion of intelligence. However, «The definition of intelligence is controversial," stated **Legg and Hutter** in A Collection of Definitions of Intelligence (Shane Legg & Marcus Hutter 2007).

Hence, dictionaries offered multiple but dependable definitions of the concept of "intelligence" as follow:

In **The Oxford Dictionaries**, the intelligence is defined as "The ability to acquire and apply knowledge and skills", in **The Cambridge Dictionary** it is defined as "The ability to learn, understand, and make judgments or have opinions that are based on reason" and **The Collins Dictionary** described intelligence as "the ability and to think, reason, and understand instead of doing things automatically or by instinct".

Through the **three** previous definitions, intelligence is considered as the **ability to learn, understand, think and reason**.

Furthermore, other authors proposed the following definitions trying to clarify this complex concept:

Binet Alfred, a French psychologist inventor of IQ Test (1905) made the following observation, "It seems to us that in intelligence there is a fundamental faculty, the alteration or the lack of which, is of the utmost importance for practical life. This faculty is judgment, otherwise called good sense, practical sense, initiative, the faculty of adapting oneself to circumstances."

Dearborn Walter (1921) an American experimental psychologist defined intelligence such as "The capacity to learn or to profit by experience."

For **W. Freeman** (1955) intelligence is "Adjustment or adaptation of the individual to his total environment, or limited aspects thereof. The capacity to reorganize one's behavior patterns so as to act more effectively and more appropriately in novel situations."

"Intelligence measures an agent's ability to achieve goals in a wide range of environments." (**Legg and Hutter** 2003)

"Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience." (**Gottfredson, et. al**.1997)

 "The ability to undertake activities that are characterized by (1) difficulty, (2) complexity, (3) abstractness, (4) economy, (5) adaptedness to goal, (6) social value, and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces." (G.D. **Stoddard** 1941)

"Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought."

Other definitions of intelligence can be added to reinforce the disclosure of this conglomerate of proposed concepts, including:

From **Linda S**. **Gottfredson** perspective intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience…" (Linda S. Gottfredson 1994).

The authors of the report "Intelligence: Knowns and Unknowns, noticed that "Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought…" (American Psychologist 1996)

Thus, I can retain from these above definitions important key points namely that the concept of intelligence is, **in particular, the ability to learn, understand, think, be emotional, abstract, create, solve, adapt, abstract and judge**.

Therefore, now that I clarified the concept of "**intelligence**" let us now introduce and present definitions of "**artificial intelligence**" as well as some fundamental AI techniques, the area that it covers so far and the historical background of AI.

2.2 Artificial intelligence

Alan Turing in an article who appeared in the 1950´s issue of Mind magazine, talks about « Can machines think? »:

Turing wrote, "I propose to consider the question, "Can machines think?" This should begin with definitions of the meaning of the terms "machine" and "think." The definitions might be framed so, as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words "machine" and "think" are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, "Can machines think?" is to be sought in a statistical survey such as a Gallup poll. However, this is absurd, instead of attempting such a definition I shall replace the question by

Another, which is closely related to it and is expressed in relatively unambiguous words.It was after Alan Turing's death in 1954 that artificial intelligence was grounded as a field of scientific research.

The term AI was born when a group of scientists (**namely J. McCarthy, M. L. Minsky, N. Rochester, and C.E. Shannon**) conducted a study with the goal of making machines understand and use human language and then keep on going on their own.

The study was made in 1955, but the term, was not officially brought into light until one year later, after the study had met its expected success.

After that, AI was accepted everywhere in the academic environment.It should be underlined that American universities were in the first place of AI development.

From the nineties, new actors came on the scene, in particular big companies (AT&T-Bell, IBM, etc.) or American government agencies such as the Defence Advanced Research Projects Agency (DARPA).

As noticed by **Shane Legg and Marcus Hutter** (2007) in Universal Intelligence in "A Definition of Machine Intelligence "A fundamental problem in artificial intelligence is that nobody really knows what intelligence is. The problem is especially acute when we need to consider artificial systems which are significantly different to humans".

Authors involved in the report "**The Future Society a Global Civic Debate on governing the rise of Artificial Intelligence**" wrote that "there was never a universally accepted definition, but always ambiguity. The notion remains broad, fluid, and contested" (The Future Society 2018)

Expectedly, there is **not a single definition of the concept of the artificial intelligence**. Hence, a collection of some currently accepted definitions bellow. I researched and selected a panel of some general proposed definitions that I found most relevant.

Let us now take a look at these definitions

"AI is the science and engineering of making intelligent machines, especially intelligent computer programs." Alan Turing.(www.formal.stanford.edu.1950)

The **English Oxford Living Dictionary** gave this definition: "The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages."

World Trade Report (2018) suggested the following definition: "AI is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with humans, such as the ability to reason, discover meaning, generalize or learn from past experience".

Allianz Insurer (2018) provided this definition: "Artificial Intelligence (AI) refers to the ability of a computer program to think and learn like a human and its snowballing impact on society is undeniable".

"AI is software that exhibits analytical, decision-making and learning abilities similar to those of humans. It is also a field in computer science that studies intelligent entities, not only from an engineering perspective, but also from a philosophical and psychological perspective." (**S.J.Russell and P. Norvig**,2010).

PwC Consulting (2017) has proposed this definition: AI "is a collective term for computer systems that can sense their environment, think, learn, and take action in response to what they're sensing and their objectives

AI "can be broadly defined as the capability of a machine to give the impression of intelligent behaviour and perform tasks normally requiring human intelligence. Specifically, AI has the capability to think, reason, act, and adapt, but there are many approaches to AI". (**College de France**).

"Artificial Intelligence refers to the use of digital technology to create systems that are capable of performing tasks commonly thought to require intelligence". (**Ministry of Economic Affairs and Employment in Finland**, 2017)

" Artificial intelligence is a wide-ranging tool that enables people to rethink how we integrate information, analyze data, and use the resulting insights to improve decision making and already it is transforming every walk of life (**Brookings**,2018)
.

"Artificial intelligence refers to systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals" (**European Commission**, 2018).

"Artificial Intelligence is the science of making machines do things that would require intelligence if done by man" (**Raphael, Bertman**, 2007).

The **Encyclopedia Britannica** defined "artificial intelligence as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings."

Webster defined artificial intelligence as (1) A branch of computer science dealing with the simulation of intelligent behavior in computers and (2) The capability of a machine to imitate intelligent human behavior.

Kris Hammond (2015) gave a definition based upon the goals that are trying to be achieved with an AI system. Generally, people invest inartificial intelligence for one of these three objectives: (1) Build systems that think exactly like humans do ("strong AI") (2) Just get systems to work without figuring out how human reasoning works ("weak AI") and (3) Use human reasoning as a model but not necessarily the end goal.

Amazon defined AI as "the field of computer science dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, problem solving, and pattern recognition"

In conclusion, Artificial Intelligence **can possibly be defined** as all technologies and tools (computer vision, speech recognition, natural language processing, Robotics …) able to:

1. Perform tasks commonly associated with intelligent beings;
2. Complete tasks which involve a certain degree of intelligence which was previously deemed only to be done by humans;
3. Simulate of human intelligence including learning, reasoning, and self-correction;
4. Imitate the intelligent human behavior.

2.3 Challenges for AI and its impact

Jurriaan Tressel, Johan van der Veen & Thomas Heeneman, consultants from Deloitte noticed that "a few technology developments will enable a spectacular leap forward. The more important are: Cloud computing, big date, Application Programming Interfaces (APIs), open source, IoT and standardization.

Nevertheless, as technologies now work and open up the horizon further and further, it is important to consider the limitations and drawbacks of AI technology.

Indeed, these questions are no longer technological; they must be redirected to the human and ethical sphere".

The authors of **Malicious Use of Artificial Intelligence Report: Forecasting, Prevention, and Mitigation,** published in 2018, provides various recommendations to avoid or limit the main dangers of AI use.

The group above makes four high-level recommendations:

1. Policymakers should collaborate closely with technical researchers to investigate, prevent, and mitigate potential malicious uses of AI.

2. Researchers and engineers in artificial intelligence should take the dual-use nature of their work seriously, allowing misuse related considerations to influence research priorities and norms, and proactively reaching out to relevant actors when harmful applications are foreseeable.

3. Best practices should be identified in research areas, with more mature methods for addressing dual-use concerns, such as computer security, and imported where applicable to the case of AI.

4. Actively seek to expand the range of stakeholders and domain experts involved in discussions of these challenges.

In 2015, **Stephen Hawking**, Hawking, Lon, **and others experts** signed an open letter on artificial intelligence titled "Research Priorities for Robust and Beneficial Artificial Intelligence".

Hence, the authors of this document aim to encourage the researcher not to focus solely on the development of artificial intelligence capabilities, but also on its benefits for society and the creation of security, measures that in the future will become grounded standards.

2.4 Impact of artificial intelligence on different industries

AI is being used in many different fields for different purposes, including reasoning, knowledge, planning, communication, learning, perceiving, displacement, and manipulation of objects.

At the **sectoral level**, the following activities can be mentioned and are impacted by the use of AI:

In healthcare industry AI helps Doctors and physicians to diagnose patient easily, solving a variety of problems, perform treatment procedures and to understand of health sciences.

It also can help analyzing complex medical data such as X-rays, and different screenings and tests, using the patient's data and external knowledge sources such as clinical research, medical professionals can build a personalized treatment path for everyone and to provide real-time medical advice to patients.

In the Finance sector, AI helps to track consumer base, identify and solve issues, ensure a 100% transaction security, offer suggestions on beneficial schemes and policies, detect fraud and even produce predictable possible outcomes by anticipating changes in the stock market.

In the education sector, AI helps answer specific student questions online. In addition, it makes possible personalized learning that tailors educational content to the needs of each individual student. Data analytics help implement adaptive learning programs by allowing educators to collect and analyze data about the performance and learning style of each student and constantly adjust the learning material according to their progress.

Transportation is the most known industry where AI technology application is currently trending. While self-driving cars and trucks may be the most anticipated developments, AI can go as far as collecting data from a variety of sources to optimize and adjust the shipping routes and simplify distribution networks while respecting standard safety measures.

In retail, conversation intelligence software helps companies interact with customers and follow up leads by analyzing and segmenting sales calls using speech recognition and natural language processing. Chabot's and virtual customer assistants allow current retail businesses to run a 24/7 customer service and answer basic questions without the involvement of human, therefore maintaining qualitative customer service experience.

Impacts of AI on Business, on society and labour market

Artificial Intelligence will necessarily influence the economy, the internal organisation of business, their relations with customers and employees as well as affecting the relations of consumers/citizens with their environment and all stakeholders involved.

Impacts on growth

According to **PwC** Consulting analyses:

"Global GDP will be up to 14% higher in 2030 as a result of the accelerating development and take-up of AI – the equivalent of an additional $15.7 trillion.

The economic impact of Artificial Intelligence in the future is expected to be driven by:
1. Productivity gains from businesses automating processes cutting the human intervention
2. On the other hand, productivity gains from businesses augmenting their existing labour force with AI technologies
3. Finally an increased consumer demand resulting from the availability of personalized and/or higher-quality AI-enhanced products and services.

Some regions have the potential to gain more than others do by **2030**:

The regions that will have the most impact by 2030 are China and the North American region.

Regions	Total impact % / GDP	Value
China	26.1%	$7.0 trillion
North America	14.5%	$3.7 trillion
Southern Europe	11.5%	$0.7 trillion
Developed Asia	10.4%	$0.9 trillion
Northern Europe	9.9%	$1.8 trillion
Africa, Oceania and other Asian market	5.6%	$1.2 trillion
Latin America	5.4%	$0.5 trillion

Figure 2: Impact of AI on GDP (PwC 2017)

Impacts on business and on society

The report "**Finland's Age of Artificial Intelligence**" noticed that: "Application of artificial intelligence would create pressures for change and offers opportunities to companies, the public sector, citizens and the whole of society. The extensive and successful utilization of artificial intelligence creates conditions for strong economic growth and a higher rate of employment, but at the same time, a proper response to the transformation of work is needed.

For business, AI will increase productivity, production flexibility, as well as new business models, products and services that will meet customer's needs.

For citizens, AI applications will make their lives easier and provide them an opportunity to improve their overall quality of life".

The **World Trade report 2018** noticed that: "AI has the potential to increase efficiency in the production of goods and services and to aid innovation by generating new ideas. Contemporary companies also rely increasingly on artificial intelligence (AI) and big data to analyse consumers' online shopping experiences in order to profile preferences and adapt products accordingly.

Klaus Schwab noted that "the new revolution would have effects on business on four major eras (1) customer expectations (2) product enhancement (3) collaborative innovation (4) organizational forms». He added that citizens would be able to:"(1) engage with governments (2) voice their opinion (3) coordinate their efforts (4) even circumvent the supervision for public affairs. In the meantime, governments will acquire new technological powers to expand the capacity of the control of the populations".

Impacts on employment

While this technology has, the potential in the future to make traditional low skilled jobs out of date it will at the same time, by developing new professional pathways create new jobs as it grows and become a global phenomenon.
At this level, particular attention must be given to training and continuing education in this field.

In any case, the opinions of observers and researchers constitute a dichotomy. Whereas, some people support that the AI will irreversibly destroy jobs, others say that the gains made will produce growth and develop prosperity. Thus, I present below some point of views on this very dubious subject.

Firstly, according to several studies, the net job destruction related to AI by 2023-2025 is between 6% and 47%, with predictions following a decreasing trend, the main prediction being 47% in 2013 and 6% to 7% in 2016.

Frey and Osborne in "The Future of employment: How susceptible are jobs to computerization", Technological Forecasting and Social Change estimated in 2013 that 47% of jobs are likely to be partially automated in the United States.

Deloitte (2014) and Oxford published a quantitative study that predicts that 35% of jobs in the United Kingdom will be substituted by robots in 20 years.

The Organisation for Economic Cooperation and Development (**OECD 2016)** published a study that estimates that 9% of jobs in OECD countries can be automated, but only 6% in South Korea and 12% in Austria. France is on average at 9%. In its recent document (OECD Employment Outlook 2019), the organization noticed, "that the digital transformation, globalization and demographic changes have already been reshaping the world of work. Looking ahead, 14% of existing jobs could disappear as a result of automation in the next 15-20 years, with another 32% set to change radically".

Forrester (2016) expected 16% of jobs in the USA to be automated by 2025 whether through AI, robots or traditional automation. This will be compensated by the creation of 9% new jobs (8.9 million), generating a net loss of 7% of jobs.

Secondly, they have expected that office and administrative jobs will be the most affected. The creation will concern the management of robots, data-scientists and other robotics technicians.

In 2017, the **Massachusetts institute of technology** (MIT) and the Boston University published a study on the impact of the robotization of the U.S labour market between 1990 and 2007. They concluded that the addition of a robot in manufacturing destroys 6.2% jobs due to the overall impact on the employment value chain. In the same year, **McKinsey consulting** estimated the loss of employment in the United States at 7 million in just three years.

Thus, 14% of employees are expected to change jobs by 2030 in order to remain up to date. It is based on that the estimation that around 15% of tasks will be automated process by 2030, compared to 9% in India and 24% in the USA and Germany and a staggering 29% in Japan. Finally, **the World Economic Forum (2018)** talked about the creation of 58 million AI-related jobs by 2022, representing the balance of the creation and destruction of 122 and 75 million jobs.

Bernard Golstein technology specialist and CEO distinguished four schools of thoughts concerning the impact of AI on jobs:

The optimists,
The moderates,
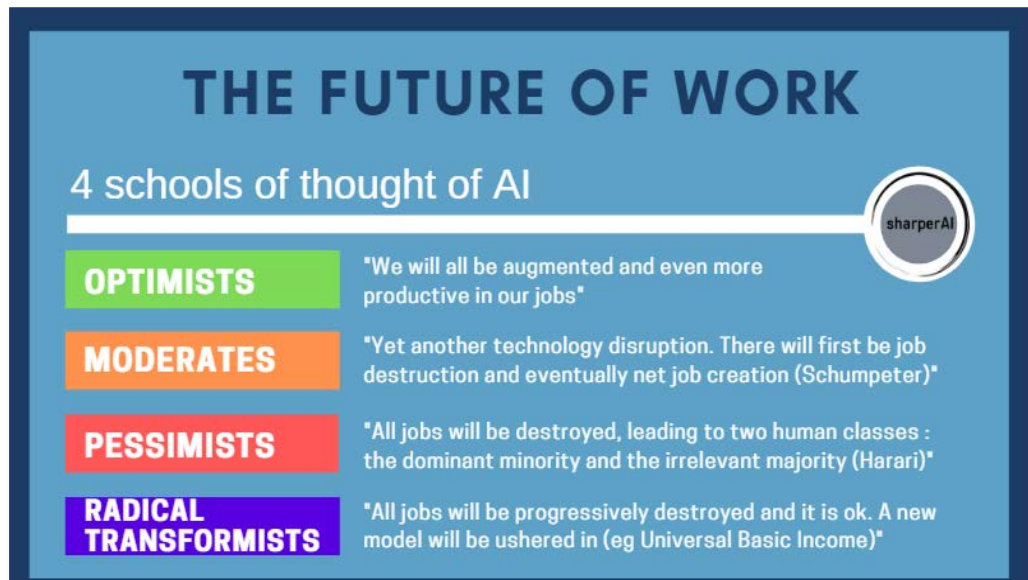The pessimists and
The radical transformists.

Figure 3: Schools of thought concerning AI and Jobs (Bernard Golstein 2018)

In conclusion, I can retain that Artificial Intelligence will have a strong impact on simple and repetitive jobs that do not require a high level of qualification but it will also have an impact on the content of skilled jobs by changing their core knowledge.

Moreover, it would be difficult to quantify in any detail the exact number of job creation or job losses.

In addition to the ethical aspect of the use of AI, the question of employment will certainly be at the center of the debates in the coming years in Finland and all over the world.

3. The use of Artificial intelligence in Finland and in the world

According to the Minister of Economic Affairs and Employment in Finland, the evolution of AI can be explained due to multiple factors, first of all the rise of very large data sets and the fact that the amount of data continues to grow at an accelerating rate. Secondly, the rapid growth of computing capacity and decreasing prices enable the processing of large data sets by an increasing number of users, and lastly the new algorithms are continuously in development for data utilisation.

In this following section, I will try to review the state of Artificial Intelligence at the world, European and Finnish level.

3.1 AI in the World and in Europe

The report of Finland's Age of Artificial Intelligence, turning Finland into a leading country in the application of artificial intelligence, namely objective and recommendations for measures, 2017 underlines that investment in artificial intelligence «Have increased quickly, particularly in US and China". Hence, "Over the past few years, several governmental initiatives have been established that aim to support the private and public sectors in the utilization of the possibilities produced by artificial intelligence and to ensure the functioning of society at a time when artificial intelligence is widely used".

The report added that: "At the moment, the United States is the leading country in the development and application of artificial intelligence. In 2016, approximately 66% of all artificial intelligence investments were made in the United States. China is closing the gap with strong investments and a state plan (17% of investments made in 2016)"

The authors of the above report observed also that: "Companies are the main drivers of artificial intelligence in the United States; the government leads artificial intelligence development in China; Europe has numerous differing strategies for artificial intelligence;
It is anticipated that Japan is to become Society 5.0 (Super Smart Society)
.

In terms of investment, Europe "is behind in private investments in AI: Euros 2.4-3.2 billion in 2016, compared to Euros 6.5-9.7 billion in Asia and Euros 12.1-18.6 billion in North America». The target is to increase the EU's investment in AI from €500 million in 2017 to €1.5 billion by the end of 2020.

The **European Commission** approach of AI it based on some pillars (in Artificial intelligence for Europe): "Being ahead of technological developments and encouraging uptake by the public and private sectors; Prepare for socio-economic changes brought about by AI; ensure an appropriate ethical and legal framework". The Commission adopted on **April 2018** a **declaration of cooperation on Artificial Intelligence**.

The signatory states have agreed to work together on Europe's competitiveness in the research and deployment of artificial intelligence and the social, economic, ethical and legal issues.

The Commission appointed a **High Level Group on Artificial Intelligence**. The group: "Will make recommendations on how to address mid-and long-term challenges and opportunities related to artificial intelligence (AI)". The Group will "also prepare draft ethics guidelines that will build on the work of the European Group on Ethics in Science and New Technologies and of the European Union Agency for Fundamental Rights in this area".

The Group will "additionally support the Commission in building a broad community of stakeholders through the European AI Alliance".

In**June 2018**, the EC proposes a Digital Europe program with a budget of 9.2B euros (10.4B USD) for 2021-2027. The program focuses on advancing AI technology and ensuring the use of AI across the economy and society.

The EC also proposes to develop common 'European libraries' of algorithms.

In **December 2018**, the Commission presented a **coordinated plan**. This document "proposes joint actions for closer and more efficient cooperation between Member States, Norway, Switzerland and the Commission in four key areas: increasing investment, making more data available, fostering talent and ensuring trust." Representatives of Member States, Norway, Switzerland and the Commission have met over the last six months period in order to identify synergies and joint actions.

Therefore, these actions points will now be reviewed and updated on an annual basis.

Moreover, they prioritized areas of public interest, such as healthcare, mobility and transport, security and energy. They agreed to:

1. Maximize investments through partnerships;
2. Create European data spaces;
3. Nurture talent, skills and life-long learning;
4. Develop ethical and trustworthy AI".

The following chart shows the main actions scheduled by the EC in 2018 and beyond 2020.

Figure 4: Timeline for Europe's AI strategy (Tim Dutton2018)

3.2 History of artificial intelligence in Finland

A **steering AI group** whose core mission is to deliberate on the future of AI in Finland, was recently appointed by the Minister of Economic Affairs Mika Lintilä on 18 May 2017.

This group, led by Pekka Ala-Pietilä published its first interim report (**Finland's Age of Artificial Intelligence** - Turning Finland into a Leader in the Application of AI: Objectives and Recommendations for Measures) on 23 October 2017 and a second interim report (**Work in the age of artificial intelligence** - four perspectives on economy, employment, skills and ethics) on June 2018. The group's final report will be completed during the course of the year2019.

The supervising group should:

"(1) Prepare a short action programme on what the Government can do immediately to make Finland a world leader in AI utilisation; (2) Come up with a long-term action programme to modernise the world of work, education, research and data economy in general".

The abstract of the report Finland's Age of Artificial Intelligence noticed, "Finland has excellent opportunities to be among the winners in this transformation – when comparing the impact of artificial intelligence on economic growth Finland was ranked second among 11 developed countries.

The extensive utilization and application of artificial intelligence offers a vision of a prosperous and healthy Finland of the future.

The **four assignments** assigned to the working group are:

1. How can the public and private sectors best work to ensure that companies receive adequate support for the production of AI-based innovations?
2. How can data-driven businesses benefit from the secondary use of the public sector's information resources?
3. How will AI affect us as individuals and what will be its impact on the future of work? What will be its wider impact on society? What types of measures are required from the public sector as we move towards the age of AI?

4. The working group has published its first interim report containing eight key actions, which will take Finland towards the age of AI.

The **five tasks** allowed to the programme are:

- To generate a snapshot of the current status and prospects for AI and robotics around the world and in Finland.
- To propose a goal state, which Finland should strive to achieve in the application of AI in collaboration with companies, research institutes, educational institutions and public organizations
- To enter a proposal on measures the implementation of which is necessary in order to achieve the stated objectives. Special attention must be given to the field's innovation activities, preparedness for changes to working life, increasing education and upgrading the qualifications of those in the labour market.
- To draw up a model for the implementation of the plan that will ensure the efficient realization of the operational program.
- To prepare a proposal for the expansion of the working group's task description and composition, so as to allow it to develop the measures necessary for the promotion of AI in the long-term and analyze the more broad-scoped societal change related to digitalization and provide proposals for solutions to the Government.
- The Finnish Artificial Intelligence steering group made **eight main actions** to adopt by all parties for taking Finland towards the age of AI:

1. Increasing competitiveness of Finnish businesses
2. Leveraging data extensively in all sectors
3. Speeding and easing up use of AI
4. Securing top-talent and attracting new talent (Top-Institute)
5. Courageouss elections and investments
6. Building best Public Services worldwide with the help of AI
7. Creating new models for global collaboration
8. Positioning Finland as a role-model for the Age of AI

In addition, AI Finland created **AI Forum 2018** "as a platform for discussing AI with political leaders, policy makers, experts, entrepreneurs and industry leaders. We bring together a group with influence and broad view on business, economy, society and emerging technologies."

The **AI Forum 2018** took place in Espoo on 8–9 October 2018. The main conclusions of this Forum are: (1) Capitalizing the potential of AI for European industry (2) AI integrated into policy-making, leveraging cooperation (3) Competitive advantage through AI ethics (4) Artificial intelligence changes the learning life and (5) Scaling research excellence and attracting rising stars.

In **May 2018**, Finland signed the **Declaration on AI in the Nordic-Baltic Region**. (Denmark, Estonia, Finland, the Faroe Islands, Iceland, Latvia, Lithuania, Norway, Sweden, and the Åland Islands) These countries agreed to collaborate in order to "develop and promote the use of artificial intelligence to serve humans."

The **final report of Finland's Artificial Intelligence** published on **14 March 2019** (Edelläkävijänä tekoälyaikaan Tekoälyohjelman loppuraportti, Työ- ja elinkeinoministeriön julkaisuja - Ministeriö - 2019:23). States "that taking Finland into the age of artificial intelligence (AI) calls for continuous capacity building, public discussion on the ethics of AI, as well as bold choices and investments. As one concrete step, the report recommends investments in use of data and AI, especially in business to business markets in which Finland already has strong leading expertise"

The report outlines, "It is important to attract top experts to Finland and increase the skills throughout the organization, including the management. It suggests examining the possibility of granting a training voucher or creating a career account for every person of working age. This would create an effective adult education market in Finland".

In the detail, the final report covers "eleven different themes, or keys, with recommended guidelines on how to utilize AI in Finland. It also presents a vision of Finland in the age of AI in 2025: a nation that is attractive and competitive and that has informed and independent people with relevant education."

3.3 Financial sector in Finland

According the thebanks.eu website the "Finnish banking landscape is rather diversified and consists of both systemic universal banks operating throughout the country and internationally, and specialized regional savings and cooperative banks".

The majority of foreign-controlled banks operating in Finland are originated from Sweden" and according to World Economic Forum's Global Competitiveness Report 2017-2018, financial market development in Finland is scored 5.5 out of maximum 7.0 and ranked 4th out of 138 analysed economies, trustworthiness and confidence of financial market is scored 5.8 (7th place).

ITEM	Rank	Value
8th pillar: Financial market development	4	5.5
8.01 Availability of financial services	3	5.8
8.02 Affordability of financial services	3	5.5
8.03 Financing through local equity market	21	4.9
8.04 Ease of access to loans	4	5.4
8.05 Venture capital availability	3	4.8
8.06 Soundness of banks	1	6.6
8.07 Regulation of securities exchanges	2	6.3
8.08 Legal rights index 0-10 (best)	30	7

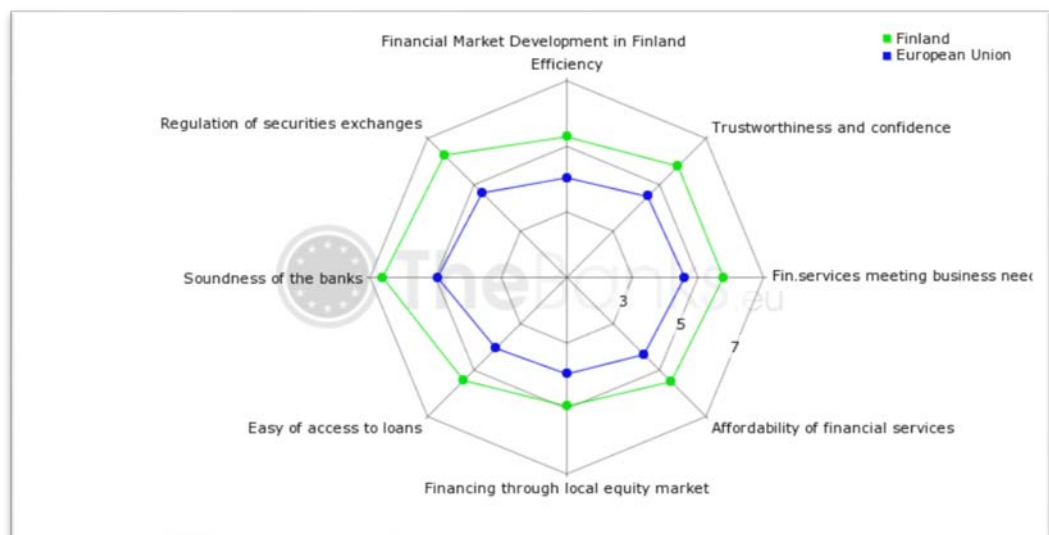Figure 5: Financial sector in Finland (WEF2018)

Figure 6: Key performances of Finnish financial sector (thebanks.eu 2017)

The Finnish Financial sector covers currently the following activities: Banks, Insurance companies, Pension insurers, Finance houses, Securities dealers and Fund management companies.

3.3.1 The contribution of the sector to the Finnish economy

According the report "Forward-Looking Financial Sector 2017", issued by Finance Finland the "Financial sector companies paid taxes for a total of €1.9 billion in 2015. When value added taxes and the taxes and statutory payments withheld from employee salaries are also included in the tax contribution, the total sum rises close to €4.5 billion".

Contributions	Amount in Euros
Withholding taxes	1,368 million
Corporate taxes paid by the Financial sector	1,106 million euro (which is 25% of Finland's total corporate tax income)
Additional employee expenses	900 million
Insurance premium tax	777 million
Value addedtax	263 million

Figure 7: The contribution of the sector to the Finnish economy (Finance Finland 2017)

Contributors	Amount in Eurosmillion
Op Financial Group – Financial sector	**249**
Nordea – Financial sector	**216**
Supercell	176
Bayer	104
Kesko	75
Metsä Fibre	68
UPM-Kymmene	61
Elisa	56
Danske Bank Group – Financial sector	**54**
ABB	53
Local Tapiola Group – Financial sector	**48**
Orion	45
Sampo Group – Financial sector	**38**
Fingrid	31
Planmeca	24

Figure 8: The largest corporate taxpayers in Finland (Finance Finland 2017)

The above report noticed also that the fifteen largest corporate taxpayers
Included five financial companies.

The five companies (Op Financial Group, Nordea, Danske Bank Group, Local Tapi-
ola Group and Sampo Group) paid € 605 million corporate taxes, which position
them as relevant major actors and possible contributors to AI in Finland.

3.3.2. Banking market

The Finnish banking industry consists of government banks, commercial banks, sav-
ings banks, and branches of foreign banks.

The report Finnish Banking 2016 (Finance Finland) underlines the following ele-
ments:

According to this report there were 274 (272 in 2017 in thebanks.eu) credit institu-
tions operating in Finland.

The credit institutions include deposit banks and other credit institutions such as fi-
nance houses, credit card companies, mortgage credit banks, and Municipality Fi-
nance plc.

The capital adequacy of the Finnish banking sector remained strong thus the net in-
terest income continues to be the banking sector's most substantial source of in-
come.

In addition, banks have continued diversifying their business models and have re-
ceived more income from asset management, trading activities and insurance ser-
vices.

Personnel expenses remained unchanged, and the increase is due to other operat-
ing expenses such as development projects and IT costs.

According thebanks.eu, the number of banks in each category is as follows: Banks
(15), Branches of foreign banks (34), Cooperative banks (197) and saving banks
(25).

The largest Finnish banking groups were OP Financial Group, Nordea Finland Group, Danske Bank Finland and Municipality Finance.

The European Banking Federation noticed in a contribution by Elina Erkkilä (2018) that: "Finnish banking market is dominated in 2017 by four large groups, which together hold 81.0% of the financial market.

The biggest group is the OP Financial Group, with 35.5% of the market share. The second largest group is Nordea group with 26.4% of market share".

Danske Bank and Municipality Finance are nearly equal in terms of their balance sheets and market shares, with respectively 9.5% and 9.6%". Structural changes from 2013 to 2017 of the banking sector in Finland are as follows:

The consolidated banking assets' evolution in Finland

In 2017, the consolidated banking assets in Finland were 418.81 billion EUR.

Figure 9: Banking assets in Finland (thebanks.eu, 2017)

Banks personnel and Branches in 2016:

The main indicators for the Finnish Banks are as follows:

Banks	Workforce	Branches
OP Group	6895	442
Danske Bank	2045	42
Savings Bank Group	1156	146
Aktia Group	876	45
S-Panki Group	466	12
Alandsbanken Group	369	10
Pop Bank Group	565	85
Evli Group	155	2
Oma Savings Bank Group	241	45
Hypo Group	46	1
Total (1)	**12813**	**830**

Figure 10: Main indicators of the banking industry (Finance Finland 2016)

Branches of Foreign Banks Operating in Finland

The main indicators for the branches of foreign banks operating in Finland are as follows:

Banks	Workforce	Branches
Nordea Bank AB	7909	161
Svenska AB	624	46
Skandinaviska AB	226	1
Forex Bank	130	14
SveaEkonomi	92	-
Resurs Bank	60	1
Nordnet Bank	42	1
Swedbank AB	36	1
BIGBANK AS	23	1
Carnegie Investment Bank	21	1
Citibank Europe	16	1
Credit Agricole Corporate	13	1
AvidaFinans	13	1
DnB Bank	11	1
TF Bank	10	1
Royal Bank of Scotland	3	1
Deutsche Bank	0	0
Collector Credit AB	-	-
BNP Paribas Fortis	-	-
Total (2)	**9229**	**233**

Figure 11: Main indicators for the branches of foreign banks (Finance Finland 2016)

The Finnish banks and Branches of Foreign Banks operating in Finland have a total of 22.042 employees and around 1063 branches.

2.3.3 Insurance market

In the insurance and reinsurance in Finland: overview, Lauri Railas, Krogerus Attorneys Ltd (2013) specified the following remarks:

The insurance markets are well developed and traditionally quite centralised.

The popularity of life assurance, as an investment instrument, rivals that of other investment instruments.

The insurance market is dominated by insurance groups, which offer comprehensive insurance products through specialised companies.

Increasingly, banks have formed business partnerships with insurance groups to form "financial department stores" offering a wide range of financial services.

Foreign insurance companies have joined the markets through EU laws concerning freedom of establishment and free provision of services.

However, domestic insurers are still able to compete with foreign insurers.

An important feature of the Finnish insurance market concerns pension insurance companies. Employers obtain pension insurance for their employees from one of the private insurance firms.

Although pension insurance is strictly regulated, it is very capital and investments are intensive.

Specialised reinsurance companies and units within insurance groups operate in the Finnish reinsurance markets.

The Act on Supervision of Financial and Insurance Conglomerates (699/2004) regulates the supervision of insurance business in Finland, setting up the regulatory authority, the Financial Supervisory Authority.

Insurance and reinsurance providers operating in Finland must be authorized by the Finnish authorities and Authorities of another state.

According Finnish Insurance in 2017 report there were "at the end of 2017:
Five dozen licensed Finnish insurers in Finland, with:
Thirty-five specializing in non-life business and reinsurance,
Nine in life insurance,
Six in statutory employee pension insurance.

The annual average number of persons employed by insurance companies was about 9,600 in total and the premiums written were 22.938 billion Euros.

The main actors of the sector are as follow:

Life Insurers	Non life insurers
Nordea Life Assurance Finland Ltd. OP Life Assurance Company Ltd.	LocalTapiola Group OP Insurance Ltd.
Mandatum Life Insurance Company Limited LocalTapiola Mutual Life Insurance Company Sb Life Insurance Ltd. Fennia Life Insurance Company Ltd. Aktia Life Insurance Ltd. Kaleva Mutual Insurance Company Försäkringsaktiebolaget Liv-Alan	P & C Insurance Company Ltd. Fennia Mutual Insurance Company A-Insurance Ltd. Pohjantähti Mutual Insurance Company Turva Mutual Insurance Company Folksam Non-Life Insurance Company Ltd. Aaland Mutual Insurance Company Försäkrings Ab Alandia Garantia Insurance Company Ltd. Eurooppalainen Insurance Company Ltd. Finnish P&C Insurance Ltd. ValionKeskinäinenVakuutusyhtiö INS. Co. for Pharmaceutical Injury Indemnities

Figure 12: Main actors in insurance industry (Finance Finland, 2017)

Statistics Finland outlines that "Non-life insurance, life insurance and employment pension insurance companies' combined profit for the financial period grew in 2017 to EUR 1.3 billion from the previous year's EUR 0.8 billion".

For Employment pension insurance companies' Premium income grew by 3.6 per cent to EUR 14.1 Billion and claims paid, in turn, increased by 3.7 per cent to EUR 14.9 billion in 2017.

For Life insurance, companies' Premium income totaled EUR 4.5 billion and claims paid EUR 4.2 (Statistics Finland, 2018)

For Non-life, insurance companies' premium income fell by 4.6 per cent to EUR 4.3 billion from one year ago and claims paid went down by 9.5 per cent to EUR 2.7 billion. (Statistics Finland, 2018) 2.3 Financial sector in Finland

3.4 Impacts of Artificial Intelligence on banking and insurance value chain

Michael Porter, in his book Competitive Advantage has "identified several key steps common among all value chain analyses and determined that there are primary (Investment team, operations and traders, marketing and sales, service) and supporting activities (Technology, Human Resources, Infrastructure) that when performed at the most optimal levels will create value for their customers. Such that the value offered to the customer exceeds the cost of creating that value, resulting in higher profit." (Kristina Zucchi, Investopedia, 2018).

The financial sector in the world has shown significant progress in recent years, particularly in the use of new technologies such as Artificial Intelligence (AI), Blockchain cryptographic technology, the Internet of Things etc. The use of these new technologies will considerably impact the different components of the banking and insurance sector's value chain.

A study conducted by **Hub Institute with the collaboration of IBM**, indicated three challenges for banking and insurance:

1. Relationship and customer experience
More experiences the system has, more it learns and more efficient it becomes.

With AI, we transform the experience for the end customer as well as for the employees. Virtual assistants help advisors to answer their customers' questions more quickly.

2. Recommendation and advice

Artificial Intelligence helps client advisors make relevant recommendations to their clients. The AI is able to understand the preferences of each client and will make personalized recommendations by sharing facts and information underlying evidence.

3. Risk management and compliance

Faced with the complexity of laws and regulations, banks are now looking to the AI to analyse the texts and facilitate the alignment of the rules. AI systems can integrate new regulations as soon as they are established and can analyse 800 million pages of text per second.

The **World Economic Forum** with the collaboration of **Deloitte** (2018) conducted also studies regarding the impact of AI in financial services. The report provides a comprehensive exploration of the impact of Artificial Intelligence into six sectors: deposits and lending, insurance, payments, investment management, capital markets and market infrastructure.

According to this study, AI will affect the front and back office operations, create change in the structure and regulation of financial market and increase the challenges for society.

The nine Key findings of the **WEF** report include the following sections: (1) from cost centre to profit centre. (2) A new battlefield for customer loyalty. (3) Self-driving finance. (4) Collective solutions for shared problems, (5) Bifurcation of market structure. (6) Uneasy data alliances. (7) The power of data regulators.(8) Finding a balanced approach to talent and (9) new ethical dilemmas.

EFMA (European Financial Management Association) in its report of 2017 outlines that:

"Progress in Artificial Intelligence "has led to a number of new opportunities for banks and insurers, who can now use AI techniques to automate and transform their businesses. In fact, leading banks the world over agree that AI will become the primary way in which they will interact with their customers within the next three years. It seems likely that

AI will revolutionise the way they gain information from and interact with customers, and may even become the face of their organisation or brand."

EFMA added, "AI presents a huge number of opportunities for retail financial services firms, who, when able to exploit their growing data repositories, can better meet regulations, increase their bottom line, improve the customer experience and more."

3.4.1 Opportunities offered by the use of AI

According to **Accenture**:

"67% of customers will grant banks access to more personal data, but 63% want more tailored advice, and the same number demand priority services, such as expedited loan approvals, or a monetary benefit, such as more competitive pricing, in return for the information they share."

"Using the components of machine learning, natural language processing and cognitive computing, there are several AI applications within banking.

These include: Fraud detection, meeting regulatory requirements, lowering costs and increasing revenue, improving the customer experience and boost customer engagement.

In a paper regarding banks and dated on 2018, **Puneet Chhahira** (Head of Marketing InfosysFinacle) said that:

" AI stack consists of building blocks and applied solutions, which are commonly used across a variety of use case. The foundational layer is Data and Analytics.

Next, come the building blocks of machine learning, deep learning, natural language processing, natural language generation and visual perception.

These building block technologies combine into applied solutions such as virtual assistants, robots and expert advisors, which may then be deployed into hundreds, even thousands, of use cases in banking functions ranging from customer service to risk management

Puneet Chhahira supports that "most banks are likely to appreciate AI by where it fits into the banking function. Today, AI has the potential to reimagine a number of banking processes in the front, middle and back office".
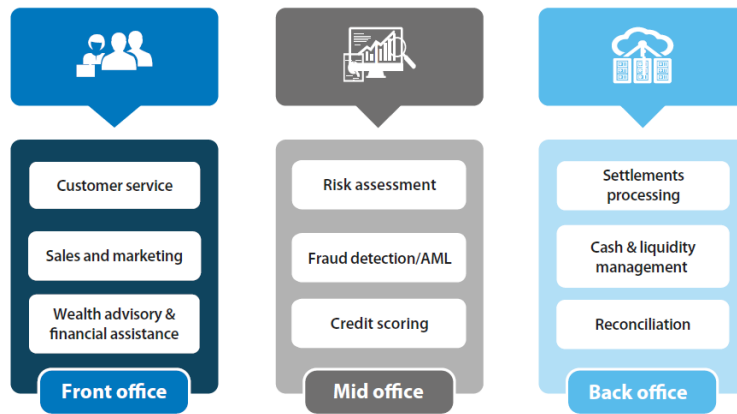
Figure 13: Impacts of AI on banking process (Finacle Connect, 2018)

For the insurance sector, the following chart shows the possible applications of the AI in the following functions: Product management, sales, underwriting and customer/claims management.
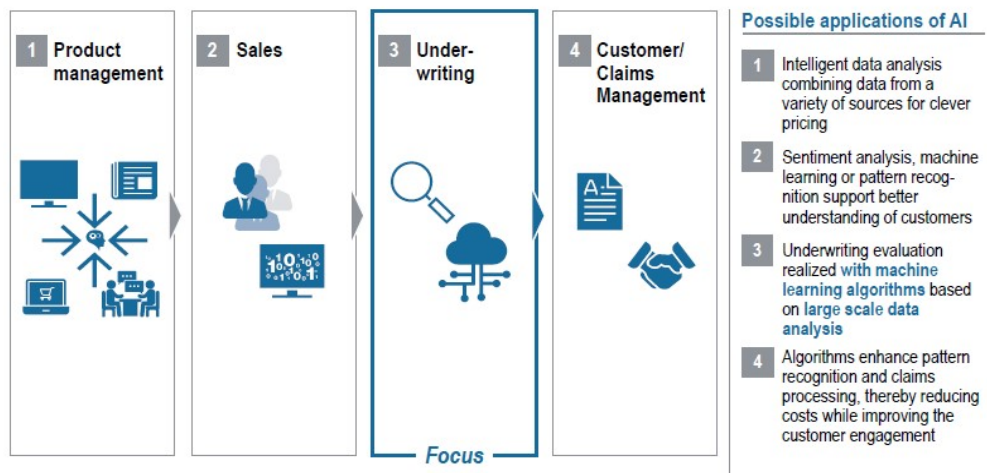

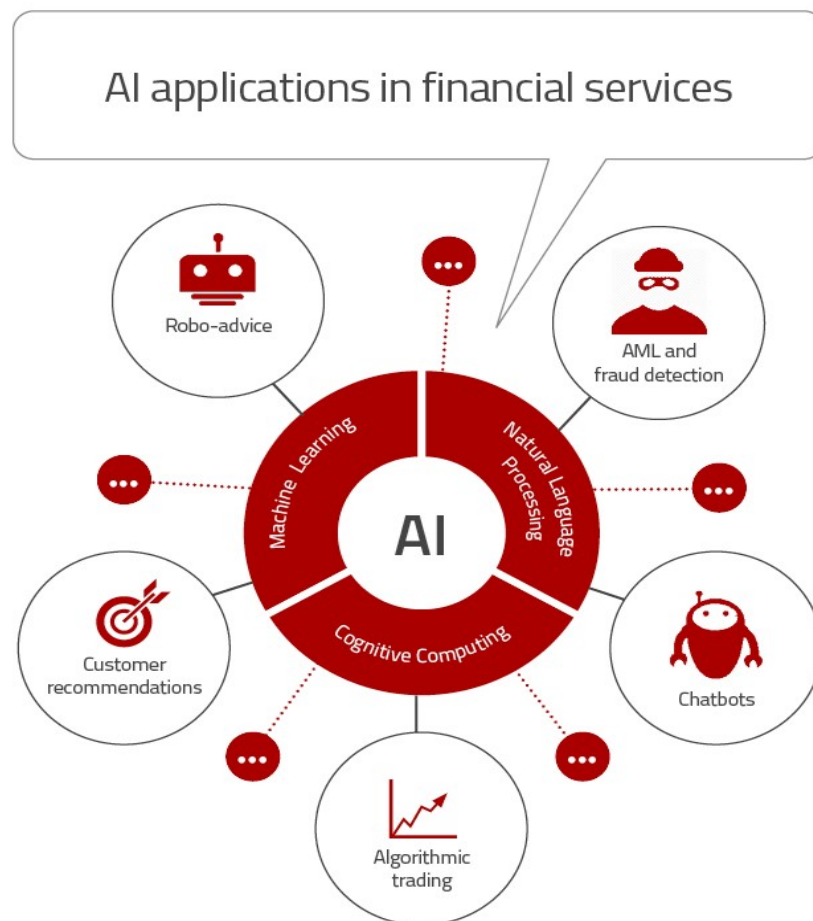Figure 14: Impacts of AI on insurance process (Roland Berger, 2017)

Figure 15: AI applications in financial services (EFMA, 2017)

As well the "most financial institutions in the learning phase" the main challenges that will face banks and insurance companies will be:

"Data security, organizational impacts, the integration of new technologies and the understanding of use cases and ROI benefits".

According to **EFMA-**European Financial Management Association (2017):

"One of the biggest challenges is finding the right talent. with only slightly more than half of survey respondents (55%) stating they have identified an AI leader within their company, more than half of those have appointed the head of innovation as the leader. While this assignment may be fine initially, external hires will usually be required, as applications get more complex

"In some cases, current employees will not be well positioned for the 'new age of banking.' In other cases, the transformation of labour caused by the advances of AI will eliminate some positions entirely"

Alternatively, there are many who believe that automation will actually increase hiring.

For instance, 91% of **EFMA (**European Financial Management Association)**/Deloitte Consulting** (2017) survey respondents believed that new cognitive technology will empower or support employees, rather than replace them".

According to EFMA's document, "there are four key recommendations that experts make to financial services firms who are looking to effectively exploit the value of AI.

These are: (1) Look to invest, (2) learn and pair up with experts from outside of the industry (3) Make use of cognitive computing to make better use of data implement the right mix of platform technologies and (4) strive to maintain a human touch.

3.4.2 Summary of AI in Finland

The publication of the Ministry of economic affairs and employment in Finland (2017) details the country's strengths and weaknesses as well as strengths and opportunities as follows:

Strengths	Opportunities
Seamless cooperation between actors, an agile operating environment.	Business revolution: industrial digital revolution, new solutions and business models, data resources gathered from export service business activities, bio-economy coordination, and the control of processes.
A highly educated and tech-friendly population.	
A harmonized and effective education system.	Reform of the public sector: the use of artificial intelligence and platforms in the administration of costs related to healthcare and care for the elderly, improving processes, healthcare data re-sources, greater demand for wellbeing as quality of life improves.
Finland is an excellent platform for piloting (having a limited and harmonized market, abundant technology resources and support for legislation).	
Promoting a culture of experimentation in public administration has brought added agility.	Intelligent transport: electrification, the servicification of mobility, control of the entire system.
Broad-scoped consensus on the necessity of large and fast changes.	Energy: renewable energy sources, a more fragmented and anticipatory energy system.
A rapidly growing startup ecosystem.	
Over the past few years, companies and public organizations have undergone various structural reforms.	Overall safety: the increased need for security as quality of life improves, digital risks, the importance of the protection of individuals and privacy.
Unique data resources: in terms of availability and quality.	

Weaknesses	Threats
Weak internationality: placing a focus on domestic activities, weakness and a lack of international links, a limited amount of global corporation, the absence of a strong mittelstand, experts from different parts of the world are not attracted to Finland as a central hub, foreign investments are smaller in comparison with similar countries.	A lack of trust in local skills, expertise and financial success.

The reduction of RDI investments has partly led to a decline in private investments.

Slow and ineffective commercialization. |
| A culture of avoiding risks. | The implementation of reforms and the rigidity of the labour market. |
| Dispersed resources, the absence of an economy of scale. | A lack in encouragement to engage in large-scale reforms. |

Figure 16: SWOT analysis to evaluate the AI in Finland (Ministry of economic affairs and employment, 2017)

Having studied in the first part, the theoretical framework of our problematic, I propose in the second part of, to present the empirical aspect of my study.

4. Research approach and methods

4.1 Research approach

The purposes of my research is firstly to try to find out the general public/citizens' perception of the progress of AI in Finland. More particularly its impact on services and relations with and in the Financial sector: (services / products, jobs, hiring, training...) and in order to end up collecting proposals to improve the use of AI in the relations between companies and their customers, companies and their social partners, citizens and administrations.

4.2 Data collection and data analysis process

To try to answer these research questions, I plan to conduct a survey with a representative sample namely the General Public / Citizens.

First, I identified what I want to cover in my survey according to research proposals. I elaborated a survey divided in 4 parts:

Personal background (3 items)
Professional background (5 items)
General questions (19 items)
Actions for progress (6 items)

Except for the last open comment section, I used closed-ended questions with five scales of intensity:

1= Strongly Agree
2=Agree
3= Neutral
4= Disagree
5= Strongly Disagree

I sent the survey in the first of March 2019 to:

My network on Facebook (482 persons);
My network on LinkedIn (154 persons);
A list of specialists (Policy maker, entrepreneurs, searchers, consultants, etc.) in the field of artificial intelligence located in Finland (50 persons) by direct professional email.

The survey was posted with the help of www.webroposurvey.com the most used query tool in the Nordic countries and the tool I was encourage to use during my studies.

The questionnaire was accessible on mobile device as well as on personal computer.

At the end of March, I collected the answers (38) after several reminders.

However, before choosing this solution, I requested a commissioner from the Finance Finland but unfortunately; I could not get a positive answer because they were already in collaboration for a master degree thesis but they approved a list of people that can help me answer the survey.

Moreover, I had the chance to learn more about the financial sector in Finland as well as the future vision of the government for better inclusion of the technology in the society. Even if it is not at its best this technology, evolve constantly with the help of big data helping business to take advantage as well and be part of the race to succeed the movement.

Due to the recent developments in the subject, I have not been able to access the academic or practical work carried out on the impact of AI to financial sector in Finland. I have learned several key elements regarding where the future of Finance is heading in Finland and in the world, as well as exploring the exalting subject of AI, with all its attributes and future possibilities including the merging with other innovative technologies. This supports the idea of unlimited possibilities to take advantage of as individuals and as societies in general to grow sustainably and with better understanding of our systems.

Furthermore, I learned how to take advantage of my contacts and my social network in order to have their valuable opinion regarding a trending subject on time. This thesis helped me project myself in the future and show my interest to the topic by gathering key data on how the technology in society and its appliances in the financial sphere are perceived in the Finnish society.

5. Results and discussion

5.1 Key findings and key results

The majority (89.50%) of the respondents feel that Artificial Intelligence will affect employment in financial sector.

The majority of the respondents (91%) think that Artificial Intelligence will affect the hiring policy in financial sector.

The majority (87%) of the respondents feel that AI will affect the training policy in financial sector.

The majority (80%) of the respondents consider that AI will impact the job policy in financial sector.

The majority (97%) of the respondents think that AI will impact the relationship between the Financial sector and customers.

63% of the respondents feel that AI will impact the relationship between the financial sector and Unions.

Policy - Privacy - Education- Employment

74% of respondents feel that AI will affect education programs in Finland.

The use of Artificial Intelligence does not introduce major risks in business.

Only 30% of the respondents feel that Artificial Intelligence will reduce inequalities in Finnish society.

61 % of the respondents think that Finland is prepared to succeed in the AI movement.

Only 18% of the respondents consider that investments in Artificial Intelligence infrastructures are sufficient in Finland.

Only 24% of the respondents feel that investments in Artificial Intelligence in Education are sufficient

25 % of the respondents think that investments in Artificial Intelligence in research are sufficient versus 31% who do not think so.

19 % of the respondents consider that the public policy in Artificial intelligence is clear versus 43% who do not think so.

Around 25% of the respondents feel that the current training system meets the needs of businesses in terms of Artificial Intelligence versus 35%.

The majority of the respondents (86%) think that the requirements for the worker level of qualification will change due to the use of Artificial Intelligence.

30 %of the respondents consider that in general, Finnish people understand how Artificial Intelligence affects their lives versus 32%.

The majority of the respondents (87%) feel that AI will impact the privacy and the security.

Around 70% of the respondents think that AI will have an impact on the efficiency of administration activities.
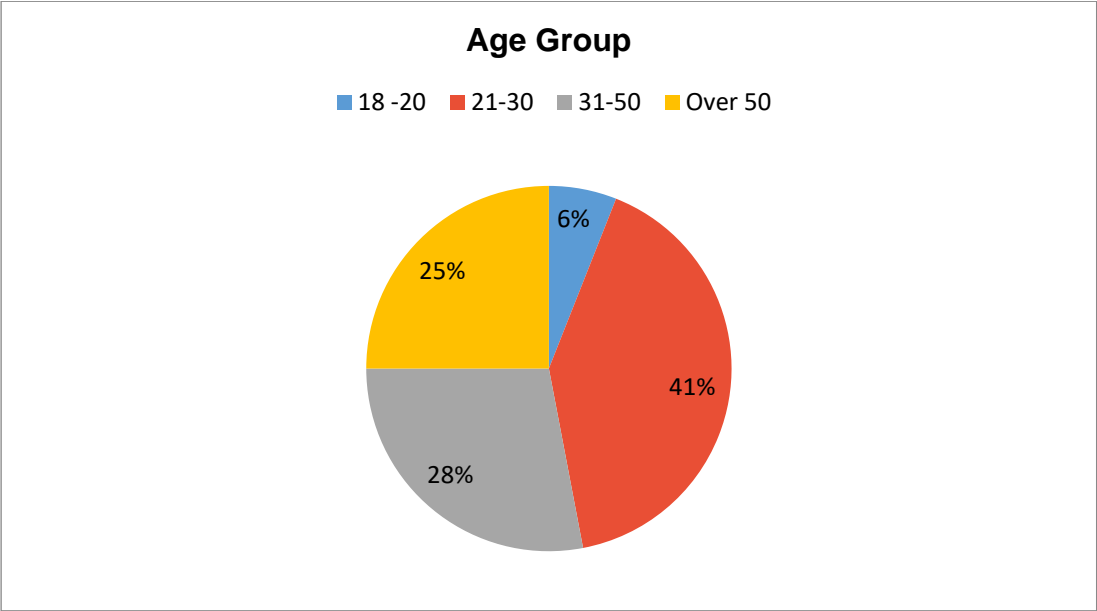
Actions to consolidate application of Artificial Intelligence in Finland

In order to strengthen Finland's position in the field of AI, respondents have outlined several proposals including the following: encouraging schools and universities to use AI (72%). Providing incentives to businesses to use AI (59%), looking for a better coordination between the university, research and the business community (75%).As well as a better coordination between business and unions (62%) and increasing investment in research and development (78%).
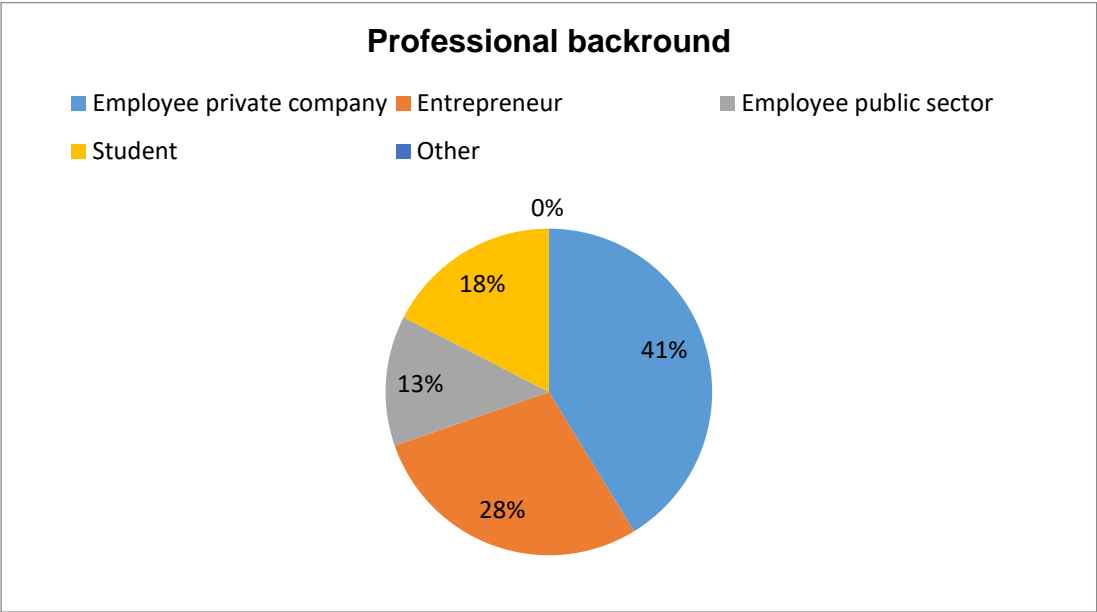
5.1.2 Key results

Personal background of respondents:

The respondent panel is composed of 58% male and 42% of female, they are mainly under 30 years old and they are part of the active society as well.
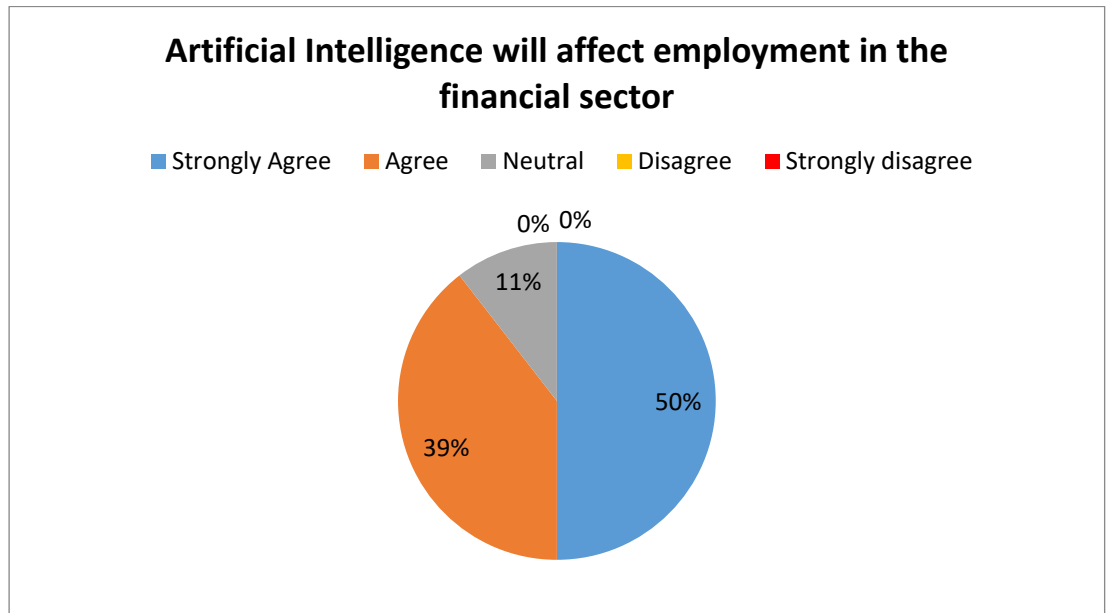
Age Group

■ 18 -20 ■ 21-30 ■ 31-50 ■ Over 50

6%

41%

28%

25%

47% of respondents are under 31 years of age.

Professional backround

■ Employee private company ■ Entrepreneur ■ Employee public sector
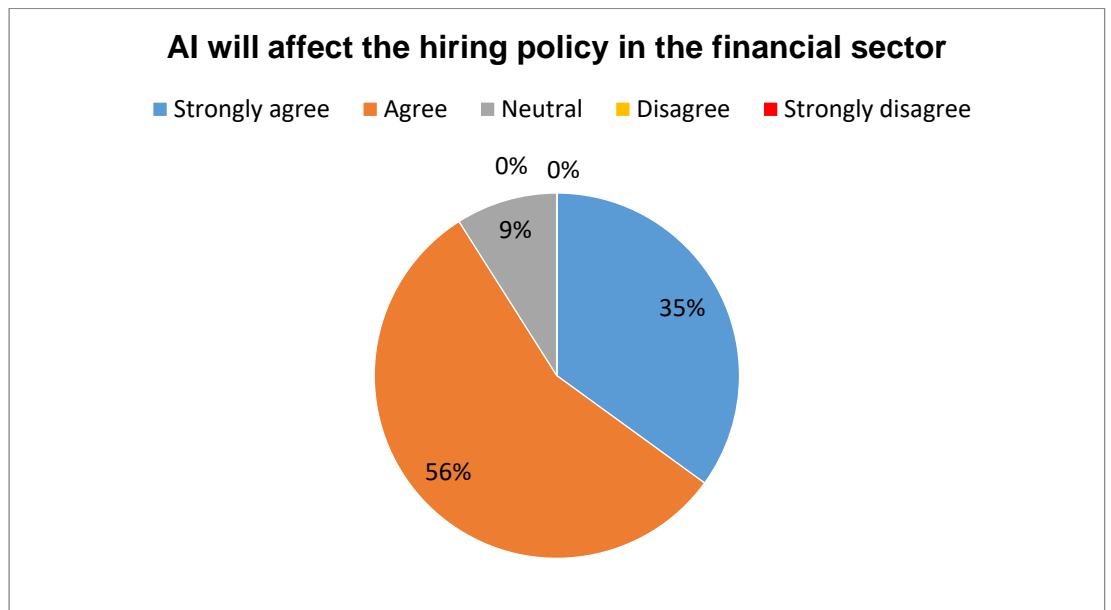■ Student ■ Other

0%

18%

13%

41%

28%

82% of respondents are part of the economically active population.

Q.1 AI will affect employment in the financial sector

Artificial Intelligence will affect employment in the financial sector

■ Strongly Agree　■ Agree　■ Neutral　■ Disagree　■ Strongly disagree
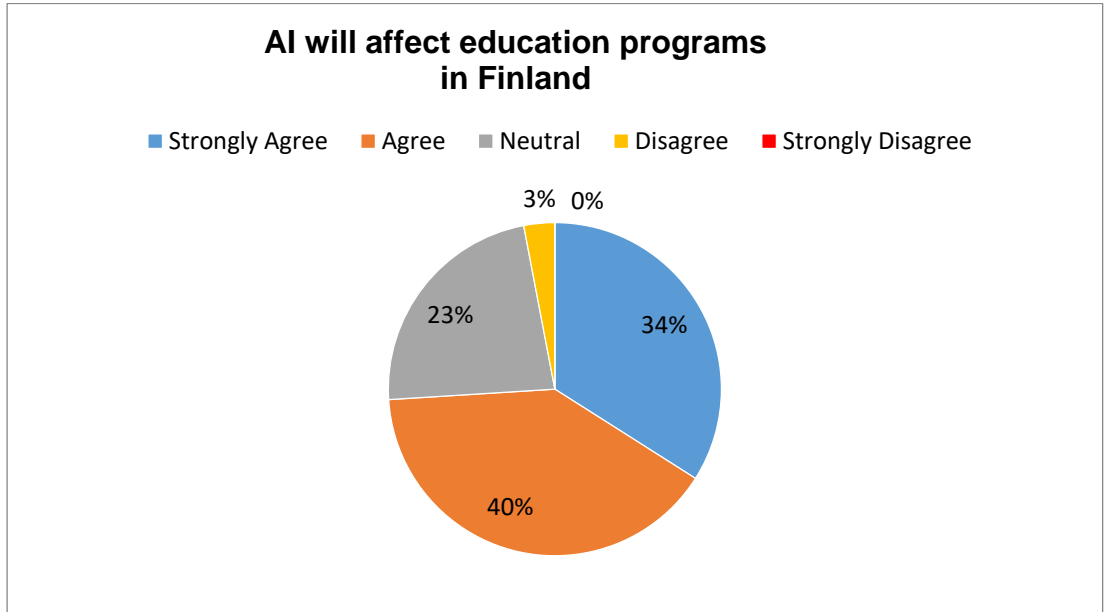
0%　0%
11%
50%
39%

A majority (89%) think that AI will have an influence on jobs in the financial industry.

Q.2 AI will affect the hiring policy in the financial sector

AI will affect the hiring policy in the financial sector

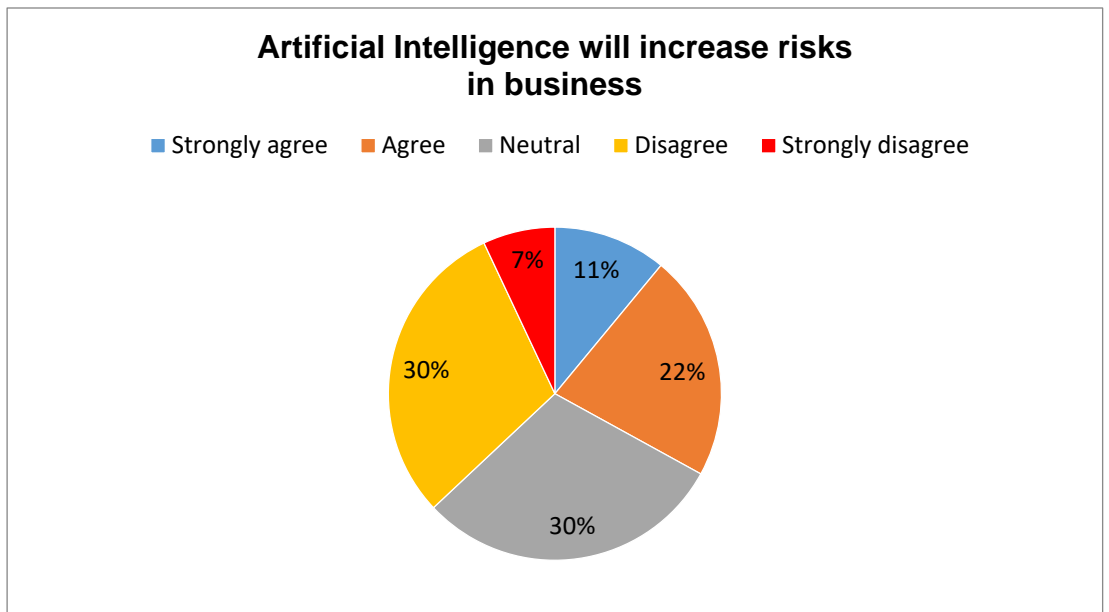■ Strongly agree　■ Agree　■ Neutral　■ Disagree　■ Strongly disagree

0%　0%
9%
35%
56%

Almost the totality considers (91%) that AI will have an influence on the hiring policy in the sector.
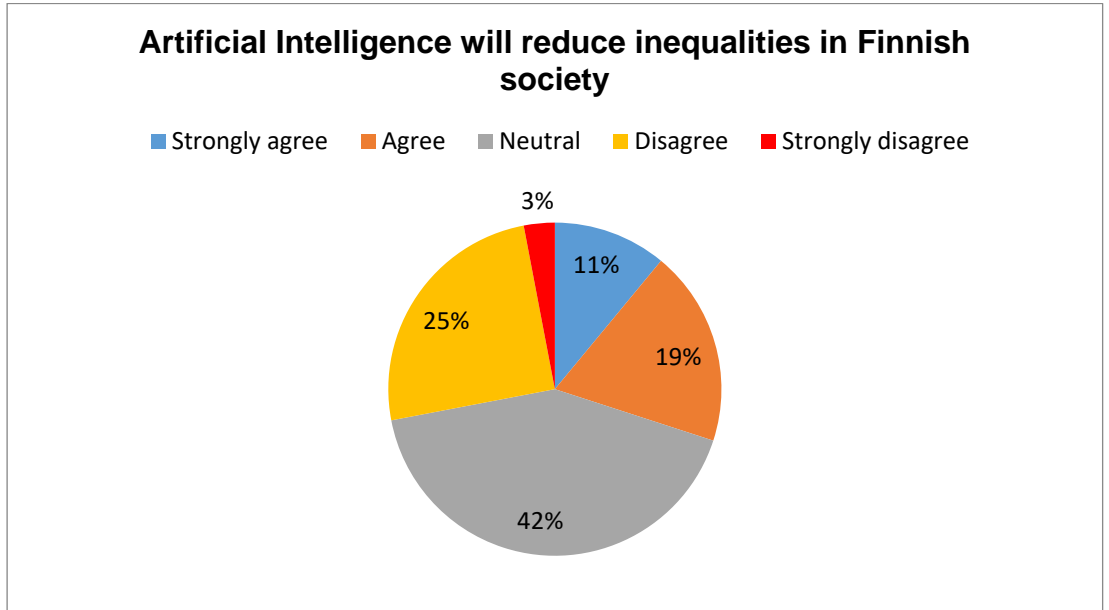
Q.3 AI will affect education programs in Finland

AI will affect education programs in Finland

Legend: ■ Strongly Agree ■ Agree ■ Neutral ■ Disagree ■ Strongly Disagree

- Strongly Agree: 34%
- Agree: 40%
- Neutral: 23%
- Disagree: 3%
- Strongly Disagree: 0%

(74%) think that AI will impact the education programs in Finland.

Q.4 Artificial Intelligence will increase risks in business

Artificial Intelligence will increase risks in business

Legend: ■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

- Strongly agree: 11%
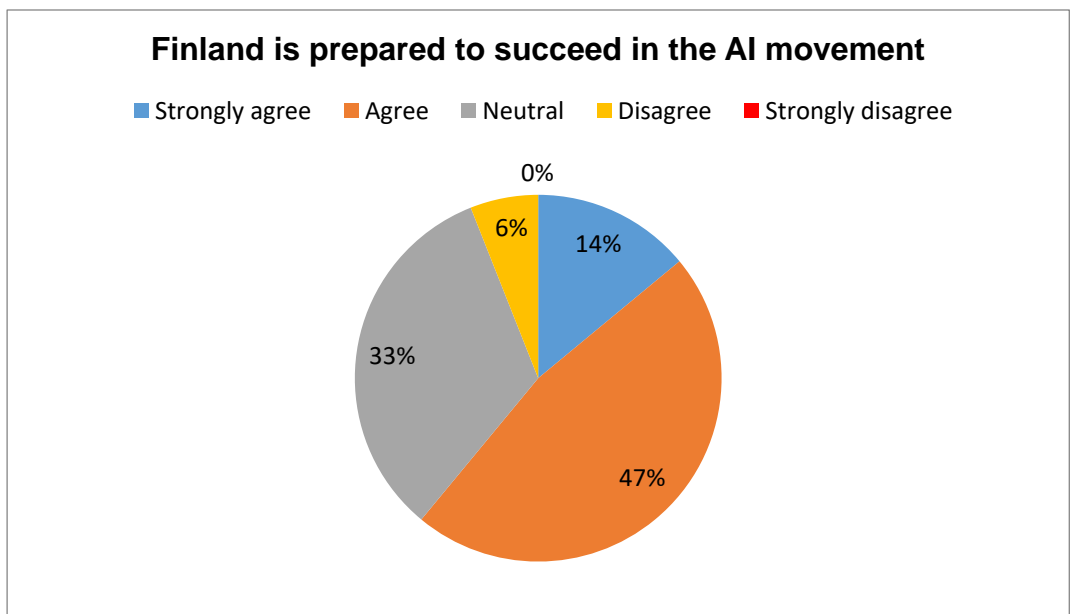- Agree: 22%
- Neutral: 30%
- Disagree: 30%
- Strongly disagree: 7%

(37%) do not feel that AI could expose the business community to risks.

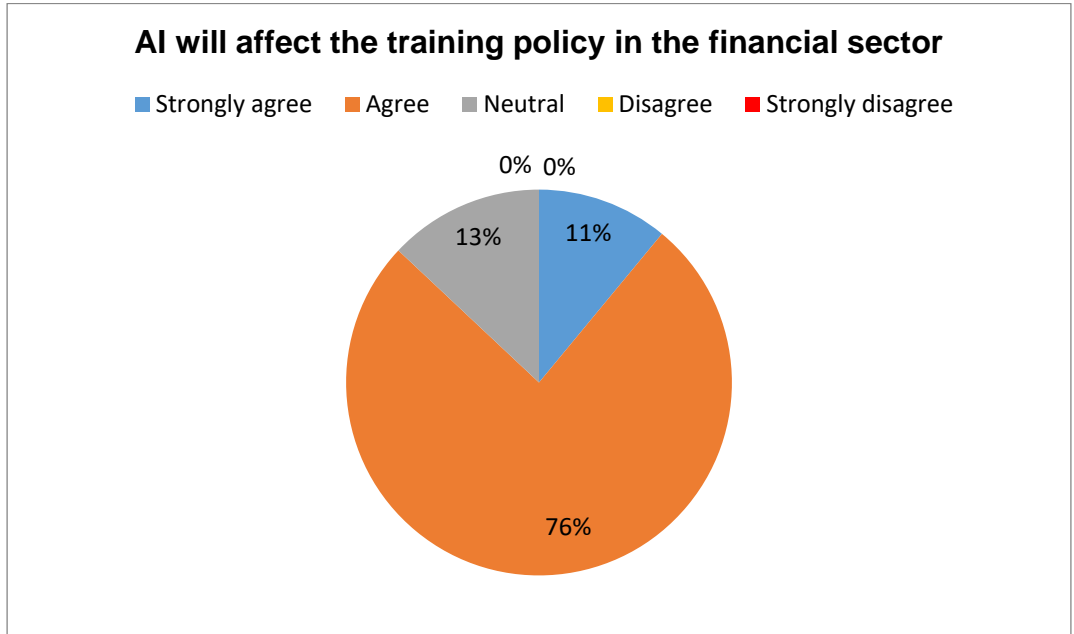**Q.5 Artificial intelligence will reduce inequalities in Finnish society**

Artificial Intelligence will reduce inequalities in Finnish society

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

3%
11%
19%
25%
42%

Only 30% think that AI will reduce inequalities within the Finnish society.

Q.6 Finland is prepared to succeed in the AI movement

Finland is prepared to succeed in the AI movement

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
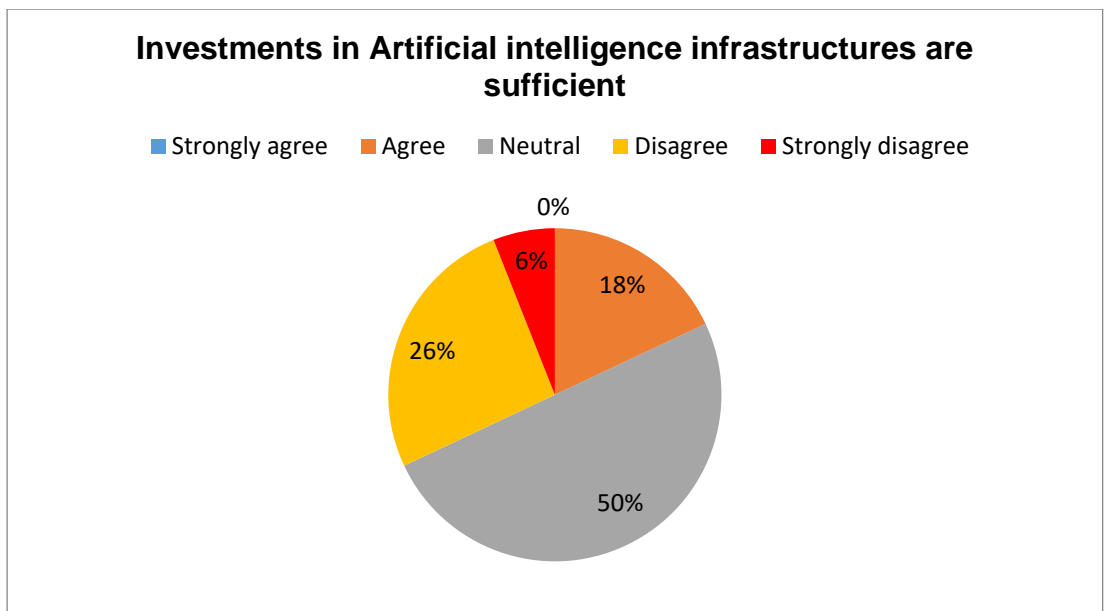
0%
6%
14%
33%
47%

Around 61% of the respondents feel that Finland is ready to be successful in AI movement.

Q.7 AI will affect the training policy in the financial sector

AI will affect the training policy in the financial sector

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
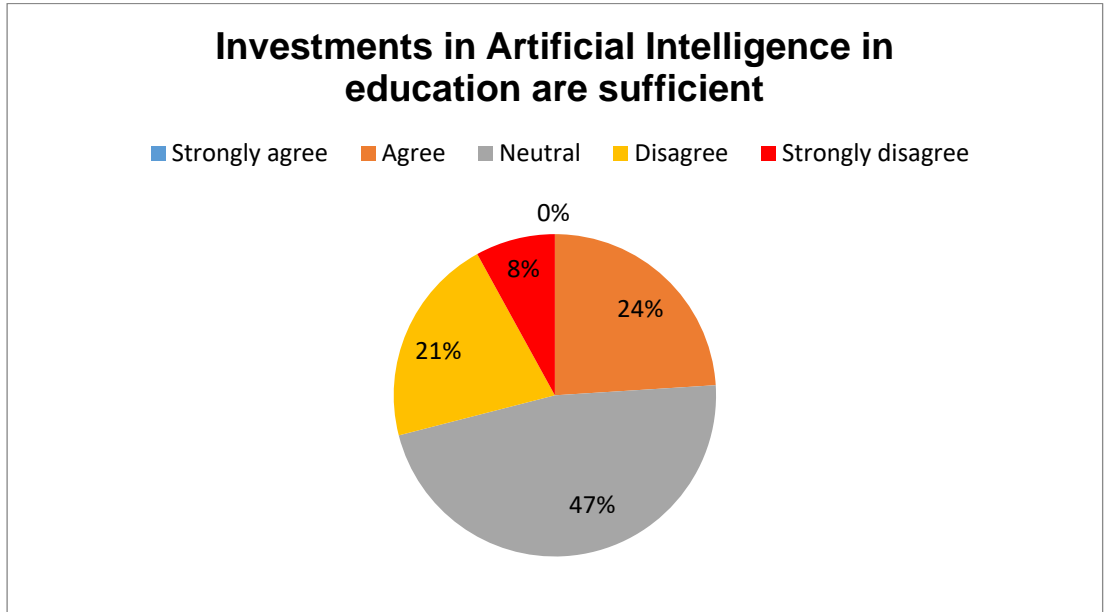
0% 0%

13%

11%

76%

Around 87% consider that AI will be affecting the training policy in the financial industry.

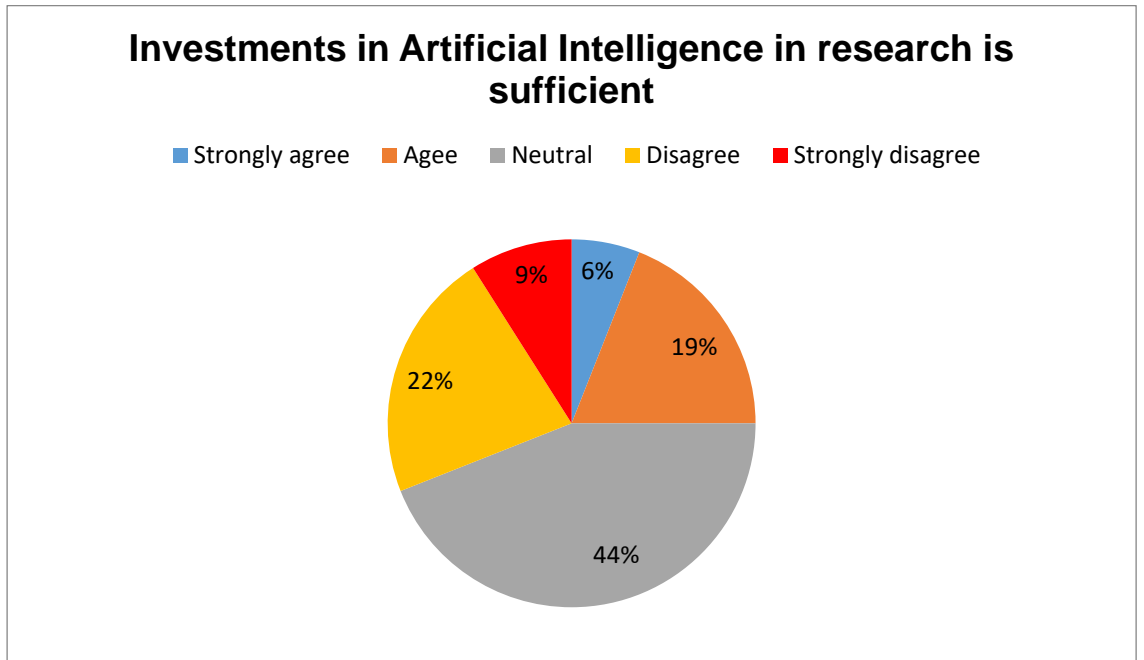**Q.8 Investments in Artificial intelligence infrastructures are sufficient**

Investments in Artificial intelligence infrastructures are sufficient

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

0%

6%

18%

26%

50%

(32%) estimate that investments in AI infrastructure are not enough.

Q.9 Investments in Artificial Intelligence in education are sufficient

Investments in Artificial Intelligence in education are sufficient

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
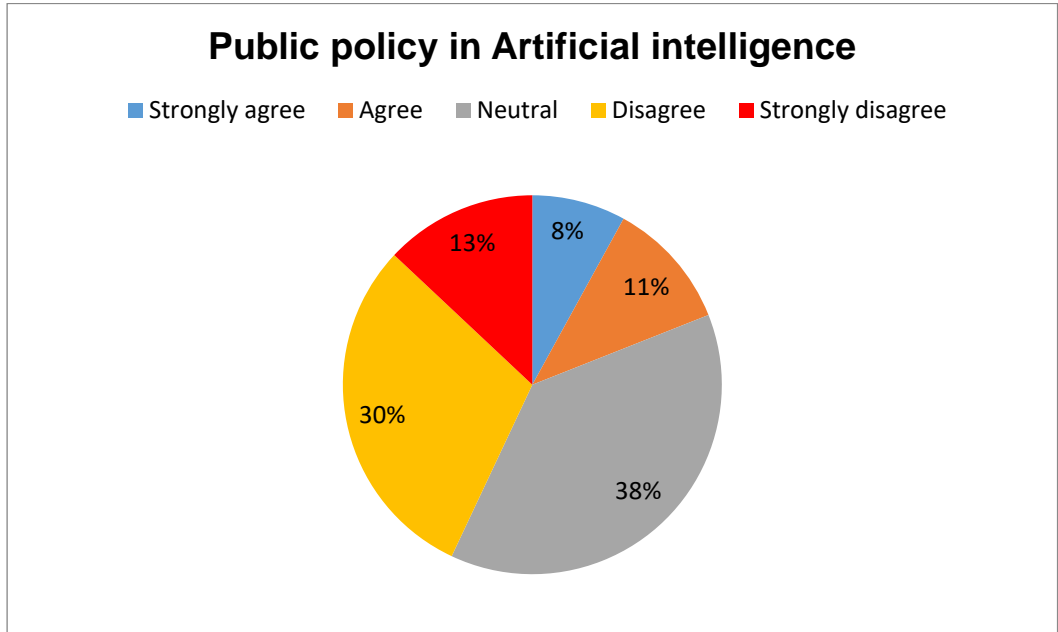
- 0%
- 8%
- 24%
- 21%
- 47%

(29%) consider that investments in education are currently not sufficient versus 24%.

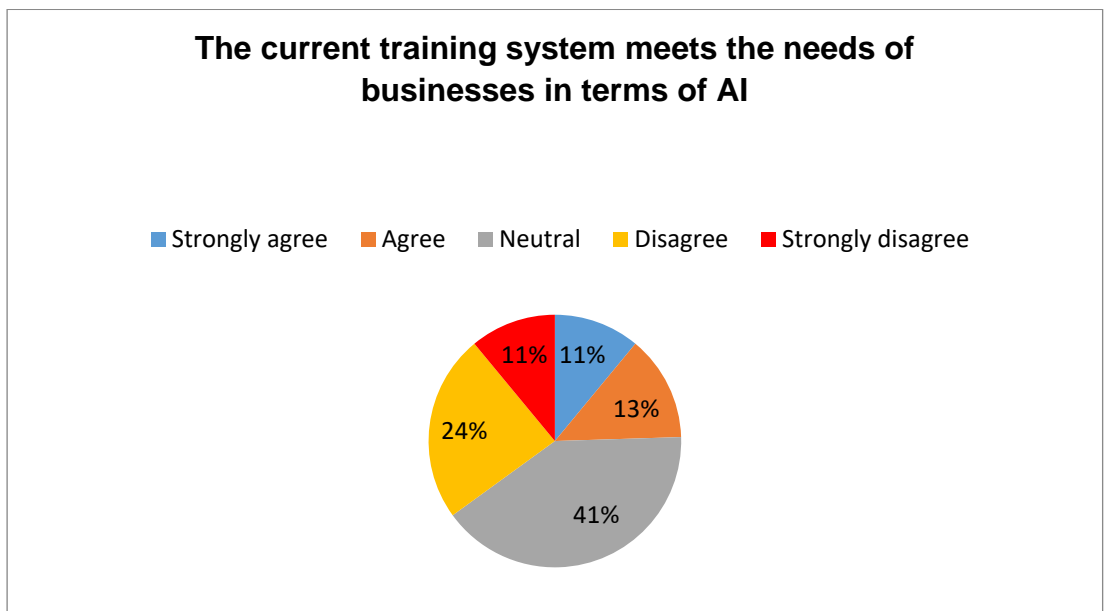**Q.10 Investments in Artificial Intelligence in research is sufficient**

Investments in Artificial Intelligence in research is sufficient

■ Strongly agree ■ Agee ■ Neutral ■ Disagree ■ Strongly disagree

- 6%
- 9%
- 19%
- 22%
- 44%

Around 31% feel that investments in research are not enough versus 25%.

Q.11 Public policy in Artificial intelligence

Public policy in Artificial intelligence

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
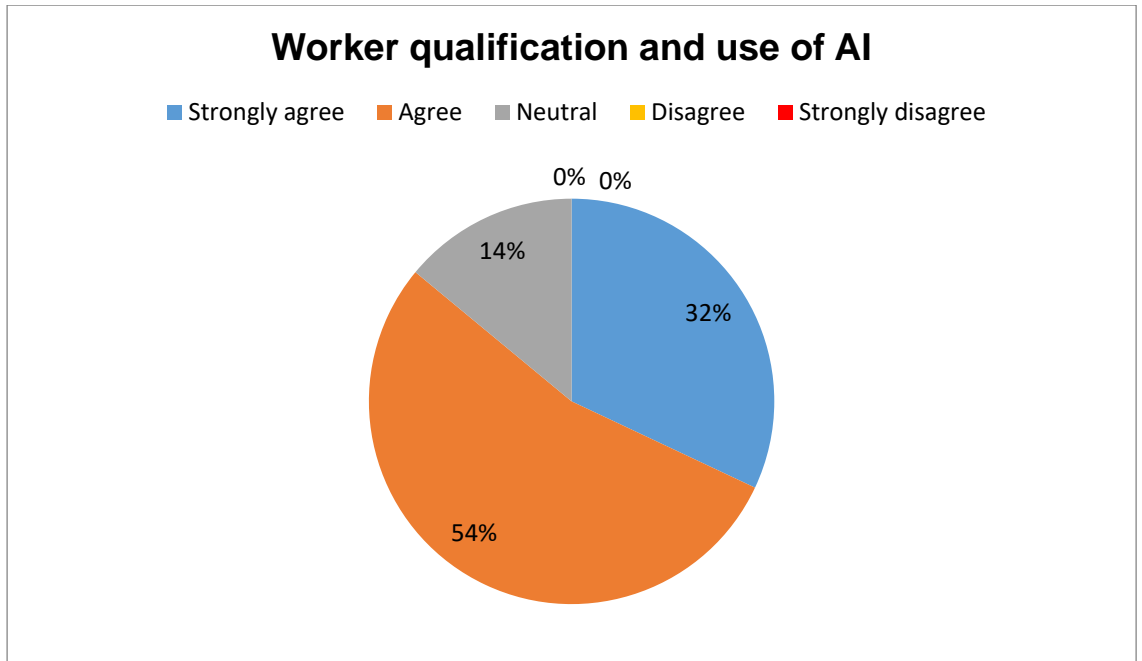
8%
11%
13%
30%
38%

A large majority of 43% consider that the public policy in Finland is not clear enough versus 19% that believe it is.

Q.12 Current training system meets the needs of businesses in terms of AI

The current training system meets the needs of businesses in terms of AI

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
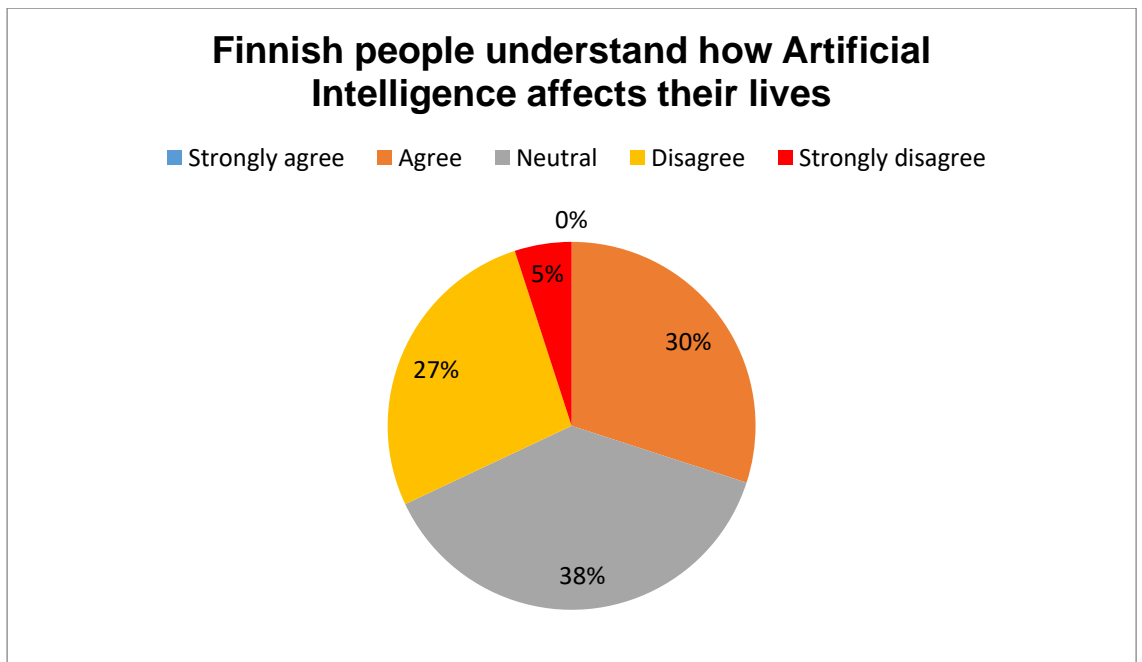
11% 11%
13%
24%
41%

Around 24% estimate that the current training system meets the expectations of the business community versus 35%.

Q.13 The requirement for the worker level qualification will change due to the use of Artificial intelligence

Worker qualification and use of AI

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
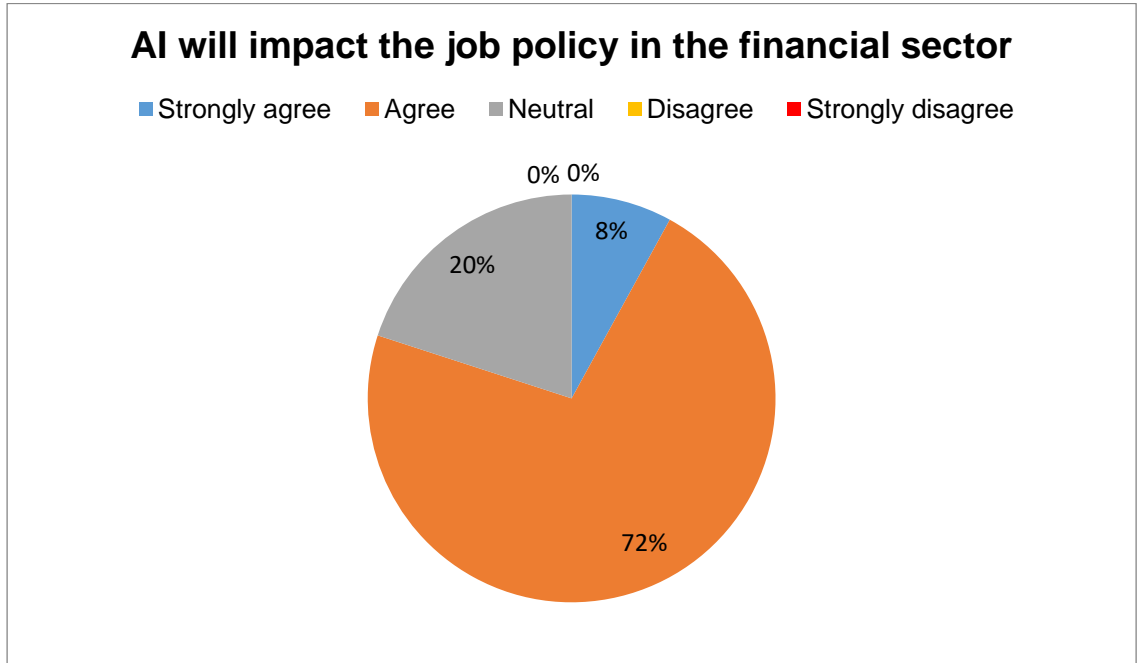
0% 0%

14%

32%

54%

(86%) think that the requirement for the workers level qualification will change due to the use of Artificial intelligence.

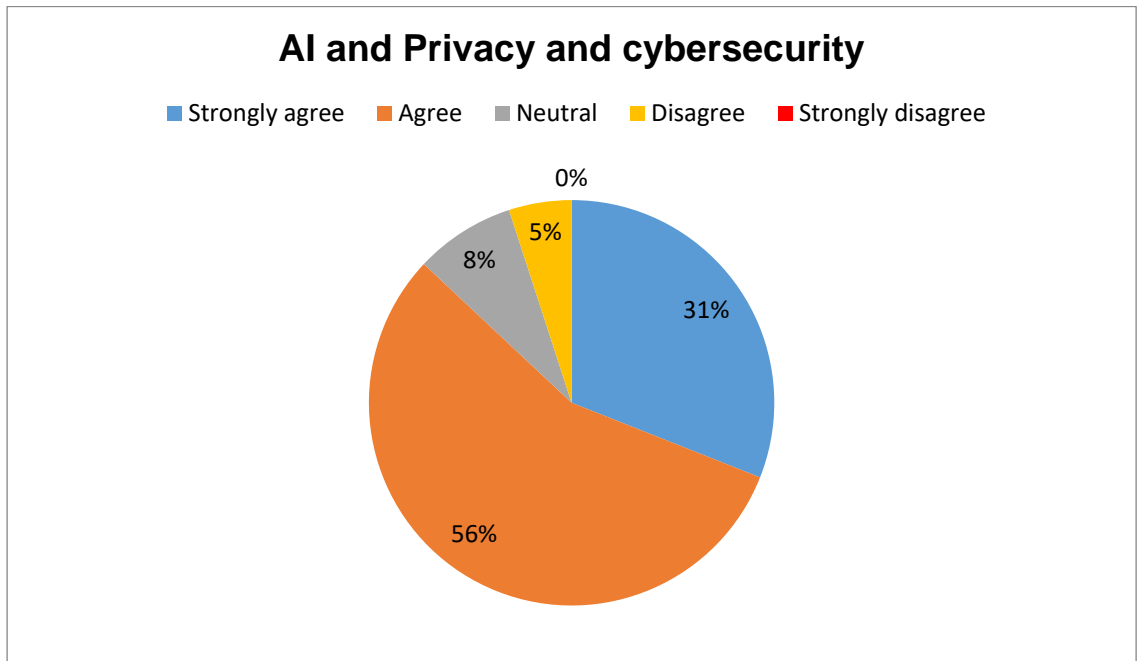**Q.14 Finnish people understand how Artificial Intelligence affects their lives**

Finnish people understand how Artificial Intelligence affects their lives

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

0%

5%

30%

27%

38%

Only 30% of Finnish people understand how Artificial Intelligence affects their lives.

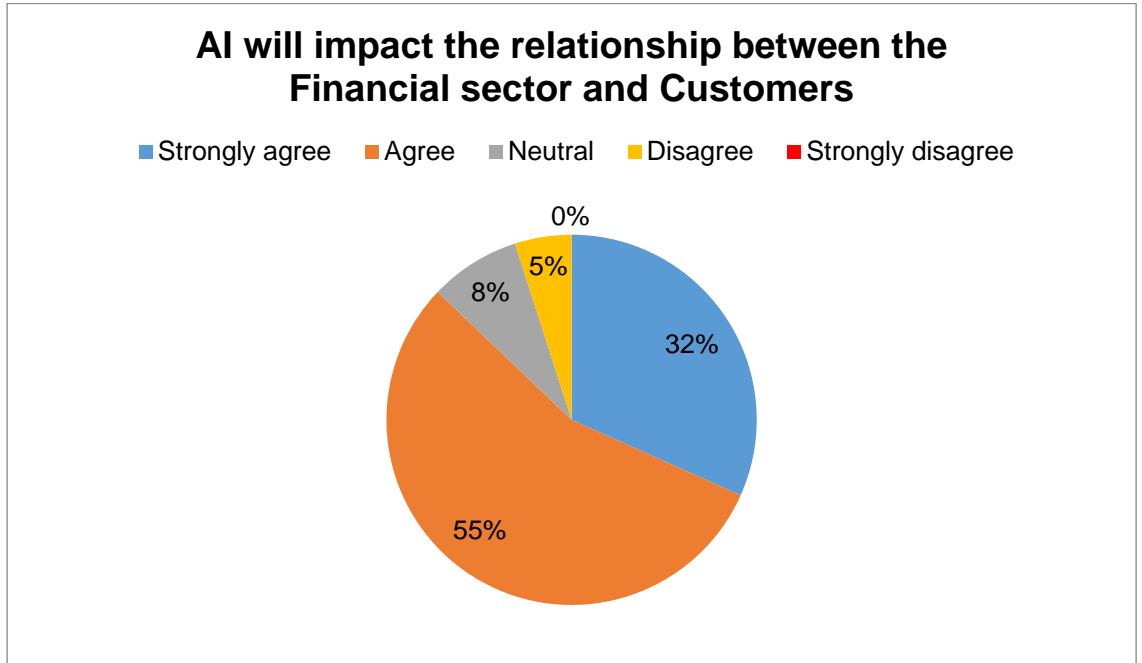**Q.15 AI will impact the job policy in the financial sector**

AI will impact the job policy in the financial sector

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

0% 0%

8%

20%

72%

The vast majority 80% estimates that AI will affect the employment policy in the financial industry.
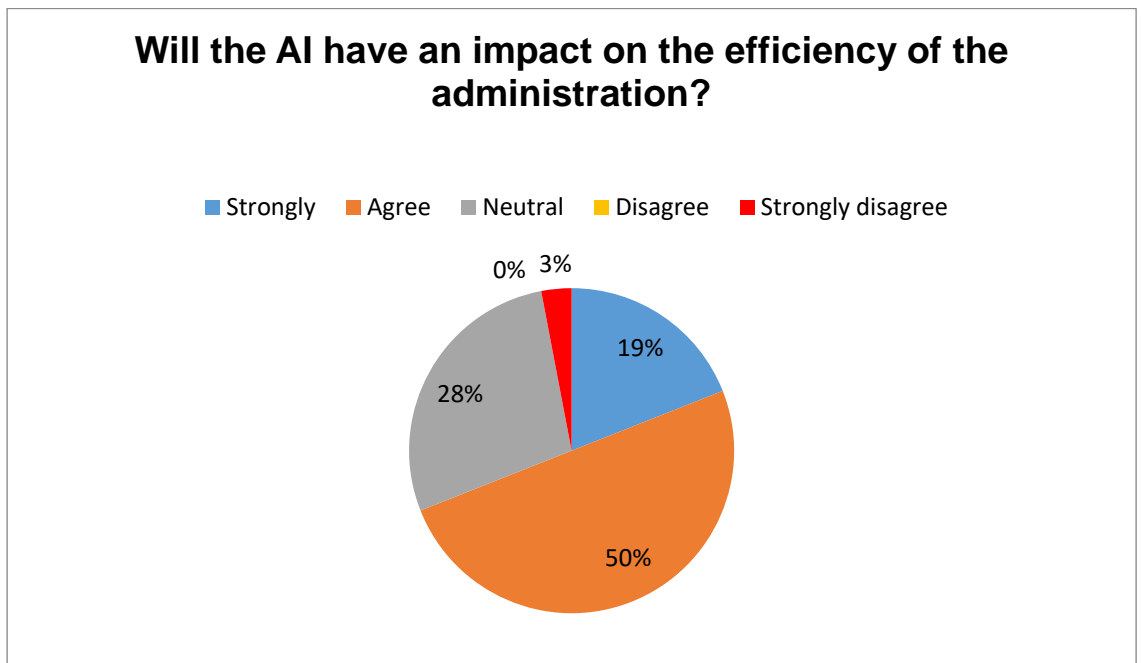
Q.16 The Privacy and Cybersecurity

AI and Privacy and cybersecurity

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

0%

5%

8%

31%

56%

(87%) think that AI will impact the privacy and the cybersecurity in Finland.

Q.17 Financial sector and Customers

AI will impact the relationship between the Financial sector and Customers

■ Strongly agree ■ Agree ▨ Neutral ■ Disagree ■ Strongly disagree
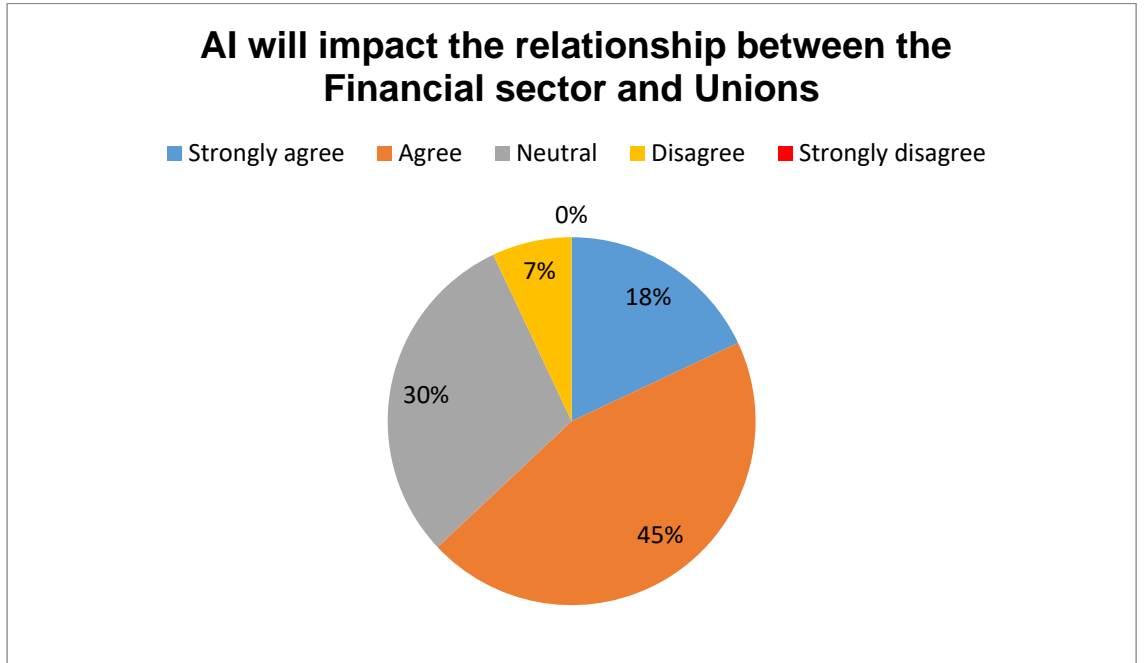
- 0%
- 5%
- 8%
- 32%
- 55%

(87%) estimate that AI will impact the relationship between the financial sector and their customers.

Q.18 AI and Government

Will the AI have an impact on the efficiency of the administration?

■ Strongly ■ Agree ▨ Neutral ■ Disagree ■ Strongly disagree
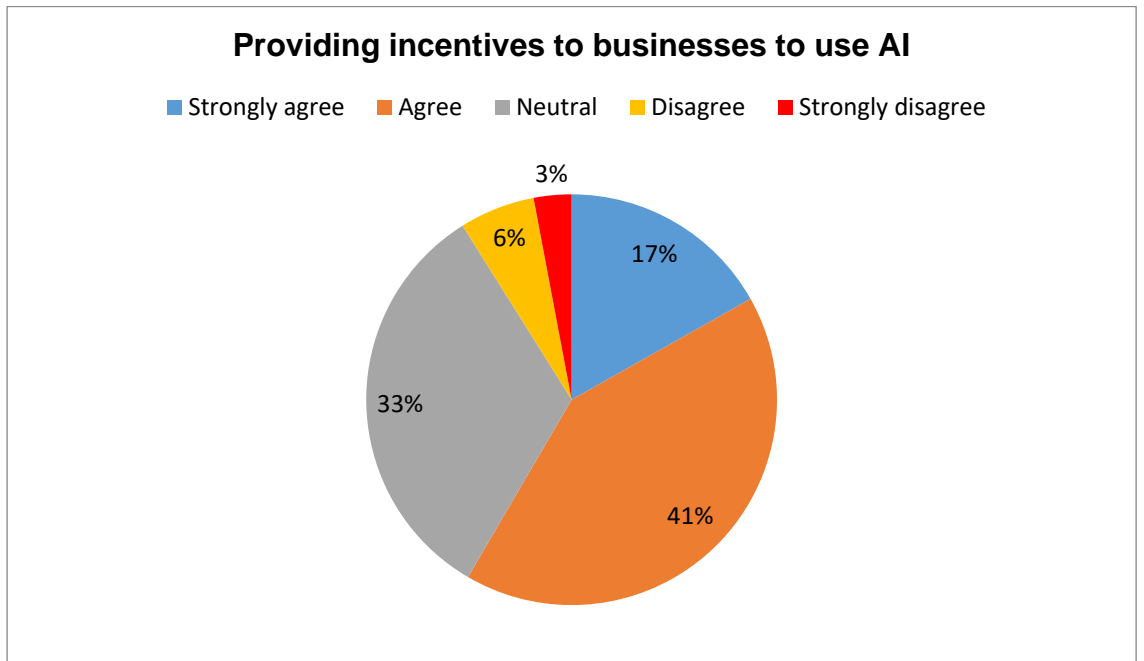
- 0% 3%
- 19%
- 28%
- 50%

Exactly 69% of the respondents think that Artificial Intelligence will have an impact on the efficiency of the Administration.

Q.19 Financial sector relationship with Unions

AI will impact the relationship between the Financial sector and Unions

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
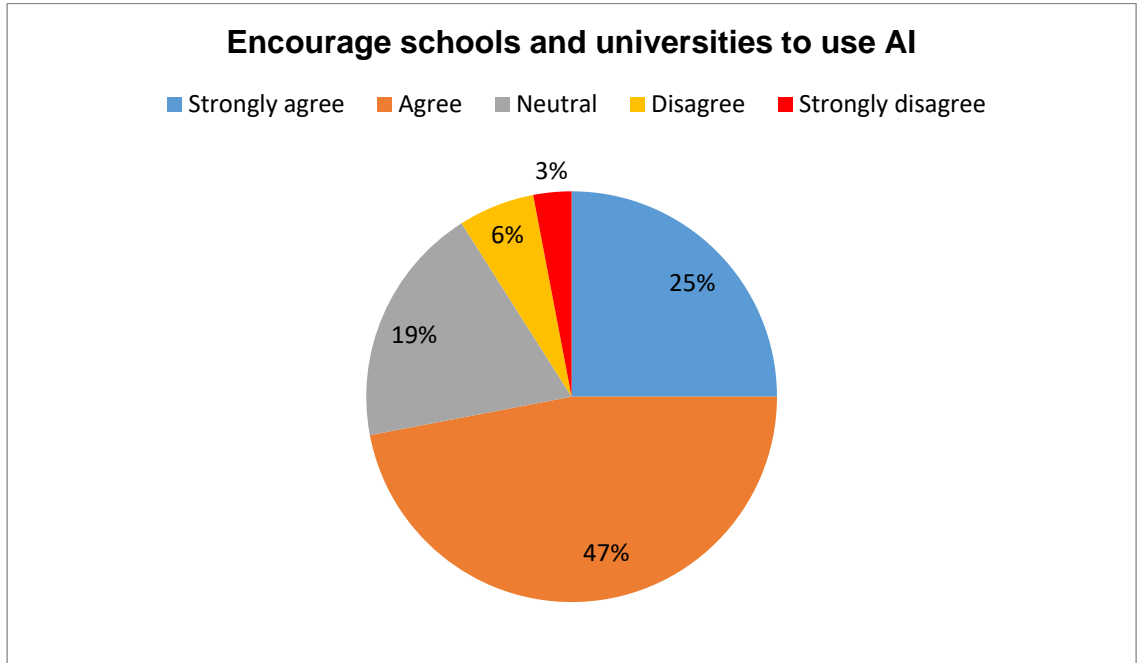
0%
7%
18%
30%
45%

(63%) agree that AI will impact the relationship between the financial industry and labour unions.

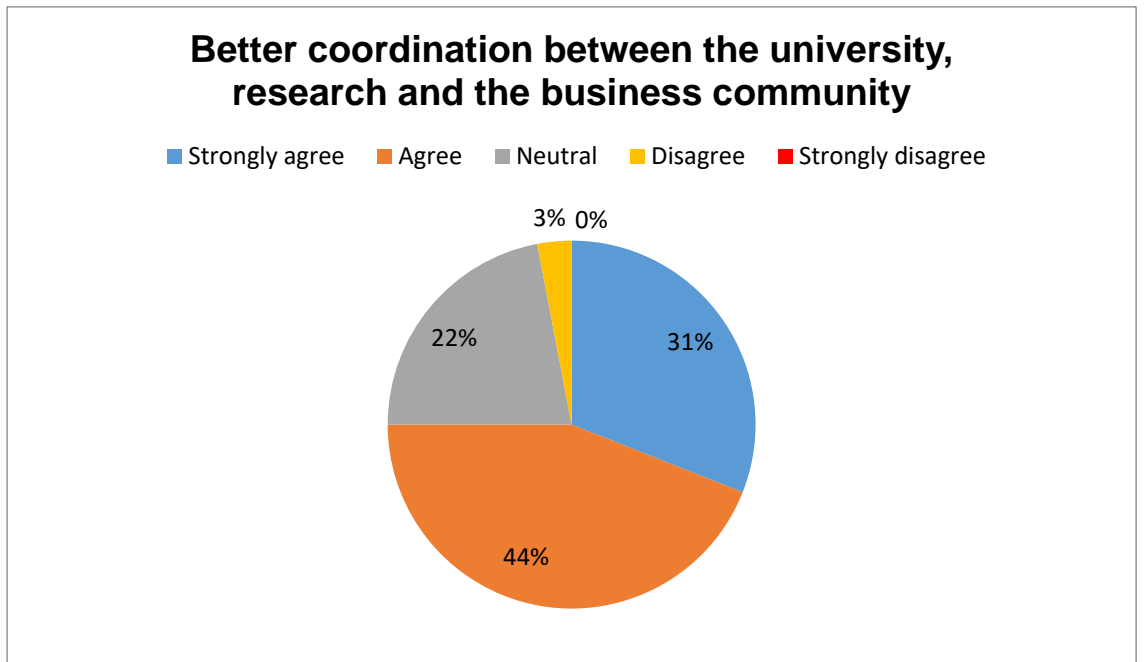**Q.20 Providing incentives to businesses to use AI**

Providing incentives to businesses to use AI

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

3%
6%
17%
33%
41%

Around 60% think that the government must allocate incentives to businesses in order to promote the uses AI.

Q.21. Encourage schools and universities to use AI

Encourage schools and universities to use AI

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
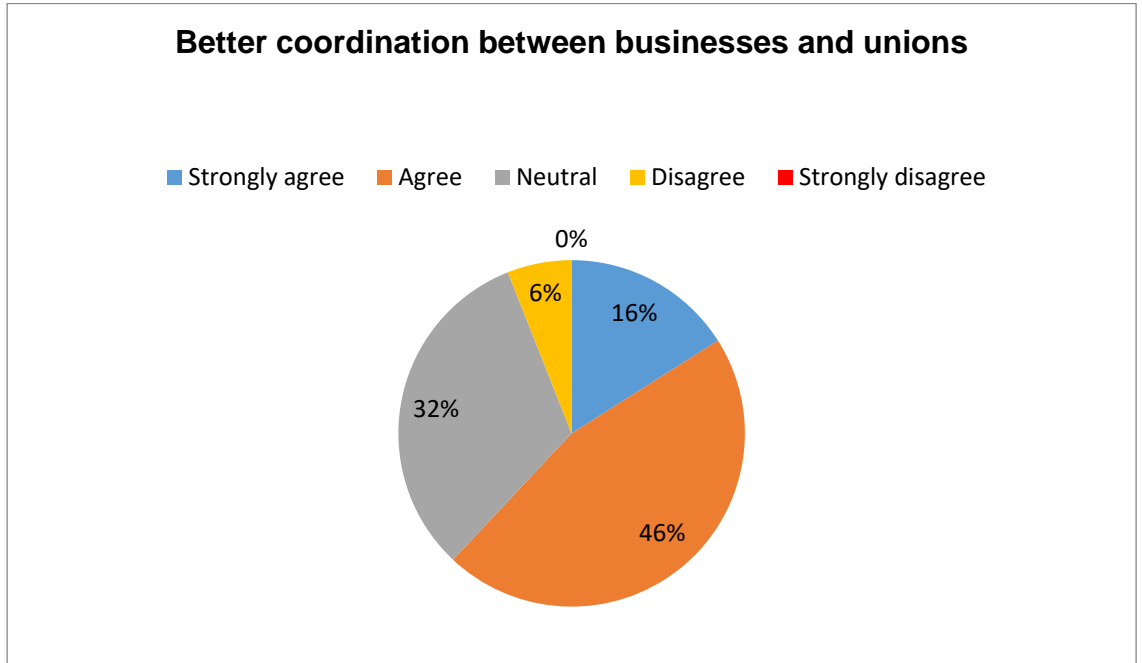
3%
6%
19%
25%
47%

Exactly 72 % feel that universities and schools should be encouraged to use AI.

Q.22. Better coordination between the university, research and the business community

Better coordination between the university, research and the business community

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree
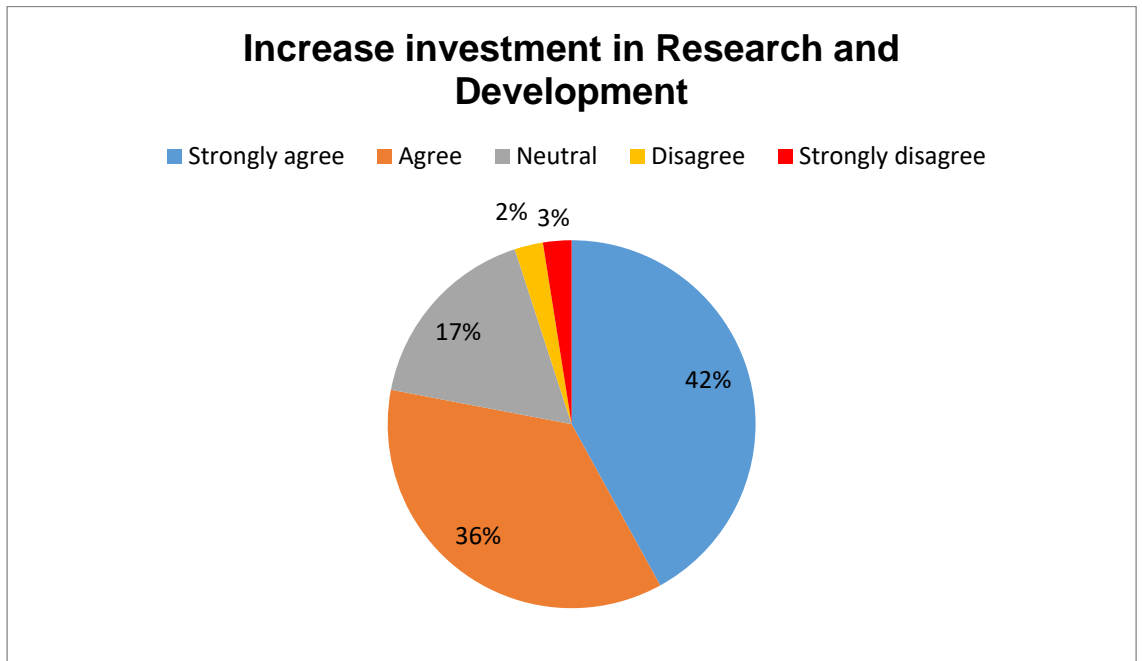
3% 0%
22%
31%
44%

(75%) think that a wider collaboration between the education system, research and the business community is to be encouraged.

Q.23. Better coordination between businesses and unions

Better coordination between businesses and unions

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

0%
6%
16%
32%
46%

(62%) estimate that a largest collaboration between the labour unions and the business community is to be privileged.

Q.24. Increase investment in Research and Development

Increase investment in Research and Development

■ Strongly agree ■ Agree ■ Neutral ■ Disagree ■ Strongly disagree

2% 3%
17%
42%
36%

(78%) think the increase in the research and development funding is to be promoted in the future.

5.2 Discussion

At the beginning of my work, I had to answer several research questions, including:

What does the literature say about the Intelligence and Artificial Intelligence?
What does the literature say about the impact of this revolution on societies and economies and in particular on the financial sector?
Is there a real understanding of the importance of AI in the economy, society and the education system and how far does AI affect and will impact the financial sector in Finland?
Will the AI affect the sector's relationships with its environment and stakeholders (customers, union, workforce, government?
Moreover, will the AI have an impact on the efficiency of the government's, on the skills and content of training courses and on security and privacy?

Concerning the definitions collected through the abundant literature, the concept of "intelligence" presents a certain level of consensus, but the concept of "Artificial Intelligence" is very controversial and the most surprising thing is that some authors even doubt its existence. Thus, Luc Julia (VP of Innovation at Samsung and the co creator of virtual assistance Siri)in his recent book "Artificial Intelligence doesn't exist «published in the beginning of 2019, had only been talking about the concept of "Augmented Intelligence" making abstraction of the term artificial.

Moreover, regarding the practical part, the majority of the responses to the survey suggest:

Firstly, that Artificial Intelligence will affect employment, hiring policy, training policy and job policy in the financial sector in Finland. In addition, most responses, estimate that AI will impact the relationship between the financial industry and the customers as well as and the labour unions.

Secondly, despite the existence of a public policy on AI and the progress made since 2017 in Finland, more substantive measures should be taken in the following areas: investment in infrastructure and research and education.

Thirdly, while the AI does not present a risk to business it does create a risk to the privacy and Cybersecurity.

Fourthly, the use of AI will introduce challenges for business in terms of human resources recruitment and training. Employees would also face the need to adapt themselves to the new requirements through the reskilling of their proficiency in this matter.

Fifthly, the adoption of the AI by the administration will improve its efficiency and consequently citizen's satisfaction.

Finally, in order to strengthen Finland's position in the field of AI, some actions should be taken shortly. For example, encouraging schools and universities to use AI in their program and in their structures, providing incentives to businesses to use AI, looking for a better coordination between the education system, research and the business community, looking for a better coordination between business and unions and increase investment in research and development.

In the open comments section, several proposals have been made by the respondents mainly focusing around issues such as transparency in the uses of the AI, regulation, ethics, partnership, education, ecosystem, communication and Networks. All those topics are in line with the recommendations of the Finnish report published in 2018 (Work in the Age of Artificial Intelligence) related to the future of work in Finland.

It can be said that AI has already an irreversible impact on lives and on organizations and business in Finland.

While the many uses allow access to goods and services, more effective government and more efficient businesses, they raise several questions, particularly in terms of data protection and personal life, skills, labour market structure and a many other areas.

This work is not pretentious to be exhaustive. It could be enhanced by other research work on the adoption of AI by banks and insurance companies. Also with the progress made by the Finnish government in terms of scientific publications, patents, investments and the number of new opening jobs in AI related activities.

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Appendix

SURVEY

ARTIFICIAL INTELLIGENCE AND FINANCIAL SERVICES IN FINLAND

Please read the questionnaire below and answer the questions that follow

(1-4)

1. Personal background	
Male	
Female	
Age group	18 -20
	21-30
	31-50
	Over 50

2. Professional background	
Employee in a private company	
Entrepreneur	
Employee in a public sector Student Other	
Unemployed	
Student	

3. General

Indicate whether you agree or disagree with following statements

1= Strongly Agree 2=Agree 3= Neutral 4= Disagree 5= Strongly Disagree	1	2	3	4	5
3.1	Artificial Intelligence will affect employment in finan-cial sector					
3.2	AI will affect the hiring policy in financial sector					
3.3	AI will affect education programs in Finland					
3.4	Artificial Intelligence will increase risks in business					
3.5	Artificial will reduce inequalities in Finnish society					

3.6	Finland is prepared to succeed in the AI movement					
3.7	AI will affect the training policy in financial sector					
3.8	Investments in Artificial I infrastructure are sufficient					
3.9	Investments in Artificial I in Education are sufficient					
3.10	Investments in Artificial Intelligence in research is sufficient					
3.11	Public policy in Artificial intelligence is clear					
3.12	Current training system meets the needs of Businesses in terms of Artificial Intelligence					
3.13	The requirement for level of worker qualification will change due to the use of Artificial intelligence					
3.14	In general, Finnish people understand how Artificial Intelligence affect their lives					
3.15	AI will impact the job policy in Financial sector					
3.16	AI will impact the privacy and the security					
3.17	AI will impact the relationship between the Financial sector and customers					
3.18	Will the AI have an impact on the efficiency of the					
3.19	AI will impact the relationship between the Financial					
4	**Actions to consolidate application of Artificial Intelligence in Finland**					
	1= Strongly Agree 2=Agree 3= Neutral 4= Disagree 5= Strongly Disagree	1	2	3	4	5
4.1	Providing incentives to businesses to use AI					
4.2	Encourage schools and universities to use AI					
4.3	Better coordination between the university, research and the business community					
4.4	Better coordination between Business and Unions					
4.5	Increase investment in Research and Development					
4.6	Open comment section -Do you please have any other proposals or suggestions to make A.I technology more inclusive in business and in Finnish society					

THANK YOU FOR YOUR CONSIDERATION

Figures