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Department of Finance and Accounting

memorandum for completing an academic Master's degree

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Heading:

the impact of artificial intelligence in enhancing financial education

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2023-2024

قال الله تعالى

{يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ}

المجادلة: 11

Dedication

To my father

The person who is a gift from god, you have been the guiding light in my life, illuminating every path I have taken. Your love, strength and support have shaped me into who I am today. Thank you for being my rock, my hero, and my biggest cheerleader. I dedicate my successes, my dreams, my love to you.

To my mother

To my dearest mom, your love knows no bounds, your sacrifices endless, and your heart knows only giving. You've taught me kindness, resilience, and the power of unconditional love. Every beat of my heart carries your name, every achievement is a testament to your unwavering belief in me. Thank you for being my constant source of strength, my confidante, and my greatest inspiration. I dedicate all that I am and all that I aspire to be, to you, my guiding star.

To my sister

To my wornderful sister Sarah, your joy and kindness light up even the darkest of days, bringing sunshine into our lives and your presence brings comfort in times of need. Together, you are my constants, my confidantes, and my best friends. I dedicate my deepest admiration, my fondest moments, and my boundless love to you.

To Houda and Lounes

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My brothers

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My aunts and uncles

Bahoussi abdelkarim and bahoussi houria, you were always for me supporting and helping and especially loving and caring. Thank you for being in my life.

Cousins

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To myself:

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I was never a quitter and I will never be.

Bahoussi Hadjer

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ABSTRACT:

The importance of financial education has surged due to developments in financial markets and demographic, economic, and policy shifts. Financial literacy is vital in an era of complex financial products and increased individual responsibility for retirement planning. Financial ignorance can lead to poor financial decisions and risks. Prior studies emphasize the need for both quantitative and qualitative education methods to enhance financial awareness and decision-making. Technologies like AI are aiding financial literacy by offering personalized financial advice. Our study were aiming on student financial education wich showed significant improvements in budgeting, saving, and financial management, underscoring the positive impact of comprehensive financial education.

Key words : financial education, financial literacy, budget, artificial intelligence

jel classification : G53, H61, C63

الملخص :

ازدادت أهمية التعليم المالي بشكل كبير نتيجة للتطورات في الأسواق المالية والتحولات الديموغرافية والاقتصادية والسياسية. تُعد الثقافة المالية أمرًا بالغ الأهمية في عصر المنتجات المالية المعقدة والمسؤولية الفردية المتزايدة عن التخطيط للتقاعد. يمكن أن تؤدي الجهل المالي إلى اتخاذ قرارات مالية سيئة وتحمل مخاطر أسوء كما تؤكد الدراسات السابقة على الحاجة إلى استخدام الأساليب التعليمية الكمية والنوعية لتعزيز الوعي المالي واتخاذ القرارات. تُساعد التقنيات مثل الذكاء الاصطناعي في تعزيز الثقافة المالية من خلال تقديم نصائح مالية شخصية حيث كانت دراستنا تركز على تعليم الطلاب الشؤون المالية وأظهرت تحسنًا كبيرًا في وضع الميزانية والادخار وإدارة الأموال، مما يؤكد الأثر الإيجابي للتعليم المالي الشامل.

تصنيف jel : G53, H61, C63

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Introduction

The importance of financial education has grown significantly in recent years due to developments in financial markets and shifts in demographic, economic, and policy landscapes. Financial literacy is crucial in an era where increasingly complex financial products are readily accessible to a broad segment of the population. For instance, many governments are actively promoting access to financial services, leading to a rapid increase in the number of individuals with bank accounts and access to credit products. Additionally, changes in the pension landscape are shifting decision-making responsibility to participants who previously relied on their employers or governments for financial security after retirement. These factors and others make it essential for individuals to be financially literate to enhance their financial well-being.

Financial ignorance carries substantial costs. Consumers who do not understand fundamental financial concepts—such as interest rates, inflation, money management, borrowing, investing, insurance, and retirement planning—assume greater risks in their financial dealings, which can adversely affect their financial welfare. The goal of improving financial literacy is to equip consumers and investors with the necessary tools, knowledge, and skills to make informed financial decisions and achieve their financial well-being (Mohamed Sadek ZAIBET, 2021).

This study purpose is giving more information and illustrates financial education, how we can get financially educated, to achieve well-being by going thru its dimensions like financial capacity, financial attitude.

Based on previous studies, there is a broad consensus on the importance of financial education in its various forms, utilizing both quantitative and qualitative methods. These studies highlight the critical role financial education plays in enhancing individuals' financial awareness, enabling them to make informed and responsible financial decisions.

Quantitative methods include the analysis of financial data, statistics related to saving, investing, and spending. These tools help individuals understand financial numbers and reports, thereby enhancing their ability to plan effectively and manage their financial resources efficiently.

Qualitative methods, on the other hand, involve education on fundamental personal finance concepts such as compound interest, debt management, and retirement planning. They also include the development of life skills that contribute to improving individuals' financial situations, such as negotiation skills, awareness of financial risks,

and sound decision-making. By integrating these quantitative and qualitative approaches, a comprehensive and holistic financial education can be achieved, contributing to the financial stability of both individuals and communities. This integrated approach not only enhances financial awareness but also helps in building a stronger and more economically sustainable society.

Consumers of all ages, from millennials to boomers, are increasingly concerned about their financial wellbeing. In response, financial service providers, including banks, wealth management consultants, and fintech startups, are adopting emerging technologies such as artificial intelligence (AI) and machine learning to offer unique value to their customers. As these technologies advance, they will rely more on support from individuals. Not only do these technologies simplify expense tracking, but they also serve as valuable tools for improving financial literacy. Advanced applications can connect with bank accounts to alert users about overspending and provide advice on saving for upcoming bills. AI-powered apps represent a significant advancement, utilizing data from various sources, including consumer interests, personal demographics, credit history, risk preferences, lifestyle, earnings, income sources, and financial goals. (Dr. Mohammed, 2020).

This study aimed to educate students about their financials, Through a seven-chapter training course consisting of introductory questions and ice-breaker games between students, along with essential topics to test students' ability to manage their finances and distinguish between needs and wants, we achieved significant results. The most notable finding was that the majority of students greatly benefited from the course. Many students previously paid little attention to concepts such as budgeting, emergency funds, or saving. However, following the course, there was a marked positive change in their financial behavior and understanding. Which leads us to the maim question: How can financial education be improved using artfificial intelligence in Algeria at this current time?

Subsidiary questions:

Can financial education significantly influence ones financial prosperity?

Does financial education contribute to better financial decision-making?

Can artificial intelligence improve the accessibility of financial advice?

Are there primary benefits of integrating AI into financial literacy programs?

Does AI assist in personalizing financial education for diverse learner needs?

Assumptions:

-Financial education significantly influences ones financial prosperity, leading to improved financial outcomes

-Financial education contributes to better financial decision-making, resulting in more informed and effective choices regarding finances.

-Artificial intelligence does not improve the accessibility of financial advice.

-There are no primary benefits of integrating AI into financial literacy programs.

-AI assists in personalizing financial education for diverse learner needs, enabling tailored learning experiences and improved comprehension.

Methodology:

We employed a descriptive-analytical methodology, collating data from diverse theoretical sources. The practical component encompassed financial education training, followed by the systematic collection and analysis of data utilizing JAMOVI software. Finally, we provided insightful commentary on the findings.

Study objectives:

 To assess the current state of financial education and the role of AI in enhancing it.

 To examine the effectiveness of AI-driven financial education tools in improving financial literacy and decision-making.

 To identify potential challenges and opportunities associated with integrating AI into financial education.

Importance of Study:

Financial literacy is vital for making sound financial decisions, yet there exist significant global gaps in financial knowledge. Exploring how AI can bolster financial education offers the potential to narrow these disparities and empower individuals in managing their finances more effectively. As AI technology rapidly evolves, it's imperative to examine its diverse applications, particularly in education. Financial education stands poised to benefit from AI-driven tools and platforms that can deliver

tailored learning experiences, catering to individual preferences and needs. Moreover, traditional financial education methods often face accessibility barriers, including cost and geographical limitations. AI-powered solutions hold promise in democratizing financial education, making it more inclusive and accessible to a wider audience, irrespective of their background or circumstances.

Chapter one:
Review of Literature

I) Financial education

Section prelude:

Essential Foundations of Financial education(Understanding Importance and Impact)

This chapter offers a succinct exploration of financial education, focusing on its significance and real-world impact. It commences by elucidating the pivotal role of financial education in equipping individuals with the knowledge and skills to manage their finances effectively.

Through a lens of importance, the chapter underscores the critical need for financial education in today's world. It emphasizes how understanding financial concepts such as budgeting, saving, investing, and debt management can empower individuals to achieve their financial goals and navigate economic challenges with confidence.

Furthermore, the chapter delves into the tangible benefits of financial education at both personal and societal levels. It discusses how informed financial decision-making can lead to improved financial well-being for individuals while also contributing to broader economic stability and prosperity.

In summary, this chapter advocates for the essential role of financial education in fostering financial literacy and resilience. By emphasizing its importance and tangible outcomes, it seeks to inspire a commitment to lifelong learning and prudent financial management practices.

1- Definition:

OECD defined financial education as the process by which financial consumers or investors improve their understanding of financial products, concepts and risks, through information instruction and objective advice, develop skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where go for help in financial issues, and to take other effective actions to improve their financial well-being. Briefly, it is where information involves providing consumers with facts data and specific knowledge to make them aware of financial opportunities , choices and consequences, instructions involve ensuring that individuals acquire the skills and ability to understand financial terms and concepts, through the provision of training and guidance, and advice involves providing consumers with counsel about generic financial issues and products, so that they can make the best use of the financial information and instruction they have received. Financial education enhances and influences financial knowledge, attitude, and behavior. For instance, Flecher completed a pre and post assessment of financial knowledge, attitudes and behaviors to evaluate the effectiveness of low state's personal finance workshop, and found that participants had improved in knowledge, attitudes and behavior. Increased financial knowledge is also found to influence student's attitudes positively toward business in general and their ability to be wise consumers in society, financial education should be considered a concept that promotes financial literacy. (Mohamed Sadek ZAIBET, 2021)

2-Financial behavior:

In order to define financial behavior, it would be useful to define the concept of behavior itself in this context. behavior is the actions and reactions of a person in response to external or internal stimuli, in addition field consumer or investor attempts to understand an explain their decisions by combining the topics of psychology and consumption/investing on a micro level and a macro level in financial markets, therefore financial behavior can be defined simply as follows : financial behavior describes the

actions and reactions(decisions and judgments) of consumers/investors during financial planning and financial management process in response to external or internal stimuli in the financial life (Ali saeedi,2018, p21). Financial behavior examines the decisions-making approach of individuals including cognitive and emotional biases, financial behavior makes the premise that wide range of qualities and quantities issues influence the decisions making process, various laboratory, survey and market studies in financial behavior show that individuals are not always rational and apply the descriptive model from the social sciences that documents how people in real life make judgments and decisions, a basis of descriptive model is that consumer and investors are affected by their previous experiences ,tastes, cognitive issues, emotional factors, the presentation of information, and the validity of data, individuals also make judgments based on bounded rationality, bounded rationality is the premise that a person reduce the number of choices to a selection of smaller shortened steps, even when this oversimplifies the decisions-making process, according to bounded rationality, an individuals will select as satisfactory outcome rather than the optimal one. (Mohamed Sadek ZAIBET, 2021, p. 1236)

3- financial capability:

The world bank defined financial capability as the internal capacity to act in one's best financial interest, given socio-economic environmental conditions, it encompasses the knowledge, attitudes, skills and behavior, that means the ability to use all of them in the correct way, to managing their resources, understanding, selecting and making use of financial services that fit their needs (The world bank, 2013, p1). Financial capable people are able to make informed financial decisions, they can numerate and can budget and manage money effectively, they understand how to manage credit and debt, they are able to assess needs for insurance and protection, they can assess the different risks and returns involved in different saving and investment options, they have an understanding of the wider ethical, social, political and environmental dimensions of finances (Financial services authority, 2013, p13). Financial capability is the ability and opportunity to use knowledge and skills implied in financial literacy, financial capability includes day to day

management and planning for the future (Monique Colen, 2011). Kepson and her colleagues developed a model of financial capability emplacing behavior, while recognizing knowledge and attitude components, they describe five domains of personal finance, making ends meet, keeping track, choosing products, planning ahead, staying informed and getting help (Jennifer Robson, 2012). Financial capability is a broad concept encompassing people's knowledge and skills to understand their own financial circumstances, along with the motivation to take action, financially capable consumers plan ahead, find and use the information, know when to seek advice and can understand and act on this advice, leading to greater participation in the financial services market. Financial capability is about bringing together informed clients with appropriate products in the marketplace, financial capability means being able to manage money keep track of your finances, plan ahead, choosing financial products and staying informed about matters. As a summary of what is being mentioned. (Mohamed Sadek ZAIBET, 2021, p. 1236)

4- Financial Literacy

Although different sources provide different definitions of financial literacy, a consistent theme runs through them "an individual's ability to acquire essential knowledge and skills to make decisions with awareness of the possible financial consequences, however it is important to elaborate on what knowledge and skills are considered essential" (Deniss rablsendki, 2015, p4)

Remund provides a very basic definition of financial literacy,' financial literacy relates to a person's competency for managing money, further, Remund conducted a review research studies identified five categories where the conceptual definition of financial literacy fall (Remund, 2010, p277)

- Knowledge of financial concepts.
- Ability to communicate about financial concepts.
- Aptitude in managing personnel finances.

● Skill in making appropriate financial decisions.

● Confidence in planning effectively for future financial needs.

OECD defined financial literacy as" the essential knowledge and understanding of financial concepts and risks, and the skills, motivations and confidence to apply such knowledge and understanding in order to make effective decision across a range of financial context to improve financial well-being of individuals and society, and to enable participant in economic life" (Ali saeedi, 2018, p4). Ray morgan stated, it can be extended as " enabling people to make informed and confident decision regarding all aspects of their budgeting, spending and saving, and their use of financial products and services, from everyday banking through to borrowing investing and planning for the future"(Kwame mireky, 2015,p13). The president's advisory council of financial literacy in the United States, defined financial literacy as the ability to acquire knowledge and skills for use it to manage financial resources for lifetime and for one's financial well-being (President's advisory council on financial literacy, USA, 2008).

OECD reports that financial literacy is the combination of consumer's /investor understands of financial products and concepts and their ability and confidence to appreciate financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being. Financial literacy is described as the ability to make informed judgements and take effective decisions regarding the use and management, it identifies four areas of competence, namely, mathematical literacy, financial understanding, financial competence and financial responsibility. (Mohamed Sadek ZAIBET, 2021, p. 1231)

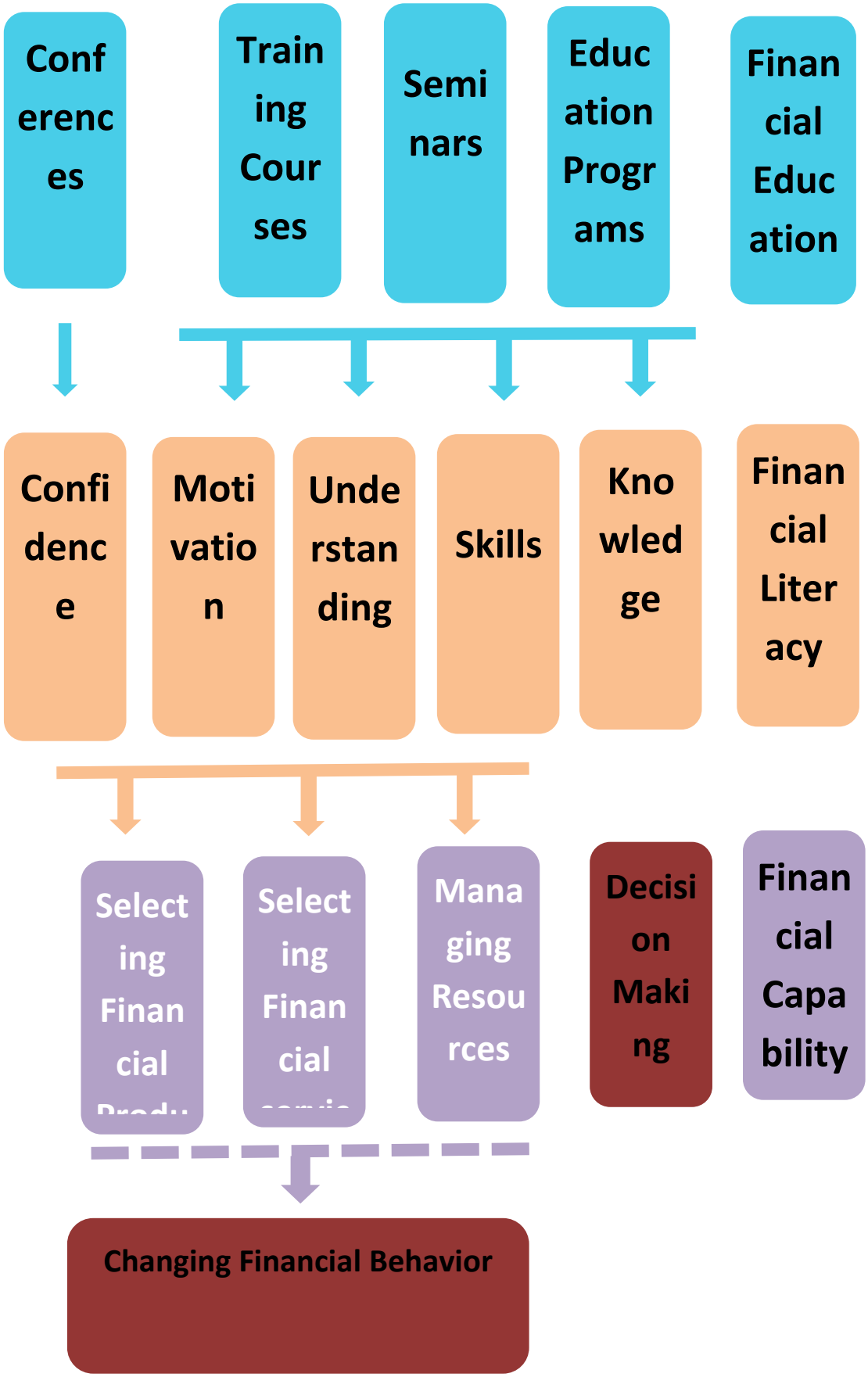


Figure 1the relationship between dimensions of financial literacy

-From the schema above, we can understand there is a strong relationship among these dimensions, which interact with each other, in order to achieve the main goal of

being financially literate, so the first step to start building financial literacy and get more financial knowledge is the financial education, which boosts, teaches and make people more conscious about financial issues, that confront their financial well-being and security through the daily life. Moreover financial education give to individuals the essential financial concepts, which they need them to improve their financial awareness and cognitive, in order to use them when they deal with money. That step or phase transforms people from financial illiteracy to financial literacy, which is the second and essential step, it is consists of, financial knowledge, financial skills, financial understanding, financial motivation, and financial confidence, all of them they allow individuals to practice efficiently their acquaintances and awareness in financial life, especially in this step appear the phase of financial capability, that means there is the opportunity and the ability to managing financial resources, selecting the best financial service and product, get financial opportunity and avoid risk, seeking for the financial information and advice and know where they can find it, in this phase we reach the whole goal of financial literacy which is financial efficiency. Further, there is another dimension which are always related with the previous dimensions and it accompanies them in all stages, this dimension is financial attitudes and behaviors, that works in interchangeably shape where it affects the other dimensions and it is affected by them. (Mohamed Sadek ZAIBET, 2021)

5- The importance of financial literacy:

Several research has demonstrated the importance of financial literacy, Danes and Hira" states that financial literacy can turn consumers into responsible and empowered market player, motivated and competent to engage in financial behaviors that increase their own welfare. A number of writers have noted that improving financial literacy can benefit all level of the economy and will support the financial services sector, social and economic exclusion will also be reduced, spending power, innovation and competitiveness will increase and loan defaults will decrease (Danes and Hira,1987,p5). According the OECD, DFID, world bank, financial literacy is especially important in our modern era for three main reasons, first, the recent financial crisis has reduced access to credit and increased its

cost in many development country markets, just as it already has in the united states and Europe, second financial literacy can help to prepare consumers four tough financial times, by promoting strategies that mitigate risk such as accumulating saving, diversifying assets, and purchasing insurance, third, financial literacy can reinforce behaviors such as timely payment of bills and avoidance of over-indebtedness, that can help consumers maintain their access to loans in tight credit markets.

As result of that we can describe the important benefits of financial literacy to consumers and investors, as follows (Capuano and Ramsay, 2011):

● **saving and retirement planning:** financially literate people have a greater capacity to save for retirement, this is achieved by financial efficiency which results in saving money, making an effort to set aside money and enhanced ability to set realistic retirement goals, and select suitable investment to realize those retirement goals, a better informed consumer will save for the future, for retirement and for unforeseen circumstances and emergencies.

●**life skills and bargaining power:** the realization of good financial behavior is achieved through the development of knowledge and skills, which provides the basis for making informed decisions; the European commission has recognized that financial literacy gives consumers greater bargaining power through understanding finance and terms in consumer contract, consumer scan gain better deals and demand more from services providers.

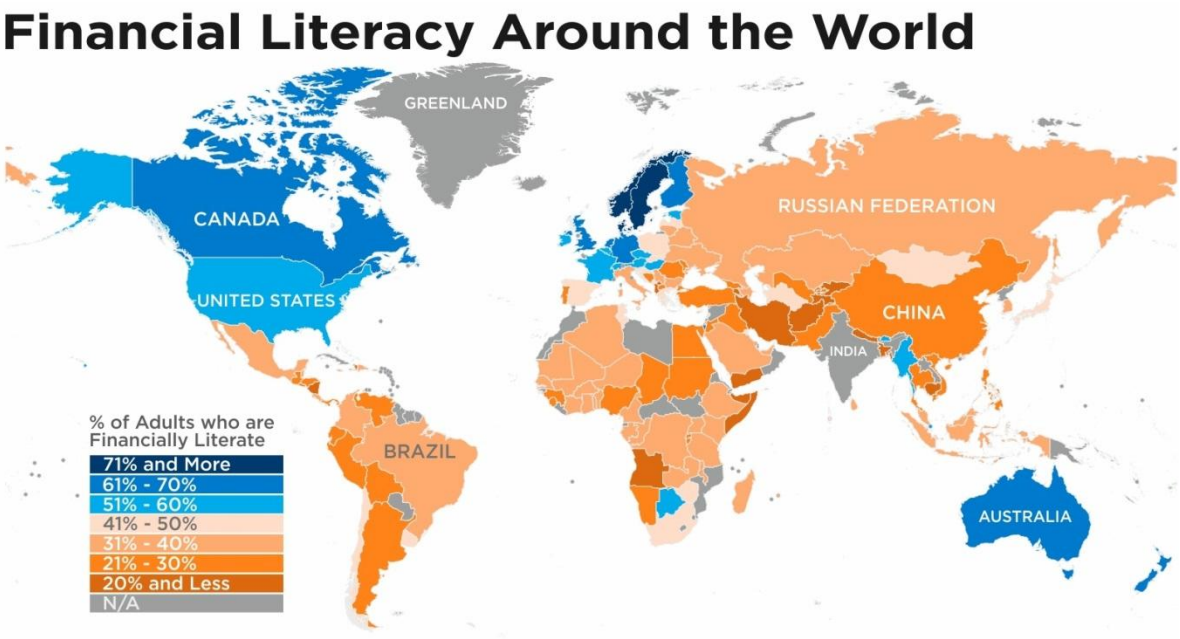
● **Financial capability:** financial literacy results in financial capability refers to the use financial products and investing without waste and unnecessary cost, financial capability can include selecting the best value product and services on the markets with the lowest suitable possible price.

● **Activity in financial market:** financial literate consumers have been seen to possess more financial product and productive investors, limited financial market participation may be consequence of low levels of financial literacy, Lusardi and Alessie find that people with low levels of financial literacy are significantly less likely to hold shares and stocks.

● **consumer rights and regulatory intervention:** education in consumer laws and fraudulent schemes is a component of financial literacy, this knowledge gives people the tools and understanding identify and avoid fraudulent schemes and reduce the severity of falling victim to such schemes, this translates in into lower levels of regulatory intervention because consumer are better able to take care of themselves, a financially capable person know where to go for help.

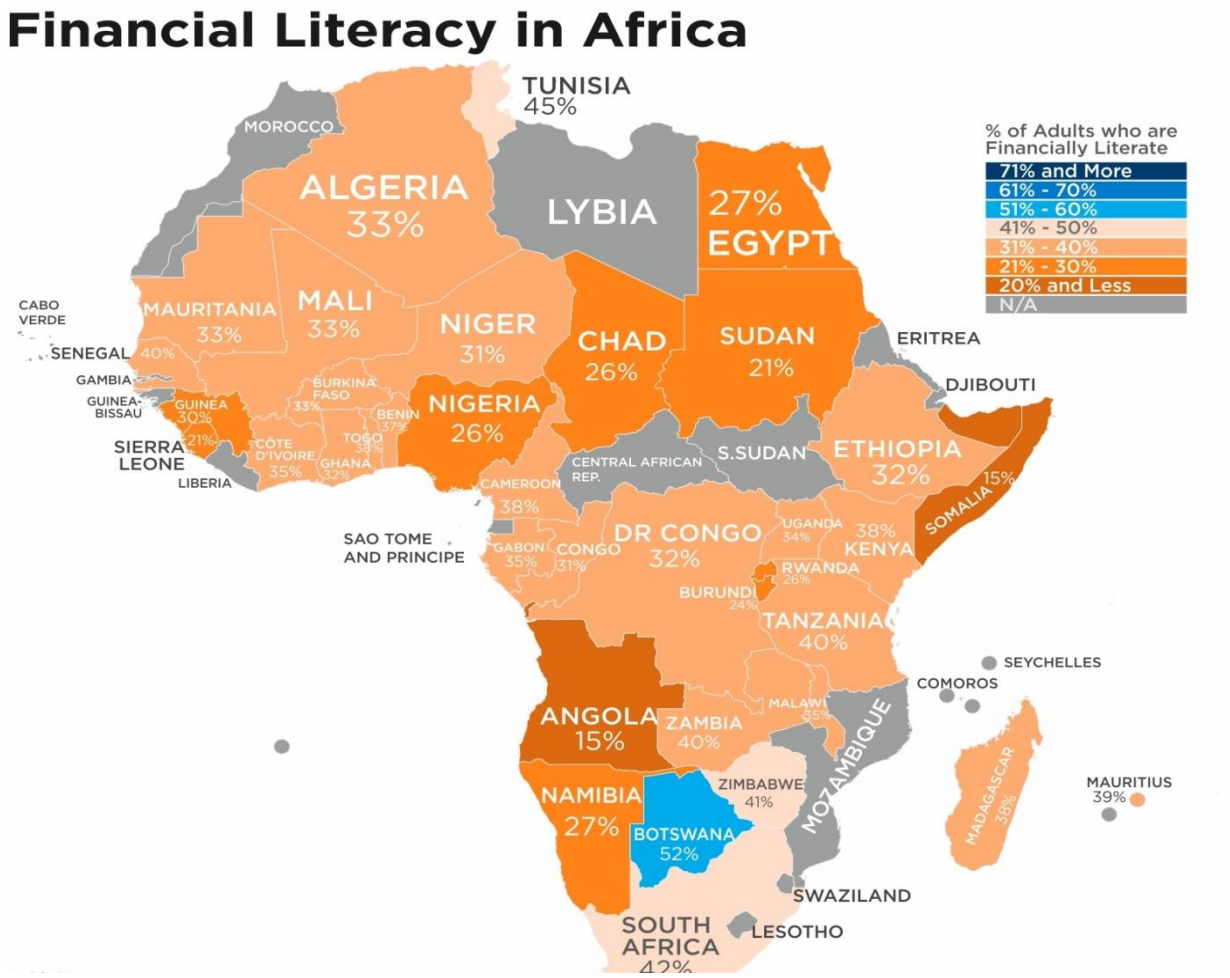
●**greater competition, innovation and quality products:** Financial literate people are more financially efficient, seeking and purchasing better, cheaper and more appropriate products and services can drive efficiencies in the financial literacy. This leads to increase competition, better quality products and greater innovation and diversity in the market, knowledge of consumer rights and contracts also allows consumers to evaluate products more carefully and as result demand more from suppliers.

● **self-funding of retirement :** the increased saving and retirement planning resulting from increased financial literacy also had positive effects on the financial system and economy, by reducing the burden on the state to provide pensions and government funding for people experiencing financial hardship, instead, people are more willing to build wealth during their working lives to fund retirement**.**



(Mohamed Sadek ZAIBET, Financial literacy and its dimensions, 2021)

Figure 2 financial literacy around the world



(Mohamed Sadek ZAIBET, Financial literacy and its dimensions, 2021)

Figure 3 financial literacy in africa

6- Effective efforts to educate investors:

The Commission published a request for public comment and data to identify, among other things, the most effective private and public efforts to educate investors. The Commission received more than 80 unique comments, including comments from investors, financial professionals, industry groups, academics, not-for-profit organizations, and other regulators.12 Based on the feedback of commenters, the Staff has identified the following characteristics of effective investor education programs:

• Based on research and evaluation. Effective investor education programs should use research and evaluation to improve current educational materials and guide the development of new educational materials. Additionally, organizations that develop investor education programs should conduct evaluations to measure the efficacy of these programs.

• Focused on clear goals. Effective investor education programs have clearly-defined and measurable goals.

• Timely and relevant. Effective investor education programs should have relevant and timely content. This content should be tailored to a specific target audience and presented in a manner that is engaging and interactive.

• Include important investor education concepts. Effective investor education programs should:

-teach basic financial concepts, including risk, diversification, and compound interest;

-explain specific investment products and strategies; and

-educate individuals about investor protection, including how securities regulators protect investors and what steps individuals can take to avoid investment fraud.

• Be easily accessible. Effective investor education programs should be accessible to their target audiences, by being easy to use, easy to find, and easy to understand through the use of plain language.

• Promoted with strategic partnerships. Effective investor education programs utilize strategic partnerships by leveraging the support of public, private, and not-for-profit organizations.

• Delivered efficiently. Effective investor education programs should efficiently deliver information to the public based on the needs of their target audience. Some examples of efficient delivery methods include: (i) in-person methods (e.g., classroom settings and presentations to large groups); (ii) online delivery channels (e.g., websites, webinars, podcasts, and videos); or (iii) a combination of online and in-person methods.

• Scalable. Effective investor education programs should be designed in a way so as to reach a high volume of investors. (Dodd-Frank, 2012)

7- Personal finance

Is the application of the principles of finance to the monetary decisions of an individual or family unit. It addresses the ways in which individuals or families obtain, budget, save, and spend monetary resources over time, taking into account various financial risks and

future life events. Components of personal finance might include checking and savings accounts, credit cards and consumer loans, investments in the stock market, retirement plans, social security benefits, insurance policies, and income tax management. (Guimaraes)

8 - Personal financial planning

A key component of personal finance is financial planning, a dynamic process that requires regular monitoring and reevaluation. In general, it has five steps:

8-1. Assessment: One's personal financial situation can be assessed by compiling simplified versions of financial balance sheets and income statements. A personal balance sheet lists the values of personal assets (car, house, clothes, stocks, bank account), along with personal liabilities

(e.g., credit card debt, bank loan, mortgage). A personal income statement lists personal income and expenses

8-2. Setting goals: Two examples are "'retire at age 65 with a personal net worth of $1,000,000" and "buy a house in 3 years paying a monthly mortgage servicing cost that is no more than 25% of my gross income".

It is not uncommon to have several goals, some short term and some long term. Setting financial goals helps direct financial planning

Plan: The financial Plan details how to accomplish your goals.

3.It could Creating include, for example reducing unnecessary expenses, increasing one's employment income, or investing in the stock market.

8-3. Execution: Execution of one's personal financial plan often requires discipline and perseverance. Many people obtain assistance from professionals such as accountants, financial planners, investment advisers, and lawyers.

8-4. Monitoring and reassessment: As time passes, one's personal financial plan must be monitored for possible adjustments or reassessments.

Typical goals most adults have are paying off credit card and or student loan, debt, retirement, college costs for children, medical expenses, and estate planning. (Guimaraes)

9- Budget:

A budget (from old French bougette, purse) is generally a list of all planned expenses and revenues. It is a plan for saving and spending. A budget is an important concept in microeconomics, which uses a budget line to illustrate the trade-offs between two or more goods. In other terms, a budget is an organizational plan stated in monetary terms.

In summary, the purpose of budgeting is to:

1. Provide a forecast of revenues and expenditures i.e. Construct a model of how our business might perform financially speaking if certain strategies, events and plans are carried out.
2. Enable the actual financial operation of the business to be measured against the forecast. (Guimaraes)

10- Budget types

- **Sales budget:** The sales budget is an estimate of future sales, often broken down into both units and dollars. It is used to create company sales goals
- **Production budget:** Product oriented companies create a production budget which estimates the number of units that must be manufactured to meet the sales goals. The production budget also estimates the various costs involved with manufacturing those units, including labor and material
- **Cash Flow/Cash budget:** The cash flow budget is a prediction of future cash receipts and expenditures for a particular time period. It usually covers a period in the short term future. The cash flow budget helps the business determine when income will be sufficient to cover expenses and when the company will need to seek outside financing.
- **Marketing budget:** The marketing budget is an estimate of the funds needed for promotion, advertising, and public relations in order to market the product or service.

- **Project budget:** The project budget is a prediction of the costs associated with a particular company project. These costs include labor, materials, and other related expenses. The project budget is often broken down into specific tasks. with task budgets assigned to each.
- **Revenue budget:** The Revenue Budget consists of revenue receipts of government and the expenditure met from these revenues. Tax revenues are made up of taxes and other duties that the government levies.
- **Expenditure budget:** A budget type which include of spending data items. (Guimaraes)

11- Planning for Emergencies and Unexpected Expenses:

Emergencies and unexpected expenses can happen to anyone at any time. From medical bills to car repairs to unexpected home repairs, these expenses can quickly drain your savings and put you in a tough financial situation. However, by planning ahead and saving for emergencies, you can be better prepared for unexpected expenses and avoid financial stress. In this essay, we will discuss several strategies for planning for emergencies and unexpected expenses.

- **Build an emergency fund**

Building an emergency fund is one of the most important steps you can take to prepare for unexpected expenses. Aim to save three to six months' worth of living expenses in an emergency fund. This can help you cover unexpected expenses, such as medical bills or car repairs, without having to rely on credit cards or loans.

- **Create a budget**

Creating a budget can also help you prepare for unexpected expenses by giving you a better understanding of your income and expenses. By tracking your spending and setting

aside money for savings each month, you can be better prepared for unexpected expenses when they arise.

- **Prioritize your expenses**

Prioritizing your expenses can also help you prepare for unexpected expenses. Make a list of your essential expenses, such as housing, food, and utilities, and prioritize those expenses over non-essential expenses, such as entertainment or dining out. This can help you save money and build your emergency fund more quickly.

- **Consider insurance**

Consider insurance as a way to protect yourself from unexpected expenses. Health insurance can help cover the cost of medical bills, while car insurance can help cover the cost of car repairs. Homeowners insurance can also help cover the cost of unexpected home repairs. Be sure to read your insurance policies carefully and understand what is and isn't covered.

- **Reduce debt**

Reducing debt can also help you prepare for unexpected expenses by freeing up more money in your budget. Focus on paying off high-interest debt, such as credit card debt, first. This can help you save money on interest and free up more money for savings and emergencies

- **Save for specific expenses**

In addition to building an emergency fund, consider saving for specific expenses that you know are coming up. For example, if you know you will need a new car in the next few years, start saving for it now. This can help you avoid taking on debt to cover the cost of the expense

In conclusion, planning for emergencies and unexpected expenses is an important part of maintaining your financial health. By building an emergency fund, creating a budget, prioritizing your expenses, considering insurance, reducing debt, saving for specific expenses, and being flexible, you can be better prepared for unexpected expenses and

avoid financial stress. With patience, discipline, and a clear plan, you can achieve your financial goals and become a more financially savvy individual. (Rainstorm, 2004)

12- Financial education in school and the workplace:

While financial literacy is an essential skill, particularly among the young, many young people lack knowledge of basic financial concepts. Back in 2000, the OECD started PISA, an ambitious project to assess student performance in critical areas. PISA gauges whether students are prepared for future challenges, whether they can analyze, reason, and communicate effectively, and whether they have the capacity to continue learning throughout their lives. Since its first wave in 2000, PISA has tested 15-year-old students' skills and knowledge in three key domains: mathematics, reading, and science. In 2012, PISA introduced an optional financial literacy assessment, which became the first large-scale international study to assess youths' financial literacy. The PISA financial literacy assessment measures the proficiency of 15-year-olds in demonstrating and applying financial knowledge and skills.

This is the definition of financial literacy from the team of experts who worked on this assessment Footnote:

"Financial literacy is knowledge and understanding of financial concepts and risks, as well as the skills and attitudes to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial wellbeing of individuals and society, and to enable participation in economic life." (OECD 2019b)

As reported in more detail in Lusardi (Reference Lusardi2015), there are four innovative aspects of this definition that should be highlighted. First, financial literacy does not refer simply to knowledge and understanding but also to its purpose, which is to promote effective decision making. Second, and in line with the objectives of this journal, the aim of financial literacy is to improve financial wellbeing, not to affect a single behavior, such

as increasing saving or decreasing debt. Third, financial literacy has effects not just for individuals but for society as well. Fourth, financial literacy, like reading, writing, and knowledge of science, enables young people to participate in economic life. We highlight this definition because it represents many of the principles covered in this inaugural issue.

The PISA financial literacy data have become a critical source of information with which to assess the level of financial literacy among the young. Starting from the original wave in 2012, we have found that several rich countries do not have high levels of youth financial literacy. For example, both the United States and some European countries, such as Italy, France, and Spain, ranked at the OECD average or below the average on the 2012 financial literacy scale. Moreover, and importantly, financial literacy is strongly linked to socio-economic status: the students who are financially literate are disproportionately those from families with higher levels of education and income and from homes with a lot of books. (OECD 2014; Lusardi Reference Lusardi2015).

The PISA 2022 financial literacy assessment will provide further insights into young people's financial literacy across 23 countries and economies, and take into consideration changes in the socio-demographic and financial landscape, such as the use of digital services, that are relevant for students' financial literacy and decision making.

Countries have started to add financial education in school, in some cases making it mandatory. Notably, Portugal made financial education mandatory in school in 2018, adding it to the civic education curriculum, and many states in the United States have passed legislation to make financial education mandatory in high school curricula. Recent empirical evidence on the effectiveness of financial education in school shows it holds much promise. For example, according to a meta-analysis covering financial education programs from as many as 33 countries on 6 continents, and considering the programs evaluated most rigorously, financial education is found to affect both financial knowledge and downstream behavior. Remarkably, the effects are similar across age groups, i.e., they hold among the young and the old, and they hold across countries.Footnote[9] Other work

examining the effect of financial education in high school also shows that young people who were exposed to high school financial education are much less likely to have problems with debt as young adults (Urban et al. Reference Urban, Schmeiser, Collins and Brown2020).

While the focus on financial education has been on whether it improves the knowledge and wellbeing of students, it could also affect others. Frisancho (Frisancho2023) in this inaugural issue examines whether financial education in high school can also affect parents. This is a very innovative paper and for many reasons. First, the analysis is carried out on a large sample of schools in Peru. As mentioned earlier, Peru is a country with a high percentage of students who perform poorly on financial literacy assessments. Second, it is possible to link the data with information from credit bureau records, which provide data on financial outcomes. This is more rigorous information than can be obtained by relying, for example, on self-reports. Third and importantly, the evaluation is based on a large-scale experiment, where students were randomly assigned to control and treatment groups, which is the most rigorous method with which to assess the impact of financial education. We hope many programs can be evaluated using these methods and that this study can provide guidelines for other countries.

The findings speak of the power of financial education: in addition to affecting students, it helps parents, specifically parents of low-income students. Among parents from poorer households, default probabilities decrease, credit scores increase, and debt levels increase too. And there is an important gender effect: it is mostly the parents of daughters who experience improvement in their financial behaviors. These findings are intrinsically important and have policy implications: Financial education in school can be far reaching and can have important spillover effects, in particular for vulnerable groups.

And if schools can be suitable places to provide financial education to the young, the workplace can be ideal for financial education programs for adults, as also recognized by the OECD in the Policy Handbook on Financial Education in the Workplace

(OECD 2022). There are many reasons why workplace financial education can be important. First, employers may benefit too. A simple statistic from the work of Hasler et al. (Reference Hasler, Lusardi, Yagnik and Yakobski2023) is quite informative. In an attempt to provide a crude proxy of the cost of financial illiteracy, the 2021 *Personal Finance Index* (*P-Fin Index)* survey asks respondents to give an estimate of the total number of hours per week they spend worrying about their personal finances, and how many of those hours are spent at work. Findings are startling. In 2021, U.S. adults reported spending about 7 hours per week, on average, thinking about and dealing with issues and problems related to their personal finances, with over three of these hours spent at work. The most financially literate respondents (who answered over 75 percent of the *P-Fin Index* questions correctly) reported spending much less time dealing with their personal finances: about three total hours per week with 1 hour per week at work. In contrast, the least financially literate respondents (those who answered 25 percent or less of the *P-Fin Index* questions correctly) reported spending a staggering 11 total hours per week and over 4 hours per week at work thinking about and dealing with issues related to their finances.

Hasler et al. (Reference Hasler, Lusardi, Yagnik and Yakobski2023) use these data to do a back-of-the-envelope calculation of the return to a workplace financial education program. For a company with 30 minimum-wage employees (earning $15 per hour) who work 50 weeks per year, financial education can recover $22,500 of value per year for an employer, which is conceivably greater than the cost of many workplace financial wellness programs. In other words, scalable, low-cost financial education programs would likely create a positive return on investment, in particular for large employers.

Because of the shift from defined benefit to defined contribution in the United States, a number of large firms have started to offer financial education programs. However, it is difficult to access that data without working directly with an employer. It is also difficult to acquire data that are representative of the population of workers or employers. The research of Clark (Reference Clark2023), who has worked with many employers in different sectors, is rather unique and helps us to shed light on the workings and promises

of workplace financial education. As noted in his paper, providing financial education when workers are first hired is ideal, because it is in the interest of both employers and employees to understand the benefits offered by the firm and how to best use them. Providing education related to retirement and retirement planning is also beneficial to both parties, given that a substantial portion of employer benefits relate to pensions and the promotion of financial security in retirement. However, as the author effectively argues, financial education should not be limited to retirement topics, as other financial decisions made by employees can interact with decisions about whether or not to participate in pension plans and how much to contribute to those plans. Holistic financial education programs offered throughout the life cycle may better fit the needs of a heterogeneous population of workers. And programs provided well before retirement may enable workers to take better advantage of the power of interest compounding, helping them begin to save as early as possible and take advantage of employer matches. It is not always possible to evaluate the effectiveness of programs using randomized controlled trials or controlling for certain factors, such as whether program attendees are those who are inherently interested in financial education, but the evidence provided in this overview of two decades of work shows that workplace financial education holds much promise.

Clark's work has included personal interactions with employers and employees, providing opportunities for both quantitative and qualitative work, and the evidence from small samples can be illuminating too. For example, the author shows that financial education programs are appreciated and rated with high marks by employees. While self-selection may play a role in program attendance, offering this type of benefit can be a useful retention tool, particularly in the tight post-pandemic labor market. We specifically encourage reading the last part of the paper, which provides useful best practices for increasing the effectiveness of employer-provided financial education programs. (Lusardi, 2023)

13- Factors making financial education increasingly important:

- ✓ **The complexity of financial product:**

A generation ago most consumers had just two basic banking products: a checking account and a savings account. Such accounts were simple to open and maintain. Now, however, consumers are faced with a variety of different types of checking or bank accounts: accounts with fees that pay interest accounts with no fees and no interest, accounts with no fees but a limit on the number of transactions per month, accounts with overdraft protection, etc., that may be provided by a number of different types of financial institutions.

Consumers also have the choice among a number of savings vehicles: money market accounts, certificates of deposit, and a variety of other products with differing maturities and yields. For those individuals interested in investing in equities there are innovative products such as equity portfolios that enable an investor to purchase a complete portfolio of stocks with a single transaction differing maturities and yields. For those individuals interested in investing in equities there are innovative products such as equity portfolios that enable an investor to purchase a complete portfolio of stocks with a single transaction but to trade the securities individually, at any time. Investors can also choose to invest in a variety of mutual funds, including international funds, growth funds, income funds, and tax-free funds. With respect to bonds, there are government bonds, municipal bonds, corporate bonds, and callable bonds which are structured so that they can be retired by the issuer at specific dates and prices prior to maturity

Even relatively straightforward financial products can appear quite complex to the average consumer, as they often require an understanding of terms to maturity, durations, payout options, and various other features. In addition, it is often difficult to assess the quality of financial products at the time of purchase. For example, with life insurance policies or pensions, it might be thirty years or more before the quality is known. Furthermore, as these products are purchased infrequently, there is limited scope for learning about quality from repeated purchases consequently, financial products can be

difficult to understand and many consumers purchase inappropriate ones or decide not to purchase any at all.

- ✓ **Increase in the number of financial products:**

Deregulation of financial markets and the reduction in costs brought about by development in information technology and telecommunications have resulted in proliferation in the number of new products tailored to meet very specific market needs. These innovations in financial products and services have enabled more consumers to gain access to greater variety of financial products. The internet has also increased both the amount of information about investment and credit products and the availability of these products. The diversity of new financial products provides consumers with more choices but also more challenges.

- ✓ **The baby boom and increases in life expectancy:**

Many OCDE countries experienced a baby boom after the WW2. The first of these baby boomers will begin retiring over the next 5 to 10 years. As many baby boomers delayed childbearing or chose to have fewer children or none at all. Thus, the retirement planning of the baby boom generation means that will be fewer workers supporting greater number of retirees. The situation is further compounded by the increase in life expectancy which means that this large cohort of retirees might be spending more time in retirement planning than previous generations and might, therefore, need to be supported for a longer. (OCED, 2005)

14- Investing:

14- 1 Impact of financial literacy on saving-investment behavior

There is considerable evidence that financial literacy predicts savings both at cross-country and individual levels. Jappelli and Padula (2011) are of the view find that financial literacy is a determinant for the level of national savings and that its impact is potential as it gives 3.6% increase in national savings. On the individual level most empirical studies are done for developed countries such as the United States, The United Kingdom, Italy and Netherlands. The only study conducted for developing countries is work by

Klapper and Panos (2001) . While analyzing households' behavior in developed countries numerous studies demonstrate that financial literacy may have important inferences for retirement planning and saving decisions. It has been shown by Lusardi and Mitchell (2006, 2007, and 2008) that less financial literate people are less likely to save for retirement. This argument was supported by Lusardi and Mi tchell (2009) and Banks et al. (2009) who observe that more financially sophisticated individuals are more likely to be retirement ready and have higher retirement income. Moreover, several studies reveal that low financial literacy translates into lack of retirement planning (Lusardi and Mitchell (2009), Alessie et al. (2008). This fact may be explained by several factors. First of all, it has been demonstrated that lack of numerical skills impacts perceived financial security (Banks and Oldfield (2007) and retirement expectations (Banks et al. (2009). Secondly, low financial literacy raises planning costs, meaning economic and psychological barriers to obtain information required for saving and investing (Alessie et al. (2008). Concerning the developing countries, Klapper and Panos (2011) are of the view that higher financial literacy is positively related to retirement planning and investing in private pension funds. However, while studying the impact of financial literacy on saving behavior one should be careful because of reverse causality issue since one can acquire financial knowledge in the process of developing and implementing a savings plan. Several researchers acknowledge the significance of financial literacy with respect to saving decisions (Lusardi and Mitchell (2008), Willis (2009), Delevande et al. (2008). However, only two studies of Jappelli and Padula (2011) and Lusardi and Mitchell (2009) explicitly address this issue with instrumental variable method. They argue that financial literacy is an applicable instrument for predicting the saving-investment behavior of individuals especially the working-women. According to Herd and Holden (2010) early-life financial education is a strong predictor of late-life financial knowledge. To sum up, the literature on factors explaining financial literacy and the effects it has for households' saving decisions is vast, however focusing mostly on developed countries. Only two papers of

Cole et al. (2008) and Klapper and Panos (2011) address the above issues for the developing countries of Russia, India and Indonesia. (Javed Iqbal Bhabha, 2014)

15- saving :

Definition :

Savings is the balance that remains after meeting of the consumption needs of an individual. People who buy on credit and have incremental EMI commitments would have little or none to save on a monthly basis. Savings help in pooling up funds for the future. (Sweta, 2023)

Why is Savings Important?

Savings can be as simple as keeping aside money on a monthly basis or even investing small amounts on a monthly basis. Savings can help in meeting financial commitments at a future date, for example, to buy a house.

Savings can help you earn more money with investments. Even money kept idle in a bank savings account earns interest annually.

Funds saved or set aside also enable an individual to stand against unforeseen emergencies. Such emergencies can arise at any time to an individual due to any reason, such as the COVID-19 pandemic spread as well as the lockdown.

For example, Ms Z's monthly paycheck is Rs.4,000. Her expenses include an Rs.1,000 on rent payment, an Rs.400 car payment, an Rs.300 student loan payment, an Rs.100 credit card payment, Rs.150 for groceries, Rs.50 for utilities, Rs.25 for her cellphone and Rs.75 for gas.

Since her monthly income is Rs.5,000 and her monthly expenses are Rs.2,100, Ms Z has Rs.1,900 leftover. If Z saves her excess income, she has money to live on while resolving her problems in the case of an emergency.

If Z does not save her extra money and exceed her expenses over her income, it means she is living paycheck to paycheck. In the case of an emergency, she does not have money to meet her day-to-day expenses, bills, and emergency expenses.

Savings can be used to increase income by investing through different investment avenues or vehicles. (Sweta, 2023)

16- The impact of the financial crisis in saving

Decreasing saving rates in many economies over the decades prior to the financial crisis are likely to be due to a combination of factors: falling real interest rates, favourable lending conditions, rising asset prices and greater economic stability. Net wealth in many countries increased over this period, especially housing wealth. As people saw the value of their homes rise they saw less need for precautionary saving, especially if they were able to borrow against the increased valuations. In countries like France, where people cannot use their home as collateral for borrowing, the effect of house prices on the saving rate is much more muted (Nahmias, 2010). Credit was heavily promoted in some countries and, with hindsight at least, underpriced for the level of risk lenders were actually incurring. The causes of the financial crisis of 2007-08 are many, but there is little doubt that individuals and financial institutions failed to understand the risks they were taking in the credit market. The financial crisis precipitated a recession in many countries; wealth declined on average, unemployment increased and general confidence in the financial system eroded. Access to credit reduced significantly. These changes created uncertainty, older workers delayed retirement in order to offset their decline in wealth and the saving rate increased across many countries, despite, in many cases, persistent low interest rates (see Chai et al., 2011 for a discussion of the theoretical impacts of the financial crisis). There is some evidence that people shift their investment portfolios into less risky, more liquid, financial assets in times of instability, although this effect may be muted by low short-term rates of return (Nahmias, 2012). Analysis of the US Survey of Consumer Finances found little difference between preretirement age groups whose assets had

declined in value (by more than six months of usual income) during the financial crisis and those whose had gained (Duke, 2011). In both groups, there was an increase in the proportion of families unwilling to take financial risk from 2007 to 2009, and an increase in median precautionary savings. In fact, those who had seen the greatest increase in wealth increased their savings the most. This suggests that uncertainty may be a particularly powerful driver of savings behaviour. As economies recover from the effects of the financial crisis, saving rates might be expected to decline again. There may, however, be a long-term impact on the availability of credit if lending conditions are tightened, and prices more accurately reflect costs and risks, including any costs of tighter regulatory requirements. With the opportunities to 'dissave' less attractive or non-existent, many people will be inclined to save more, all other things being equal (Table 1). If there is lingering uncertainty about economic prospects, households may also seek to pay off debt or build precautionary savings. Low interest rates and rising inflation may also lead to a move away from traditional savings products, into riskier investments which offer a higher return, or assets which are seen as being safe in the long term, such as gold. (Lewis, 2012, p. 09)

17- Why people save?

The life-cycle motive, that is, to provide for anticipated future expenses during old-age, when individuals will not be able to rely on earnings and their income is likely to decrease. This includes pension saving, as a particular type of long-term saving.

· The precautionary ('rainy day') motive. This includes money put aside to cover unforeseen events or to provide a buffer against events like job loss, illness, relationship breakdown, or accidental damage to household goods.

· The improvement motive, that is to enjoy a gradually improving lifestyle. This can include shortterm saving for consumer durables, holidays, or gifts, or longer-term saving for, say, a child's education or wedding, or the deposit on a car or house (sometimes called the 'down payment' motive). Loan repayment is also a form of 'improvement' saving: for

example, repaying a mortgage or a loan on assets such as property, livestock or machinery. Similarly, repayment of a student loan is a form of saving. In this case, the asset is human capital, which can be used to generate an income stream. 13

· The enterprise motive. This is saving to accumulate enough money to carry out speculative or business activity, i.e. saving for the purpose of generating more money.

· The bequest motive. Some people save with no intention of using the money in their lifetime – they put money aside, or keep assets, explicitly to pass on to children or other family members. The bequest motive explains why people save more in old age than the life-cycle model would predict. Other issues may also be relevant to the development of financial education and awareness policies, in particular:

· 'Motiveless' saving. Some people build up savings simply because their income is consistently greater than their expenditure, and they do not actively manage the surplus. In this case, people may not be maximising their financial well-being.

· 'Windfalls'. People occasionally get a sum of money unexpectedly, for example through an inheritance, redundancy payment, or even winning it. This requires active decision-making and perhaps consideration of products which have not been used before.

· 'Dissaving'. An array of products becomes available when people start to draw down their wealth in old age. Pension assets and other long-term savings are generally used to generate an income in retirement. People may also have property, which can be used to release cash, either by 'trading down', or making use of equity release financial products. Decumulation brings people into contact with a different set of products from those which they have seen before and that require a different set of decision-making skills, including annuities and reverse mortgages (Lewis, 2012)**.**

18- How people save ?

The way people save can have a significant impact on the economy. Too much informal saving, or a preference for saving in property or livestock, for example, may mean

insufficient financial investment for long-term growth. A reliance on foreign investment, or vulnerability to foreign hedge funds seeking a quick profit, can lead to financial market volatility. In general, people with higher incomes are more likely to save with financial institutions, and in countries with well-developed capital markets more likely to buy stocks and shares and make other financial investments. Property is frequently used as the main non-financial investment. In lower income countries, people are more likely to invest in livestock, household goods, jewelry or gold. People on low incomes are much more likely to save informally, most often keeping cash at home, or with family members. In many low-income countries, people use mutual savings clubs or self-help groups, for example, savings and credit associations, which build up savers' funds to lend to members of the group4 . Loans may be long-term, or short-term to cover emergencies. The groups are self-managed, community-based and democratic. Research from the UK found that a high proportion of low-income households saved for birthdays and holidays, but did not save for the long term (Dolphin, 2009). Methods of saving were often informal: as well as keeping cash at home, it was common to overpay on fuel prepayment meters, or put money into a 'hamper scheme'. These schemes enable people to save towards a basket of food or other goods, and are often used to spread the cost of Christmas or other festivals. Saving money informally often means it is not protected, so the risk is higher and there is no redress. Savings clubs are not regulated and the safety of the money deposited depends on the members themselves, and in particular the treasurer. Hamper schemes are also not regulated as, legally, the saving is payment in advance for goods and services. There are also gender differences in saving habits. A 2007 UK study found a 'savings gap' between women and men that could not be accounted for by income differences (Westaway and Mckay, 2007). Women were as likely to save as men, but they saved less money and were more likely to save for the short term, whereas men saved for the long term. The same study also found that women's savings patterns were more likely to be disrupted by lifetime events such as having a child or getting divorced. Men were more likely to save when they became fathers; women less likely when they became mothers. The gender differences were much less evident for women without children. Young women (16-24)

saved more than men, and were more likely to enrol in an employer pension scheme. Australia reported a large gender savings gap – annual median savings of 150 AUD for women, and 620 AUD for men. This may be explained by women leaving the workforce to care for children, which reduces their compulsory superannuation contributions. There is also some evidence that women tend to be more risk-averse than men (Jianakoplos and Bernasek, 1998; Eckel and Grossman, 2008), which may inhibit investment in stock market based vehicles, and lead to a preference for cash. The consequence of different saving patterns in developed countries is that women are likely to be less well off in retirement than men, and to rely on state benefits. Women's saving behaviour also differs from men's in developing countries. A World Bank study looked at household panel data for 20 countries (Floro and Seguino, 2002). This concluded that income and other sources of women's bargaining power, including education and assets, have a significant impact on household spending decisions. As in developed countries, women spend more of the money they control on food for their children and other family needs. This could be seen as an investment, as healthy children will live to look after their parents in old age. Women's saving behaviour also depends on local culture – e.g. the need to save for a dowry, or to remit money to parents – and their access to a safe place to keep their money. For example, other family members may take cash, whereas gold is regarded as belonging to the woman herself. (Lewis, 2012, p. 13)

II) Artificial intelligence

Section overview: Exploring AI (From Origins to Impact)

This chapter offers a straightforward look at Artificial Intelligence (AI), covering its definition, history, and how it affects our lives. It starts by defining AI as teaching machines to think like humans.

We then travel back through time, exploring AI's history from its beginnings to today. We focus on Machine Learning (ML), which lets machines learn from data, and Deep Learning (DL), where neural networks help machines understand complex patterns.

The chapter also dives into AI's impact on society, from improving industries with smart predictions and automation to changing how we interact with technology through virtual assistants. But along with the benefits come questions about fairness, privacy, and who gets to benefit from AI's advancements.

In sum, this chapter gives a clear picture of AI, its journey through time, and how it's shaping our world today. It encourages readers to think about both the good and challenging sides of AI's influence.

1-Definition of Artificial Intelligence:

The prospect of creating intelligent computers has fascinated many people for as long as computers have been around and, as we shall see in the historic overview, the first hints in the direction of Artificial Intelligence date even before that. But what do we mean by Artificial Intelligence?

The precise definition and meaning of the word intelligence, and even more so of Artificial Intelligence, is the subject of much discussion and has caused a lot of

confusion. One dictionary alone, for example, gives four definitions of Artificial Intelligence: (joost nico kook, 2009)

An area of study in the field of computer science. Artificial intelligence is concerned with the development of computers able to engage in human-like thought processes such as learning reasoning, and self-correction.

The concept that machines can be improved to assume some capabilities normally thought to be like human intelligence such as learning, adapting, self-correction, etc.

The extension of human intelligence through the use of computers, as in times past physical power was extended through the use of mechanical tools.

In a restricted sense, the study of techniques to use computers more effectively by improved programming techniques.

Definitions that are more recent speak of imitating intelligent human behavior, which is already a much stronger definition.

For some time now, the Artificial Intelligence community has been trying to imitate intelligent behavior with computer programs. This is not an easy task because a computer program must be able to do many different things in order to be called intelligent.

Instead of looking at a general definition of Artificial Intelligence, one can also restrict oneself to the definition of artificially intelligent systems. There are many definitions around, but most of them can be classified into the following four categories:

Systems that think like humans

Systems that act like humans

Systems that think rationally

Systems that act rationally. (joost nico kook, 2009)

2-Brief history of artificial intelligence:

While the term artificial intelligence had not yet been conceived, the 1950s were the very early days of AI. Early computer systems were being built, and the ideas of building intelligent machines were beginning to form.

In 1950 it was Alan Turing who asked whether a machine could think.Turing not long before had introduced the concept of his universal abstract machine (called the Turing machine) that was simple and could solve mathematical problem (albeit with some complexity). Building on this idea, Turing wondered that if a computer's response were indistinguishable from a human, then the computer will be a thinking machine. The result of this experiment called the Turing Test.

In the test if the machine could fool a human into thinking that it was also a human then it passed the intelligence test. One way to think of the Turing test is by communicating to the other agent through a keyboard.
Questions are asked of the peer through written text, and responses are provided through the terminal. This test provides a way to determine if intelligence was created. Considering the task at hand, not only the intelligent peer contain the necessary knowledge to have an intelligent conversation, it must be able to parse and understand natural language and generate natural language responses. The questions may involve reasoning skills (such as problem solving), so mimicking humans would be feat!

An important realization of Turing during this period was the need to start small and grow intelligence, rather than expecting it to materialize. Turing proposed what he called the Child Machine in which a lesser intelligent agent would be created and then subjected to a course of education. Rather than assume that we could build an adult intelligence, we would build a child intelligence first and then inject it with knowledge. This idea of starting small and at lower levels corresponds with later ideas of so-called "scruffy" thinkers. The human brain is. complex and not fully understood, instead of striving to imitate this, why not start smaller at the child (or even smaller organism) and work our way up? Turing called this the blank sheets argument, A child is like a notebook that's full of blank sheets but is a mechanism by which knowledge is stored.

Alan Turing's life ended at a young age, but he's considered the founder of the field of Al (even though the moniker would not be applied for another six years). (joost nico kook, 2009)

3-Categories and Phases of Al：

As AI is a fast-evolving technology and a broad concept, there are different trains of thought and definitions, but three critical categories can be defined, based on the AI's capabilities

3-1. Artificial Narrow Intelligence (ANI): ANI is also known a "Narrow Al or "Weak Al". It is all around us today, and it is the only type of AI that we have achieved to date. Examples include autonomous vehicles, facial recognition, speech recognition, drones, robots, personal assistants such as Siri by Apple, Cortana by Microsoft and Alexa by Amazon. Such Al is considered weak or narrow because it operates in controlled environments and is unable to replicate human intelligence although it is able to simulate human behavior and even perform better than humans. An area of ANI is Deep Learning, where the computer is able to teach itself, Google Deep-Mind teaches itself to play Go and has beaten human champions. (Ravindran, 2022)

3-2. Artificial General Intelligence (AGI): It is also referred to as "Strong Al" or ""Deep Al" or ""Human-level AI" and it doesn't exist today. Prof.Linda Gottfredson (2015) explains AGI as "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". Unlike ANI, AGI is able to think, understand and behave in a manner that is human-like in any scenario. In other words, AGI can mimic human behavior or human-like intelligence.

If and when AGI comes to be developed, the impact could be profound. The opportunity to develop and deploy AGI-driven machines that could equal the brightest humans will present opportunities to develop solutions to mitigate intractable problems such as

climate change, find cures for incurable diseases, prevent pandemics, and save lives and planet Earth.

Is AGI real? The critics argue otherwise. Andrew Ng, an authority in the field of Al, who was part of the "'Google Brain" project and served as Chief Scientist for Chinese search giant Baidu, appealed to cut out the AGI nonsense" but to allocate resources for research on how today's technology is beginning to impact issues such as *job loss/stagnant wages, undermining democracy, discrimination/bias wealth inequality". Others such as philosophers Hubert Dreyfus and Jaron Lanier refute the idea that singularity is inevitable, arguing that it is impossible - at least in the next 50 year (Ravindran, 2022)

3-3. Artificial Super Intelligence (ASI): Also known as Superhuman intelligence", this is still in the realm of science fiction, where issues like immortality and human extinction would become topics of interest and debate. But theoretically, it is the logical progression from AGI or Strong Al. An ASI system or super intelligent agent would be able to exceed all human capabilities, including general wisdom as well as other cognitive, social, and creative skills and capabilities. To achieve this, they need to be able to have cognitive capabilities. The audacious goal of ASI is to develop algorithms for machines to have capabilities like that of a human brain in terms of intelligence, including cognitive skills. This is one of the most cutting-edge endeavors in the realms of science and technology and is comparable to other frontier scientific explorations such as trying to discover and explain the origin of life, the workings of the universe or the structure of matter.

There is considerable research and debate on whether and when ASI will supersede humans. Swedish-born philosopher Nick Bostrom of the University of Oxford, who is known for his work on existential risk and super intelligence risks, famously said: "Machine intelligence is the last invention that humanity will ever need to make.

The scientific community remains divided on this as there is a lack of concrete evidence and consensus. Some researchers who believe in the future of ASI predict its arrival as early as 2045, while others project its arrival within this century. Techno sceptics are also divided, with one group focusing on the evil side of super intelligence, while others dismiss it entirely as science fiction. Designing, codifying, and developing ASI will _involve the integration of complex algorithms that are capable of continuous learning from its environment, common sense reasoning, interpretation of perceptions and emotions, and the ability to reason. The current Deep Learning systems are driven by mathematical models based on a cause-and- effect relationship but are unable to distinguish cause from effects, "such as the idea that the rising sun causes a rooster to crow but not vice versa" (Pearl and Mackenzie, 2018; Lake et al., 2016). We have yet to develop algorithms that can integrate all these components to fully realize ASI, though there has been progress in a few of these areas. (Ravindran, 2022)

4-impact of artificial intelligence:

Impact on the Number of Jobs

However, if society is to gain from technology the focus should be on protecting workers not saving jobs (Baldwin, 2016; Eurofound, 2017). The point

is not to stop technology progress and innovation but to help workers who may lose their jobs to reenter the labor market or at least not to feel socially excluded. through social safety nets, retraining and other inclusive policies (Eurofound, 2017). As mentioned before, substitution of labor by capital is not a new phenomenon. It exists the last 250 years (since the Luddites), that is, during the whole period of technological advancement. The last 144 years technology has created more jobs than it has eliminated (Deloitte, 2015). McKinsey (2017a) estimates that even though 800 million jobs may be lost in the worst-case scenario, at the same time millions of jobs will be created.

However, the concern that automation will displace jobs remains on the headlines. As early as 1964 US President Lyndon B. Johnson founded a national commission for the

examination of the effects technology would have on the economy and employment (McKinsey, 2017).

Economists are notorious in accurately predicting the future, but it is relatively easier to calculate the number of jobs that can be substituted by capital (automation) while it is quite difficult if not impossible to say anything about the number of jobs technology and AI will create (McKinsey, 2017). Examples from recent history are quite reassuring. Technological revolutions since the industrial revolution have created more jobs than the number of jobs lost due to these revolutions. The textile technology that revolutionized he textile industry despite Luddites' protests has indeed created much more jobs than those substituted by

textile machines (Mokyr et ai., 2015).

Since 1990, management consultants, business analysts and information technology managers are some of the rapidly growing occupations (Deloitte, 2015).

In the US, in 2010 only one out of 270 listed professions in 1950s had disappeared, namely, the elevator operator. Every technological revolution is followed by complementary technologies which create new professions that were unknown before (UN, 2018). But one does not have to go far, just check the number of people working on agriculture two centuries ago and compare it to today's number of farmers (Deloitte, 2015). Productivity increase destroyed millions of jobs in agriculture but, at the same time. it created even more jobs in the industry as well as the service sector.

Impact on Consumer Surplus

One concern scholars express is that although technology moves forward, productivity increase has stagnated for the last 15-20 years (Peralta-Alva & Roitman,2018). Brynjolfsson, Rock, and Syverson (2019) provide an explanation for the so called "productivity paradox". They argue that implementation lags are one major factor for keeping productivity low while technological progress is fast. New technologies take time to implement widely. These lags are even greater across countries. However, adoption of new technologies at a global level has accelerated significantly the last two centuries. For instance, it took more than years for steam and motorships to be spread

all over the world, 80 years for railway, less than 60 years for electricity and telephone, 40 years for cars and aviation and only 20 years for cell phones, Bloom et al, (2017) find that because research productivity falls fast., the research effort needs to keep increasing faster to offset the decreasıng productivity.

Impact on Quality of Jobs

Moreover, digital platforms such as Airbnb and Uber, have provided access to everyone to use her capital (apartment or car) to make money while offering a valuable service. Other less known digital platforms include Amazon mechanical turk a crowdsourcing marketplace which brings together employers (individuals or firms) and employees from all over the world offering access to the global market 24/7 (Eurofound, 2017). Concerns have been raised because of low remuneration, low job security and quality and sometimes insecure payment. However, they provide opportunities for people to top up their income, while they offer flexibility and autonomy as well as better work-life balance. The significance of digital platforms increases for people from less developed countries who have access to better paying tasks from advanced economies employers, contributing to global convergence.

Impact on Inequality

Despite the increasing concern regarding inequality, research shows that there is convergence at the global level (Baldwin, 2016; Spence, 2011) Spence (2011), based on data on the reduction of global poverty, very optimistic about the future and predicts that his grandchildren will live in a world where 85%-90% of the population will be earning high incomes compared to 15 -20% today. He bases his optimism on the fact that during the post- World War II era there has been a reversal of 200 years of divergence. (Agata Stachowicz-Stanusch, 2020)

We Should Not Fear Al but..

This optimistic conclusion does not mean that humanity will keep its path to development without any problems The two World Wars of last century are continuous alarm and reminder that things may go totally wrong (Pinker, 2018). The fact that today's technology remains yet too far from achieving Artificial General Intelligence,

that is, AI that can act autonomously as a human, does not mean we should not prepare ourselves and create the necessary institutional frameworks and social structures to delve with such issues when the time comes.

Currently there are more imminent issues which stem directly from the current technological advancements and need to be tackled. Issues related to Al, automation and digitization. Inequality within countries may rise due to the fact that automation eliminates specific low or medium skill tasks (McKinsey, 2018). Highly skilled workers are those mostly benefiting from the new jobs technology creates, while at the same time it is hard for low-skilled workers who may lose their jobs due to automation to find another job. This exacerbates inequality and social tensions giving rise to fear and populism. Automation may create new jobs that offer greater opportunities for human creativity to be expressed, innovative spirit and problem-solving capacity (Delloite, 2015), however, society has to tackle issues of how to support and train low-skilled workers to find a new job. An important issue is how to better distribute the gains from AI without stifling the incentive to innovate. Intellectual property rights (IPR) support innovation but at the same time create monopoly conditions which create incentives for firms to abuse IPR by using part of their financial benefits to lobby government for extending their monopoly rights. (Agata Stachowicz-Stanusch, 2020)

5-Why is AI Important?

Artificial Intelligence (AI) is becoming increasingly important today due to its ability to replicate human-like thinking, reasoning, and decision-making. AI has the potential to transform various industries, including healthcare, finance, transportation, education, and entertainment, by improving efficiency, accuracy, innovation and safety. Here is why AI is important :

5-1 Efficiency: One of the significant advantages of AI is its ability to automate repetitive and time-consuming tasks, which allows humans to focus on more complex and creative tasks.

5-2Accuracy: AI can analyze vast amounts of data, identify patterns, and make accurate predictions, which can help in better decision-making and improved outcomes.

For example, AI can analyze patient data in the healthcare industry, including medical history and symptoms, to provide more accurate diagnoses and personalized treatment plans.

5-3 Innovation: AI can simulate human-like intelligence and behavior, which can lead to new products, services, and experiences that were previously not possible. Generative AI techniques, such as GANs (Generative Adversarial Networks), can create realistic media, including text, images, and music, which can be used in various applications, including art, gaming, and marketing.

AI can also enable the development of new products and services, such as chat bots and virtual assistants, to improve customer experience and engagement.

5-4 Safety: AI can also help ensure safety by monitoring and analyzing data in real-time identify potential safety risks and take action to prevent accidents or other adverse outcomes.

For instance, in the transportation industry, Al-powered systems can analyze traffic data and identify potential safety risks, such as accidents or traffic jams, and reroute traffic to avoid these risks.

In conclusion, AI is becoming increasingly important in various industries, and its potential to improve efficiency, accuracy, innovation, and safety is enormous. With continued advancements in AI technology it will likely have an even more significant impact on our lives. (Anderson, 2023)

6- Al AND THE FUTURE OF JOBS

Key questions related to when and to what degree AI will displace enough human activities to push people out of jobs. What jobs will be safe from extinction? Will there be enough new jobs created? How will individuals and groups of people survive without an active source of income? As AI and emerging technologies make headway into the workplace, it is clear that many mundane repetitive tasks will be taken over by virtual personal assistants and chat bots. Presumably living individuals more time and freedom to focus on creative and cognitive tasks .Just as with technological revolutions of the

past, job displacement will cut across the economy, and everybody will feel it in some way. It has already changed the shopping experience, shopping malls stand empty, and many big-name main-street brick-and-mortar stores have closed due to heavy financial losses.

Economists are studiously trying to anticipate what will happen when the next recession hits. Companies will indeed be tempted to deploy algorithms to replace the humans they must furlough to survive. Trucks and cars can already be driven without human intervention, and transaction counters can function well without human cashiers. In any case, it is clear to most researchers that human workers will continue to be replaced by computers. (Sheikh, 2020)

7- The challenges that face AI :

To accelerate the benefits of AI and to mitigate risk, governments must proactively replace analogue policies and laws with digital and AI-friendly alternatives that are fair, equal and unbiased. There are many challenges that must be addressed:

- AI is a key driver of the Fourth Industrial Revolution. Algorithms are already being applied to improve predictions, optimize systems and drive productivity in many sectors.
- Early experience shows that Al can pose serious challenges. Without proper oversight, AI may replicate or even exacerbate human bias and discrimination, cause job displacement and lead to other unintended and harmful consequences
- AI regulation is a complex endeavor and it needs expert oversight and useful frameworks. Regulatory and statutory requirements will diverge sharply across application areas. It is very likely that many jurisdictions will lack understanding and willingness to reach consensus to take action, and they will be left behind. Emergent controversies will also force governments to implement hastily constructed and suboptimal regulatory policies. (Sheikh, 2020)

8- Deep learning is defined as a family of machine learning models that are characterized by their deepness and generality. These models can learn complex, non-

linear relationships between input data elements and the corresponding output. The implementation of these models uses artificial neural networks with multiple hidden layers; hence defined as deep neural networks (DNNs). While the data is transformed through these multiple hidden layers, each level learns the input data and transforms it into a slightly abstract and composite representation and eventually captures complicated relationships.

Deep learning can be considered an evolution of machine learning. Earlier, machine learning algorithms were used to develop models for different applications. Many machine learning algorithms were developed to learn data and improved over time and are still used for making intelligent decisions. Deep learning is a subfield of machine learning with a multi-layered neural network that can learn and make intelligent decisions on its own. Deep learning models can learn the high-level features from the data on their own, while machine learning models need manually engineered features that are identified by domain experts.

Although the concept of deep learning was theorized earlier, it became more popular among data scientists recently. The main reasons can be stated as the recent advent of big data and high computational power GPUs (graphics processing unit). Most of the computationally infeasible algorithms and models became feasible technologically and concept-wise with the availability of a large amount of data, inexpensive data storage, and computation power. Consequently, deep learning models are widely used to solve real-world problems involving tasks like image recognition, speech recognition, and natural language processing. (Meedeniya, 2023)

9- Definition of machine learning

Machine learning is programming computers to optimize a performance criterion using example data or past experience. We have a model defined up to some parameters, and learning is the execution of a computer program to optimize the parameters of the model

using the training data or past experience. The model may be predictive to make predictions in the future, or descriptive to gain knowledge from data, or both.

The field of study known as machine learning is concerned with the question of how to construct computer programs that automatically improve with experience. (Dr.A.Senthilselvi, 2021)

9-1 Applications of machine learning

Application of machine learning methods to large databases is called data mining. In data mining, a large volume of data is processed to construct a simple model with valuable use, for Example, having high predictive accuracy

The following is a list of some of the typical applications of machine learning

1. In retail business, machine learning is used to study consumer behavior
2. In finance, banks analyze their past data to build models to use in credit applications, fraud detection, and the stock market.
3. in manufacturing, learning models are used for optimization, control, and troubleshooting
4. In medicine, learning programs are used for medical diagnosis.
5. In telecommunications, call patterns are analyzed for network optimization and maximizing the quality of service.
6. In science, large amounts of data in physics, astronomy, and biology can only be analyzed fast enough by computers. The World Wide Web is huge; it is constantly growing and searching for relevant information cannot be done manually.
7. In artificial intelligence, it is used to teach a system to learn and adapt to changes so that the system designer need not foresee and provide solutions for all possible situations.
8. It is used to find solutions to many problems in vision, speech recognition, and robotics.

9. Machine learning methods are applied in the design of computer-controlled vehicles to steer correctly when driving on a variety of roads. (Dr.A.Senthilselvi, 2021)

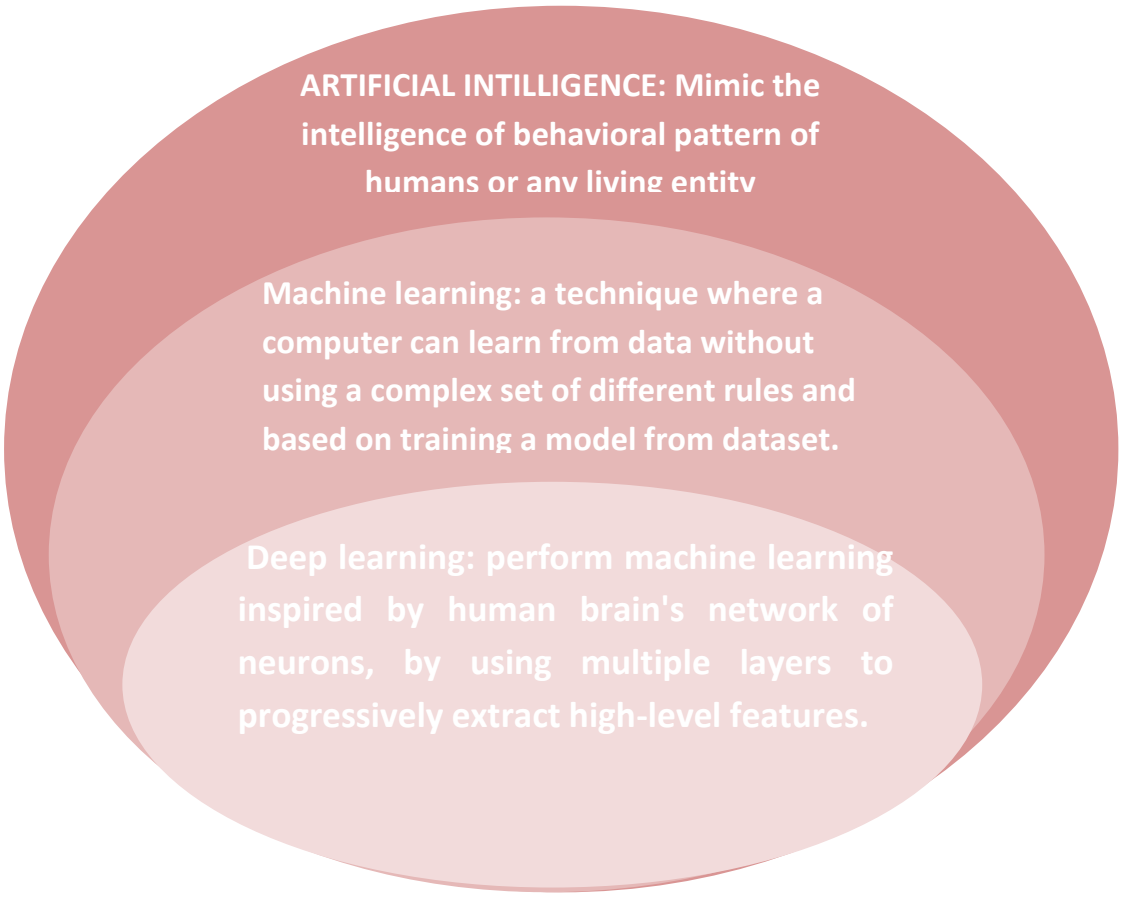


Figure 4 artificial intilligence paradigm

(Meedeniya, 2023)

10- the risks of artificial intelligence (AI)

The tech community has long debated the threats posed by artificial intelligence. Automation of jobs, the spread of fake news and a dangerous arms race of AI-powered weaponry have been mentioned as some of the biggest dangers posed by AI.

1. Lack of AI Transparency and Explainability

AI and deep learning models can be difficult to understand, even for those that work directly with the technology. This leads to a lack of transparency for how and why AI comes to its conclusions, creating a lack of explanation for what data AI algorithms use,

or why they may make biased or unsafe decisions. These concerns have given rise to the use of explainable AI, but there's still a long way before transparent AI systems become common practice. (Thomas, 2024)

2. Job Losses Due to AI Automation

AI-powered job automation is a pressing concern as the technology is adopted in industries like marketing, manufacturing and healthcare. By 2030, tasks that account for up to 30 percent of hours currently being worked in the U.S. economy could be automated — with Black and Hispanic employees left especially vulnerable to the change — according to McKinsey. Goldman Sachs even states 300 million full-time jobs could be lost to AI automation.

"The reason we have a low unemployment rate, which doesn't actually capture people that aren't looking for work, is largely that lower-wage service sector jobs have been pretty robustly created by this economy," futurist Martin Ford told Built In. With AI on the rise, though, "I don't think that's going to continue."

As AI robots become smarter and more dexterous, the same tasks will require fewer humans. And while AI is estimated to create 97 million new jobs by 2025, many employees won't have the skills needed for these technical roles and could get left behind if companies don't upskill their workforces.

"If you're flipping burgers at McDonald's and more automation comes in, is one of these new jobs going to be a good match for you?" Ford said. "Or is it likely that the new job requires lots of education or training or maybe even intrinsic talents — really strong interpersonal skills or creativity that you might not have? Because those are the things that, at least so far, computers are not very good at."

Even professions that require graduate degrees and additional post-college training aren't immune to AI displacement.

As technology strategist Chris Messina has pointed out, fields like law and accounting are primed for an AI takeover. In fact, Messina said, some of them may well be

decimated. AI already is having a significant impact on medicine. Law and accounting are next, Messina said, the former being poised for “a massive shakeup.”

“Think about the complexity of contracts, and really diving in and understanding what it takes to create a perfect deal structure,” he said in regards to the legal field. “It’s a lot of attorneys reading through a lot of information — hundreds or thousands of pages of data and documents. It’s really easy to miss things. So AI that has the ability to comb through and comprehensively deliver the best possible contract for the outcome you’re trying to achieve is probably going to replace a lot of corporate attorneys.” (Thomas, 2024)

3. Social Manipulation Through AI Algorithms

Social manipulation also stands as a danger of artificial intelligence. This fear has become a reality as politicians rely on platforms to promote their viewpoints, with one example being Ferdinand Marcos, Jr., wielding a TikTok troll army to capture the votes of younger Filipinos during the Philippines’ 2022 election.

TikTok, which is just one example of a social media platform that relies on AI algorithms, fills a user’s feed with content related to previous media they’ve viewed on the platform. Criticism of the app targets this process and the algorithm’s failure to filter out harmful and inaccurate content, raising concerns over TikTok’s ability to protect its users from misleading information.

Online media and news have become even murkier in light of AI-generated images and videos, AI voice changers as well as deep_fakes infiltrating political and social spheres. These technologies make it easy to create realistic photos, videos, audio clips or replace the image of one figure with another in an existing picture or video. As a result, bad actors have another avenue for sharing misinformation and war propaganda, creating a nightmare scenario where it can be nearly impossible to distinguish between creditable and faulty news.

“No one knows what’s real and what’s not” . “So it really leads to a situation where you literally cannot believe your own eyes and ears; you can’t rely on what, historically,

we've considered to be the best possible evidence. That's going to be a huge issue." (Thomas, 2024)

4. Social Surveillance with AI Technology

In addition to its more existential threat, Ford is focused on the way AI will adversely affect privacy and security. A prime example is China's use of facial recognition technology in offices, schools and other venues. Besides tracking a person's movements, the Chinese government may be able to gather enough data to monitor a person's activities, relationships and political views.

Another example is U.S. police departments embracing predictive policing algorithms to anticipate where crimes will occur. The problem is that these algorithms are influenced by arrest rates, which disproportionately impact Black communities. Police departments then double down on these communities, leading to over-policing and questions over whether self-proclaimed democracies can resist turning AI into an authoritarian weapon.

"Authoritarian regimes use or are going to use it," Ford said. "The question is, How much does it invade Western countries, democracies, and what constraints do we put on it?" (Thomas, 2024)

5. Lack of Data Privacy Using AI Tools

If you've played around with an AI Chabot or tried out an AI face filter online, your data is being collected — but where is it going and how is it being used? AI systems often collect personal data to customize user experiences or to help train the AI models you're using (especially if the AI tool is free). Data may not even be considered secure from other users when given to an AI system, as one bug incident that occurred with ChatGPT in 2023 "allowed some users to see titles from another active user's chat history." While there are laws present to protect personal information in some cases in the United States, there is no explicit federal law that protects citizens from data privacy harm experienced by AI. (Thomas, 2024)

6. Biases Due to AI

Various forms of AI bias are detrimental too. Speaking to the *New York Times*, Princeton computer science professor Olga Russakovsky said AI bias goes well beyond gender and race. In addition to data and algorithmic bias (the latter of which can "amplify" the former), AI is developed by humans — and humans are inherently biased. "A.I. researchers are primarily people who are male, who come from certain racial demographics, who grew up in high socioeconomic areas, primarily people without disabilities," Russakovsky said. "We're a fairly homogeneous population, so it's a challenge to think broadly about world issues."

The limited experiences of AI creators may explain why speech-recognition AI often fails to understand certain dialects and accents, or why companies fail to consider the consequences of a chatbot impersonating notorious figures in human history. Developers and businesses should exercise greater care to avoid recreating powerful biases and prejudices that put minority populations at risk. (Thomas, 2024)

7. Socioeconomic Inequality as a Result of AI

If companies refuse to acknowledge the inherent biases baked into AI algorithms, they may compromise their DEI initiatives through AI-powered recruiting. The idea that AI can measure the traits of a candidate through facial and voice analyses is still tainted by racial biases, reproducing the same discriminatory hiring practices businesses claim to be eliminating.

Widening socioeconomic inequality sparked by AI-driven job loss is another cause for concern, revealing the class biases of how AI is applied. Workers who perform more manual, repetitive tasks have experienced wage declines as high as 70 percent because of automation, with office and desk workers remaining largely untouched in AI's early stages. However, the increase in generative AI use is already affecting office jobs, making for a wide range of roles that may be more vulnerable to wage or job loss than others.

Sweeping claims that AI has somehow overcome social boundaries or created more jobs fail to paint a complete picture of its effects. It's crucial to account for differences based on race, class and other categories. Otherwise, discerning how AI and automation benefit certain individuals and groups at the expense of others becomes more difficult. (Thomas, 2024)

8. Weakening Ethics and Goodwill Because of AI

Along with technologists, journalists and political figures, even religious leaders are sounding the alarm on AI's potential pitfalls. In a 2023 Vatican meeting and in his message for the 2024 World Day of Peace, Pope Francis called for nations to create and adopt a binding international treaty that regulates the development and use of AI.

Pope Francis warned against AI's ability to be misused, and "create statements that at first glance appear plausible but are unfounded or betray biases." He stressed how this could bolster campaigns of disinformation, distrust in communications media, interference in elections and more ultimately increasing the risk of "fueling conflicts and hindering peace."

The rapid rise of generative AI tools gives these concerns more substance. Many users have applied the technology to get out of writing assignments, threatening academic integrity and creativity. Plus, biased AI could be used to determine whether an individual is suitable for a job, mortgage, social assistance or political asylum, producing possible injustices and discrimination, noted Pope Francis.

"The unique human capacity for moral judgment and ethical decision-making is more than a complex collection of algorithms," he said. "And that capacity cannot be reduced to programming a machine." (Thomas, 2024)

9. Autonomous Weapons Powered By AI

As is too often the case, technological advancements have been harnessed for the purpose of warfare. When it comes to AI, some are keen to do something about it before it's too late: In a 2016 open letter, over 30,000 individuals, including AI

and robotics researchers, pushed back against the investment in AI-fueled autonomous weapons.

“The key question for humanity today is whether to start a global AI arms race or to prevent it from starting,” they wrote. “If any major military power pushes ahead with AI weapon development, a global arms race is virtually inevitable, and the endpoint of this technological trajectory is obvious: autonomous weapons will become the Kalashnikovs of tomorrow.”

This prediction has come to fruition in the form of Lethal Autonomous Weapon Systems, which locate and destroy targets on their own while abiding by few regulations. Because of the proliferation of potent and complex weapons, some of the world’s most powerful nations have given in to anxieties and contributed to a tech cold war.

Many of these new weapons pose major risks to civilians on the ground, but the danger becomes amplified when autonomous weapons fall into the wrong hands. Hackers have mastered various types of cyberattacks, so it’s not hard to imagine a malicious actor infiltrating autonomous weapons and instigating absolute Armageddon.

If political rivalries and warmongering tendencies are not kept in check, artificial intelligence could end up being applied with the worst intentions. Some fear that, no matter how many powerful figures point out the dangers of artificial intelligence, we’re going to keep pushing the envelope with it if there’s money to be made.

“The mentality is, ‘If we can do it, we should try it; let’s see what happens,” Messina said. “‘And if we can make money off it, we’ll do a whole bunch of it.’ But that’s not unique to technology. That’s been happening forever.’ (Thomas, 2024)

III) **The impact of AI on financial education**

As we look to the future, it is evident that AI will continue to play a pivotal role in shaping the landscape of financial education. By harnessing the power of AI, we can

bridge the gap in financial education, empower individuals to make better financial decisions, and ultimately build a more financially literate society

1-Financial Crises Brought About By AI Algorithms

The financial industry has become more receptive to AI technology's involvement in everyday finance and trading processes. As a result, algorithmic trading could be responsible for our next major financial crisis in the markets.

While AI algorithms aren't clouded by human judgment or emotions, they also don't take into account contexts, the interconnectedness of markets and factors like human trust and fear. These algorithms then make thousands of trades at a blistering pace with the goal of selling a few seconds later for small profits. Selling off thousands of trades could scare investors into doing the same thing, leading to sudden crashes and extreme market volatility.

Instances like the 2010 Flash Crash and the Knight Capital Flash Crash serve as reminders of what could happen when trade-happy algorithms go berserk, regardless of whether rapid and massive trading is intentional.

This isn't to say that AI has nothing to offer to the finance world. In fact, AI algorithms can help investors make smarter and more informed decisions on the market. But finance organizations need to make sure they understand their AI algorithms and how those algorithms make decisions. Companies should consider whether AI raises or lowers their confidence before introducing the technology to avoid stoking fears among investors and creating financial chaos. (Thomas, 2024)

2- Loss of Human Influence

An overreliance on AI technology could result in the loss of human influence — and a lack in human functioning — in some parts of society. Using AI in healthcare could result in reduced human empathy and reasoning, for instance. And applying generative AI for creative endeavors could diminish human creativity and emotional expression.

Interacting with AI systems too much could even cause reduced peer communication and social skills. So while AI can be very helpful for automating daily tasks, some question if it might hold back overall human intelligence, abilities and need for community. (Thomas, 2024)

3- Uncontrollable Self-Aware AI

There also comes a worry that AI will progress in intelligence so rapidly that it will become sentient, and act beyond humans' control possibly in a malicious manner. Alleged reports of this sentience have already been occurring, with one popular account being from a former Google engineer who stated the AI chatbot LaMDA was sentient and speaking to him just as a person would. As AI's next big milestones involve making systems with artificial general intelligence, and eventually artificial superintelligence, cries to completely stop these developments continue to rise. (Thomas, 2024)

4- The relationship between artificial intelligence and financial education:

In today's rapidly evolving financial landscape, staying ahead requires more than just basic knowledge; it demands continuous learning and adaptation. Artificial Intelligence (AI) and Machine Learning (ML) are revolutionizing how we manage our financial lives, from budgeting and saving to investing and planning for retirement. These technologies offer personalized insights, automate complex processes, and simplify decision-making. Therefore, there is a comprehensive list of AI tools that enhance financial literacy for individuals and professionals alike. Whether you're looking to manage your debts better, optimize your investments, or navigate the intricacies of estate planning, AI and ML tools provide the edge you need to succeed financially.

i. **-Budgeting and Expense Tracking**

Planning and tracking your income and expenses is fundamental to managing personal finances. Budgeting involves creating a plan for spending your money each month and tracking expenses to ensure you only pay what you earn.

- Apps like **YNAB:** (You Need A Budget) use AI to categorize expenses automatically as they are recorded, making it easier for users to stick to their budgets without manually sorting each transaction. It also sends notifications for significant transactions.
- **Pocket Guard** :uses algorithms to analyze personal spending patterns and income to create a budget that fits the user's financial situation, suggesting where cuts can be made or where spending can be increased safely.
- **Quicken** :offers forecasting features that use past transaction data to predict future balances and spending. This helps users plan and avoid overspending.
- **Oportun:** is an app that analyzes your spending habits and automatically transfers the optimal amount of money from your checking account to a savings account based on your upcoming needs and financial goals.
- **Acorns:** incorporates educational content tailored to the user's financial activities and goals, helping users understand financial principles as they manage their finances.

ii. -Saving and Emergency Funds:

A critical aspect of financial literacy is understanding the importance of saving for the future and unexpected expenses. This includes knowing how much to save, where to keep your savings, and how to manage an emergency fund to cover financial surprises like medical emergencies or sudden job loss.

- **Oportun**: is an excellent example of an app that uses AI to analyze your spending habits and automatically transfers the right amount of money from your checking account to a savings account. This ensures you save an optimal amount consistently without impacting your daily finances.
- **Qapital:** uses rules you can set based on your financial habits and ML insights to help you save more effectively. You can set goals and rules that trigger automatic savings, like rounding up change to the nearest dollar on purchases.

- **copilot.money:** provides future balance predictions and financial health monitoring, using AI to forecast monthly budgets and savings needs based on upcoming bills and expected income.
- **Empower:** offers financial planning tools that integrate data across all accounts to provide advice on how much should be kept in an emergency fund, considering personal risk factors and financial goals.
- **YNAB:** integrates with your bank accounts to provide real-time tracking of your financial activities and uses this data to help you allocate funds appropriately, including building and maintaining an emergency fund.
- **Acorns:** automates savings into investment accounts and provides educational content and suggestions based on user spending patterns to improve financial literacy and encourage better saving habits.

iii. -Debt Management:

Knowing how to manage debt effectively involves understanding different types of debt (such as credit card debt, student loans, and mortgages), the implications of accruing interest, and strategies for repayment that minimize interest paid over time.

- **Tally :**is a credit card management app that uses AI to help users pay off their debt strategically, managing all their cards and payments in one place.
- **Undebt.it** :is a tool that offers various debt repayment strategies and personalizes them based on the user's specific debt situations. It simulates different payoff plans, allowing users to choose the most effective one for their needs.
- **Credit Karma**: uses AI to analyze your credit profile and recommends consolidation loans and balance transfer credit cards when beneficial.

Though less widespread, services like **Rocket Money** and **Trim** use AI to help negotiate bills and suggest financial decisions, including some aspects of debt management.

- **YNAB:** integrates debt payments into your budget, ensuring you allocate enough monthly money to effectively meet your debt reduction goals.

- **SmartAsset:** offers tools and calculative content that educates on debt management and broader financial planning, supported by data-driven insights.

iv. Investing Basics:

Basic investing knowledge includes understanding different types of investments (stocks, bonds, mutual funds, real estate, etc.), the associated risks, and how to diversify investments to spread risk and maximize returns over time.

- **Betterment** and **Wealthfront** are popular robo-advisors that use AI to optimize users' investment portfolios, providing an easy entry point for novice investors.
- **SigFig :**is an investment management service that uses algorithms to tailor portfolios and provide ongoing recommendations based on evolving financial data and individual objectives.
- **Quantopian** :offers a platform for building, testing, and executing trading algorithms. Users can leverage community-contributed data and models to predict stock performance.
- **Riskalyze:** is a technology that quantifies risk tolerance and aligns your portfolio, using sophisticated algorithms to measure how portfolio changes might impact risk exposure.
- **Bloomberg Terminal** :uses advanced data analytics to provide real-time financial data, news, and insights, although it's at a higher price point and complexity than typical consumer tools.
- Services like **Syfe** incorporate behavioral finance insights to tailor investment strategies considering financial factors, human behaviors, and biases.
- **Investopedia:** offers AI-enhanced quizzes and interactive content that adapt to users' learning pace and style, focusing on investment concepts.
- **TradingView** and **MarketWatch Virtual Stock Exchange** offer simulation features that enable users to experiment with stock trading without financial risk using real-time market data.

v. -Understanding Credit Scores and Credit Reports:

Financial literacy includes knowing what a credit score and credit report are, how they are calculated, and their impact on your ability to borrow money and at what interest rates. It also involves understanding how to improve your credit score and how to read and dispute possible errors in your credit report.

- **Credit Karma** and **Experian** offer free AI services to monitor your credit reports from major credit bureaus and send alerts about significant changes or suspicious activities.
- **Credit Sesame:** uses AI to analyze your financial data and offer personalized advice on improving your credit score, including suggestions on reducing credit utilization or addressing delinquencies.
- **FICO Score Simulator:** available through many credit card providers and financial institutions, uses predictive modeling to show how specific actions might change your FICO score.
- NerdWallet provides educational articles and tools, including a credit score simulator that allows users to see how different actions might affect their credit score.

Tally is an app that uses AI to manage your credit card payments. It determines the best way to reduce debt across multiple cards, ensuring payments are made in a way that could improve your credit score.

WalletHub monitors your credit score for free and provides insights into spending behaviors that could potentially improve your financial standing.

vi. -Insurance:

Knowledge of various types of insurance (health, auto, life, property, etc.) and how insurance policies work helps individuals protect against significant financial losses due to accidents, illness, death, or property damage.

Policygenius uses AI to simplify comparing and buying insurance, offering personalized suggestions based on users' input about their life situations and needs.

Lemonade uses AI to handle claims quickly and efficiently, with many claims being paid out almost instantly without human intervention, demonstrating a transparent process to policyholders.

Companies like Zesty.ai use AI and big data to offer precise risk assessments for property insurance, considering factors like natural disaster risks that traditional models may not fully capture.

Insurify and Allstate's ABIe are examples of virtual agents that help users understand insurance options and manage their policies more effectively.

Shift Technology uses AI to detect insurance fraud, helping insurance companies reduce losses and maintain fairness for all policyholders.

vii. -Retirement Planning

It is understanding how to plan for retirement, including knowledge of retirement accounts like 401(k)s, IRAs, and pensions, how to estimate the amount of money needed for retirement, and strategies for investing that money.

Empower uses AI to provide users with a comprehensive wealth management service, including retirement planning that considers your unique financial situation and future needs.

Betterment offers retirement planning through its robot-advisor platform, automatically adjusting users' portfolio allocations based on age and the time left until retirement.

Vanguard's Retirement Nest Egg Calculator and similar tools use statistical modeling to help users see how their savings might last under different withdrawal rates and market conditions.

Wealthfront incorporates advanced forecasting techniques to estimate financial needs based on personalized life and economic factors, including anticipated healthcare costs.

Fidelity's Snapshot and Schwab's Retirement Planning Resources offer interactive tools and educational content powered by AI to help users understand and plan their retirement more effectively.

viii. Understanding Economic Indicators

Although more advanced, knowing how broader economic conditions affect personal finance and investments is beneficial. This includes understanding indicators like inflation, interest, and unemployment rates.

Tableau and Microsoft Power BI offer advanced data visualization capabilities that can automatically integrate AI to highlight critical economic trends and patterns.

Knoema and Moody's Analytics provide economic forecasting tools that use ML to predict future economic indicators based on current data and historical trends.

Bloomberg Terminal uses advanced AI to offer real-time tracking and updates on economic indicators, providing critical information to financial professionals and investors.

Coursera offers economics courses that include interactive elements and personalized learning experiences powered by AI, helping users build their understanding of economic indicators.

Financial tracking apps like Seeking Alpha and Investing.com offer customizable alerts on economic data releases and market movements, which AI facilitates for timeliness and relevance.

Robo-advisors such as Wealthfront and Betterment incorporate economic indicators into their investment strategies, using AI to adjust portfolios in response to predicted economic changes. (AI Tools To Enhance Our Financial Literacy, 2024)

5- Role of AI in Financial Sector

As the spectrum of AI applications in the financial sector increases and on the other hand, its potential risks are also increasing on. Widely, AI applications are observed

across banks, insurance companies and capital markets in the form of automation, analysis and decision making and so creating new business models. As per Accenture report, AI applications will become the primary step of banks to interact with their users in the future.

As per research report by BCG consulting group, China occupied remarkable progress in the application of AI in the financial sector and by 2027,

23 percent of their job market in finance will have changed, with AI assure gains in enhancing efficacy and automation process.

It is perhaps the job market disruption, unpredictable and risky outcomes or the biased AI systems that led to WEF (world economic forum) warning about AI destabilizing the financial system in the future. WEF is not alone in warning about the increased risk of AI seeping in financial systems - a Thomson Reuters report also indicated that firms that are reaping huge benefit in automating large swathe of back-office work, should do so judiciously. (Murugesan, 2019)

In summary of this part, AI is transforming financial literacy through interactive and customized learning experiences, personalized financial guidance, and improved security measures. AI-driven tools engage users in immersive learning, while tailored advice aids in informed decision-making. Moreover, AI plays a crucial role in detecting and preventing fraud, bolstering security across the financial industry. Through harnessing AI's capabilities, financial literacy can be promoted effectively, empowering individuals to attain superior financial results.

Chapter recap:

These three chapters illuminate the transformative power of education in distinct yet equally impactful domains: Artificial Intelligence (AI) and Financial Literacy. In the realm of AI, the journey unfolds from its inception to its current state, emphasizing its definition, historical evolution, and profound societal impact. AI, characterized by Machine Learning (ML) and Deep Learning (DL), revolutionizes industries and daily life, prompting critical reflections on ethical considerations.

Shifting gears to financial literacy, the narrative pivots to the importance of understanding financial concepts and their implications. From budgeting to investing, financial education empowers individuals to navigate economic complexities, fostering personal financial well-being and contributing to broader economic stability. All of the chapters underscore the transformative potential of education, whether in navigating technological advancements or achieving financial resilience in an ever-changing world.

Chapter two:
Prior studies

Chapter introduction:

This concise introduction provides an overview of prior studies examining the intersection of financial education and the impact of Artificial Intelligence (AI). Previous research has highlighted the critical role of financial education in empowering individuals to make informed decisions about their finances, emphasizing concepts such as budgeting, saving, investing, and debt management. Additionally, studies have explored the transformative potential of AI in financial services, from enhancing customer experiences to optimizing investment strategies. However, there is a gap in understanding how the integration of AI technologies can augment financial education efforts and improve financial outcomes for individuals and society as a whole. This abstract sets the stage for further research to explore synergies between financial education and AI, aiming to harness the full potential of technology in promoting financial literacy and well-being.

A. FINANCIAL EDUCATION

1-The papers in this first issue all highlight a common finding: many people lack sufficient financial literacy for today's complex financial landscape. This includes tasks like opening bank accounts, managing mortgages, and navigating investments like crypto currency. Vulnerable groups, such as women and those with lower incomes or education, are particularly affected.

Financial literacy is crucial as it enables better financial decision-making, reduces susceptibility to biases, improves understanding of financial information and insurance, and promotes confidence in using financial tools. In short, it enhances financial well-being.

Moreover, improving financial literacy doesn't just benefit individuals; it can also have positive effects on the broader economy.

2- Retirement planning is crucial for maintaining desired lifestyles post-career. In Malaysia, self-employed individuals show less concern about this compared to other countries. This study investigates how financial attitude, literacy, and health literacy influence retirement planning among self-employed individuals in Malaysia, with a focus on the role of financial advisors. Analysis of survey data from 416 self-employed individuals in northern Malaysia reveals that financial attitude and literacy significantly impact retirement planning, with financial advisors moderating these relationships. These findings offer insights to enhance retirement planning among self-employed individuals. (Wan Mashumi Wan Mustafa, 2023)

3- Since the implementation of collective forest tenure reforms in China, various financial products for forestland mortgage have emerged, even in rural regions. However, rural households face challenges in making sound financial decisions to boost their income due to limited financial knowledge and skills. Hence, it's crucial to examine the interplay between financial literacy, borrowing behavior, and rural

household income. Drawing from learning-by-doing theory and credit constraint theory, this study utilizes data from a survey of 460 households across five rural counties in Liaoning Province. Alternative econometric models are employed to analyze the "Financial Literacy-Borrowing Behavior-Household Income" transmission channel. Results indicate a positive correlation between financial literacy levels and household income, characterized by an inverted U-shaped relationship. Furthermore, financial literacy significantly influences farmers' credit behavior, thereby fostering income growth. These findings shed light on the role of financial literacy in enhancing access to loans in China's rural areas. The study concludes with recommendations for policymakers to prioritize financial education to alleviate credit constraints in collective forest regions (Yuanyuan Guo, 2023).

4- Evaluating individuals' levels of financial literacy is widely acknowledged as essential for crafting effective financial education programs and assessing their real-world impact. To address the lack of consensus on an appropriate tool for measuring financial literacy, the OECD and its International Network on Financial Education (INFE) developed a standardized questionnaire in 2011, intended for use across various countries. Italy contributed to this effort through a survey conducted by the financial consortium ABI–PattiChiari. The survey utilized a tailored version of the OECD/INFE questionnaire, incorporating three indicators of financial literacy from the OECD survey (financial behavior index, financial attitude index, financial knowledge index), along with two new indicators (financial familiarity index and financial planning). (Lusardi, 2019)

5- This study investigates financial literacy in the United States, utilizing data from the 2021 National Financial Capability Study. Numerous studies have underscored the significance of financial knowledge while documenting the relatively low levels of financial literacy across America. Leveraging recent data collected during a period marked by rising inflation and the COVID-19 pandemic, we reveal that fundamental financial concepts remain poorly understood in the US, particularly among younger

individuals, those with lower levels of education, women, and the unemployed. Our analysis also sheds light on the widespread lack of understanding regarding inflation and identifies specific subgroups that are particularly susceptible. Furthermore, we explore the impact of financial literacy on financial well-being and behaviors. Responses to key financial literacy questions are closely associated with crucial financial behaviors and outcomes, including retirement planning, financial resilience, and debt management. (ANNAMARIA LUSARDI, 2011)

6 -We analyze data from the 2010 Swedish Financial Supervisory consumer survey to examine the extent of financial literacy and retirement planning among the Swedish populace. Our findings reveal widespread low levels of financial literacy among adults. Generally, younger individuals, older individuals, women, and those with lower incomes or educational achievements exhibit lower levels of financial literacy. Interestingly, individuals who have attempted to plan for retirement demonstrate higher levels of financial literacy, particularly in understanding risk diversification, which is closely associated with retirement planning. We contextualize our results within the framework of the Swedish pension system. (JOHAN ALMENBERG, 2011)

7- Only a small percentage of retirees opt for reverse mortgages. This study delves into the impact of financial literacy and prior familiarity with the product on its adoption through a stated-preference experiment. By deliberately varying the features of reverse mortgages, we aim to discern consumers' preferences and explore disparities based on their financial literacy and prior acquaintance with reverse mortgages. Our findings indicate that individuals with greater financial acumen are more likely to be aware of reverse mortgages. However, their propensity to purchase these products does not significantly increase at any price point. Instead, they exhibit greater sensitivity to factors such as interest rates and the insurance aspect, particularly concerning the non-negative equity guarantee associated with these products. (Ismael Choinière-Crèvecoeur, 2023)

8- Financial literacy gauges an individual's grasp of crucial financial concepts, facilitating sound short-term decision-making and enabling survival in contemporary society. Environmental factors like regional disparities and economic structures can influence financial literacy. Numerous studies have explored the correlation between financial literacy and financial behavior, highlighting its significance in shaping financial conduct in developing nations. Moreover, financial literacy correlates with heightened participation in equity markets, utilization of affordable mortgages, and engagement in retirement planning activities.

9- Financial literacy assesses an individual's understanding of fundamental financial concepts, guiding prudent short-term decision-making and serving as vital knowledge for navigating modern society. Environmental factors, including regional disparities and economic systems, can influence financial literacy levels. Numerous studies have explored the connection between financial literacy and financial behavior, emphasizing its pivotal role as a determinant of financial conduct, particularly in developing nations. Furthermore, financial literacy is linked to heightened participation in equity markets, utilization of affordable mortgages, and engagement in retirement planning activities.

10-Retirement financial planning is crucial for ensuring a desired lifestyle post-retirement. While self-employed individuals in developed countries commonly engage in such planning, the percentage in Malaysia is comparatively lower. This study aims to explore the relationship between financial attitude, literacy, and health literacy among self-employed individuals in Malaysia regarding sustainable retirement planning, with a focus on the moderating role of financial advisors. Utilizing structural equation modeling and survey data from 416 self-employed individuals in northern Malaysia, the study found that financial attitude and literacy significantly influence retirement planning. Furthermore, the involvement of financial advisors moderates these relationships. The study's findings aim to address the retirement planning needs of self-employed individuals by incorporating essential financial planning

determinants for a well-prepared retirement. (Wan Mashumi Wan Mustafa, The Effects of Financial Attitudes, Financial Literacy and Health Literacy on Sustainable Financial Retirement Planning, 2023)

11- The objective of this research is to investigate the significant impact of financial literacy on investment choices. Financial literacy empowers individuals to effectively manage their financial assets by exploring various investment opportunities and diversifying their portfolios. Individual investors strive to maintain a balance between their income and expenses by taking advantage of diverse investment options such as stocks, bonds, shares, and financial instruments available through both traditional and alternative channels like stock exchanges. In the current economic climate, factors such as low stock prices, potential capital gains, financial interest, and rumors circulating in the stock market compel individual investors to participate in trading activities. These indicators offer equitable investment prospects compared to traditional banking deposits and other forms of investment. Nonetheless, financial literacy acts as a catalyst for investors, guiding them towards making informed investment decisions and optimizing their resources effectively.

Findings: The research reveals that financial literacy, alongside economic, political, and market dynamics, significantly shapes the quality of individuals' investment decisions. Additionally, rumors circulating within financial markets exert notable influence on investors' decision-making processes. (Faheem Shaheen, 2022)

12- A substantial and expanding body of literature indicates that significant portions of the population lack the fundamental skills necessary for making prudent financial choices. This evidence has spurred numerous financial education endeavors worldwide. While these initiatives commonly involve educational programs, they are seldom designed with evaluation in mind.

The central inquiry revolves around the effectiveness of financial education in enhancing individuals' levels of financial literacy. Employing an evaluative

framework, our study examined the impact of financial education on financial literacy, investment attitudes, and individuals' self-perception of their financial acumen. To mitigate the influence of potential confounding variables, we conducted the same experiment both in real-world settings and within controlled laboratory environments. To our knowledge, this represents the first instance of such an approach in literature.

Notably, the findings from both the field and laboratory experiments exhibit striking similarities. Thus, while the laboratory setting offers an optimal environment for delivering the educational course, its efficacy persists when administered to subjects in uncontrolled settings. Our evidence indicates a significant effect on financial literacy and investment attitudes, with an even more pronounced impact on self-assessed financial literacy among university students. An intriguing observation emerges from this exercise: the influence of financial education appears to enhance individuals' perceptions of their knowledge more than their actual knowledge levels. This suggests that while financial education programs can indeed elevate financial literacy, they may also instill greater confidence in individuals' abilities without necessarily equipping them with improved decision-making skills.

Our findings underscore a crucial caveat concerning the efficacy of financial education initiatives. The observed increase in "self-confidence" emerges as a notable consequence of financial education, suggesting that it is an inherent outcome of such programs. (Brugiavini, Cavapozzi, Padula, & Pettinicchi, 2015)

13- Financially literate individual investors can make smart investment decisions over complex financial scenarios to boost their financial wealth. The aim of the study is to investigate the influence of financial literacy on investment decisions of individual investors in Jaffna district. Further this study explores the impact of financial knowledge, financial behavior and financial attitude on investment decisions of individual investors. Two hundred individual investors in Jaffna district were selected

as sample by using random sampling technique and primary data was collected through a structured questionnaire. Financial literacy consists of three dimensions namely financial knowledge, financial behaviour and financial attitude whereas investment decisions are measured by accounting information, self/firm-image coincidence, advocate recommendations and personal financial needs. Data was analyzed using the techniques of correlation, regression, t-test and ANOVA. The results reveal that financial literacy significantly positively impacts on investment decisions of individual investors in Jaffna district. The findings recommend the necessity for effective financial literacy programs focusing especially on enhancing financial knowledge, behaviors and attitude to facilitate informed investment decisions of individual investors (Balagobei, 2021)

B. Artificial intelligence

1- This chapter provides an overview of machine learning, a subset of artificial intelligence (AI) focused on the development of intelligent systems capable of learning. It adopts a perspective that perceives intelligent systems as agents. Learning is often regarded as the cornerstone of intelligence because it empowers the agent to operate independently from its creator. This autonomy becomes crucial when designers lack complete knowledge of the task environment, making learning an indispensable component of agent design. Consequently, learning grants autonomy by liberating the agent from relying solely on the designer's expertise for success, enabling it to transcend the assumptions inherent in its initial setup. Learning within intelligent agents serves as both a construction mechanism and a means to navigate unfamiliar environments.

Intelligent agents structured around learning can be conceptually divided into a performance element, responsible for action selection, and a learning element, tasked with adjusting the performance element. The design of the learning algorithm is

influenced by the characteristics of the performance element and the feedback provided by the environment.

The chapter further develops a comprehensive theory concerning the complexity of induction, examining the inherent challenges associated with various types of learning problems in terms of sample complexity and computational complexity. (Boden, 1996)

2- Artificial intelligence, commonly known as AI, refers to the technology enabling computers and machines to mimic human intelligence and problem-solving capabilities. Whether utilized independently or in conjunction with other technologies such as sensors, geolocation, or robotics, AI can undertake tasks that would otherwise necessitate human intervention or intelligence. Digital assistants, GPS navigation systems, self-driving vehicles, and generative AI tools like OpenAI's Chat GPT are among the myriad examples of AI pervading both news headlines and everyday life.

As a branch of computer science, artificial intelligence encompasses, and is often linked with, machine learning and deep learning. These fields involve crafting AI algorithms inspired by the decision-making processes of the human brain, which can 'learn' from available data and enhance their ability to classify or predict with greater accuracy over time (IBM, 2024).

3- The recent buzz surrounding AI has largely been tied to various forms of deep learning. To grasp why deep learning technologies evoke both excitement among researchers, who view it as the long-awaited breakthrough in AI, and apprehension among tech leaders and policymakers, it's crucial to contextualize deep learning within the achievements of its constituent technologies over the past six years.

The latest surge in deep learning commenced in 2012 when Geoffrey Hinton and his team employed deep convolutional neural networks (CNN) to tackle image recognition a longstanding challenge in science and engineering. By achieving notably higher detection rates and reducing false positives without the need for intricate coding,

Hinton demonstrated the ability to train computers in image classification simply by presenting numerous labeled samples, thus epitomizing "machine learning."

In 2017, deep learning reached new heights with Google's AlphaGo, and subsequently AlphaGo Zero, triumphing over the world's foremost Go player, Hanjin Lee. Utilizing reinforcement learning, AlphaGo Zero autonomously honed its skills by competing against itself, devoid of any external instruction. Not only did it master Go strategies devised by humans over centuries, or even millennia, but it also conceived novel strategies never before contemplated by humans. (Chishti, 2020)

4 -Deep learning, a subset of machine learning, employs deep neural networks with multiple layers to analyze data and generate output, achieving superior accuracy when trained on extensive datasets.

The primary distinction between deep learning and traditional machine learning lies in their approach to improvement. While machine learning models progress gradually and may require manual adjustments by programmers to address inaccuracies, deep learning models autonomously extract features from data without explicit guidance.

Example:

Chatbots like Siri, Apple's voice-controlled virtual assistant, exemplify deep learning applications. Siri continuously improves its performance by adapting to user interactions, providing increasingly personalized assistance over time. (Pandey, 2023)

5 -Today, the influence of AI on our daily routines is more pronounced than ever before. Whether we're checking our emails or browsing Netflix, AI algorithms are making decisions to enhance our user experience based on our preferences, trends, and behavior. In domains like medicine, search engines, language processing, automotive technology, and especially advertising, the impact of Artificial Intelligence (AI) is no longer solely reserved for major industry players driving innovation; it's become a fundamental aspect of our everyday lives. This shift is not exclusive to a select few; it's

becoming increasingly accessible to everyone. As technology continues to advance, AI is gradually becoming integrated into our daily activities, and it won't be long before it becomes an indispensable component of virtually everything we do. (Pandey, 2023)

6-Current societal challenges related to retirement planning, healthcare systems' evolution and environmental changes require households to pay a closer attention to their personal finances. This in turns calls for the associated industry to transform and scale. To do so, the personal finance industry could potentially leverage artificial intelligence tools for which there has been increasing levels of chatter. However, there is, to my knowledge, little consensus on whether or not those tools are appropriate given the challenges ahead. The literature review at the heart of this article first suggests that the stream of personal finance where transformation is more than needed is the one pertaining to investments, rather than the field of loans, insurances or payments. Second, the productivity levers fuelling the transformation of this branch are yet more driven, as of today, by simple digitalization notions rather by the usage of A.I. instruments. Over the next couple of years, more attention should thus be paid to uses/business cases associated to investment products and the digitalization of their distribution chain. (Ribes, 2022)

7- Financial literacy is a combination of the awareness, attitude and behavior necessary to make sound financial decisions and achieve individual financial well –being. A number of countries have now carried out financial literacy surveys of their adult populations, which provide insights into savings –related knowledge, attitudes and behavior. These surveys suggest that people are ill -equipped to take complex financial decisions, do not plan ahead sufficiently, and have a poor understanding of investment concepts. In Pakistan, individuals and especially the working women only know that they deposit money in various financial institutions just to get profit. They don't know what exactly they are doing and they are ignorant about the functions and existence of financial markets. This scenario generates the need to study and measure financial literacy in Pakistan. This study

explore the financial literacy of working women in developing countries as an important factor which affects the saving-investment behavior of female workforce in developing countries like Pakistan. (Javed Iqbal Bhabha, 2014)

8-The results indicate that the financial literacy of UAE investors is far from the needed level. The financial literacy level is found to be affected by income level, education level, and workplace activity. High-income respondents hold high educational degrees, and those who work in the field of finance/banking or investment had as expected a higher financial literacy level than others. Whereas, financial illiteracy exists regardless of the age of the respondents. A significant difference in the level of financial literacy was found as well between the respondents according to their gender. Specifically, women have a lower level of financial literacy than men. Finally, the results indicate that there is a significant relationship between financial literacy and investment decisions. The most influencing factor that affects the investment decision is religious reasons and the least affecting factor is rumors. (Hussein A. Hassan Al-Tamimi, 2009)

9- Households with limited financial literacy often refrain from investing in riskier financial assets, not necessarily because of the assets' inherent risk, but rather due to their lack of understanding. A concise training program that elucidates key financial concepts can effectively address this barrier, bolstering their willingness to embrace risk in their investments. This hesitance towards risk can be attributed to a natural aversion to ambiguity, which rationalizes their behavior.

By enhancing financial literacy, households can gradually overcome this aversion, becoming more comfortable with the idea of engaging in riskier financial products. This, in turn, can lead to increased participation in financial markets and potentially improve their overall financial well-being. Thus, the process of improving financial literacy serves as a crucial step towards empowering households to make informed and

confident decisions in the realm of finance, ultimately contributing to their financial security and stability. (Marco Nieddu, 2020)

10- Savings and investments by individuals are important both for personal financial well-being and for economic growth. Many governments try to encourage their citizens to save more, or to save more appropriately, by preferring formal institutions to informal saving and by promoting more diversification. However, there are considerable barriers to saving, including limited access to financial markets by some groups, complexity of financial products and information asymmetries. Knowledge and understanding of saving and investment concepts is particularly low in many countries. In addition, there are behavioural and cultural factors which may limit people's propensity to save. As a consequence, policy makers have developed several strategies to influence whether and how individuals save. Policy responses typically involve a combination of prudential regulation and consumer protection legislation, financial incentives, financial education and awareness initiatives, as well as behavioural techniques to encourage people into sound saving decisions. (OCDE, 2012)

C. Financial education and the impact of artificial intelligence :

1-Artificial Intelligence represents a convergence of various digital technologies capable of executing tasks previously believed to be exclusive to humans. It employs intricate learning and decision-making processes based on the analysis of both structured and unstructured data. While AI is widely perceived to offer substantial benefits in terms of company efficiency and performance, its impact on financial key performance indicators (KPIs) remains largely unexplored. This research endeavors to examine the practical financial implications of AI. The central research question investigates whether company-driven AI initiatives have an impact on financial KPIs, such as return on assets (ROA) and market capitalization. To achieve this objective, a combination of theoretical analysis and empirical investigation is employed. Initially,

existing scholarly research on the measurable financial effects of digital technologies is reviewed. Subsequently, a regression model for panel data is applied to a dataset encompassing financial data from the forty largest German companies, along with their corresponding AI efforts represented as a binary variable, over a seven-year period. The findings do not conclusively confirm a statistically significant financial influence of AI. However, there is evidence of a consistent increase in AI efforts over the examined years (Maier, 2024).

2- The fusion of finance and technology has spawned a new wave of entities reshaping the financial landscape. Many of these fintech companies offer cost-effective, adaptable, and user-centric services, disrupting traditional financial services and capturing a significant portion of the market share previously held by traditional banks. The era where banks were the sole gateway to the financial system has come to an end. Instead, emerging technologies are introducing novel forms of accessible financing, swifter and more efficient payment solutions, and enhanced customer service. This article illustrates how innovative fintech business models can deliver increased speed and efficiency, tailored services, automation, and enhanced accessibility, while mitigating many longstanding issues associated with traditional financial transactions. (Trinh Quang Long, 2023)

3- The financial technology sector led the way in effectively merging machine learning algorithms leveraging big data with artificial intelligence techniques. The implementation of decision support system (DSS) protocols ensures the swift and cost-effective delivery of financial products, service channels, methodologies, and risk management strategies. The advanced finance sector within the deep service value chain experienced significant transformation due to the innovative and rapid advancements in smart artificial intelligence (AI) and machine learning (ML) techniques, influencing all decision-making processes. This research explores digital services, including the utilization of DSS protocols in financial service operations. It begins by elucidating the basics of DSS methodologies, as well as AI and ML,

followed by an illustrative example of a campaign management system designed for tax repayment rescheduling. (Pahsa, 2024)

4- One method of integrating financial literacy into educational curricula involves incorporating it into closely related subjects such as mathematics. Research into curriculum development that facilitates this integration is essential. This study aims to create mathematical tasks infused with financial literacy concepts for integration into mathematics courses for children in Grades 1 through 8. These tasks were developed by aligning with mathematical education standards, concepts, subjects, and objectives, while also addressing societal issues like fair wages and working conditions. The task design process considers the relationship between mathematics education and financial literacy, children's financial comprehension, and task design parameters. Each task includes a student-oriented first page and implementation steps, teaching guidelines, cautions, and limitations for teachers, along with background information inspiring the task design. It is anticipated that these tasks will enhance students' financial literacy from an early age and prove valuable for further experimental studies (Ozkale, 2022).

5 - In South Korea, the challenge of low comprehension of financial products has become apparent, leading to a gap in financial literacy. This study proposes an innovative solution to bridge this gap by utilizing statistical interdependence and explainable AI (xAI) to illustrate the interconnectedness of economic variables. By translating complex financial information into intuitive visual formats, this methodology empowers individuals to make informed decisions. Collaborations with South Korean financial institutions ensure alignment with local practices and regulations. Initial testing suggests promising results in enhancing financial literacy, particularly regarding financial products. The study provides valuable insights for addressing financial literacy challenges in South Korea and potentially worldwide, underscoring the importance of technology and collaboration in fostering financial understanding and economic stability. It lays the groundwork for future research and

policy interventions aimed at improving financial literacy in technologically advanced societies (Insu Choi, 2023).

6- We examine the potential of GPT, a large language model, to function as a financial robo-advisor for the general public, utilizing a financial literacy assessment. Results indicate that Davinci and ChatGPT, based on GPT-3.5, achieve scores of 66% and 65%, respectively, on the financial literacy test, surpassing the baseline of 33%. Notably, ChatGPT based on GPT-4 achieves an almost perfect score of 99%, suggesting that financial literacy is becoming an emerging capability of state-of-the-art models. We employ the Judge-Advisor System and a savings dilemma to demonstrate how researchers can evaluate the utilization of advice from large language models. Additionally, we propose several avenues for future research in this domain (Paweł Niszczota, 2023).

7- AI-driven automated financial advisory systems, commonly known as Robo-advisors, have been swiftly adopted by both service providers and customers in financial markets. However, there is a scarcity of empirical studies examining customers' real-life experiences interacting with fully operational Robo-advisors. Additionally, little is known about how the design of these automated systems influences customers' perceptions and acceptance of this novel technology. To address these gaps, we engaged 24 participants with varying levels of experience and understanding of financial investment to utilize a Robo-advisor provided by a retail bank and perform tasks. Through observations and retrospective post-test interviews, we discovered that participants did not fully grasp the social aspects purportedly offered by Robo-advisors. Key issues included a lack of transparency and information that was difficult to comprehend. Consequently, participants expressed distrust in the results generated by the system, leading to hesitance in adopting the investment advice provided by the Robo-advisor. Furthermore, the potential of interactive data visualization was identified. This study enhances our understanding of customers' perceptions and adoption based on their interaction with a functional Robo-advisor and

offers design recommendations for creating transparent and comprehensible automated advisory systems in financial service contexts. (Hui Zhu a, 2023)

8- In this study, we explore the potential interest in robo-advisory services among Millennials and Generation Z. Drawing on data from a survey conducted in Italy, we reveal that individuals with a higher level of financial literacy are more inclined to consider using robo-advisors. Furthermore, we find that engagement in online activities involving financial transactions, such as online purchases and digital payments, is predictive of interest in receiving financial advice through digital platforms. Conversely, non-financial online activities show no correlation with interest in utilizing a FinTech robo-advisory tool. (Eleonora Isaia, 2022)

9- The issue of secrecy in automated decision-making (ADM) tools extends beyond credit scoring, impacting various sectors and industries. Human decisions, like ADM tools, can often be inscrutable and opaque, with ADM tools sometimes touted as a potentially fairer and more transparent alternative. However, the reality is that automation tends to exacerbate secrecy rather than alleviate it. There are several reasons for this, including technological challenges in achieving explainability, as well as the cost-effectiveness of maintaining opaque systems. As we argue in this chapter, organizations often intentionally choose opacity to evade scrutiny and conceal their practices from the public and regulators. The opacity of ADM and AI tools is a direct result of the secrecy inherent in corporate practices.

Despite the myriad harms caused by opacity, legal systems and market practices have evolved to permit or even encourage secrecy surrounding AI and ADM tools, as evidenced by regulations applied to Automated Banks, as discussed in this chapter. However, potential solutions exist to address opacity and its associated harms, as outlined in our discussion. The key question remains whether there is sufficient motivation to prioritize positive social impact with automated tools, rather than solely focusing on optimization and profits. (Bednarz, 2023)

Chapter's recap:

In summary, prior research underscores the importance of financial education in empowering individuals to manage their finances effectively. Meanwhile, studies also recognize the transformative impact of Artificial Intelligence (AI) in financial services, yet there remains a gap in understanding how AI can enhance financial education. This highlights the need for further research to explore how the integration of AI technologies can augment financial education efforts, ultimately aiming to improve financial outcomes and promote overall financial literacy and well-being.

Chapter three:

The applied aspect

In our practical endeavor, we embarked on a qualitative study focused on training outcomes. The study methodology involved surveying students both prior to and following the training sessions. Subsequently, we meticulously analyzed the collected data utilizing the JAMOVI statistical software. The intent was to ensure accuracy and precision in our analysis, thereby yielding insightful and reliable results.

Personal information:

Descriptive

	Age
N	40
Missing	0
Mean	23.9
Median	23.0
Mode	23.0
Standard deviation	4.24
Range	20
Minimum	18
Maximum	38

Table 1 Descriptive of age

The table presents the distribution of people across different age groups. It lists ages from 18 to 38 and the corresponding number of people in each age category.

Frequencies of age

Age	Counts	% of Total	Cumulative %
18	2	5.0 %	5.0 %
19	2	5.0 %	10.0 %
20	1	2.5 %	12.5 %
21	4	10.0 %	22.5 %
22	7	17.5 %	40.0 %
23	10	25.0 %	65.0 %
24	3	7.5 %	72.5 %
25	2	5.0 %	77.5 %
26	2	5.0 %	82.5 %
27	1	2.5 %	85.0 %
28	2	5.0 %	90.0 %
30	1	2.5 %	92.5 %
32	1	2.5 %	95.0 %
36	1	2.5 %	97.5 %
38	1	2.5 %	100.0 %

Table 2 Frequencies of age

The majority of individuals fall within the age range of 21 to 26, which accounts for approximately 65% of the total.

The distribution is skewed towards younger ages, with fewer individuals in older age groups.

This a gradual decline in the cumulative percentage as age increases, indicating a trend of decreasing representation in older age categories.

Ages 18 and 19 represent the lowest percentages individually, but collectively contribute to 10% of the total.

Ages 27 and above constitute only a small proportion of the sample, with each age group representing less than 5% individually.

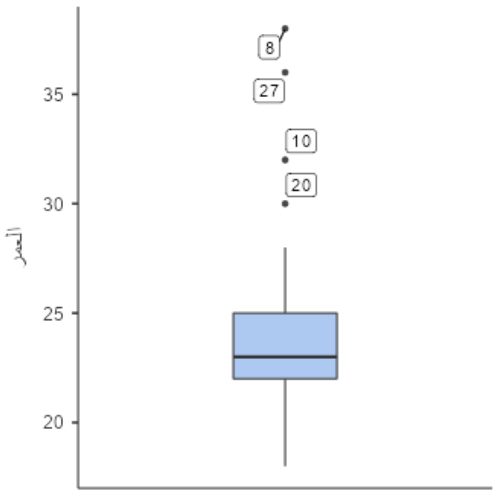


Figure 5 box plot of age distribution

Overall, the distribution suggests a concentration of individuals in their early to mid-twenties, with a decreasing proportion as age increases beyond that range.

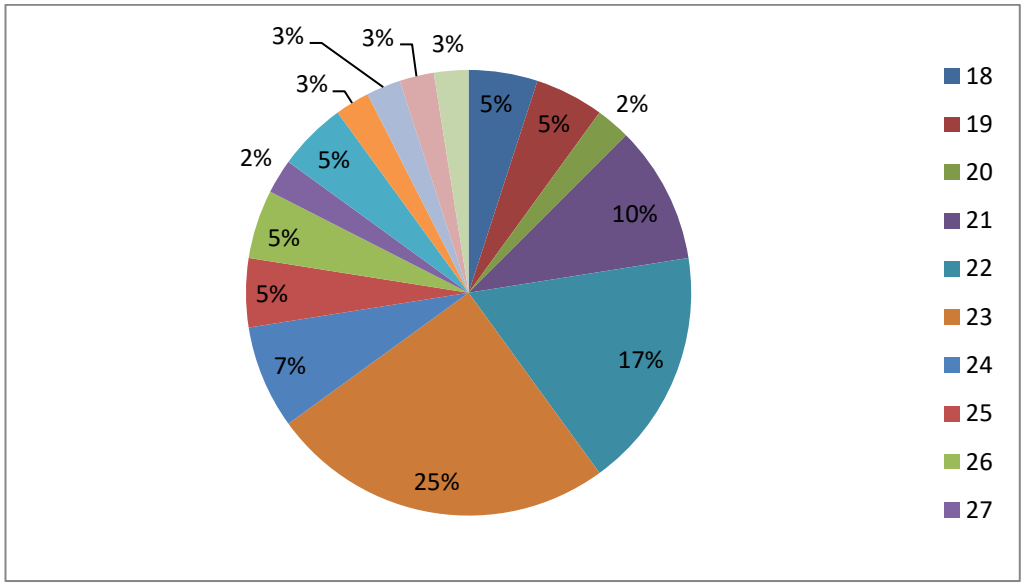


Figure 6 pie chart of age

Young Adults (18-22): **There is a higher concentration of people in the age range of 18 to 22.**

- **Mid-Twenties (23-28):** The number of people peaks at age 23 and then generally declines.
- **Late Twenties to Late Thirties (30-38):** Each age has only one person.

Frequencies of Gender

Gender	Counts	% of Total	Cumulative %
Female	29	72.5 %	72.5 %
Male	11	27.5 %	100.0 %

Table 3 Frequencies of Gender

Relative Percentages: While females make up only 29% of the group, their percentage representation is much higher at 72%. In contrast, males constitute a smaller percentage of the group (11%) and have a lower corresponding percentage representation (27.5%). This suggests that females are overrepresented relative to their proportion in the group, while males are underrepresented

Figure 7 pie chart of gender distribution

Female vs. Male: There is a higher percentage of females compared to males in the group.

Gender Disparity: The data shows a significant disparity in gender representation, with females comprising a larger proportion of the group compared to males.

Frequencies of education levels

education levels	Counts	% of Total	Cumulative %
High school	1	2.5 %	2.5 %
PHD	2	5.0 %	7.5 %
License	7	17.5 %	25.0 %
Master's	30	75.0 %	100.0 %

Table 4 Frequencies of education levels

The table presents the distribution of education levels among individuals in the group, categorizing them into secondary, PhD, license degree, and master's degree.

the table illustrates a diverse distribution of education levels within the group, with master's degrees being the most prevalent followed by license degrees, PhDs, and secondary education. The overwhelming majority of individuals hold master's degrees, reflecting a group with a high level of education and expertise

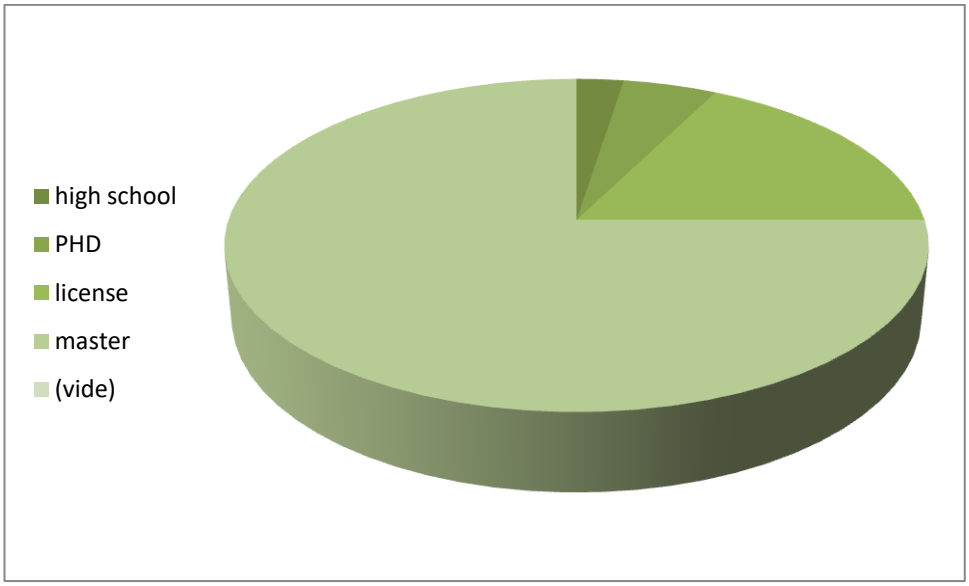


Figure 8 pie chart of education levels

Secondary: Only one person (2.5%) in the group holds a secondary education level.

PhD: Two individuals (5%) have attained a PhD degree.

License Degree: Seven individuals (17.5%) possess a license degree.

Master's Degree: Thirteen individuals (75%) have achieved a master's degree.

Frequencies of fields

Fields	Counts	% of Total	Cumulative %
Social Science	5	12.5 %	15.0 %
Economical Sciences	16	40.0 %	92.5 %
Science and Technology	12	30.0 %	82.5 %
Language	6	15.0 %	97.5 %
Architecture	1	2.5 %	100.0 %

Table 5 frequencies of field of study

Economical Sciences Dominance: Economical sciences have the highest representation within the group, followed by social science, science and technology, language, and architecture.

Varying Levels of Representation: While some fields have higher percentages, others have lower representation.

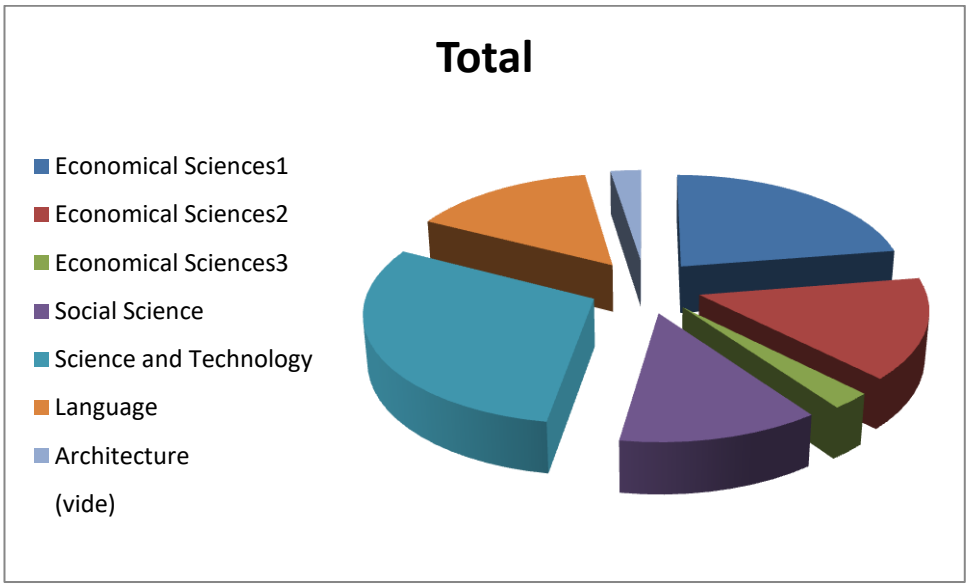


Figure 9 pie chart of field of study

Social Science: Five individuals (12.5%) are in the field of social science.

Economical Sciences: Sixteen individuals (40%) are studying economical sciences.

Science and Technology: Twelve individuals (30%) are in the field of science and technology.

Language: Six individuals (15%) are studying language.

Architecture: One individual (2.5%) is studying architecture.

Results before the training

Frequencies of spending habits

Spending habits	Counts	% of Total	Cumulative %
Agree	6	15.0 %	15.0 %
Somewhat agree	17	42.5 %	57.5 %
Disagree	17	42.5 %	100.0 %

Frequencies of spending habits6 Table

The results show that a majority of respondents (85%) were either somewhat confident or not confident at all in their ability to identify problematic spending habits before the training. This highlights the potential need for the training program to address these gaps in knowledge and build confidence in personal financial management.

Agree (15.0%): Only a small portion of respondents (6 out of 40) felt confident in their ability to identify spending habits that caused financial problems before the training.

Somewhat agree (42.5%): The largest group of respondents (17 out of 40) somewhat agreed, indicating a moderate level of confidence in their ability to identify problematic spending habits. This suggests that while they had some awareness, they might have lacked complete confidence or knowledge.

Disagree (42.5%): An equal number of respondents (17 out of 40) disagreed, indicating they were not confident in their ability to identify spending habits that caused financial problems before the training.

Frequencies of money and emotions

money and emotions	Counts	% of Total	Cumulative %
Agree	13	32.5 %	32.5 %
Somewhat agree	3	7.5 %	40.0 %
Completely agree	1	2.5 %	42.5 %
Disagree	23	57.5 %	100.0 %

Table 7 money and emotions

Agree (32.5%): A significant portion of respondents (13 out of 40) agreed that they understood the relationship between money and emotions before the training.
Somewhat agree (7.5%): A small segment (3 out of 40) somewhat agreed, indicating some awareness of the connection between money and emotions but possibly not a deep understanding.
Completely agree (2.5%): A very small fraction (1 out of 40) completely agreed, showing strong confidence in their understanding of the topic.
Disagree (57.5%): The majority (23 out of 40) disagreed, indicating that most respondents did not have a good understanding of the relationship between money and emotions before the training.

Frequencies of personal budget

personal budget	Counts	% of Total	Cumulative %
Agree	5	12.5 %	12.5 %
Somewhat agree	8	20.0 %	32.5 %
Completely agree	1	2.5 %	35.0 %
Disagree	26	65.0 %	100.0 %

Table 8 Frequencies of personal budget

Agree (12.5%): A small portion of respondents (5 out of 40) agreed that they could create a personal budget before the training.

Somewhat agree (20.0%): A larger segment (8 out of 40) somewhat agreed, indicating some ability to create a personal budget, though possibly not comprehensively.

Completely agree (2.5%): A very small fraction (1 out of 40) completely agreed, showing strong confidence in their ability to create a personal budget.

Disagree (65.0%): The majority (26 out of 40) disagreed, indicating that most respondents were not confident in their ability to create a personal budget before the training.

From the table above we can easily notice that the smallest section of the participants were able to set a budget for some personal purposes, in the other hand the largest Part of the respondents found that it was nearly impossible to set a budget for daily basis with the percentage of (65%).

This highlights a clear area of improvement that the training program should focus on, as understanding the main importance of setting a budget.

Frequencies of budget rules

budget rules	Counts	% of Total	Cumulative %
Agree	3	7.5 %	7.5 %
Somewhat agree	9	22.5 %	30.0 %
Completely agree	2	5.0 %	35.0 %
Disagree	26	65.0 %	100.0 %

Table 9 Frequencies of budget rules

The results indicate that a significant majority (65%) of respondents had difficulty distinguishing between needs and wants before the training. Only a combined 12.5% (completely agree and agree) felt confident in their ability to make this distinction. This highlights a clear area of improvement that the training program should focus on, as understanding the difference between needs and wants is a fundamental aspect of personal financial management.

Agree (7.5%): A small portion of respondents (3 out of 40) agreed that they understood and could apply budget rules before the training.
Somewhat agree (22.5%): A larger segment (9 out of 40) somewhat agreed, indicating some level of understanding or partial ability to apply budget rules.
Completely agree (5.0%): A very small fraction (2 out of 40) completely agreed, showing strong confidence in their ability to understand and apply budget rules.
Disagree (65.0%): The majority (26 out of 40) disagreed, indicating a significant lack of understanding or confidence in applying budget rules before the training.

Frequencies of using AI powered apps and technologies

using AI powered apps and technologies	**Counts**	**% of Total**	**Cumulative %**
Agree	2	5.0 %	5.0 %
Somewhat agree	4	10.0 %	15.0 %
Disagree	34	85.0 %	100.0 %

Table 10 Frequencies of using AI powered apps and technologies

The results clearly show that a vast majority (85%) of respondents did not engage with AI-powered apps and technologies before the training. Only 15% (agree and somewhat agree combined) had any level of agreement with using these technologies. This highlights a significant area for development, suggesting that there is a need for training and education on the benefits and usage of AI-powered tools in personal financial management. The training program should focus on increasing familiarity and comfort with these technologies to enhance their financial management skills.

Agree (5.0%): Only a small fraction of respondents (2 out of 40) felt confident in their usage of AI-powered apps and technologies.
Somewhat agree (10.0%): A slightly larger segment (4 out of 40) somewhat agreed, indicating a moderate level of engagement or familiarity with AI-powered apps and technologies. This suggests some exposure but not extensive use.
Disagree (85.0%): The overwhelming majority (34 out of 40) disagreed, indicating that most respondents did not use or were not comfortable with using AI-powered apps and technologies before the training.

Frequencies of financial goals

financial goals	Counts	% of Total	Cumulative %
Agree	5	12.5 %	12.5 %
Somewhat agree	7	17.5 %	30.0 %
Completely agree	16	40.0 %	70.0 %
Disagree	12	30.0 %	100.0 %

Table 11 Frequencies of financial goals

The results show that while a notable portion of respondents (40.0%) were completely confident in their ability to set financial goals, and an additional 30% had some level of agreement (agree and somewhat agree combined), a significant portion (30.0%) were not confident at all. This indicates that although many respondents had a good understanding of setting financial goals, there remains a substantial group who lacked this ability. The training program should aim to reinforce and expand on these skills, ensuring that all participants can confidently set and achieve their financial goals.

Agree (12.5%): A small portion of respondents (5 out of 40) agreed that they were able to set financial goals before the training.
Somewhat agree (17.5%): A slightly larger group (7 out of 40) somewhat agreed, indicating some ability to set financial goals, though perhaps with limitations.
Completely agree (40.0%): A significant portion (16 out of 40) completely agreed, showing strong confidence in their ability to set financial goals.
Disagree (30.0%): A considerable segment (12 out of 40) disagreed, indicating they were not confident in setting financial goals before the training.

Frequencies of emergency fund

emergency fund	Counts	% of Total	Cumulative %
Agree	**2**	**5.0 %**	**5.0 %**
Somewhat agree	**5**	**12.5 %**	**17.5 %**
Usually disagree	**9**	**22.5 %**	**40.0 %**
Completely disagree	**24**	**60.0 %**	**100.0 %**

Table 12 Frequencies of emergency fund

The results indicate that a large majority of respondents (82.5%) had difficulty or lacked confidence in setting up an emergency fund before the training, with 60% completely disagreeing and 22.5% usually disagreeing. Only a small fraction (17.5%) had any level of agreement (agree and somewhat agree combined) in their ability to set up an emergency fund. This highlights a critical area for improvement, suggesting that the training program should prioritize teaching the importance of emergency funds and providing practical steps for setting them up to ensure financial preparedness among participants.

Agree (5.0%): A very small portion of respondents (2 out of 40) agreed that they were able to set up an emergency fund before the training.

Somewhat agree (12.5%): A small segment (5 out of 40) somewhat agreed, indicating limited confidence or partial ability to set up an emergency fund.

Usually disagree (22.5%): A moderate portion (9 out of 40) usually disagreed, suggesting that they mostly struggled with setting up an emergency fund.

Completely disagree (60.0%): The majority (24 out of 40) completely disagreed, indicating a significant lack of ability or confidence in setting up an emergency fund before the training.

Results after the training

Frequencies of spending habits

Spending habits	Counts	% of Total	Cumulative %
Agree	13	56.5 %	56.5 %
Somewhat agree	1	4.3 %	60.9 %
Completely agree	6	26.1 %	87.0 %
Usually disagree	1	4.3 %	91.3 %
Completely disagree	2	8.7 %	100.0 %

Table 13 Frequencies of spending habits

The results show a significant improvement in the ability to identify spending habits that cause financial problems after the training. A combined 87% of respondents (agree, somewhat agree, and completely agree) felt confident in their ability to identify problematic spending habits. Only 13% of respondents (usually disagree and completely disagree combined) did not feel confident in this area. This indicates that the training program was largely effective in enhancing participants' understanding and ability to identify spending habits that could lead to financial problems.

Frequencies of money and emotions

money and emotions	Counts	% of Total	Cumulative %
Usually disagree	5	21.7 %	21.7 %
Completely disagree	18	78.3 %	100.0 %

Table 14 Frequencies of money and emotions

The results show that after the training, a substantial majority of respondents (78.3%) still completely disagreed that they understood the relationship between money and emotions. Additionally, 21.7% usually disagreed, indicating an overall lack of improvement in this area. This suggests that the training program may not have been effective in addressing this particular aspect of financial management. The program might need to revisit and enhance its content on the psychological aspects of financial decisions to better help participants understand and manage the interplay between their emotions and financial behavior.

Frequencies of personal budget

personal budget	Counts	% of Total	Cumulative %
agree	10	43.5 %	43.5 %
Somewhat agree	2	8.7 %	52.2 %
Completely agree	10	43.5 %	95.7 %
Disagree	1	4.3 %	100.0 %

Frequencies of personal budget15 Table

Overall, the results suggest that the training was largely successful in equipping participants with the knowledge and skills to create a personal budget. The majority of respondents expressed confidence in their ability to do so, indicating that the training had a positive impact on their financial management abilities.

Frequencies of budget rules

budget rules	Counts	% of Total	Cumulative %
agree	6	26.1 %	26.1 %
Somewhat agree	2	8.7 %	34.8 %
Completely agree	14	60.9 %	95.7 %
Disagree	1	4.3 %	100.0 %

Table 16 Frequencies of budget rules

The results indicate that the training had a positive impact on participants' understanding and application of budget rules. The majority of respondents (69.6% - combined percentage of agree and somewhat agree) expressed some level of confidence in their ability to understand and apply budget rules, with a significant portion (60.9%) completely agreeing. This suggests that the training effectively equipped participants with the knowledge and skills necessary for effective budgeting.

Frequencies of using AI powered apps and technologies

using AI powered apps and technologies	Counts	% of Total	Cumulative %
agree	**6**	**26.1 %**	**26.1 %**
Somewhat agree	**4**	**17.4 %**	**43.5 %**
Completely agree	**7**	**30.4 %**	**73.9 %**
Disagree	**2**	**8.7 %**	**82.6 %**
Completely disagree	**4**	**17.4 %**	**100.0 %**

Table 17 Frequencies of using AI powered apps and technologies

The results indicate that after training, a considerable portion of respondents (56.9% - combined percentage of agree, somewhat agree, and completely agree) were using AI-powered apps and technologies to some extent. However, there were still some respondents (26.1% - combined percentage of disagree and completely disagree) who were not utilizing these technologies. This suggests that while the training may have increased awareness and usage of AI-powered tools for some participants, there is still room for improvement in encouraging widespread adoption among all participants.

Frequencies of financial goals

financial goals	Counts	% of Total	Cumulative %
agree	13	56.5 %	56.5 %
Somewhat agree	2	8.7 %	65.2 %
Completely agree	7	30.4 %	95.7 %
Disagree	1	4.3 %	100.0 %

Table 18 Frequencies of financial goals

The results suggest that the training had a positive impact on participants' ability to set financial goals. The majority of respondents (87.0% - combined percentage of agree and completely agree) expressed some level of confidence in their ability to set financial goals, with a significant portion (30.4%) completely agreeing. This indicates that the training effectively equipped participants with the knowledge and skills necessary to set and work towards achieving their financial goals.

Frequencies of emergency fund

emergency fund	Counts	% of Total	Cumulative %
agree	12	52.2 %	52.2 %
Somewhat agree	3	13.0 %	65.2 %
Completely agree	7	30.4 %	95.7 %
Disagree	1	4.3 %	100.0 %

Table 19 Frequencies of emergency fund

The results suggest that the training had a positive impact on participants' ability to set up an emergency fund. A majority of respondents (95.7% - combined percentage of agree, somewhat agree, and completely agree) expressed some level of confidence in their ability to set up an emergency fund, with a significant portion (30.4%) completely agreeing. This indicates that the training effectively equipped participants with the knowledge and skills necessary to establish an emergency fund, which is essential for financial preparedness.

Final results

Overall this study aimed the financial education and its dimensions by giving definitions and details, to make it more reliable in the real life we choose a training that had very positive results and it did educate the participants to make a budget and emergency funds and separate between their wants and needs. On the other hand the students used the AI generated apps and programs suggested in the training, and it did helped them track their expenses and make more wise financial decisions.

Conclusion

Financial literacy has increasingly become a focal point of research in recent years, reflecting a growing recognition of its significance. A wealth of literature delves into the profound impact of financial literacy, underscoring its pivotal role in enabling consumers to effectively budget, manage income, and navigate financial intricacies such as saving, investing, and fraud prevention. In an era marked by burgeoning complexity within financial markets and heightened individual responsibility for financial decisions, the importance of financial literacy escalates exponentially. It serves not only as a cornerstone of individual financial well-being but also as a linchpin for the smooth operation of financial systems at large.

The primary objective of this study is to underscore the fundamental importance of financial literacy in fostering individuals' financial health. It endeavors to comprehensively address the core concepts and intricacies surrounding financial literacy, elucidating its essence and indispensable nature. Additionally, the study elucidates the foundational dimensions of financial literacy and elucidates the intricate interplay among these elements.

Moreover, this study sheds light on how students have leveraged training opportunities to augment their financial literacy. Empowered by AI-driven applications and software, students have witnessed significant strides in grasping financial principles and refining practical skills crucial for adept financial management. These state-of-the-art technological advancements have played a pivotal role in nurturing student engagement and facilitating seamless integration of financial literacy principles into their daily lives. Through the judicious utilization of these innovative tools, individuals not only bolster their personal financial well-being but also contribute to the resilience and dynamism of financial markets on a broader scale.

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