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MACHINE LEARNING IN FINANCE

WHAT ARE THE CURRENT CHALLENGES FOR EMPLOYEES TO ADAPT AND

WHICH SKILL SET IS IMPORTANT FOR EMPLOYEE'S GOING FORWARD?

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ABSTRACT

The main motivation for this research was to understand the main challenges that the automatization processes in finance has brought to the company and employees. To understand the prospects in the future of Finance department, the issues that employees are having now with automatization when fixed will complete the full process. This will change further the way the department work and new skills will be needed.

One of the main focuses of this document is to understand how Machine learning has and will change the workplace and how machine learning will affect employees. Also, how they feel about the technology at the moment and help people to understand the importance of digital transformation within finance.

To develop a better understanding of machine learning a comprehensive literature review was undertaken evaluating the change in technology and the role of machine learning. It outlined what skill set is important for employee's going forward. Also, what are the current challenges for employees to adapt.

Based on literature and compared to the findings, is possible to see how machine learning is becoming more present in the daily tasks of the Finance departments, reducing time, errors and risk, also the automation of process allows more time to work on value-added task. Overall employees are happy with the future of machine learning. However, they have some fears about the future and their jobs. But they believe that they need develop their skills to do not be left behind.

Machine learning is very important for the finance department to automate processes and bring fast and good results for the company. To achieve the best of this technology, companies need working closely with employees.

Keywords: Machine Learning, Finance, Automation

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I would like to dedicate this project to everyone that helped me get through this last year in college, it has not been easy, but at the same time it has never being boring.

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My supervisors for all the knowledge shared and making suggestion to how improve my work.

To all people that I interview that find a time in their agenda to talk with me.

And my colleagues from college to always share the knowledge with me.

LIST OF ACRONYMS USED

AI – Artificial Intelligence

ML- Machine learning

X- Company analyzed

Y- Bank analyzed

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CHAPTER I

1. Introduction

The following dissertation examines how machine learning has been impacting finance workers lives. The evaluation mainly examines the finance team from a software company and a bank.

1.1. Introduction Background of research

Nowadays many financial services are incorporating machine learning to their operations, this can reduce risk, optimize the process, reduce the time to realize an operation. To be ensure accuracy and make correct predictions it is necessary to have a large amount of data on the system, the machine will identify a standard.

This research project aims to understand how employees are required to have different skills than in the past, to solve possible issues and how it can change more in the future. As there will be further automatization. A large focus will be on how machine learning and automation will affect the future for people working in finance. Some benefits that machine learning can bring to companies is security, mobility, automatization (prepare and distribute reports automatically), reducing reliance on tools such as excel.

This project can contribute to see how employees are adapting and the importance of automation, this can increase the existing literature as study more the employee perspective.

1.2. Rationale for the study.

During the Covid 19 pandemic the shift towards machine learning has accelerated, and main areas where regarding the demand on companies to focus on digital transformation and incorporating machine learning. The main questions on this, is to "how the employees adapt?" From the research, it seems that there will be more pressure on employees to contribute to agile projects, strategic projects, and value-added tasks. The companies must consider training requirements, but also prepare the staff for changes. The aim is getting a deeper knowledge from speaking with employees in the software company experiencing these changes. Also, find out what the main challenges are for them.

Through literature research it was analysed how the system in finance has changed over the years, how the process were years ago and now how them have been using more of technology to improve the internal systems. Afterword analyse how technology has been helping the finance and accounting workers and create a strategy to improve how things are done.

1.3. Statement of the research objectives

The following aims where set-out:

1. Get an insight into the finance department and how automation is present in the employee's role.

2. Identify the main reasons why the process is not working properly
3. The changes in the employee's role due automation.
4. If the employee is comfortable with the changes and if they have the skills for the new working environment.
5. Have sufficient information to develop conclusions to design an effective way to improve how the automatization can help organization.

1.4.   Information gathering & data collection technique used

This report will be based on interpretivist phenomenological analysis, using for this a qualitative method, which one will give insight how the interviews on the context make sense on the situation. In this case the use of interviews will contribute to develop an understanding of the main issues with automatization now, review what needs to be fixed, skills that employees in finance require to and what skills they may need to develop for the future. As addition to this another survey seeing the perspective of an employee from IT department.

1.5.   Expected Outcomes of the study

Develop an understanding of the main issues with automatization now, review what need to be fixed, skills that employees in finance need to have and what they may need developed for the future.

1.6.   Chapter by chapter Overview

The report is divided into five chapters, the first one is the introductions, the second one literature review, the third the research methodology, the fourth finding and discussion, and the sixth the conclusions.

The first chapter correspond to the introduction of the research and the rationally for the study, the objectives and the research questions. Also, it explains briefly how the data is collected and the expected outcome.

The second chapter is the literature review, this will cover the themes studied with actors and research done previously, machine learning and the use in finance, the benefits, challenges and the future of work in finance and machine learning.

The third chapter refers to methodology used in the investigations, data collection method. The findings from the interviews will be discussed in chapter four and it has some recommendations. And finally, the conclusion in the fifth chapter, where the recommendations, limitations and the conclusion will be presented.

CHAPTER II

2. Literature Review

Many companies are on a digital transformation journey. A large part of that journey is focused on taking menial tasks away from employee's so they can focus on complex issues and issues which add more value to the organization (Purcell, 2017). The literature review will explain how Artificial intelligence (AI) and particularly how machine learning is at the core of this digital journey. The focus will be on how finance departments are leveraging Machine learning technologies to work more effectively.

The role of machine learning within organizations was evident before the Covid 19 pandemic but has since accelerated even more due to trends associated to the new ways of working. (Nassr, 2021) In the literature review the role of machine learning in finance will be examined. The review will also inspect the benefits and challenges related to the shift towards machine learning. Another aspect in regards to the future of work will also be reviewed, as machine learning is creating a shift in this area.

2.1. Machine learning

The scientific field of machine learning (ML) is a branch of artificial intelligence, as defined by Computer Scientist and machine learning pioneer. "Machine learning is the study of computer algorithms that allow computer programs to automatically improve through experience" (Mitchell, 1997).

Machine learning is a subcategory of artificial intelligence, algorithms on computers are utilized to over time learn from information as stated (Marr, 2016). Machine learning applications do not have to be programmed per say, the algorithms mean the computer teaches itself, and over time it can teach itself to improve. As per (Marr, 2016) here are some milestones and we can see improvements over the years.

• 1950 – Alan Turing set up a test for a computer to trick a person into believing the computer is also human.

• 1981 – Gerald Dejong creates the Explanation based learning, where the computer reviews training material, develops a rule it can follow and deletes data that is not seen as important.

• 1997 – IBM have a program called Deep Blue, which was successful in beating the world champion in Chess.

• 2022 – as cited from (Feature Space, n.d.) ARIC Risk Hub Analytics – this is a machine learning based software that is used by financial institutions to detect fraudulent use of card payments.

2.2. Finance and Machine learning

Machine learning is now significantly important for companies particularly in their financial department. There is a common understanding that due to the various demands in industries, employees in the finance area for their companies should have more scope to work on tasks which provide more value.

This is demonstrated via an article on (Dutaret, 2022) "Over the last two years, companies have adapted and embraced technology to enhance their offerings to customers within the digital space. Research by Deloitte on 'Emerging Technology' found that 47% of financial services executives surveyed said it would be essential to implementing AI within the financial realm by 2023".

Machine learning can be implemented and used in accounting and finance. Such as analysis of data where the application can provide reliable, stable, reproductive and accurate findings (Mohammad Zoynul Abedin, 2021)

In a recent SAP research paper on Financial Planning and Analysis (FP&A) (SAP, 2022), the survey conducted in 2020 showed that, too much of the companies resources and time is spent on low value activities (42%). Low value activities such as data collection, data validation and other administrative tasks. On average the survey suggests that only 26% of an employee's time is spent on high value activities. Such as driving improvements on processes. As stated in the SAP study the capabilities of Machine learning in Finance where:

1. Improving forecast confidence

2. Budgetary control

3. Real time business simulation

4. Business process optimization

5. Real time forecasting

One company who specialize in Machine learning is Microsoft Azure, they are specializing in providing solutions to businesses, also in the finance area. There the cloud software using machine leaning applications can help companies find much more efficient ways of working. As stated on Microsoft Azures site (Microsoft Azure, 2022). They offer the ability for business to better understand their customers, so that the business can better enhance their customers experiences with intelligent contact center.

2.3. Machine learning and automatization benefits

As stated by (Shimamoto, 2018) Organizations who are implementing machine learning must also consider the additional governance and internal controls considerations for the associated risks.

FP&A accountants have the need to work with other departments, so that they can provide their expertise in modelling and data analysis to develop machine learning applications. It is not only for technical teams within the organization to create such applications (such as within the IT of a company). The organization must include all department associated to develop a process that machine learning applications can take over, speed up processes with the ability also to add more accuracy.

As can be seen in an article in the wall street journal, Vice president of Alphabet Inc's Google Kristin Reinke mentions that they are using Machine learning to modernize how they close their financial books, manage risks, and improve their processes. They now have modern applications which can review their data while closing the books, where it would have taken 1 day, and many excels put together. They can now complete the same process in the matter of 2 hours, without so many manual steps. (Trentmann, 2022).

The main Opportunities for Finance within a business are below:

• Speeding up processes

• Better use of resources

• Forecast accuracy

• Better insights

• Eliminating bias

The question is asked by (Newswire, 2021), Do Finance departments really understand the value and potential for Machine learning in their daily work? The author continues to explain that machine learning and automation can remove routine daily tasks from the finance employee.

"Respondents to Unit4's study suggest the top benefits of AI are improving data quality (33%) and saving time (32%), but only a quarter of respondents say it would help colleagues make faster decisions, and only 24% believe it would deliver actionable insights for decision making." (Newswire, 2021). It is also possible to reduce or remove bias from machine learning predictions, part of the programming for a good machine learning application is to train against bias. (Klaas, 2019).

The use of Machine learning is expected to reduce costs and overall drive a companies competitive advantage (Nassr, 2021).

2.4.   Challenges for machine learning

As cited from (Ghosh, 2019), 80% of large companies have utilized machine learning for their core business. 7 years ago, it was less than 10%. Although Machine learning is valuable with many benefits. There are some challenges as there is a still a huge human factor involved.

Challenges for Machine learning:

2.4.1.   Culture

According to the Forbes article "Why Machine Learning Is The Future Of Business Culture" (Vigo, 2019), companies culture can be naturally resistant to change. An example stated is within the IT department, there needs to be a shift from developing IT architecture to developing IT application such as machine learning tools. It is important that society/business understand there will be a total new skill set required by 2030 when AI and machine learning applications will have freed up the average worker (Purcell, 2017) from manual tasks. There will need to be a cultural shift for worker to learn new skills.

2.4.2.   Trust

There is the issue of trust in machine learning, how can the organization be so sure the results provided by such applications are correct? As mentioned in the article "5 AI fears and how to address them – Many people fear Machine learning applications will make a bad decision or provide incorrect suggestions. This can come down to people simply thinking the results are just simply not right. (Casey, 2019). As mentioned by (Ghosh, 2019) AI must gain the trust from the employee's that work with the technology. This means the decisions made by the Machine learning application should be transparent on how the decision was made.

2.4.3.   Data quality

It is vitally important the machine learning application is fed with good data. If some data is missing the machine learning may be flawed as valuable information to make decisions are missing. If the data used is not sufficient there may also be bias by the machine, as not enough data or good quality data was examined (Klaas, 2019).

2.4.4.   Knowledge gap

Like Data quality the machine learning application needs both process experts and IT to develop the machine learning. IT within the company cannot set up the machine learning application without having the necessary holistic understanding of the task the machine will work on, to automate. (Ghosh, 2019)

2.4.5.   Fear

There is the perception that Machine learning will lead to applications that will reduce the need for human intervention the need for the person at all. The fear is that jobs will no longer be available in the future. In a paper where large companies in the UK and Norway where employees were surveyed, the

result found nearly all interviewed were worried of mass unemployment in the future due to technology advancement. (Caroline Lloyd, 2019)

2.4.6. Problem too complex

There are still many complex issues that are not suited to machine learning, in the finance area, validation and analysis still require experienced and knowledgeable employees to complete many

tasks. At this stage machine learning is best use for the menial tasks. The advantage of machine learning is to free employees to focus on the more complex tasks. (Marr, 2016)

2.4.7. Believing Machine learning will always produce correct results

Employees and organizations must be careful not to give the machine learning application full autonomy. The best approach is for a hybrid approach where the experiences employee can validate the results, also controls and checks need to be implemented. (Nassr, 2021)

2.5. Future for Machine learning in Finance

Digital transformation is top priority within 2022 for organizations (Wire, 2022). As conveyed by (Herbert, 2017) Digital transformation is not about a company adapting to new technologies. But is an organizational and cultural switch for the company to access and adopt to new technologies now and into the future. Real digital transformation is a mindset change within the company, it is about breaking down the barriers and the roadblocks due to outdated logic and processes. It is about using technologies to re-imagine the business and create new revenue streams, reduce costs, and improve customer experiences.

Due to advances in technology and the exponential accelerated growth in communication devices, the business is always on the go and work can happen from all different locations. Advancement also in technology means many financial tasks can happen any time anywhere and it also happen from the employee's mobile devices, such as their smart phone. Due to these changes' organizations need to adopt to keep up with competition (Daniel Rowles, 2017)

One of the applications developed via Machine learning for finance companies is the Chat Bot. As seen in the article by Tech Tunnel. A chat Bot is a robotic assistant who can answer general queries to customers or to those within the company. It means finance employees are free from many general queries which can be time consuming. To spend time on value added tasks for their department (Thombre, 2018)

Some of the main advantages to the Chat Bots (Hajjar, 2022)

1. Improving customer service

2. Onboarding employee's

3. Perform transactions

4. Helping with internal operations

Benefits of chat Bots (Lis, 2018)

1. Cost saving

2. Personalization

3. Increase in sales

4. Scalability

The Chat Bot is one example where this application can free up employee's from answering basic questions. The advantages to Digital transformation and machine learning applications were seen by organizations in recent years. Due to Covid 19 and lockdowns in countries due to the pandemic also meant there was an acceleration towards digitalization and the future of work (Kudyba, 2020).

As explained by (Kudyba, 2020) organizations have become more focused on Agile methodology for running projects and process, to speed changes required in the company to adopt to the challenges provided by the lockdown.

It is possible to see that people will need more time and scope within finance to work in an agile manner and adopt to the new business pressures and demands. There is a new demand on business leaders to push the company and finance department towards digital transformation. Machine learning and AI can help drive the changes required for the business to thrive. AI and machine learning will also give the people working within finance more time to work on value added tasks and within agile projects, rather than focusing their time on administrative menial tasks (Purcell, 2017).

The organizations will also need to put effort to ensure their employee's trust in the new technologies and are less suspicious. It is necessary companies develop their workforce to adapt and learn the new skillset required to succeed and grow.

CHAPTER III

3. Research Methodology

Kumar (2010) explained Research is the process of collecting, analysing and interpreting information to answer questions. The purpose of this chapter is to explain the different methods used to gather analysis and interpret the information. The overall method carried out in this research is a mono method qualitative research. This purpose of this research will be to analyse the influence of machine learning in a Finance department.

Interviews were completed with 7 employee's who work in a software company, 1 employee from a bank and 1 person who works in IT which supports automation process. This research was done to understand their perception of the impact of machine learning in finance. Also, was used a secondary method of research that was analyses of books, periodicals, journals and other relevant sources.

3.1. Philosophy Employed

The Interpretivism approach is the philosophy that address the understanding of people experiences and how they see the world, through this approach is possible to collect a good source of data since it focuses on people perception and narrative.

In the ontology with an inductive approach when conducing qualitative, as the questions are open and offer to the sample the opportunity to answer according to experience. In this approach even though the question based on the themes uncovered it allows to see their perspective. The validity comes from the depth in the answers not the numbers of respondents.

3.1.1. Research approach

Qualitative research is aimed to explore deeply the why and how of situations. Understand and interpret social phenomena within its natural setting, it is used as a holistic explanation for behaviour and attitudes, and may be completed with variables, constructs, and hypotheses according to (Creswell, 2009). Though the qualitative research methodology, researchers intend to collect strong information and get a detailed picture of case, events and issues.

Questionary questions are available in appendix 3 and 4.

3.2. Justification for the adoption of method

The major aim of research design is to use tools and a measure to answer the research question (Punch 2006). This project will use only quantitative research with interviews with employees from a finance team and one employee from an IT department. Through interviews it will be possible to gather data regarding the employee's perspective of the use of machine learning in Finance.

3.3. Sample codification

The sample consisted of 9 interviews in total and the interviews were broken down into common themes. The sample size was determined by the limited time and availability of subjects who work within finance and IT and have experience working with ML and automation topics. The biggest sample come from company X, which is a large multinational with an office based in Dublin. While there was also one subject from a large Irish bank and another working within IT. The samples are broken down per the subject's working area. A list of interviewees and more details on their background is found in the appendix.

Table 1. Interview Codification

Company	Area	Interviewees
X	Finance operations (FO)	5
X	Process and testing (PT)	2
Y	Financial reporting (FR)	1
Z	IT development (IT)	1

3.4. Thematic Coding

Table 2. Thematic Coding

Theme	Interview
1. **Involvement with automation topics**	FO – I have seen automation in my current role for the last 2 years, it is in place to simplify and shorten processes of our team by removing repetitive tasks. We have moved away from manually entering data into the system (10 years ago) to monitoring what is in our system and working more with IT to help solve issues in the system or helping create new processes PT - working in the process management team, many decisions are still human determined to review if a change in process should take place, maybe in the future the ML can make such decisions Basically we always come up with new enhancement in our system, in our current system and we trying to mainstream the process as much as we can, meaning that we have to automize. FR – At the moment, our team are exploring ways of automating some of the processes we do in order to allow

	time for other projects and learning. Therefore, we are still only at the beginning of our journey into automation. IT – "My day-to-day work consist of automating our systems. Some challenges include building systems that are easy to maintain and develop. Some process continues very manual. Some automation process needs a step back to identify why the automation is not working
2. **Complexity within their role**	FO-Left with more complex tasks difficult for those not working in the IT area. Topics are getting much more complex as the Cloud business and technology grows. In business I feel machine learning will have to grow further if it's to stay relevant as clients expect a near bespoke service. as the tasks get automated, I am focusing in more complex cases, and other improvements/automations that may be done PT -IT are working on the complexity I am helping with the testing/idea generation. The topics are getting more complex due to more complicated projects, caused by complex go-to-market strategy without sufficient time give to prepare our processes properly FR There are new challenges that come up every day which can be a struggle, particularly working in a new role. It is important that colleagues understand the processes etc so that this can complement the use of AI and digitalization. At the moment, I am making my way through my accountancy exams which still hold a lot of information and require a lot of study hours on top of gaining experience. IT -It can be hard from an IT perspective what processes can be automated
3. **Importance to automation for their role**	FO-Simplify what we do today, give employees more time to spend with their family, friends etc Increases accuracy in accounts, better processes; Better work life balance; Time to work on complex tasks PT-It can make everyone's life easier; Automate routine tasks FR- Digital transformation evokes an image of exciting change thanks to digital technologies. I think this term

	encapsulates the huge impact that technology and AI has, and will continue to have on businesses and colleagues. Businesses and the way of work will transform from what we know from the past and even today.
4. Development of Skills	FO -Through working on complex tasks and gaining experience. You need to improve communication skills to work with different teams to solve the internal issues. Yes, or you are left behind. I am always learning and thinking on how to remain relevant, and provide my team and the company with good Ideas and solutions PT - Though testing and experience In my area I work on the process realization, which are supposed to support customers on their way to digital transformation. But it's my functional skills in a limited area, while the question has a different focus. FR- At the moment, I am taking part in a 3 year digital development plan with the aim of upskilling in digital and keeping up to date with relevant changes.
5. The future for Machine learning	FO-I am happy with it and I only can see the bright side. The company won't increase headcount as this make the business inviable/non-profitable. Direction is something scary as people may lose their jobs PT -Hard to judge It can make everyone's life easier FR, I find it a positive for employees and employers as it allows for more time to complete other interesting tasks, professional and personal development instead of performing manual tasks that could be automated. IT Artificial Intelligence will always improve processes in every department. If the automation trained enough, it could offer valuable insights and help

3.5. Ethical section

The consent for the interviews can be found on the Appendix 2.

3.6. Secondary research

Secondary research was conducting in conjunction with the interviews. In this researcher is included books and websites, most of this source can be seen in the literature reviews of this dissertation.

3.7. Limitations of Research

Some of the main limitations is that it was difficult to get in touch with professionals from IT from the main company. For this the interviews needed to be done with someone from another company. Due to the relative lack of time only 7 interviews could be conducted.

CHAPTER IV

4. Findings and Discussion

In this section the results that were obtained from the qualitative results will be analyzed. The answers to the interviews were reviewed and triangulate the findings with the literature review to understand how machine learning affects the employee's life.

4.1. Findings

The main area's covered when speaking with the participants in finance can be seen and summarized in the Appendix 3. At a high level is possible see a summary of some of the main questions on how they were answered.

Table 3 Interview Results Summary

Question	% Yes	% No
Do you see ML in your role?	87.5	12.5
Involved in Projects	62.5	37.5
Role in finance changed?	87.5	12.5
Change for the better?	87.5	12.5
More complexity when working with ML?	87.5	12.5
Do you see the benefits of ML?	87.5	12.5
Company, keeping you involved in plans for ML?	100	0
Do you have more time to develop skills?	87.5	12.5
Comfortable with the direction of ML?	75	25
Department culture aligned with ML?	75	25
Do you see limitations in ML	12.5	87.5
Excited for the future?	100	0
Are you developing your professional skills (digital transformation)?	87.5	12.5

4.1.1. Machine learning and the role it plays in the employees

From the participants interviewed all were aware of machine learning. 87% interviewed have been involved directly with machine learning and projects or operations related. Depending on their role within finance the research showed employees are working directly on a regular basis on projects which are developing more uses for ML in their department. The objective to these projects from interviewing the participants is to remove the repetitive tasks so that the employee's have more time to work on value added tasks. Several of the sample size had changed their role from operational tasks in the past to working in specific departments focused on improving operations within the finance department. Examples include the 2 members who are working in the invoicing department as subject matter experts.

Their role is to work with the process teams to give them ideas on areas that need to be automated, they act as bridge between the operational teams and the process developers. There was one person interviewed who now has a sole purpose to test new developments within the finance processes and provide ideas to IT developers on improving current processes with the help of AI. The use of Machine learning is expected to reduce costs and overall drive a company's competitive advantage (Nassr, 2021).

It was also clear from the initial findings that ML is not always best used or cannot be used for newer business models or processes. When speaking with a member from the process development department, they mentioned it is not possible to use ML in her area of work, because the finance processes are so customized and nonstandard that there is a large need for manual workarounds. It was mentioned the culture within the company can be still to rely on human intervention to make certain processes work.

It does appear from the findings that some of the ML enhancements has improved the workload for many interviewed and they can see areas that will be automatized in the future in their area. Many feeling happy they will have more time to add value, improve their work life balance and develop their skills.

4.1.2. Evolution of the role in finance

One of the main areas of the research was to understand if the employee's role in finance has changed and to understand if it has made the job better, easier and more fulfilling. From the small sample 87.5% says their role has changed, while all agreeing the change has happened for the better. Also, at 87.5 % the respondents have stated that their job has become more complex. The main reason for this appears that machine learning has taken some of the more boring tasks like data entry away from most of the employee's interviewed. Meaning they have time to work on more complex tasks.

They also in most cases time to work with the process developers to provide new automation ideas and test the new processes. Some respondents mentioned the new processes are complex and not in line with automation and standardization, so this is adding complexity to their role in finance. Respondents in general mentioned they have gained more knowledge by spending more time on complex and nonstandard processes and issues.

The research also indicated for those manual tasks that are yet to be automated, the interviewed expectations is that these tasks will become automated on some level soon. For those working in finance longer from the interviewed they have mentioned that some tasks for example invoicing before was 90% manual 10% automated has now become 10% manual and 90% automated. This was also in the literature review by (Newswire, 2021). "Do Finance departments really understand the value and potential for Machine learning in their daily work?" The author continues to explain that machine learning and automation can remove routine daily tasks from the finance employee.

4.1.3. Development of the employee and the direction of Machine learning

The interview results found that 87.5% of the participants had time to develop their skills and took time to actively grow and stay relevant within the changing working environment. Many found they developed their skills by working on more complex tasks, since they have more scope to do so in general. However, one respondent working for the process management team said they do not have the time to develop their skills as they felt they did not have the time, they also mentioned it is hard to understand the companies machine learning strategy.

It appears the interviewed also feel the company are communicating the need for automation as part of their strategy within finance. 100% of the interviewed are fully aware of the companies drive to continue automation. However only 75% believe the finance department strategy is aligned with the need to automate. While 25% of the interviewed felt uncomfortable with the direction of further automation, one of the main concerns is about their future and the prospect the machine will take their job away. Overall including the concerns and worries 100% of the interviewed are excited about their future in finance and work.

4.1.4. Digital transformation and the evolution of work in finance

The research found that the finance employee's interviewed believe digital transformation is already well established and some believe it is the new revolution within the industry. Many comments around digital transformation are that it cannot be stopped. Overall, the research showed the finance employees are overall excited to see the transformation that has happened so far. Some feeling it has giving them a better work life balance, they also feel that the increase in Machine learning could lead to an even better balance in the future. Apart from one person interviewed, the participants feel confident their skills are developing in the right direction so they can prosper and stay relevant within the finance department going forward.

4.1.5. Findings from an interview with an IT employee

The employee interviewed from IT supports teams within his company to automate some tasks. As stated during the interview "Artificial Intelligence will always improve processes in every department. If the automation trained enough, it could offer valuable insights and help". It is clear from the IT developers they also see the value your Machine learning. The big challenge from a technical side for IT is that it can be difficult to build the Machine learning model and to train it. Some of the other challenges:

"My day-to-day work consist of automating our systems. Some challenges include building systems that are easy to maintain and develop. Some process continues very manual. Some automation process needs a step back to identify why the automation is not working." It is a challenge for IT who are not experts in the processes to understand each step of the process. They also have the challenge to understand if the task can be automated or the task maybe too complex.

4.2. Analysis and results

The main areas of focus on the study were to best understand using the qualitive research and compare this to the literature review (Triangulation). The analysis of the findings is then broken down into the below:

1. Machine learning within finance
2. Benefits of machine learning
3. Challenges for machine learning
4. The future for machine learning within Finance

The methodology to collect the qualitative research focus on the interview's perception on machine learning. The research is dependent on the participants based on their experience within the real world of machine learning within Finance and IT. This type of research has become more prominent since the 1960s. The sample for the interviews is relatively small however the sample of participants varies between their responsibilities. The feedback gained is from one IT technician, finance (1 Finance operations manager, finance admin operative issuing invoices, subject matter experts within finance operations, finance project tester/supports automation developments, process developer for finance and another finance operative but within a new business model for pay as you go software). The feedback from their experiences is analysed against the literature.

4.2.1. Machine learning within finance

Machine learning within the finance departments within X and Bank Y is very much active. The main opportunities for machine learning are seen by the research of literature and from the interviews point to the fact that there for some processes an acceleration on completion of processes. Many of the labour-intensive tasks have been reduced due to machine learning, an example was seen within the invoicing department, where 90% of invoices are now automated. Some processes can clearly not be fast-tracked due to the complex nature. For machine learning to work the process requires an internal governance to ensure compliance. This is not always possible for some tasks.

4.2.2. Benefits of machine learning

It was observed that many of the interviewed do feel their resources as an employee are in better use with machine learning, since some tasks are automated (mainly the simple repetitive and labour-intensive tasks). As seen in the literature machine learning leads to better use of resources, most interviewed agreed they have more time to work on value added tasks. "*Machine learning can be implemented and used in accounting and finance. Such as analysis of data where the application can provide reliable, stable, reproductive, and accurate findings*" (Mohammad Zoynul Abedin, 2021)

Some interviewed echoed that due to machine learning reporting in some aspects of the role is quicker and more accurate. However, the qualitive research did not see a high number of respondents mention machine learning as a good tool to increase accuracy or to provide the employees with a better insight. The main focus from the employees in regard to the benefits is that their tasks can be more interesting, they can specialize in certain areas, and some see it as a great way to improve work life balance.

4.2.3.   Challenges for machine learning

As seen in the initial literature research machine learning comes with many challenges. Many of the challenges was mentioned by the interviewed participants.

4.2.3.1. Culture

The main challenge for those interviewed was that they all understood the trend that most manual tasks will be replaced by machine learning. As seen in the initial literature research "*It is important that society/business understand there will be a total new skill set required by 2030 when AI and machine learning applications will have freed up the average worker (Purcell, 2017) from manual tasks*". The general feedback regarding the qualitative research reflected that the companies finance departments are making the finance employee aware of the shift, commonly referred to as digital transformation. It appears that this is a challenge as the feedback from some interviewed stated that although they aware of the shift to automation, they do not always have time to develop their skills and are not sure what development is required. Others stated that the finance department culture is not fully aligned with the shift to automation.

4.2.3.2. Trust

Trust in the machine learning applications appears not to be such a big issue in relation to the qualitative research. It is stated in the literature research that this can be an issue for employees. The only aspect which the qualitative research uncovered was that automation can be implemented for many special cases. This points to the fact that many developing processes feel for cases they see as complex they tend to rely too much on the finance employees. This could be a fact automation is not possible, however it could point to the fact that machine learning is only trusted for menial tasks. As mention by (Ghosh, 2019) it is also important the information provided is transparent so that the employee can also trust the results, this appears to be more difficult for more complex tasks.

4.2.3.3. Data Quality

The machine must have enough data and data of good quality for it to be affective. this is a challenge seen within finance now as also seen in the qualitive research. However, it looks like this will improve over time as we seen in our research the companies have many projects and departments with projects to increase the data quality for the machine.

4.2.3.4. Knowledge gap

The issues regarding knowledge gaps are apparent from the research, during the interview with IT one of the main issues stated from the IT side, is to understand which processes can really be automated. From the finance side interviewees mentioned it is not so easy to request automation also as they are not sure fully what can be automated, and the automation process can take too long due to the alignments with IT. Some processes which can be automated are not automated on time and the process may become irrelevant in the meantime as it is replaced by another financial process.

4.2.3.5. Fear

There is a fear with some interviewed that machine learning will lead to their role in the finance department becoming redundant. The fear is that the machine will overtime take too many of the tasks and leave less opportunity for the employee. This is not so much a big issue now but will become a challenge for companies to develop their staff to expand on their role or to take up new roles as the finance department transforms over time.

4.2.3.6. Problem too complex

This is apparent as a big problem within the finance processes. Many of the new processes which are being rolled out appear to not meet any of the requirements for automation. This is due to a lack of trust, lack of data and the knowledge a finance person or IT person is available to fix whatever issues can arise with complex tasks. The advantage of machine learning is to automate menial tasks and to allow the employee more time to work on complex tasks. This is overall seen as good by those interviewed during the qualitative research. However, some complex tasks appear to be adding more stress on others interviewed.

4.2.3.7. Believing the machine is always right

It is important that the machine learning application is not given full autonomy, there needs to be reporting to validate the results of the machine learning application. From the qualitative research we found little mention about the checks done regarding the machines output. It appears to be an issue, as the rate of change happening within the finance department there is less focus on monitoring, he machines work.

4.2.4. The future for machine learning within Finance

Digital transformation is understood by those within finance based on the qualitative research. As conveyed by (Herbert, 2017) Digital transformation is not about a company adapting to new technologies. But is an organizational and cultural switch for the company to access and adopt to new technologies now and into the future. It was clear there was a coloration between the statement of Herbert and the findings from the qualitative research. There has already been a shift to using technologies to automate menial tasks. There is also a change in the finance department's structure to include teams dedicated to creating ideas for automation while also working with IT teams to test

automation before it can go live within the company. It is possible to see departments establish expert teams who work closely with the process creators on an ongoing basis. The respondents to the research all stated that they are fully aware about the transformation to digitalization.

Based on the analysis the recommendations to continue to grow machine learning in the finance department

- Continue to develop machine learning to take the menial and labour-intensive tasks away from the employees, but also ensure that the skills required for complex tasks are properly developed and ensure that new employees can learn the processes so over time they can work on complex tasks

- Costs saved on machine learning is used partly to develop the employee's skill sets and ensure that employees in all teams understand machine learning and how it can improve their work.

- Ensure all employees within the finance department understand the digital transformation strategy and how it relates to the finance departments culture and ethos.

- Promote the advantages of machine learning within the department, address the employee's fears and make sure they have a sufficient development plan to help them grow new skills. For those older in the company find a way to bring them on the journey.

- For complex tasks ensure the process designers and IT are working on standardizing the processes so that some automation advantages can be used. The company overall strategy should be to reduce complexity and remove the customizations they provide to customers. If competitors can offer the customization, they may have limited automation but higher costs. A cost benefit analysis should be considered.

- Ensure controls are in place were employees monitor the machine learning app on a regular basis to ensure any data issues are found.

- Ensure Finance and IT work closely to continue the automation into the future, while giving them better knowledge of each others' processes.

CHAPTER V

5. Conclusion

Machine learning has become a corner stone within many organizations for growth which is evident within the finance department. Digital transformation within finance is happening and will continue to happen into the future. Companies already on their digital transformation journey has a competitive advantage. Those working in finance has seen and can see for the future that they will work on more interesting and complex topics within their department. They are overall excited about this shift from working on menial tasks and focus on their professional development and in many cases a better work life balance.

The research found that the main benefits to Machine learning within the finance department is that employee's can dedicate more of their time to value added tasks. The employee also feels they are developing their skills as they gain more experience as they are exposed to more complex duties. The company can see the benefits including cost savings, competitive advantage, more accuracy and has quicker access to data.

There are still many challenges for the department and employees. There is a big shift in culture and new skills are also required for the typical finance worker. The challenges that need to be overcome include trust of Machine learning, the limitations for machine learning on complex tasks and the fear the employee may have for losing their employment in the future.

Automation and digital transformation are here to stay and companies who do not embrace this change will not have a future. The employees in finance appear to be aware of this and know they must embark on this journey; some employees feel ready while others feel they are not sure what skills they need to acquire. It is up to the management to develop their staff and promote the changes as positive to remove the fear for those who are reluctant to change or feel they cannot work in the new world of finance.

5.1. Limitation

The study satisfied its aims and objectives for the purpose of this project; however, it is important to say that this project has some limitations. Firstly, the time to complete the task, due to the limited time to complete the research the sample size of interviews is low. If there was more time and a bigger sample including interviews from different companies, as this could add more perspectives.

In relation to samples, the only way to get better results were qualitative, since this is a very specific subject, only those who work with finance and automation processes could answer questions. One of the main limitations was to find an IT employee that worked in automation of process for finance. The IT employee interviewed does not work directly with the finance team and was not working directly with an of the finance employee's interviewed.

Gathering information on the topic was another small limitation, as machine learning is relatively new and most of the research is directed for statistics results. Meaning there was limited information related to employees' challenges and the skills those employee's need to develop.

5.2. Recommendations

Due the limitation time and small samples, the main recommendation related to future research is gotten a bigger sample for the three main groups (Finance, automation process, automation developer) to get a better idea how they work together and what are the main issues between them. It would also be beneficial to get the insight from the company's top management.

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Form A: Application for Ethical Approval
Undergraduate/Taught Postgraduate Research

This form should be submitted to the module leader for the relevant initial proposal and/or the relevant supervisor is the proposal has already been accepted.

Please save this file as *STUDENT NUMBER_AEA_FormA.docx*

Title of Project	**Machine Learning in Finance**
Name of Learner	**Julia Carolina de Abreu**
Student Number	**51705842**
Name of Supervisor/Tutor	**Daniel O'Sullivan /Vincent Taiwah**

Check the relevant boxes. All questions must be answered before submitting to the relevant lecturer / supervisor. Note: only one box per row should be selected.

Item	Question	Yes	No	NA
1	**Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?**	☒	☐	■
2	**Will you tell participants that their participation is voluntary?**	☒	☐	■
3	**Will you obtain written consent for participation (through a signed or 'ticked' consent form)?**	☒	☐	■
4	**If the research is observational, will you ask participants for their consent to being observed.**	☐	☐	☒
5	**Will you tell participants that they may withdraw from the research at any time and for any reason?**	☒	☐	■
6	**Will you give participants the option of not answering any question they do not want to answer?**	☒	☐	☐
7	**Will you ensure that participant data will be treated with full confidentiality and anonymity and, if published, will not be identifiable as any individual or group?**	☒	☐	■
8	**Will you debrief participants at the end of their participation (i.e., give them a brief explanation of the study)?**	☒	☐	■
9	**If your study involves people between 16 and 18 years, will you ensure that passive consent is obtained from parents/guardians, with active consent obtained from both the child and their school/organisation?**	☐	☐	☒

Item	Question	Yes	No	NA
10	**If your study involves people less than 16 years, will you ensure that <u>active</u> consent is obtained from parents/guardians <u>and</u> that a parent/guardian or their nominee (such as a teacher) will be present throughout the data collection period?**	☐	☐	☒
11	**If your study requires evaluation by an ethics committee/board at an external agency, will you wait until you have approval from both the Independent College Dublin and the external ethics committee before starting data collection.**	☒	☐	☐

Item	Question	Yes	No	NA
12	**If you are in a position of authority over your participants (for example, if you are their instructor/tutor/manager/examiner etc.) will you inform participants in writing that their grades and/or evaluation will be in no way affected by their participation (or lack thereof) in your research?**	☒	☐	☐
13	**If you are in a position of authority over your participants (for example, if you are their instructor/tutor/manager/examiner etc.), does your study involve asking participants about their academic or professional achievements, motivations, abilities or philosophies? (please note that this does not apply to QA1 or QA3 forms, or questionnaires limited to market research, that do not require ethical approval from the IREC)**	☐	☐	☒
14	**Will your project involve deliberately misleading participants in any way?**	☐	☒	■
15	**Is there any realistic risk of any participants experiencing either physical or psychological distress or discomfort?**	☐	☒	■
16	**Does your project involve work with animals?**	☐	☒	■
17	**Do you plan to give individual feedback to participants regarding their scores on any task or scale?**	☐	☒	☐
18	**Does your study examine any sensitive topics (such as, but not limited to, religion, sexuality, alcohol, crime, drugs, mental health, physical health, etc.)**	☐	☒	■
19	**Is your study designed to change the mental state of participants in any negative way (such as inducing aggression, frustration, etc?)**	☐	☒	■
20	**Does your study involve an external agency (e.g. for recruitment)?**	☐	☒	■

21	**Do your participants fall into any of the following special groups?** *(except where one or more individuals with such characteristics may naturally occur within a general population, such as a sample of students)*		☐	☒
			☐	☒
			☐	☒
			☐	☒
			☐	☒

If you have ticked any of the shaded boxes above, you should consult with your module leader / supervisor immediately. You will need to fill in Form B Ethical Approval **and submit it to the Research & Ethics Committee** instead **of this form.**

There is an obligation on the researcher to bring to the attention of the Research & Ethics Committee any issues with ethical implications not clearly covered by the above checklist.

	☒
I consider that this project has no **significant ethical implications to be brought before the relevant Research & Ethics Committee. I have read and understood the specific guidelines for completion of Ethics Application Forms. I am familiar with the codes of professional ethics relevant to my discipline (and have discussed them with my supervisor).**	

Name of Learner	**Julia Carolina de Abreu**
Student Number	**51705842**
Date	**17/05/2022**

	☐
I have discussed this project with the learner in question, and I agree that it has no significant ethical implications to be brought before the Research & Ethics Committee.	

Name of Supervisor/Lecturer	**Daniel O'Sullivan**
Date	**17/05/2022**