LUND UNIVERSITY
School of Economics and Management

Department of Informatics

Artificial Intelligence Adoption in Software Development

A Qualitative Study on Developers' Views

Master thesis 15 HEC, course INFM10 in Information Systems

Authors: Charles Collins
Kémaël Josua Kauppaymuthoo

Supervisor: Saonee Sarker

Grading Teachers: Avijit Chowdhury
Odd Steen

Artificial Intelligence Infusion in Software Development

AUTHORS: Charles Collins and Kémaël Josua Kauppaymuthoo

PUBLISHER: Department of Informatics, Lund School of Economics and Management, Lund University

PRESENTED: June, 2023

DOCUMENT TYPE: Master Thesis

FORMAL EXAMINER: Osama Mansour, PhD

NUMBER OF PAGES: 125

KEY WORDS: *software development, artificial intelligence, human artificial intelligence interaction, AI pair-programming, ethics*

ABSTRACT:

The sustained continued rapid evolution of Artificial Intelligence (AI) has revolutionised various sectors, including software development. This qualitative study employs a thematic analysis approach to investigate the views of individuals participating professionally and personally in software development, focusing on the adoption of Artificial Intelligence (AI) technologies in the field. The research methodology adopts an inductive and iterative methodology. Data collection involved semi-structured interviews conducted in a variety of ways with a concentrated sample of respondents, all of whom understand topics related to software development and more generally, AI. As this study examines the current reaction towards the adoption of AI from software developers, it concludes that the interviewees most notably view AI adoption with varying levels of confidence, low introspected self-reported understanding, a sense of empowerment, conscious for workforce ramifications and ethical wariness. The literature befits the observations made in this paper as they both corroborate and contrast each other.

Contents

Figures

Tables

Introduction

This chapter introduces to the reader our chosen topic, the usage of artificial intelligence in Software Development and how it may pertain to those currently working within that specific area. From there, we will present our research question, and the purpose of our research and identify any delimitations that we believe may impact the development of the thesis.

1.1 Background

The Fourth Industrial Revolution, as described by Burgess, Connell, Nankervis & Montague (2021), has ignited many ethical considerations, both old and new, in response to the rapidly evolving technological advances we are currently witnessing. The endless pursuit of automation has proven to be concerning for the job prospects of future generations (Vicsek, Bokor & Pataki., 2022). More specifically, the rapidly spreading adoption of Artificial Intelligence (AI) and where that leaves the 'man' in 'craftsmanship'.

Although there are many interpretations regarding the definition of AI, Kaplan and Haenlein (2019, p.17) define it as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation."

Fear of 'replacement' is often one of the first concerns raised when the topic of AI is brought up (Dégallier-Rochat, Kurpicz-Briki, Endrissat, Yatsenko & 2022). AI is not a by-product or reaction to current world affairs. Instead, it is the pursuit of further automation that may have the potential to affect all aspects of our daily lives, regardless of what country we choose to reside in. These concerns held by many workers towards the evolution and expansion of AI are not entirely baseless (Vorobeva, El Fassi, Costa Pinto, Hildebrand, Herter & Mattila, 2022). After all, AI has gone from fulfilling repetitive, simple tasks to performing highly complex equations that require a considerable amount of independent thought and precision, based on available data (Huang, Rust, and Maksimovic, 2019). We are already seeing the adoption of AI-driven technology in the forms of medical diagnoses, autonomous vehicles, and scheduling software (Dwivedi, Hughes, Ismagilova, Aarts, Coombs, Crick, Duan, Dwivedi, Edwards, Eirug, Galanos, Ilavarasan, Janssen, Jones, Kar, Kizgin, Kronemann, Lal, Lucini, Medaglia, Le Meunier-FitzHugh, Le Meunier-FitzHugh, Misra, Mogaji, Sharma, Singh, Raghavan, Raman, Rana, Samothrakis, Spencer, Tamilmani, Tubadji, Walton & Williams, 2021). The willingness to adopt the technology is already leading some companies to consider laying off their staff, thereby allowing AI to replace those jobs in the future (Espiner, 2023).

However, according to Vorobeva et al (2022), a considerable amount of work still needs to be done in the field of AI before many human tasks can become fully automated. According to the authors, we still require human input when it comes to analysing and interacting with most human emotions, which prevents any imminent automation overhaul. This information does not account for the long term. Whilst we remain mostly reliant on human contribution, the creation and subsequent implementation of AI that can better understand our needs and feelings is increasing (Dwivedi et al.,2021).

A good example of this would be OpenAI's 'ChatGPT', as it continues to push AI development and increase the conversation surrounding it. This form of AI, known as generative AI, a transformer based large language model (LLM), possesses the ability to engage with its users on a variety of topics, all while retaining a relatively familiar human composure. In addition to this, ChatGPT can create an extensive amount of content for the user's convenience or usage, such as pieces of literature and code for running programmes (Vincent, 2022). Therefore, it begs the question, what perception do software developers and those working within Information and Communications Technology (ICT) currently feel about the industry's adoption of AI?

1.2 Problem

There have been many investigations conducted on the topic of AI, researchers have explored the different industries AI can contribute towards such as aiding surgeons (Murphy, Killen, Burnham, Sarvari, Wu & Brown, 2022), fighter jet pilots (Dempsey, 2022) or agricultural and forestry development (Holzinger, Saranti, Angerschmid, Retzlaff, Gronauer, Pejakovic, Medel-Jimenez, Krexner, Gollob, & Stampfer, 2022). With this in mind, we intend to delve further into the relationship between software developer's reactions and emotions given the expanding role of AI in their field of work.

Prior studies have assessed how some employers are attempting to help train their staff to ease the transition to this new form of workflow, relying on user-oriented technologies such as Virtual Reality (VR) and Augmented Reality (AR) to achieve this (Harborth and Kümpers, 2022). These forms of technology can provide staff with the necessary training and a greater understanding of what may be required of them going forward, all while ensuring the employees don't feel alienated in the process.

While institutions such as Cambridge Leverhulme Center for the Future of Intelligence, Sydney Human-Centred AI Lab and Berkley Center for Human-Compatible AI have embraced what has come to be known as 'Human-Centred' AI (HCAI) (Holzinger et al., 2022). Defined by Holzinger et al. (2022, p.4) as "a synergistic approach to align AI solutions with human values, ethical principles, and legal requirements to ensure safety and security, enabling trustworthy AI." The ability to push AI-driven algorithms further with HCAI allows for greater technological performance in addition to improving human performance.

These findings, whilst informative, do not shed much light on how the people in these scenarios feel about the shift in their ways of work because of AI (or HCAI). Therefore, we believe that we must gain a better understanding of how people working within the ICT industry feel about their company or the wider industry shift towards AI.

1.3 Research Question

"How do software developers view the adoption of AI technologies in Software Development?"

1.4 Purpose

The topic of AI has long been in the public discourse. Having been a staple of the science fiction genre for several decades, typically depicted as the herald of a new robot-driven age (Willcocks, 2020). However, considering AI's rapid evolution in the past decade or so, this fantasy is now a thing of the past (Dwivedi et al., 2021). Instead, there is a growing demand for governments and industries to recognise what real AI can currently offer us. The notion has already been adopted by several industries that have developed ways in which AI can aid them in the current (Murphy et al., 2022; Holzinger et al., 2022) and future projects (Dempsey, 2022)

The growing reliance on automation within multiple industries has led to an increase in concerns from employees of being replaced by AI (Schwabe & Castellacci, 2020). To meet some of these concerns, some companies within the ICT industry have attempted to ease concerns and incorporate new training initiatives (Harborth and Kümpers, 2022) or opt to embrace the potential of HCAI (Holzinger et al., 2022).

We believe that there remains an insufficient amount of research conducted to ascertain how workers currently feel about this shift towards further automation, whether it be only limited or fully implemented.

1.5 Delimitation

AI-driven automation in the ICT sector, specifically within the field of Software Development is at the crossroads of the social and technical dilemma. The social dimension is deeply affected by one of the fastest-growing technology globally (Bhugin, Hazan, Ramaswamy, Chui, Allas, Dahlström, Henke & Trench, 2017). The very concepts of AI and machine learning are rooted in the replication of learning and the fundamentals of human intelligence. The significance of this research is in line with the current situation, and the potential direction, that this technology has concerning society, organisations, and individuals alike. Therefore, we hope that our research will further contribute to the already ongoing discussion about job automation at large, though done in an ICT-centric manner. Thereby adding additional insight into how and to what extent such occupations are affected.

Despite our desire to make a major contribution to the discussions currently present within Information Systems and the wider ICT industry, we would like to acknowledge our limitations when working on this paper. The limited time we have had to work on the thesis will be reflected in the scope of our research and the scale of our results. However, we believe that our findings will add to this already heavily discussed topic.

2 Theoretical Background

This chapter explores artificial intelligence, discussing its history, subcategories, and how it interacts with humans. Additionally, it defines software and system development. Then examines the infusion of AI in software development and relevant associated topics.

2.1 Artificial Intelligence

2.1.1 History & Overview

The concept of artificial intelligence (AI) is not inherently new, its earliest roots can be traced as far back as ancient Greece, to the philosopher Aristotle, who suggested the adoption of a set of laws to help govern the rational part of the mind (Russell, Norvig & Davis, 2009). Since then, the concept of AI has been explored by with various philosophers and inventors, such as Ramon Llull, Leonardo Da Vinci, and Gottfried Wilhelm Leibniz. All theorising their own forms of autonomous engines. Thomas Hobbs touched on the idea of an 'artificial animal' in his 1651 book, Leviathan, when he wrote "What is the heart but a spring; and the nerves, but so many strings; and the joints, but so many wheels" (Russell, Norvig & Davis, 2009).

However, it wasn't until 1943 that Warren McCulloch and Walter Pitts proposed the first model of artificial neurons, which drew inspiration from the function of neurons in the brain, propositional logic, and Turing's theory of computation (Russell, Norvig & Davis, 2009). Alan Turing, a pioneer in the field, argued that machines could make informed decisions and could come to their own conclusions. Turning's belief led to the development of the Turing Test in 1950 (Russell, Norvig & Davis, 2009). A few years later, in the summer of 1956 a group comprised of computer scientists and mathematicians including Allen Newell, Cliff Shaw, and Herbert Simon form the Logistics Program (Anyoha, 2017), worked for eight weeks in the maths department at Dartmouth College to form an outline for a new field of research. This new field of research focused on what they called 'Artificial Intelligence' which was where the name originated from (Strickland, 2021).

In the years that have followed AI has made tremendous leaps in progress, especially in the wake of the world wide web, which was responsible for ushering in a wave of new data (Strickland, 2021). The creation of the Graphic Processing Unit (GPU) chip for the video game industry also led directly lead to the creation of CUDA, a platform that allowed researchers to make use of GPUs for general-purpose processing (Lauriola, Lavelli & Aiolli, 2022). This evolution came from keen-eyed scientists who observed that the GPU could be fooled into completing other tasks, notably training neural networks (Strickland, 2021). Following this development, the craze for deep learning really took off, voice assistants became operational, cars were now capable of self-driving and websites could be effectively translated into multiple languages (Strickland, 2021).

A more recent innovation within the AI industry is that of generative AI. This form of AI centres around learning algorithms that can create content for a variety of different mediums, such as text, images, code audio and synthetic data (Rouse, 2023). The arrival of generative AI has drastically changed how we perceive creativity, initiating debates and discussions regarding its credibility and originality (Vallance, 2022). Despite the continued debates, generative AI has continued to expand, in 2017, only twenty percent of respondents claimed to have adopted AI in at least one area of work. This is in stark contrast to a more recent figures that places that adoption around fifty percent (McKinsey & Company, 2022).

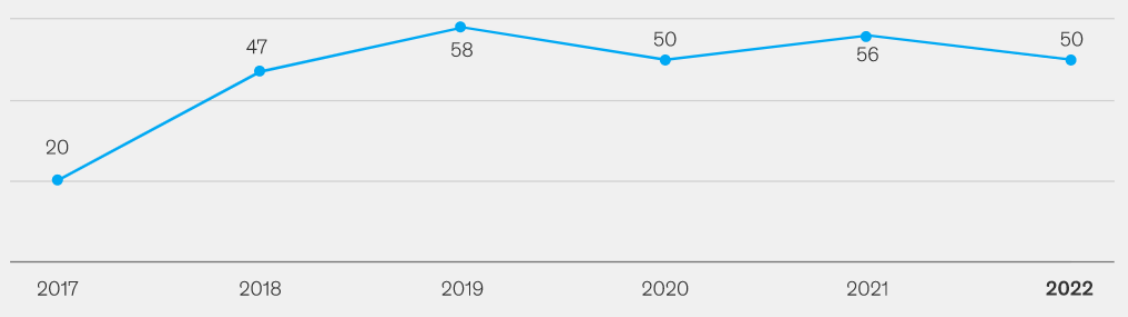

Figure 2.1 - Graph shows the increased adoption of AI in different industries since 2017 (McKinsey & Company, 2022)

Despite the varied definitions over the years (Abedin, Meske, Junglas, Rhabi & Motahari-Nezhad, 2022), most interpretations of AI refer to it as a machine or system, capable of performing complex human-like tasks, such as learning, reasoning, and adapting (Abedin et al., 2022) based on data derived from workplaces and wider society (Zirar, Ali & Islam, 2023). However, how the AI goes on to perform a task is almost entirely dependent on the data they are fed. This is due to the system's inability to find and amend gaps within the data, hence the need for greater data consistency and quantity in AI applications (Zirar, Ali & Islam, 2023). It is important to remember that AI falls within the greater category of data and information (Fernández-Lora et al., 2022).

2.1.2 Categories of AI

To greater determine how effectively AI systems can imitate its human counterparts, there have been attempts to categorise it. The logic of these categorisations often considers AI that can complete functions resembling humans in performance as advanced, whilst an AI that performs lesser than its human counterparts would be considered less advanced (Joshi, 2019). When it came to assessing how AI completes a specific function, Professor Arend Hintze (2016), categorised the Functionality-Based Types of Artificial Intelligence as:

- Reactive Machines – Considered the most basic form of AI (Marr, 2021), this AI system possesses no memory of its own and is entirely task-specific, with every input generating the same output (Coursera, 2023). It is common for Machine Learning Models (MLM) to be Reactive Machines they can easily comprehend large quantities of data that would be almost impossible for humans (Coursera, 2023). However, they cannot make predictions unless provided with the necessary information. Arguably the best example of Reactive AI was Deep Blu, an IBM supercomputer that defeated the world champion chess of the late 1990s, Garry Kasparov (Coursera, 2023).

- Limited Memory – Utilising pre-programmed information, and observational and historic data (Marr, 2021), this category of AI uses data, both past and present to solve complex tasks. Despite this, new data that emerges from completing activities will not be stored within the AI's memory, preventing it from retaining any knowledge of its recent actions and building upon it for future tasks (Coursera, 2023).
- Theory of Mind – Hintze (2016) stresses that the prior two categories are based on the state of AI from the past few years, whereas his latter two categories are somewhat speculative at best. In the case of the theory of mind, this category houses the idea of AI capable of showing independent thought and expression. Despite Hintze (2016) believing this category to be non-existent yet, there have been instances of AI showcasing the ability to have its feelings and opinions, most recently with the launch of Microsoft's Bing, powered by OpenAI's Chat-GPT (Roose, 2023).
- Self-Aware – The most advanced of all the categories (Marr, 2021), this form of AI could be considered an evolved version of the Theory of Mind (Hintze, 2016). Capable of recognising its very existence, this form of AI would be able to justify its emotions and remedy its own needs and desires (Marr, 2021).

Alternatively, AI has also been categorised based on the machine's competency (Techliance, 2023). Borrowing from the prior categorisation of AI, The Capability-Based Types of AI are:

- Artificial Narrow Intelligence (ANI) – Alternatively referred to as Narrow AI or even Weak AI. This category cannot perform tasks outside of what it has already been specifically assigned to complete. It uses pre-programmed fixed domain models, classifying data in a multitude of ways including Machine Learning (ML), Natural Language Processing (NLP), and Deep Learning (Kanade, 2022).
- Artificial General Intelligence (AGI) – AGI, or as it is also called, Strong AI and Deep AI respectively is not yet in operation as of the writing of this paper. This type of AI would possess a mind of its own and be capable of performing a variety of tasks, due to its ability to observe and learn from past experiences, like that of humans. It could also express its own emotions, utilise common sense and showcase its creativity, these abilities would stem from its very advanced data processing capabilities (Kanade, 2022).
- Artificial Super Intelligence (ASI) – Building upon what was established with AGI, ASI refers to AI that far exceeds its human counterparts when it comes to completing tasks. Possessing the ability to think independently and come to its conclusions, this hypothetical AI would represent a turning point in human history, drastically impacting the relationship between humanity and AI (Techliance, 2023).

2.1.3 Human-AI Interaction

Human-AI interaction (HAI) pertains to the field of study that believes the future will not only be technological, but equally ethical and humanistic, for AI should enhance humans instead of replacing them (Xu, 2019). The role of HAI involves designing user-friendly AI systems, whilst equally ensuring that the AI can communicate with its users (Abedin et al., 2022).

As previously mentioned, one of the main challenges in HAI is to improve communication (Abedin et al., 2022), with Benda, Novak, Reale and Ancker (2021) stressing the need to further extend our design knowledge, focusing on topics such as the design principles and theories to produce more effective interfaces allowing for greater HAI. This involves

designing user interfaces that are easy to navigate, as well as developing NLPs that can better communicate to humans, like how humans are able communicate with each other (Gruetzemacher, 2022).

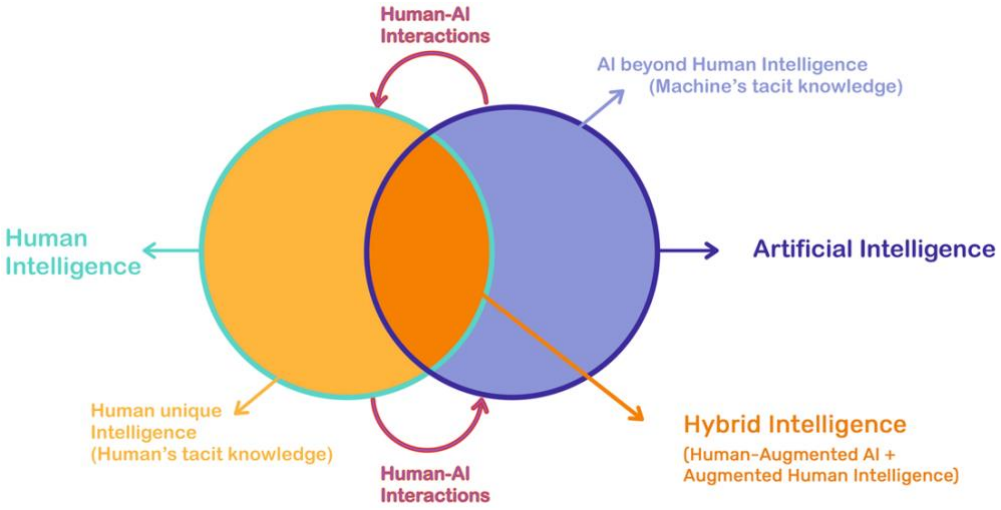

Figure 2.2 - Diagram showcases the relationship between Human Intelligence and Artificial Intelligence (Jarrahi, Lutz & Newlands, 2022).

Successful HAI needs both collaboration and communication between humans and AI systems. This can involve AI systems that are capable of interpreting emotions exhibited by humans and will offer the appropriate advice, an example of this can be seen in Czerwinski, Hernandez & McDuff's (2021) paper that proposes a virtual therapist that could recognise their needs and would be able to aid patients. Whilst Sharma, Lin, Miner, Atkins & Althoff (2023) noted how greater reliance on HAI can lead to improvements in text-based peer to peer mental health support.

Another important aspect of HAI is ensuring that AI systems provide transparency regarding how they make decisions, as users can find it hard to grasp how AI comes to its conclusions (Meske & Bunde, 2020). This can result in fears that the AI system may be biased and may lack accountability (Abedin, 2021). These concerns are being investigated by researchers, who seek to develop AI systems that can explain their decision-making processes to humans in an understandable manner (Amershi et al., 2019).

In the same line of thought, the state of HAI in the literature corroborates the ambivalence found in studying IS artefacts which are themselves agentic (Baird & Maruping, 2021). In fact, "the transfer of rights and responsibilities from […] human agents" to, and from, the artefact creates a scenario where the current landscape of theorising in the IS field does not befit such scenario (Baird & Maruping, 2021). The independence and actionable nature of such artefacts reveals that there exists a deeper and more complex relationship between AI systems and their human users. This puts into question where the duty of care for a certain process lies, given the degree of autonomy, and even ability for decision-making, portrayed by systems which could be deemed as increasingly independent.

2.1.4 Summary

To conclude, Artificial Intelligence has come a long way since 1943 (Russell, Norvig & Davis, 2009). Over the years, AI has been categorised into different types to greater assess the capabilities and limitations of AI systems (Joshi, 2019). However, the continued development of AI has also been met with scepticism and worry regarding its impact on people's employment (Greenhouse, 2023), in addition to privacy and security concerns (Abedin, 2021; Wiggers, 2022). Whilst AI continues to become further integrated into our daily lives, it is vital that we consider the implications of Human-AI interaction from an ethical standpoint and ensure that the future of AI develops in a way that benefits everyone.

2.2 Software Development

2.2.1 The Evolution of Software Development

Software Development is the process of designing, creating, testing, and maintaining software applications. Throughout the years, the field of Software Development has grown from having to painstakingly code manually using programming languages such as COBAL and BASIC (Yost, 2019). This rigorous process was improved with the development of Integrated Development Environments (IDEs) in the 1980s. Allowing developers to code fasters due to the tools it offered. The 1990s also saw the emergence of Object-Oriented Programming (OOP) providing developers with a more modular and flexible approach to coding. OOP allowed developers to create reusable code modules that could be easily modified and updated (Doherty, 2020). Followed by Web Development which emerged in the wake of the World Wide Web, this allowed users to create web pages using coding mainstays such as HTML and JavaScript (Cardona, 2019). The turn of the century also saw the rapid acceleration of mobile devices, leading to Mobile Development, focusing on creating applications for smartphones and tablets that ran on a variety of different devices (Yost, 2019). A more recent addition is DevOps, it stresses more collaboration, greater automation, and the need for continuous delivery. The goal of DevOps aims to streamline the Software Development process by integrating development and operations teams that were formerly siloed, to work in unison to conduct automating testing and deployment (Microsoft Azure, 2023), thereby giving developers the resources needed to meet their deadlines.

2.2.2 Defining the Characteristics of Software Development

The characteristics most associated with software development is:

- Iterative Process: Software Development is an iterative process. This involves designing, coding, testing, and refining the software. The process helps ensure that the product meets the desired functionality and quality standards. Such a process can be repeated several times to ensure that the software is fully functional once for deployed (Bygstad, 2004).
- Collaborative: A key characteristic, this involves discussions with stakeholders, developers, managers, and customers (Chen, Hsu & Vu, 2023).

- Agile: The Agile methodology has revolutionised Software development by emphasising flexibility, engagement with end user, and continuous delivery. This characteristic involves breaking down the software development process into smaller, more manageable chunks and producing working software in small iterations (Butt, Khan, Hussain & Wang, 2023).
- Cross-Platform: Considering the ever-growing popularity of mobile devices and the Internet of Things (IoT), software development has become increasingly cross-platform. Therefore, this means that developers need to be able to design and produce applications that can operate across multiple and devices (Blanco & Lucrédio, 2021).
- Data-Driven: Software development has become increasingly data-driven, with developers relying on data analytics and machine learning to improve the software's performance and user experience (Denne & Cleland-Huang, 2004).Data-Driven: Software development has grown to be become very data-driven, with developers now relying on data analytics and machine learning to improve the software's performance and ultimately the users experience (Denne & Cleland-Huang, 2004).

2.2.3 The System Development Life Cycle

The System Development Life Cycle (SDLC) encompasses the different stages involved in creating and developing a software system (Preston, 2023). The SDLC provides a structured approach to Software Development, with additional stages to accommodate for Software Engineering (Restrepo, Aguilar, Toro & Suescún, 2021). According to Preston (2023) the fundamental stages of the SDLC are:

1. Planning: The first stage of the SDLC helps both system developers and system engineers understand the scope of the project. During this stage, the team may conduct an initial analysis of the task, noting the resources required for the project to determine how feasible the project is (Preston, 2023).

2. Systems Analysis: This stage is mostly focused on defining the requirements of the system. Thus, ensuring that the plan meets everyone's expectations before proceeding to the next stage (Preston, 2023).

3. Systems Design: It is at this stage that a detailed design plan is created. The design plan will include lots of information about system, such as the system's data structures, algorithms, and interfaces (Preston, 2023).

4. Development: At this stage, the functional creation of the new system commences. This stage involves programmers writing code based on the design plan, and system components are integrated to create a functional system. The creation of the new system also provides developers with the ability to interact and test the system it during its development to discover errors or run troubleshooting tests (Preston, 2023).

5. Systems Testing and Integration: A very iterative stage, the system is tested to assess if it meets the requirements outlined in the systems analysis stage. The testing includes quality control testing and integration testing with software related to the system that is being developed. Results at this stage may lead to setbacks in the products completion, to allow developers to fine tune their new system so that it meets expectations (Preston, 2023).

6. Deployment: In this stage, the system is deployed and shown to the end users. This involves installing the system on the appropriate production hardware. The launch of the product will vary depending on the needs of the client. Launches can include limited commercial releases or more reduced launches, taking the form of closed beta testing. At this stage any problems that have gone unnoticed during the prior stages can still be addressed despite the deployment. Alterations and adjustments will be handled through the process of troubleshooting and debugging (Preston, 2023).

7. Operation and Maintenance: This is the final stage of the SDLC and involves maintaining the system after it has been deployed and used by the intended end users. Any maintenance issues that have been detected are typically addressed in updates, that offer patches to amend the problem. This method therefore allows developers to customise and alter the product to better suit the customer's needs (Preston, 2023).

It is important to acknowledge that there are different variants of the SDLC, such as the figure presented below:

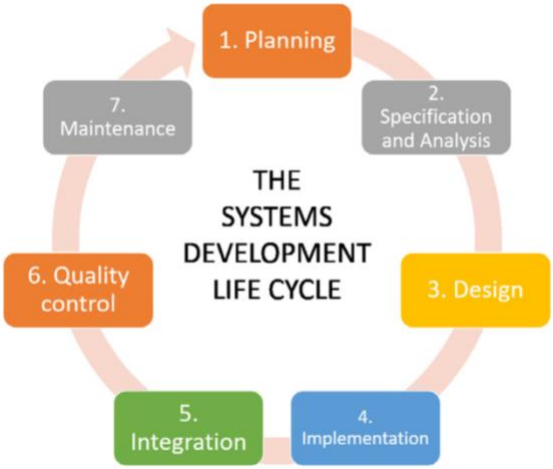

Figure 2.3 - Diagram depicting the System Development Life Cycle according to Alan Dennis, Barbara Haley Wixom and Roberta M. Roth (2014) cited by Restrepo et al. (2021).

2.2.4 Summary

In conclusion, Software Development has evolved from a manual, time-consuming process to one that is now highly automated and driven by data (Yost, 2019). As technology continues to evolve, software development is likely to follow, transforming to accommodate for new developments. Whilst the SDLC offers a precises timeline for software developer to adhere to, thus ensuring that every part of the project is considered and implemented effectively. By following the SDLC, software development teams can produce high-quality systems that meet the needs of the client and intended users (Preston, 2023).

2.3 AI Adoption in Software Development

2.3.1 Industry Landscape

To diligently explore of the implications carried by AI-infusion in software development, it is critical to under the current stance of the industry on the matter. Whilst we remain centred on the developers themselves, the industry is a key stakeholder and actor which possess a direct and significant relationship with the former. To this end, we explore the industrial landscape within which software developers navigate their role and practice.

With varied degrees of adoption, the market for AI-based code recommenders for AI-infused development as expanded to new heights (Dakhel, Majdinasab, Nikanjam, Khomh, Desmarais, Ming & Jiang, 2023). Noteworthy contenders, such as Github Copilot, Tabnine, Amazon CodeWhisperer and the famous GPT-4 Large Language Model (LLM) with its Visual Code and other IDEs integrations, have all risen from the previously mentioned substantial growth in market demand (Roth, 2023). Notwithstanding the myriad of regulatory, licensing and ethical concerns regarding the monetisation of AI-based recommender products which in many instances originally ingested code from open source licensed repositories, they remain the as the essence of commercial endeavours in the matter.

In addition, software creation includes artistic workflows, especially where front-end development is concerned. For this reason, tools such as Midjourney, Dall-E by OpenAI, the creators of ChatGPT, and an upcoming Adobe Firefly product of AI art generation, represent only a handful of products designed and used, at times concurrently, by developers in the industry (Johnson, 2023).

It may therefore be ascertained that the industry is at a landmark moment of its history, with financial injections and venture capitals in the billions for AI technologies alone (Vallance, 2023). In software development applications alone, the industry at large has released several commercial code generators and art generation noteworthy tools (MSV, 2022; Johnson, 2023). Thus, the direction of the industry for AI-infused software development appears to be one of considerable strength towards the wide implementation and dissemination of such tools.

2.3.2 Augmentation & Replacement

AI is situated at the forefront of contemporary and landmark technological innovation, a combination of computational tools and techniques which has carried with it substantial implications for software development as we knew it (Virvou, Tsihrintzis, Bourbakis, Jain & 2022). Indeed, AI-infusion in the field comes under different form and could be categorised as having the potential to augment or replace the traditional practice of development (Virvou et al., 2022). With developers potentially subjected to different forms of AI-infused workflows, it is paramount to stress upon the nature of each form as the necessary theoretical foundation for further reasoning and understanding our findings.

First and foremost, AI-infused augmentation in software development acting as a support agent, thus focusing on the assistive capabilities of such tooling (Dakhel et al., 2023). A pivotal and differentiating factor for this form of AI-infusion could be deemed as the

developer-centric approach to leveraging AI tools. Indeed, developers interact with the technology directly to improve decision-making in their work, yet decisions rest solely in the hands of the developers, not the tool. Examples of such augmentation range from the simulation of real-world usage for application testing and bug correction suggestion to the generation of code snippets during coding. Further integrated forms of augmentation on the other hand differ in that they partially alienate decision-making by automating some of the developer's tasks completely, aiming at efficiency of otherwise tedious or error-prone and/or repetitive tasks (Movement, 2023). In this instance, some, but not all, of the developer's decisions are actionable by the tooling directly, as the goal is to alleviate the workload by offloading some of the manual verification that a human developer would do (Virvou et al., 2022).

There is thus a shared responsibility with the developer for the overall outcome of the development, where the human still has the last say and may intervene at any point in time (Movement, 2023). Situations which illustrate this kind of AI-developer relationship arise in cases such as the tooling writing entire modules and coupling them to the main instance of the software, without the developer's intervention being necessary. Another similar case would be the use of AI to generate and automatically implement website design assets where the developer does not write, nor is assisted to write, the code for the implementation as it is fully achieved by the AI tooling.

Another more pervasive form of AI in software development includes, but is not limited to, AI-infused replacement (Nieto-Rodriguez & Vargas, 2023). This kind of infusion completely shifts the traditional approach in the field to novel practices (Nieto-Rodriguez & Vargas, 2023). In other words, this approach builds upon augmentation to bring about high-level cognisance tools which can not only automate repetitive tasks but understand and reason with the parameters of projects and the implications of disrupting events (Nieto-Rodriguez & Vargas, 2023). From this point of view, AI-infused replacement would entail the nearly sole reliance on AI for project tasks prioritisation, resources allocation, software architecture, amongst others. In other words, where developers would need to take reasoned decisions, manage their software projects and deadlines, or design advanced architectures which encompass multiple user requirements, AI-infusion has the capability to overtake such responsibilities.

With due consideration to the above, AI-infused software development operates at many different levels and involves a plethora of different approaches. At its core, however, the degree of autonomy, onus, and accountability that AI tools possess varies greatly as it is set to evolve at an unprecedented rate (Raja & Zhou, 2023). AI is rapidly taking its place in history; software developers may just find themselves in the crosshairs of their very own creation.

2.3.3 Applications & Challenges

Challenges such as the ability to source quality data in sufficient quantity to produce performant and accurate AI models to be trained accordingly, are an inherent trait of AI technologies (Whang, Roh, Song & Lee, 2022). In the same line of thought, general concerns pertaining to the principle of XAI, or in other words "explainable AI", are equally applicable in the context of software development (IBM, 2023). However, the scope of applications and challenges which are hereby explored should remain scoped to the software developer, their

acceptance, overall stance over such technologies and the different applications or scenarios for effective use of AI-infusion in the field.

2.3.3.1 AI Assisted Software Development and Pair-Programming

One of the most prominent use-case for AI in software development is AI-assisted or -guided programming. As previously explained, AI pair-programming is most notably a form of augmentation to the software development role. Where this is considered specifically, some challenges to this application may already be identified and brought to light.

On the one hand and at the time of writing this research piece, code AI code suggestions are far from being fool proof (Movement, 2023). To this end, developers must be wary of adding code snippets which may have been wrongly interpreted by the AI system or which have been derived from outdated documentation. The concerns are therefore manyfold, one could already speculate that this could have ramifications for safe and secure code (Virvou et al., 2022). It also raises a few questions, not least, where does legal and moral accountability lie for bugs or major breaches with real-world consequences resulting from AI-generated code implementation? Indeed, it may be assessed that, for the developer, there exists a substantial amount of uncertainty when it comes to accountability. Whereas the use of said tools is mostly encouraged in the industry, and has been deemed as enabling faster development, the degree of reliance which would be seen as reasonable is still largely unfathomed (Dakhel et al., 2023).

On the other hand, another application is where software developers may reap the benefits of the ability of AI tools to summarise or answer questions based on the public or internal documentation as to the technological stacks they use, which could be argued to facilitate their ability to find the resources they need without being explicitly suggested code. In some cases, code suggestion is accompanied by documentation referencing and explanation.

2.3.3.2 Legal and Ethical Considerations

Software developers represent a large swath of the working population, with a tremendous 2.56% in 2016 of the estimated US workforces (Labs Qubit, 2022). This number matters for a plethora of reasons, one of which is the particularly idiosyncratic Open-Source Software (OSS) aspect of the software development community (Malgonde, Saldanha & Mithas, 2023). Open Sourcing is the principle of “software [which] is code that is designed to be publicly accessible—anyone can see, modify, and distribute the code as they see fit.” (RedHat, 2019). The licensing model of such principle “prevents restrictions on the use of the software, [as] anyone can run, study, modify, and redistribute the source code, or even sell copies of their modified code, as long as they do so under the same license.” (RedHat, 2019). The relationship between AI pair programming and open-source software is that it has recently come to light that certain platforms and tools, such as Github Copilot, have been caught harnessing code from open-source repositories and used it explicitly, without consent or crediting to their original developers (Vincent, 2022).

Coming back to the licensing model, this situation raises two main issues. First, crediting open-source code to their original author is fundamental to the open-source principle. Secondly, where some licenses did not allow the use of open-source code for paid solutions and prohibit its use in commercial applications where revenue is to be directly derived from such code, i.e., repackaging or reselling the software. Additionally, the intellectual property rights of AI-generated code or software outputs can be complex, and legal frameworks may need to evolve to address issues related to authorship, ownership, and liability in AI-assisted

software development (Vincent, 2022). Whilst the work of some may benefit the many, there is a certain level capitalisation on “volunteer code” by technological conglomerates.

Moreover, AI-assisted software development also raises ethical and legal concerns. For example, issues related to data privacy, security, and intellectual property rights (Wiggers, 2022). AI models often require access to large amounts of data, which can raise privacy concerns, especially when dealing with sensitive data, such as personally identifiable information (PII) or proprietary business information (Vincent, 2022). Ensuring compliance with data protection regulations, such as the European Union's General Data Protection Regulation (GDPR), is equally critical when using AI-assisted software development (Virvou et al., 2022).

Beyond privacy alone, algorithmic bias is a crucial point of contention to the implementation of AI in various scenarios, including, but not limited to, professional use cases (Bond, Mulvenna & Wang, 2019).

2.3.3.3 AI Art Generation and Creative Capabilities

As seen in the industry landscape, the realm of AI adoption involves creative components of art generation and otherwise front-end and visual workings (Johson, 2023; Wingström, Hautala & Lundman, 2022). To this effect, one prominent use case for AI in software development is that users can produce high quality visual assets which answer specific front-end needs. A few use cases for such technology range from the implementation of different design systems which leverage the ability for AI generated art to adhere to certain themes and artistic genres, amongst other substantially specific parameters tailored to UI and UX needs (Cramer & Kim, 2019). This requires little efforts and images can be produced with certain layers, allowing further modifications (Chen, Chen, Zhao & Wang, 2020). One could make the case that, whereas front-end development has the potential to be tedious and require specially acquired skills in user experience design, an AI helping tool could allow more back-end focused developers to transition over, or expand, their responsibilities to include this portion of software development.

Lastly, contemporary AI creative capabilities equally involve more bleeding edge perks, which have been enabled by the recent GPT-4 model. Such perks consist of utilising an image or photo-based request showcasing a wireframe or draft of a UI, which may have been drawn onto paper, to produce high quality corresponding HTML and CSS code to recreate the wireframe (OpenAI, 2023).

2.3.3.4 User Acceptance of AI Adoption

Notwithstanding such emotional response, there is also a common denominator between AI systems acceptance and other technologies (Del Giudice, Scuoto, Orlando & Mustilli, 2023). The perception of value is a major influencer in the overall acceptance of the technology, and this is further supported by the fact that the automation of repetitive tasks has the connotation of enabling the more enjoyable aspects of the role to be prioritised. A counter effect, however, resulting from such potential, is the elicitation of what may be deemed as entry-level or tasks with a high educational potential for entry-level roles (Del Giudice et al., 2023). One could derive the conclusion that AI systems may be seen more positively by middle or late-career-positioned individuals who have already moved on, and learned the ropes, through these repetitive or more mundane tasks. Whereas for more early career roles in software development, these AI tools could hypothetically be seen more as a threat to their relevance.

What this would translate into when it comes to software developers is not necessarily self-explanatory. Indeed, for software development specifically, the automation of repetitive tasks in programming have existed for a long time before the advent of advanced and generative AI tools (Korzeniowski & Goczyła, 2019). Different DevOps methodology have long harnessed the potential to automate the workflow of software developers in order to maximise their efficiency (Sravan, Sai Ganesh, Kiran, Aakash Chandra, Aparna & Vignesh, 2023). The difference may therefore lie within the intersection between the assistive and interactive nature of such tools, which add a layer of complexity to the acceptance of developers to adopting horizontally integrated AI tools.

Although technology acceptance as a broader context is hereby discussed and the Technology Acceptance Model (TAM) is hence relevant, it would however deserve a discussion of its own which resides outside of the scope of this research.

2.3.3.5 Summary

In perspective, AI-assisted software development could face further challenges in the future. Indeed, it could be believed that the ability to rapidly disseminate itself in the industry may not preclude the appearance of major roadblocks by developers. As AI technologies continue to advance, there may be concerns about the impact of automation on the job market for software developers too (Koetsier, 2022). Some argue that AI could potentially replace certain aspects of software development completely, as discussed in previous sections, leading to job displacement and major tectonic shifts in the workforce (Movement, 2023). Notwithstanding the latter, proponents of AI argue that it can augment human creativity and performance, leading to new opportunities for innovation and growth (Leddy, 2019). Regardless, the adoption of such technology also has a need for acceptance by its users, which has been deemed in the literature as involving complex mechanisms where emotions play a fundamental role. Finding the right balance between human expertise and AI capabilities in software development could be contended as a pivotal challenge for the future of AI-infused software development.

2.3.4 AI Systems User Emotions

Information systems research reconciles the socio-technical nature of people and technology, which in the case of AI systems has raised different approaches to the study of emotional responses to their use (Gkinko & Elbanna, 2022). It can be assessed that, at large, there exists an interesting research area for the emotional reaction of AI users to such tools (Gkinko & Elbanna, 2022). One such conversation revolves around the implication of AI tools for research, and it argued that compared to an AI, “[a Interviewer] does not simply “process” the words of an article. Instead, they interpret, they experience” (Chubb, Cowling & Reed, 2022). It is therefore possible to draw a parallel, between researchers and software developers. Whereas in research the human component of interpreting and experiencing a text is argued to represent a foundational component of the research process, the same may, or may not, be contended to the same extent far for software developers.

Given the conversational nature of current AI tools in software development and their particular prominence in the field, the use of previous research on chatbots and their users’ emotions raises points of interest. A salient point of this operating context in particular remains that the tools are used internally, organisationally speaking. Once such study has been previously conducted by Gkinko & Elbanna (2022), and their findings reflect that the intricate

nature of conversational AI tools possess deeply intertwined connections to organisational parameters in the context of IS use. Indeed, it is argued that the interpretation of such emotions is affected twofold. On the one hand, the hope that the AI tool will improve after each interaction fuels the motivation and perseverance of users to dismiss shortcomings or frustrations arising from their interactions (Gkinko & Elbanna, 2022). Not only that, but the paper also stresses that most users will place the onus on themselves for the inability of the AI tool to successfully address a request (Gkinko & Elbanna, 2022). On the other hand, however, the organisational context and way such AI systems are implemented are critical and greatly affect the overall perception or emotional response of its users (Gkinko & Elbanna, 2022). Such claims may either be, partially or completely, affirmed or repudiated by our empirical findings as the emotional stance of software developers to similar tool is further explored.

Further in relation to emotions, the very property and relationship between AI systems and emotions leads to the question of technology acceptance. Where software developers are concerned, whether there is a positive or negative emotional outlook and experience using such tools may very well carry reverberations of its own as to they will be inclined to see AI as a support agent, or on the contrary a hindrance which has the potential to endanger their livelihood. Indeed, it is most probable that there would be a relationship between AI technology user acceptance and emotions, as argued by the recent study of Del Giudice et al. (2023). Whilst this may seem as evident, or even logical, to purport at first glance, this causality has multiple implications which are themselves much more complex.

The ability for AI systems, for example, to mimic human interaction and human behaviour has the potential to trigger an emotional response alike one an individual would have for another, i.e., empathy or a conflict avoidance response (Del Giudice et al., 2023). When placed into context, the challenges to the application of AI systems for software development could draw from this indicator in order to guide the strategy used to ensure the acceptance of AI supported software development tools.

2.3.5 Summary

With consideration to the present discussion, the implications of AI-infusion in software development emphasise the need to understand the current stance of the industry and how it may relate to the software developer’s perspective. The industry has released several commercial code generators and AI art generation tools which are increasingly popular. Whereas AI-infusion can be interpreted in different ways, we have identified core concepts which encapsulate its nature, namely augmentation and replacement. Augmentation focuses on assistive capabilities of AI which aims at automating some of the developer’s tasks, while replacement completely shifts the traditional approach in the field to novel practices, with little to no supervision.

We also get a closer look at the emotional responses of human users when it comes to the utilisation and reliance upon AI systems in software development. It is contended that the way in which AI tools are implemented and used within an organisation can greatly affect the emotional response of users. Such parameters include, but are not limited to, the degree to which the tools are able to mimic human behaviour. Indeed, this ability to mimic has the potential to trigger an emotional response like that of human interaction. We conclude that the perception of value and the automation of repetitive tasks are major influencers in the overall acceptance of AI technology.

3 Research Methodology

This chapter will outline the research design of this proposed research study. We will discuss the philosophy we will be using as inspiration, the research approach we will undertake and how we intend on collecting and analysing our data. Furthermore, we will assess the ethical considerations of our research design and its scientific quality.

3.1 Research Philosophy

Qualitative research in information systems could be contented as favourable to the depth and detailed understanding and problematising of real-world phenomena which reconciles organisational theory, technology, and people (Monteiro, Constantinides, Scott, Shaikh & Burton-Jones, 2022). The research philosophy therefore serves as the backbone of any research study, guiding the flow of scientific work. Therefore, we must select a research philosophy that we believe best serves our chosen topic and lets us present our findings in the most appropriate format. Hence why we have chosen to adhere to interpretive paradigms. These paradigms will allow us to acknowledge and work with the subjective thoughts already accumulated in the social world, which we will be able to observe and in turn reconstruct based on our findings (Goldkuhl, 2012).

It is essential as researchers and interviewers that we listen and understand the experiences and emotions discussed with our interviewees, thereby adhering to how Patton (2015) defines phenomenology. We equally believe that everybody lives inherently different lives and has different experiences from one another, providing different perspectives on how they understand a phenomenon. In turn, this ‘melting pot’ of different interpretations will enable us to produce greater results, stemming from our interviewees' diverse backgrounds.

In the case of our research problem specifically, the interpretive paradigm would entail that the use of AI technologies in systems development possess a relationship to the subjective perception and variety of experiences that our respondents possess. Thus, to uncover, interpret and analyse such subjective views enables the problematisation and phenomenological hypostatisation of AI-supported systems development, and more particularly so when it comes to the design and development phases of the Systems Development Life-cycle (SDLC).

Goldkuhl (2012) believes that qualitative research is strongly related to that interpretivism. Given that we will be interpreting interviews from our willing interviewees, we will therefore be using interpretivism to conduct and analyse our data. We will adhere to the process by gathering, presenting and analysing the data before comparing it to what has already been collected (Patton, 2015).

3.2 Research Approach

The research subject at hand could be argued as prone to pose substantially intricate subtleties and complexities which stem from its socio-technical nature, an inherent property of the information systems (IS) field and research (Mansour & Ghazawneh, 2009). Indeed, the

potential ramifications of AI-driven automation from a societal perspective, and more specifically concerning the software development and ICT industries occupations, could be manyfold. Henceforth, under the purview of IS, the investigation should arguably cater for the broad ripple effect and human factor encapsulated by such change. For this reason, the qualitative approach seems most fitting as it would allow shedding light on the multidisciplinary interlinkages offered by this research question (Baskerville & Myers, 2002). Indeed, deeply complex variances, relationships and the primacy of qualitative notions and data will form grounds for this research to be assembled in a manner that is consistent and purports the qualitative method in seeking the truth (Barnham, 2015). This may include, but is not limited to, the perception, opinion and history of stakeholders partaking in this industry. The latter may be directly, or indirectly at times, affected by the question.

In relation to AI adoption in software development, the qualitative approach is befitting for multiple reasons. On the one hand, this technology specifically possesses a highly relevant relationship with the partial human perception (Del Giudice et al., 2023). Indeed, the impact that this technology has, and will have, is intimately intertwined to the replication of human-like cognitive load, including, but not limited to, the replication of skills, ability to reason and derive meaning from information, and creativity (Del Giudice et al., 2023). The way individuals at the front of this paradigm shift in systems development place their views, could provide insightful conclusions as to the potential workforce resistance to this technology, or absence thereof.

The intent remains for the human dimension to be paired with the technological direction, advances, and technical features of AI-supported automation. The manner in which they are used to bolster the performance and replace or enhance organisational ICT-related deliverables and processes, offers the opportunity to uncover relationships that greatly benefit from the thoroughness of a qualitative approach (House, 2018). In the same line of thought, it is appropriate to add that this approach provides the flexibility needed to face the evolution and changes that would come into play when pursuing the question as new elements arise from the ongoing research process (House, 2018).

Notwithstanding its implication for other fields, this subject also pertains to the cause and effect between human occupations that rely upon and contribute to technologies that have the potential to modify the organisational need for such human resources. The qualitative method therefore equally enables to establishment a thorough integration of the triad between organisations, individuals and technology. This creates a sufficient scope which does not restrict the discovery of new knowledge artefacts (Morgan & Smircich, 1980).

There are other considerations that should be addressed thoroughly when it comes to the chosen research method and the subject matter. First and foremost, the qualitative method, in contrast to its quantitative counterpart, may come with challenges specific to its research process (Barnham, 2015). Interviews shall be conducted as the empirical basis for this research, which is why its most salient strengths should be considered, and vulnerabilities known and mitigated for.

Irrespective of the chosen method, aspects such as traceability, transparency as to the data provenance and handling are key for ethical and reproducibility reasons, essential principles when it comes to scientific rigour (Torrington, 2021). The main stakeholders that are initially the target of this research are mainly software development professionals, which can range from software engineers to project leaders and UI designers. The aim is to give an account,

and fair assessment, of the potential differences or similitudes between the workforce types of workloads.

Ultimately, we decided not to use a theoretical framework. Our reasoning for this decision stems from the idea that an inductive approach to our research would be stifled by such a framework. We were inspired by the argument made by (Garvey & Jones, 2021) where it is contented that findings derived from the data in an inductive fashion would be hindered using a theoretical framework.

3.3 Data Collection Methods

As pointed out in the previous section, "Research Approach", data collection via interviewing has been selected as the central method of this research, which offers strong compatibility with the chosen qualitative method (Qu & Dumay, 2011). There is equally a relevant level of symbiosis between the interview process and capturing the subjective perception, sentiment and setting of automation in the ICT-related workplace.

In view of the above, a semi-structured approach to interviewing entails a greater balance between flexibility and rigidity, which enables the derivation of novel and more spontaneous insights, all the while retaining a sufficient level of streamlining and structure (Qu & Dumay, 2011). It also serves effectively in establishing both the greater context, and a detailed account of the protruding and underlying issues or elements, which the interviewer can further explore should they feel compelled to (Qu & Dumay, 2011). This also entails that a great deal of time has been invested in preparing, conducting, debriefing, and making sense of the interviewees produced artefacts and transmitted knowledge and information (Qu & Dumay, 2011). Whilst group interviewing is an option which may reduce the amount of time spent interviewing, our reasoning remains that social pressure would be too far of a risk in shutting down certain individuals' thoughts, all for the sake of conformity, and would therefore quash the unveiling of unique and singular perceptions (Frey & Fontana, 1991). Adoption of AI technology, particularly in the workforce may be considered controversial, which is why it has been deemed important that researchers foster and provide an environment of trust and safety; an environment where free speech and opinions are not subjected to the influence and notion of being politically correct or not. The datasets yielded by the interview process will need to be transcribed and organised in a manner that facilitates the efficiency with which specific parts can be identified and ordered. This can be potentially achieved by using visually efficient visualisations of the transcripts that have a logical flow.

One of the weaknesses of this data collection method, however, is that the potentially biased point of view of the interviewer may invertedly and unconsciously influence the subjects and direction in which the conversation is carried. For this reason, researchers must take all precautions in ensuring that they do not exert such influence, risking the integrity of the good ethics and validity of the interview process.

The development of the interview structure and strategy is deemed to reflect a logical, and efficient, progression on the subject that sets both a judgement-free environment and allows answers to build upon one another. There should therefore be a friendly briefing, the clearance of necessary formalities and consent, followed by the questionnaire and ending with a debriefing that entertains a grateful and reassuring parting between the interviewee and

interviewer(s), all of which will contain techniques such as silences, specific and open-ended questions, amongst others (Qu & Dumay, 2011).

In view of the highly volatile and iterative nature of our interviewing process, which rests on the basis that questions are not hard-pressed but rather the equivalent of guided themes, we did not include a detailed process for our interview guide. In addition, with the absence of a theoretical framework, given the inductive thematic analysis, such interview guide does not reflect any pre-developed theoretical framework. This level of flexibility, therefore allowed to derive questions from the theme without any particular and specific parameters, which therefore arguably does hold, nor warrant, a deep dive in this area.

3.4 Selection of Participants

Participant selection weighs heavily on the credibility of qualitative research that relies on interviewing (DeMarrais & Lapan, 2004). It is therefore key to understanding the criteria used for determining the eligibility of different participants. At this stage, participants should have held an occupation in the ICT and/or software development industry for at least a year, and reasonable professional, or personal, experience for at least one year with AI tools in the context of software development should exist. In addition, participants should demonstrate awareness and a fundamental understanding of AI adoption in the field. The latter criterion is necessary, as forming an opinion on the matter requires some basic level of comprehension and familiarity, at the very least (DeMarrais & Lapan, 2004). Ideally the participant should have relatively recent hands-on experience with AI-based tools or processes directly involved in their professional and/or personal projects. Individuals responsible for the implementation of AI-based tools that directly influence software development and its workflows, are also relevant and may draw a contrasting view on the matter (Bruneliere, Muttillo, Eramo, Berardinelli, Gómez, Bagnato, Sadovykh & Cicchetti, 2022).

Ultimately, we have settled on five participants, all connected by their exposure to software development. They all explicitly agree and wilfully participate in the interview process. The channels and methods employed to conduct the interviews vary in order to accommodate the different participant's requirements and constraints. The below Table 1 illustrates the properties of each interview.

Table 3.1 - Interview Details

PARTICIPANT (P)	JOB TITLE	AGE	INTERVIEWER	INTERVIEW METHOD
P1	iOS developer	41	Charles	Email Exchange
P2	Service desk OS - 24/7 Specialist	26	Charles	Video Call
P3	Web Developer	25	Charles	Email Exchange

P4	Consulting Engineer	26	Josua	In person
P5	Compliance Officer	26	Josua	Video Call

We shall henceforth use the combination "P#:##", where "P#" represents the participant identifier, and the last two digits represent the row where the elements which are referred to can be found. For example, "P1:10" would represent the dialogue row number ten made during the interview with participant number one.

3.5 Data Analysis Methods

Beyond data collection, the aggregated and compiled information should be submitted to, what could be argued as, the crux of the research process, the analysis. To this end, and because the aim is ultimately to explore and evaluate information from such repository, different methods can be used. In this instance, the large datasets that are to be generated from the interviewing type of data collection, paired with the qualitative approach, possess a strong affinity for analysis in bottom-up inductive fashion, which takes advantage of using a thematic analysis (Braun & Clarke, 2022; Nowell, Norris, White & Moules, 2017). Indeed, due to the plethora of possible subjects and types of contributions about AI-infused software development and its adoption in the respective participants' fields, the reliance on coding propels the results' depth and relevance (Gheondea-Eladi, 2014). The process of open coding, paired with a thematic analysis enhances the derivation of meaning by alleviating the necessity of seeding such meaning from existing theories and, quite the contrary, enables the generation of novel observations and theories iteratively from the data (Braun & Clarke, 2022; Nowell et al., 2017; Gheondea-Eladi, 2014). This is equally of particular interest as it increases the probability that the produce of the research contributes to increasing the existing body of knowledge.

To utilise coding to its fullest extent, the process of using open coding with thematic coding and then finally applying overarching themes is used. This process is, in essence, a way to "consolidate" the collected data, and forge an always greater umbrella of sense and ultimately leading to different broader thematics (Braun & Clarke, 2022; Nowell et al., 2017). This method can also be used iteratively, and multiple passes on the same data are possible. However, this research can also benefit from the participation of multiple researchers instead of multiple passes. The implementation of "pair-coding", as described by Paul, Rodrigues & Cicek (2021), has the potential to provide more "insight, time efficiency and credibility". It is a strategy that a common single coding process, regardless of the number of researchers, may fail to contribute to as effectively. The data was therefore initially passed by both researchers independently, where the thematic analysis is implemented. Once achieved, the results were compared, and agreements was reached as to each data snippet and passage. Paul et al. (2021) also raises some challenges that were encountered during the "pair-coding" process. These are hereby acknowledged, and it therefore remained essential to establish a common descriptive language across the coding process.

In addition to coding, and even though the quantitative method is not being used, visualisation of the different overarching themes as a diagram has been implemented. Whilst this is not a mandatory or theory-related endeavour, it eases the process of compiling the coding results, break down the mental complexity involved in understanding the bigger picture that will be generated by the coding mechanisms and provides a visual support for the reader.

3.6 Ethical Considerations

Ethical considerations vary between the different approaches. These range from the collection and handling of data itself, most notably where it is associated with the participants and host organisation, all the way to the measures taken in ensuring that participants are treated fairly, transparently informed about their rights, anonymised beyond reasonable measures, and provide informed formal consent in the absence of any degree of potential duress (Mero-Jaffe, 2011). Ethical considerations do not only affect the quality and integrity of the work itself but could potentially carry deep-running consequences for the institution behind the paper, the researchers' reputation, and ability to pursue research in the future and, most of all, the participants of the study themselves.

In view of the above, the systematic consideration for such ramifications is paramount. Hence, we devised a working method to ensure that the integrity of the research and its actors may never be compromised. This is of course notwithstanding, in the legal jargon, the arising of intervening acts, which would break the chain of causation leading to such ramifications. Aldridge et al. (2010) and Mero-Jaffe (2011) papers offer reasoning for potential procedures which we established and cater, amongst other aspects, for:

- Participant's consent to the collection of the data.
- Contact details and means of communication in case of post-consent repudiation of the right to use the participant's answers.
- 256-bit AES encryption of the data when stored, cloud or local, and processing on machines ascertained as free from malware and possessing the latest security updates.
- Rely on encrypted solutions for communicating sensitive information.
- Disclosure on the purpose for which the data will be used, including information as to how long will the data be stored.
- Copy and confirmation for the use of the transcripts after they have been generated. Amendments are to be performed where requested by the concerned party.

The possibility of recording audio, or producing other digital artefacts, during the interviews is equally an important aspect that should be addressed from an ethical standpoint. Notably, where additional legal protections exist, such as the General Data Protection Regulation (GDPR), currently in effect for European Union (EU) nationals and residents, under which falls any "physiologically" identifiable information (Goberna Caride, 2021).

It may also be noteworthy to make provisions for the reassurance that researchers themselves, whether digitally or otherwise, will not reveal or share the identity of the participants or the organisation under circumstances other than those necessary to the research process and guaranteed by ethics. For example, they shall not discuss sensitive information about the participants at home, in informal or otherwise unwarranted contexts.

As far as the actual research paper goes, all data that pertains to the participants should be submitted to a thorough anonymisation process (Aldridge et al., 2010). This is done to prevent the possibility that some information could leak identifiable features about the organisation, or specific employees (Mero-Jaffe, 2011). In the case of the research subject at hand, participants may be inclined to reveal specific information regarding software tools, which underpins the importance of ensuring that this information cannot be used to trace back the organisation.

3.7 Scientific Quality

An unequivocal alignment between the research question and the field that such research is supposed to contribute to, is key to ensure the quality and validity of said research (Malterud, 2001). This alignment should ideally be consistently reflected across its produced knowledge to maintain the scope and relevance of the research (Malterud, 2001). More specifically in this context, it can be said that the subject falls within the field of IS as it addresses the social component in relation its technical context, and even its organisational implications. Building the interview questionnaires will therefore require to consistently ensure that questions remain centred around the primacy of the research, which should also limit the production of irrelevant data and prevent confusion or negatively impact time efficiency.

Additionally, Malterud (2001) also lays the premise that demonstrable procedures, strategies and methods must be utilised, as they attest to the rigorous compliance to research methods and recognised philosophical currents. Indeed, decisions and the reasoning behind the way in which the research is conducted should equally be justified in the research and academically supported (Flick, 2007). To this effect, horizontal and transparent adoption of such methods should form part of the research and its procedures and should contribute to the reliability and trustworthiness of its findings.

Generalisability is an essential element for the external validity of the research and in achieving scientific rigour (Hays & McKibben, 2021). In this instance, a “naturalistic generalizability” approach will be taken, which would enable the readers of the research to determine the extent to which the findings may apply in other contexts or based on “their previous experiences” (Hays & McKibben, 2021). The scene of AI adoption, coupled with the potentially smaller sampling, may not provide sufficient generalisability. Indeed, the small subset of developers selected for this research does not represent a significant sampling size. For this reason, mitigation is attempted twofold. One, we ensure that the number of details included in the study are extensive and are placed against the literature for discussion and potential corroboration, which should offer enough clear variables that generalisability may be transferred to comparable situations (Hays & McKibben, 2021). Second, the variety of sectors in which the selected participants operate arguably strengthens the degree of generalisability at hand (Hays & McKibben, 2021).

Lastly, it should be stated that quality can also be affected if there is a poor definition and consensus as to the core concepts under the scrutiny of the research. For example, AI-driven automation may apply more obviously in certain contexts, and less in others. Indeed, what defines and qualifies as AI-driven automation? Which tools or situation are considered as being affected or affecting automation, and which may not? Thus, quality will also depend on ensuring consensus, and equally importantly, laying a robust foundation that curtails for the

core concepts which may apply. This is not meant to hinder the flexibility of the research, which also represents a variable within quality.

4 Empirical Results

This chapter will showcase the overarching themes which make up the key results of our research. We shall first present our findings visually with a diagram, this will then be followed by each of our overarching themes being discussed individually in greater detail.

Using the thematic analysis, the iterative process of thematic analysis and coding enabled the derivation of overarching themes, from which concepts and observations may be theorised. To this effect, the result of our analysis yielded five (5) themes, namely varying degree of confidence, hesitant attitude, sense of empowerment, potential workforce ramifications and ethical wariness. The themes codes were colour-coded in the transcripts as represented in Figure 4 below.

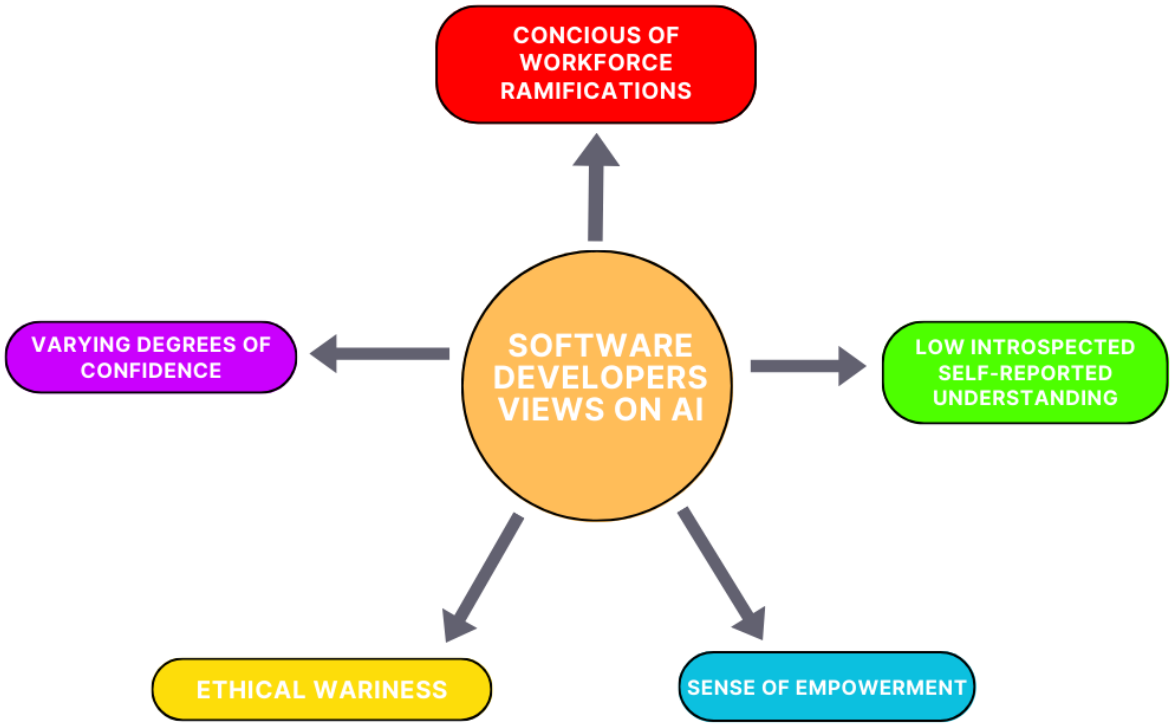

Figure 4.1 – Overarching Themes Diagram

4.1 Varying Degrees of Confidence

One of the most protruding observations that was made during the analysis of our hereby interview artefacts and exhibits, concerned the exuded degree of confidence from software developers towards AI tools, applied to their respective overarching fields. Indeed, a recurring notion conveyed by our participants denoted that they did not perceived tools as constantly reliable, quite the contrary as a rather prone to mistakes and error inducing system. Whilst they did not condemn the tool in its entirety and expressed how useful it is to them, they also did not condone its shortcomings and ability to mislead, thus warranting constant wariness.

Our firstly listed participant provided such a view where they stated that the AI tools they use, ChatGPT in this example, was *"mostly wrong"* and *"delivers false information"* (P1:10). In addition, participant one equally states that there exists a disconnect between the perceived and real-world value of AI in software development, the latter paling in comparison to the former (P1:16). As per the same participant's point of view, AI bias seems to be affecting the confidence they hold in using AI tools (P1:20). More specifically an interesting assertion is that AI would be a strong contender in making decisions, but equally problematic in its own way due to the existence of AI bias (P1:20).

The second interview led to equally interesting statements which highlight the issue of falsification, undermining the degree with which AI tools can be entrusted with. In this instance, this issue of confidence is specifically curtailed within the category of generative AI tools. More specifically *"[…] Chat-GPT will just lie if it doesn't know the answer."* (P2:16). There seems to also to exist a weaker affirmation as to understanding why exactly the tool provides what it provides, and whether the onus is on themself or on the AI for being unable to understand the prompt (P2:20).

On the third transcript, the struggle of receiving useful and correct information from AI tools is also mentioned, thus reinforcing the sentiment that one cannot be confident when relying on such tools (P3:16).

The fourth interview was enriched by the participant's willingness to expand on the subject and delve into the details of their views on the matter. Furthermore, this particular participant contributed with additional managerial and substantially informed perspectives, thus diversifying the pool of interviewees with more organisational seniority. As such, there is mention of the impression that taking the output of AI tools for granted is unacceptable, promoting instead a remedy encompassed within training and fact-checking (P4:28; P4:64).

Where coding specifically is concerned, the same interview led to the conclusion that the generated code in popular programming languages was outright not functional or was very far from what the user needed and requested (P4:30). This strongly supports the premise that confidence is eroded.

Finally, the fifth interview stresses the requirement for reliability where software development is used in highly regulated and sensitive industries, such as finance (P5:12). A salient concept resurging is the unofficial, and almost covert, use of AI in the workplace. This participant also corroborates the overall confusion which stems from interacting with such tools, placing the user in a situation of doubt as to where the issue lies or why the tool did not work at this particular time (P5:20). Is also mentioned, the inconsistency of providing the same information, and yet receiving completely different answers, at time erroneous ones which are portrayed as correct beyond reasonable doubt by the tool itself (P5:20).

In a more contradictory statement, our fifth respondent equally mentioned that they find the tool to be very usable and *"[…] easy to go on and about your code"* (P5:12; P5:14). Therefore, it seems that whilst most of our answers convey a fragile confidence and trust, other statements mention usability as being strong, hence contradicting the former assessment.

Interviews four and five equally bring under the spotlight the potential relationship between the expressed lack of confidence of developers and the covert fashion in which the AI will

"hallucinate" and affirm misleading or false statements just as if they were factually accurate. This is in the stead of simply not stating that which is not known, which is ever more challenging to identify when the answer is factually partially correct and partially incorrect (P4:28; P4:64; P5:20).

4.2 Low Introspected Self-Reported Understanding

An interesting observation we made during the coding process was the responses participants gave regarding their understandings of the topic of AI. Although everyone claimed to have a "*basic knowledge*" (P3:6) of AI (P5:10), we noticed that a few of the participants were quick to stress that they did not have extensive knowledge or did not know that much about it. Whether it be that their comprehension of the topic was "*Lukewarm*" (P2:6) or that they were "*[…] not as obsessed with it as many others seem to be at the moment"* (P1:6). It was clear to us that some of the participants were reluctant to present themselves as knowledgeable in the area. Some participants were quick to contradict themselves regarding how much they have interacted with AI (P3:8; P:14) whilst others appeared hesitant towards the concept of AI itself, saying:

> *"I struggle a bit with the term AI because people and companies tend to throw it around nowadays as a blanket term. Things that used to just be called an algorithm, or just some sort of code, are now [considered to be] AI."* (P1:14)

This response indicated to us that there is a sense of uncertainty when it comes to comprehending what AI is to those working in or close to the software development field. This possible overreliance on the term may have caused greater confusion within the field of software development and more generally the ICT industry, leading many people to feel uncertain towards how best to describe AI.

We also noticed that it was often the individuals who proclaimed to have a limited grasp of AI that went on to exhibit a good understanding of the topic. Going so far as to discuss in depth the more recent developments within the field of AI. In our opinion, this demonstrated confliction in how they perceive the concept of AI or at the very least were somewhat reluctant to admit how much they comprehended. Although some of the participants did clarify that their grasp of the fundamentals of AI might be better than your '*[…] average joe*' (P2:6).

However, we did have one interviewee who had no problem claiming to greatly understand the concept of AI (P4:14), it should be worth noting this individual does have a managerial position. Their occupation is seemingly in stark contrast to the other participants in our research. Who were either relatively new to the ICT industry (P2:2; P3:2; P5:4) or may not be currently bound to same business hierarchical structure daily (P1:4). It was implied to us that this awareness came comes from a need by those in managerial positions to be in touch with the constant developments in the field of AI (P4:66). Alternatively, this somewhat unique response in our research may relate to varying levels in confidence found in the different roles of software development. This respondent did mention however that they believe they hold an "arrogant" view on the matter, referring to their ability to understand how to use AI correctly compared to other software development professionals (P4:26)

Though it is hard to say exactly why most of the participants showed uncertainty towards AI, and by extension its adoption in software development, it was clear to us that they did have some level of interest or at the very least, curiosity towards the topic. This could be based on how much they all knew, despite some indicating otherwise.

4.3 Sense of Empowerment

Throughout the aggregated interviews, it was noted that, despite the contention of weak confidence in the tool's result itself, our respondents almost consistently expressed a sense of empowerment. Such sense of empowered seems to stem from claims of increased time-efficiency, ability to do more than and enabling them to focus on the things that matter most. Therefore, even though there is allegedly little confidence in the quality of the output, such AI tools are considered to also yield useful and beneficial results at times.

For the first interview, there is a single reference to speed where, in the context of using Apple's M series chips, the advantages of using machine learning in software development has enabled the ability to find previously difficult to implement functionalities. In their words, it *"[…] allows us to do certain features in apps and so, that really wasn't possible before."* (P1:18).

The second interview, states that AI tools equally *"[…] bring[s] efficiency to information gathering first-hand"* (P2:14). Such statement supports the premise that there is a shared and acknowledged understanding that many tasks which are different in nature, i.e., information gathering and functionality implementation, are benefiting from the adoption of AI from a software development perspective.

Where the third interview is concerned, the respondents mention the use of AI for shortening the entire software development life cycle, which implies the need for a variety of different tools. Indeed, the *"analysing time complexity"* and *"alternative code suggestions"* are mentioned, which could be argued to work together, presenting a more holistic approach to AI adoption (P3:38). It should be noted that this statement is reflected upon by the respondent in a more hypothetical capacity rather than through experience and should therefore be considered as such.

During the fourth interview, multiple references to an increase in overall efficiency, time saving and *"achieve more with the same [number] of people"* (P4:58). This view is further stressed where the respondent raises the notion that view AI in their field as substantially useful in removing a layer of repetitive and, what they deemed as, boring tasks (P4:34). This is especially true where tools such as Github Copilot have the ability of *"[…] writing boilerplate code […] very quickly"* (P4:34).

Interview number five supports the pattern detected in other interviews, where the tool is perceived as both flawed, and helpful concurrently. In the words of the respondent themself, they deem it as *"[…] very useful in software development, even though it's not perfect."* (P5:29). Again, the concept of time is of prime importance, going as far as mentioning the ability to complete tasks in minutes instead of days when using AI for large datasets (P5:31). They speak of AI adoption as a game changing tool, and it is later compared against the

advent Excel processing software, thus automating much of the initial paper-based manual information systems work in organisations (P5:33).

Overall, woven across all interviews exists the ambivalence of confidence and empowerment. In the case of the latter, we identify a perceived perk for time saving, as well as the ability to achieve more work all whilst supressing a layer of repetitive and monotonous workflows.

4.4 Conscious of Workforce Ramifications

Based on our findings from the research we carried out, the respondents all had differing views pertaining to how AI adoption would impact developers within software development, and by extension the ICT industry. Though they all noted at various points throughout the interviews that AI was useful for software development. However, the extent to which it could impact the demand for developers was also discussed multiple times. Particularly concern was directed at those attempting to enter the industry. One interviewee stated:

> *"Instead of having teams of fifty programmers on a project, you might see ten or eight or something like that. It's not gonna completely go away. Personally, I believe not yet but in the future like two to four years from now. You can see the amount of programmers getting hired for entry-level positions being a lot less"* (P2:40)

Similar sentiments were echoed in other interviews regarding concerns for low skilled or inexperienced developers (P4:60; P5:45). There was also the thought that the reduction in developers in favour of AI may stem from more demanding workloads that human developers may struggle to keep up with (P3:28). This idea of meeting more deadlines was occasionally attributed to corporate greed (P2:40; P2:56), with one interviewee finding the recent layoffs at one major technology corporation somewhat suspicious, given the recent developments in AI (P4:62). Although, the cost of running AI technology at work for some companies was the reason why one respondent has not already used it at work (P3:12). On the other hand, another respondent noted that AI may offer a lot of value to startups or smaller companies with limited industry experience the ability to produce better high quality, more professional looking results. A feature like this could prove to be advantageous when starting out (P5:37).

When it came to concerns for the current and possible future workforces, one interviewee said that they believed that the role of developer may evolve into something completely different altogether (P1:28). Later stating, that greater AI adoption in software development may be what is necessary to force humans out of the world of work altogether, forcing us to instead focus on enjoying life and reflecting on what really matters (P1:40).

We also detected a feeling of pride for the human contribution made in software development and the wider ICT industry. One such interviewee even proclaimed themselves as being 'irreplaceable', citing our inherent desire for human-to-human interaction (P2:8; P2:16). This notion of value found in human developers was by the third interviewee, who dismissed AI as simply *"[…] another tool"* (P3:22). Respondent two went further when describing what they thought regarding the idea of AI replacing humans, saying that AI "*[…] is never a person, it's never a pilot, but it is a very good steering wheel"* (P2:60; P2:62).

In relation to the idea of human input, we noticed that the interviewees all had interesting thoughts pertaining to AI produced art. There was particularly strong sentiment towards AI art not being recognised as a valid art form altogether (P2:36), although it could serve as a good reference or provide a rough outline for artists, echoing the sentiment that it is just another *"[…] tool to help you"* (P2:36). Interviewee one even claimed that it is shows us that what humanity *"[…] believed to be uniquely human - the creative outlet - is about to become "not unique" anymore"* (P1:26). Whilst others felt somewhat conflicted when it came to considering how AIs creative abilities may impact software development, particularly front-end development (P4:56).

4.5 Ethical Wariness

The subject of ethics is of particular interest, for what an individual may find ethical or unethical has the potential to greatly influence its view, opinion, and the probability that such an individual would be accepting of a particular situation, artefact or otherwise concept (Lin-Hi, Haensse, Hollands & Blumberget, 2023). Upon analysing the interview results, we found that the subject of ethical AI adoption engendered different point of views as to the potential for moral dilemmas.

Concerning our first interview, the respondent approaches their ethical considerations from an AI bias standpoint. Indeed, they state that *"[…] I think a technology that is unbiased can really turn the looking glass at ourselves, as humanity."* (P1:24). They do so on a very positive note, highlighting the potential to quash human bias. Further, they promote a more in-depth approach to determining the positive or negative implications of AI on humans, prone on a more optimistic view where a *"political and philosophical"* reasonings are needed (P1:40)

The second interview led to additional comment as to the ethical outlook on AI adoption in the field, as such a distinction is made between text generated information and image generation using AI (P2:30). The respondent mentions will also emphasise the issue of training AI datasets upon copyrighted materials, where the word "stealing" is used multiple times under multiple forms (P2:30). From this point of view, ethics exist mostly in the case of artistic and creative assets, even though it should be noted that copyrighted digital artefacts are not strictly limited to digital art.

Our third interview is quite brief on the subject, yet they mention that they *"[…] would include human oversight when moral issues are involved"* (P3:24). The notion of including human intervention or supervision where AI tools are adopted is thereby nuanced to entail areas where moral issues exist, yet they do not provide examples to support their claim and illustrate where exactly that might be the case.

On the other hand, the fourth instance expands much further onto the specifics of ethical considerations and state that they give "value", or in other words importance, to ethics where AI adoption is concerned (P4:52). Despite claiming such an interest, they equally mention that they do not *"[..] feel much yet"*, further conveying that although they apprehend the ethical future of AI, the current situation has not devolved into an ethically compromised situation just yet (P4:54). There is wariness as to the issues of ethics, and one of their wishes for future AI growth would be to focus on the primacy of the ethical interest (P4:70).

There transpires a different point of view from the last interview transcript, where ethics are only discussed from a plagiarism point of view. Even more so, the subject is tallied with AI generate creative works (P5:37). This, subject which seems to be touched upon by almost all respondents where ethics are concerned, is a prominent aspect of our analysis. There seems to be a fine line where outright ban of the AI adoption for creative workflows in software development may not be ban, on the contrary its potential is acknowledged, but giving credit to authors is viewed as major point of contention against such adoption.

Ultimately, whether respondents curtailed the ethical implications of AI adoption within a particular opinion or school of thoughts, they almost all demonstrated an acute interest and were keen on positioning themselves in that area. They therefore demonstrated that the moral aspect of such an adoption could not be dissociated with the subject.

5 Discussion

This chapter contains the reconciliation of our empirical findings and the existing literature. Each chapter discusses the overarching themes order to draw relationships between thematic-analysis-derived concepts and existing theories and research. Last but not least contrasts and contradictions between certain insights are explored further.

5.1 Context

5.1.1 Varying Degrees of Confidence

More broadly, the concept of confidence and trust in AI tools from a user perspective applies thoroughly. Research appears to corroborate a more generalised and horizontally disseminated concept, which supports the premise that confidence plays a fundamental role in most socio-technical environments submitted to the adoption of AI tools (Bitkina, Jeong, Lee, Park, Park, & Kim, 2020). Furthermore, confidence in such contexts encapsulates "trust, usability and utility" (Bitkina et al., 2020).

As for software development specifically, a vast majority of the literature regarding software developers' confidence towards the use of AI tools in their field is relatively recent, given the landmark rise in advanced AI-assisted software development tools (Cheng, Wang, Zimmermann & Ford, 2023; Wang, Cheng, Ford & Zimmermann, 2023; Team Tabnine, 2022). More particularly, some relevant findings convey the critical and socio-technical nature of maintaining confidence and trust from software developers to fully harness the potential of such tools (Cheng et al., 2023; Wang et al., 2023).

In view of the literature, and as previously observed, the adoption of AI in software development has denoted the existence of a delta for the developers' views when it comes to their confidence in AI adoption for their field. Whilst there is a notable penchant for low levels of confidence, such notion does not rest exclusively upon one side of the axis (P4). In some instances, our respondents expressed their fondness of the high usability and performance of the tool, which entails that there is no complete consensus, but rather a majoritarily shared perspective. This inconsistency does support the conjecture that confidence in the usability of the tool does not alter the motivation nor perseverance of its users in a significant way.

Notwithstanding this contrast, most of our respondents strongly convey low levels of confidence in the tools, especially where accuracy and factual correctness are concerned. An interesting basis which seems to stem from our analysis and is purported by the literature concerns the concept of explainable AI, or the acronym XAI. In fact, where AI systems mostly operate as "black-boxes", the reasoning and process leading to the output of such systems can be intricately intertwined within neural networks, which result in unexplainable results then accepted at face value (Waltl & Vogl, 2018). Respondents of the second, fourth and fifth interviews have shared their confusion when it comes to some of the results, they get from the AI tools they use. They mention explicitly their inability to assess whether unhelpful results originate from the way they prompted the system, or if the system itself is deficient for

this subject. This illustrates that the "black-box" effect purported in the literature affects confidence levels of software developers using AI systems in their fields.

In addition, the related experience of misinterpretation of the users input and having to learn "how to talk" to the AI could be contended as defying the very purpose of human-like dialoguing capabilities and interfaces of such tools. The latter being arguably one of the strongest assets of modern AI tools. In addition, such an application of AI often offers a "single source of truth", compared to say an search engine or otherwise when informing or assisting software development (Munn, Magee & Arora, 2023). This could provide grounds to speculate on the notion of confidence being affected: where multiple results are immediately listed, accessible and compared, versus a single answer which must be developed further or questioned by the user, a potentially more tedious and unenticing endeavour.

In summary, we determine that software developers view, for the most part, the utilisation of AI tools in software development, and at large, with varying levels of confidence. This includes a predominant observed lower level of said confidence.

5.1.2 Low Introspected Self-Reported Understanding

An important aspect of developers' views on AI equally caters for their internal perception of their level of understanding for the concept itself. To this effect, literature on the matter is sparse, although not inexistant. Thus, one of the studies to be considered for a baseline would be from Fortuna & Gorbaniuk (2022), where a comparison between software development IT professionals and non-IT professionals self-reported overall understanding of the concept of AI was assessed. The findings of this study portray an increased curiosity and motivation for software developers to improve their understanding of AI all whilst demonstrating a lower self-reported understanding of AI concepts (Fortuna & Gorbaniuk, 2022). More specifically, the research states that:

> *"[IT professionals] […] can be described as experts […] not only because of their professional experience, but also because of their subjective beliefs, the indicators of which are the higher self-esteem of knowledge and familiarity of AI exemplars. [IT professionals] showed greater caution in terms of the overall assessment of the typicality of AI exemplars [which] […] were not correlated with the familiarity scores […]" (Fortuna & Gorbaniuk, 2022).*

In other words, there exists a distinction where software development professionals affirm a high level of familiarity with the concept of AI, and yet will introspect an understanding which is lower than, or on par to, their laymen counterparts.

Such findings from past research, carries tremendous reverberations which befits the findings of our analysis. In the case of our respondents, all apart from one, would affirm that they are met with some level of struggle when it comes to understanding what AI is, or what the adoption of such tool's entails. Further delving into other responses in the interviews, we have been able to assess a level of understand of the concept of AI which stood superior to that which they claimed.

More specifically, respondents 1 and 2 were the most critical when it came to their own understanding of the concept of AI. It is contended that the software developers interviewed

in this paper view AI as a challenging concept to fathom or reason with, even though they have demonstrated they hold a higher command it than they reported.

5.1.3 Sense of Empowerment

Whereas AI pair-programming is considered a novel technique which integrates human and machine-generated code, its central aim is to enhance the efficiency and effectiveness of software developers (Peng, Kalliamvakou, Cihon & Demirer, 2023). Moreover, the literature reports upon the potential for developers to learn new skills and frameworks by providing code examples and explanations in real-time (Peng et al., 2023; Imai, 2022; Bird, Ford, Zimmermann, Forsgren, Kalliamvakou, Lowdermilk, & Gazit, 2022).

The same literature, however, also advances the existing ambiguity and uncertainty as to the existence of evidence which could propel such claims beyond reasonable doubt (Imai, 2022; Bird et al., 2022; Jaworski & Piotrkowski, 2023). Research at the present stresses the tendency for the AI assistive system to be largely inaccurate or provide irrelevant suggestions (Imai, 2022). The importance for a matured and acquired symbiosis between the user and the assistive tool is thus also discussed (Bird et al., 2022).

The latter aspect of such ambivalence in the literature is previously brought forward in view of our results for the level of confidence developers place in such AI tools. As for the former, our findings support the premise that developers view in majority a salient sense of empowerment and the ability for such systems to alleviate tedious and menial tasks, such as writing boilerplate code, debugging errors, and searching for solutions online.

Our second, fourth and fifth respondents attest of their experience in an unequivocal tone, and even though the tool is criticised, they convey that they ultimately benefit from its intervention and find themselves accomplishing more than they would have had otherwise. More specifically, the fourth and fifth respondents mentioned the ability for the tool to cater for redundant and repetitive tasks which they find unappealing. This perspective has also been specifically mentioned in the literature where "[participants] were successful in using the AI programming assistants to generate repetitive code, such as 'boilerplate [code]' (Liang, Yang & Myers, 2023).

5.1.4 Conscious of Workforce Ramifications

The effect of AI on the labour market at large, and the potential ripple effect of the abrupt transformation it carries have been widespread subjects of contention in past decade, and even more so during the past few years with the advent of generative AI (Morandini, Fraboni, De Angelis, Puzzo, Giusino & Pietrantoni, 2023; Willcocks, 2020). In the case of software development specifically, the literature acknowledges the field as hosting tremendous potential for AI adoption, a topic of discussion held both independently, and in view, of new generative models and advances (Korzeniowski & Goczyła, 2019; Imai, 2022)

The views conveyed by our respondents hold a pattern where they consider themselves mostly shielded from major disruptions are downsizing, as such it is specifically stated by our first, second, fourth and fifth respondents. Despite this, they also shared that they are concerned about the impact that AI will have on the workforce and tend to place more emphasis on the creative side of AI tools, mainly front end, and artistic digital assets creation in the context of

software development. Morandini et al. (2023) address the multifaceted nature of such implications, which supports the views expressed by our respondents where they advocate for a balanced and interdisciplinary-conscious implementation of such tools to limit the potential for societal damage of an aggressive adoption of AI.

In the same line of thoughts, respondent four placed forward their doubts as to the official reasoning behind their organisation's current downsizing process. Instead, they believed that AI may be responsible for this sudden restructuration. This could be an example of drastic AI implementation, which disregards the recommendations and findings of the literature.

Another area where our respondents and the literate coincide lies within the most vulnerable roles based on hierarchy and overall experience. Indeed, just as respondents two, four and five stated, Jaworski & Piotrkowski (2023) affirm that their findings led to an anticipated greater negative effect on entry level roles. The shared view appears therefore to be that inexperienced or junior roles in software development are mostly likely to incur ramifications from the adoption of AI in the field.

5.1.5 Ethical Wariness

The potential ethical implications of AI adoption in software development are assuredly complex by nature, and the literature on the matter raises essential matters, including, but not limited to copyrighting (Vincent, 2022; Flick & Worrall, 2022; Škiljić, 2021).

On the one hand, astronomic swaths of data are necessary to train AI models, more so where generative AI is concerned (Naveed, Hashmi, Tajved, Sultan & Imran, 2022). To this effect, criticisms have mounted against due to the largely absent crediting of sources used to produce specific AI outputs, which in the case of code suggestion has even harvested open-source code, directly breaching their redistribution licenses (Vincent, 2022).

Where art and creative assets are concerned, the ability for modern AI art generation to produce outputs which adhere or copy artists signature or "fingerprint" artistic styles is problematic, which is an issue not strictly concerned to copyrighting, but rather includes it (Flick & Worrall, 2022; Škiljić, 2021).

Coincidentally, respondents when queried on the matter all showcased a pre-existing familiarity with the issues of copyright and ethics pertaining to the use of AI, especially in the case of generative AI. Respondents one, four and five demonstrated an increased understanding and strong interest in the matter, where the concept of reusability of pre-existing data was mentioned. Respondents also tend to also support areas of the literature which criticise the unrestricted use of data under the pretext of public access and licensing (Flick & Worrall, 2022; Škiljić, 2021).

Our respondents also recognise the potential and technological feat underlying the tools, which may show willingness to compromise and find common grounds in order to benefit from said potential.

5.2 Further Observations

5.2.1 Contrasting Results

Whilst we believe that our findings offer interesting observations into how software developers and those in the industry view AI adoption in software development, we also detected some opposing concepts in our results which we intend on addressing.

One such example of contradictions is situated within our second and third finding. As they seemingly suggest that developers feel both hesitant towards AI and equally empowered by it. Such hesitancy could come from AIs impressive capabilities, with it being able to perform so many tasks within software development alone, such as coding, testing, and deploying software. It is therefore possible that developers may feel reluctant to say with confidence that they grasp all aspects of what it is, despite understanding it quite well. Alternatively, with all the abilities it possesses, there is a chance that they may feel hesitant towards all matters pertaining to AI as it has the possibility to affect their own or others career prospects.

Contrary to their hesitancy towards AI, our findings also suggest that software developers feel greatly empowered by it. This feeling appears to stem from AIs argued ability to further enhance productivity and increase efficiency, whilst providing the user with industry quality work (Peng et al., 2023; Imai, 2022; Bird et al., 2022). These features can seemingly provide the developers with a sense of empowerment when it comes to their work. They may also feel that being so empowered by AI can allow for them to relax more as the tool has alleviated them of a chunk of their workload.

Such feelings of empowerment brought on by AI technology are further contradicted with another of our findings suggesting that software developers seem to lack confidence when it comes to using AI in their field, as they view its output as untrustworthy.

6 Conclusion

Our concluding chapter presents our final, closing thoughts on our research. Then we discuss some of the limitations that we believe may have affected our study and subsequently our results, before closing the chapter with some advice for future researchers exploring a similar topic.

6.1 Final Thoughts

The goal of our research was to uncover the views held by software developers regarding the adoption of AI technologies, with this in mind our research question was:

"How do software developers view the adoption of AI technologies in Software Development?"

We believe that our study was able to successfully capture and present their thoughts in an appropriate and respectful way. The findings suggest that software developers have mixed and somewhat contradictory views on AI adoption. They also recognise the potential benefits brought forth by AI, as it can improve their productivity, efficiency, and overall quality of work. Despite this, there was a lot of concern directed towards the level of confidence they can hold in the tools, as well as potential ethical, societal, and professional ramifications of AI adoption in software development.

The paper contributes to the ongoing discussion regarding AI adoption by providing the views carried by software developers', whose experiences reflect the wider research context. The paper has also made use of the thematic analysis approach in qualitative research, as we were able to uncover the developers views organically, lending further credence to their authenticity.

We found that their overarching views on the matter of AI adoption, pertaining to their varying levels of confidence, low introspected self-reported understanding of the concept of AI, sense of empowerment, potential conscious to workforce ramifications as well as ethical wariness. We equally established that their views in many instances have corroborated existing literature on the subject, in addition to highlighting contradictions with other views and the literature.

6.2 Limitations

Upon reflection, there were some limitations in our research that were initially not consider when outlying our research goals in the first chapter. The first of which stemmed from the limited time we had to work on the project, as this meant that we had to be very flexible when it came to how the interviews were conducted. Therefore, we detected that the levels of enthusiasm and engagement from participants varied, with the ones who were able to be

interviewed in person or over video call provided us with rich data. This was most likely due to how those interview formats allowed for us to press them on their responses and request further elaboration. Whilst the interviews that were conducted over email exchange as a result of the respondent's availability, provided us with less data due to the sometimes blunt or direct responses that we were unable to press them further on. Therefore, the results we obtained from these interviews were somewhat inconsistent.

When conducting the interviews, our interview guide was built upon the premise that all AI-based tools were to be considered as a valid basis for AI adoption in software development. Further conducting the interviews in absolute impartiality meant that interviewees placed, out of their own volition and without constant external influence, a substantial emphasis on generative AI specifically. In order not to temper with the respondent's point of view and foil our results' validity, the interview attempted not to stress the importance of addressing one kind of AI model over another.

This realisation is deemed as noteworthy, considering the interviewees have mostly portrayed the implications of AI tools in software development to exclusively connote recent generative and LLM-based tools, including, but not limited to, ChatGPT, Github Copilot and Midjourney.

Additionally, from the interviews arose an organisational parameter concerned with the adoption of AI tools; indeed, their official use is prohibited or at the very least heavily controlled within the professional environment of most respondents. The particulars involved as the reasoning for this situation may not be generalised at this time and would advocate for additional extended research on the subject, providing a more organisational perspective on the matter. It could also be conjectured that this organisation-wide stance stems from fear of regulatory repercussions, or that the tool is not yet mature enough to be officially incorporated.

6.3 Future Research

Considering the limitations that have already been discussed, we would suggest that any further research into this area should such include a greater sample size to include more individuals who work in the field of software development, particularly those with different positions in the field. This would allow for further exploration into other aspects of AI adoption in software development. To ensure greater consistency with the data from such interviews, we would also strongly encourage future researchers to refrain from conducing the interviews in different ways.

Appendix: Interview Invitation

Hello,

We are Master's students currently studying Information Systems at Lund University's School of Economics and Management (LUSEM), under the supervision of Professor Saonee Sarker, Department of Informatics, LUSEM.

The aim of our thesis, titled: AI-based Automation in Systems Development intends on understanding how System Developers feel about the rapid evolution of Artificial Intelligence (AI) and how the arrival of such automation might affect their current line of work.

We would be most grateful if your organisation would be interested in collaborating with us on this endeavour. Our project involves conducting a series of short 30-45 minutes interviews with a few software developers, UI designers and managers. This process may be conducted anonymously at your convenience.

We believe that hearing from those currently working in the industry could provide us with valuable insights into how AI is currently perceived and utilised within the ICT industry. A company such as [Company] is in an ideal position to give us valuable first-hand information from its perspective.

The interview can be conducted in various ways depending on your schedule. We could interview in person, over video-conferencing or by letting you respond to our questions with an email.

Please note, there will be no compensation for participating in this study. However, your participation will be of great value to our research in information systems, and we will be more than happy to share our findings with you accordingly.

If you are interested in participating or require any additional information, then please get in touch with us.

Thank you for your kind consideration.

We look forward to hearing from you.

Sincerely,

Charles Collins and Kémaël Josua Kauppaymuthoo

Appendix: Questionnaire

1. How old are you? How many years of experience do you have in the field of ICT?

2. What is your current professional title? What does your role involve?

    - Work us through your typical day at work, what do your tasks involve? What tools do you use?

3. How familiar would you say you are with the concept of Artificial Intelligence (AI)?

4. What experience do you currently have with AI technologies in your projects?

5. If you could choose a specific AI technology to use in your professional toolset, which one would use? Please explain why that would be the case.

6. Do you welcome AI in your professional field?

7. Are you currently using AI tools in your personal life?

8. Have you faced any challenges when using AI, if so, how did you overcome them?

9. What are some of the benefits you have seen with AI in Software Development?

10. In your opinion, what are some of the most exciting AI technologies that are available today?

11. Could using AI technologies influence how you feel about your work?

12. Is it important to ensure that the AI technologies you use are ethical and unbiased in their decision-making?

13. Do you believe AI art generation works against, or on the contrary enhances, the ability of professionals to be creative in the case of designing interfaces and products?

14. Considering AI programming capabilities, do you believe that the number of employees that businesses will need to carry out projects will be impacted in the future?

15. How do you see the current state of AI evolving in the next few years?

16. Are you staying up to date on the latest developments and breakthroughs in AI technologies?

17. How can you see AI changing your job in the future? How do you feel about this?

18. On a more general level, what would you do differently regarding the development of AI?

19. Can you think of any area in software development and design which would benefit or be further enhanced by AI

20. Considering this interview, do you perceive AI as a good or a bad technology for software development? (Explain why).

Appendix: Thesis Interview - Confirmation of Participation

Please read the following information and sign below (digital signatures are accepted):

By agreeing to participate in this interview, you acknowledge that you have understood the information presented to you regarding this study's purpose, nature, and procedures. You equally recognise that you are participating voluntarily and have the right to refuse or retract your consent at any time during or after the interview without penalty or retention of your data.

You understand that the data collected from this interview will be used for the purposes of research and may be published or presented in an academic setting. Your privacy and confidentiality will be protected by anonymising any identifying information collected from you during the interview. This means that your name, location, and other personal information will be kept confidential and/or redacted accordingly.

You acknowledge that you are participating in this interview without any expectation of financial or other compensation and that you are not waiving any legal rights you may have because of your participation in this study.

If you have any questions or concerns about participating in this study, please do not hesitate to contact Charles Collins or Kémaël Josua Kauppaymuthoo at any time. Thank you for your participation; we look forward to your answers.

Full Name:

Signature:

Date:

Appendix: First Interview Transcript (P1)

LINE	PERSON	CONTENT	OPEN	THEMES
1	Interviewer	How old are you? How many years of experience do you have in the field of ICT?	-	-
2	P1	Forty-one, but I feel like twenty-seven. I've worked within the field of IT since 2001 when I started out as a web developer, an IT admin, as it was called then. So, I guess we could just call it twenty-plus years.	N/A	N/A
3	Interviewer	What is your current professional title? What does your role involve?	-	-
4	P1	As I am self-employed, I don't really have a title in the strict sense, but I'd call myself an iOS developer, app developer, web developer, full stack developer, etc. It depends a bit on the context. During my last employment, I think my title was Lead Developer or something like that.	N/A	N/A
5	Interviewer	How familiar would you say you are with the concept of Artificial Intelligence (AI)?	-	-
6	P1	I am not as obsessed with it as many others seem to be at the moment. But of course, there is a chance that I am a little more familiar with the concept than your average person, seeing that I work within the broader field of computers and stuff. For a little while there I was reading up a bit on neural networks and whatnot, but I think I am more of the person that needs to see its use within the boundaries of some sort of product.	Limited interest, better judging it in practice	reserved, refrained
7	Interviewer	What experience do you currently have with integrating AI technologies into your projects?	-	-

8	P1	I'm not too familiar with it as in having worked with it. I think as an app developer there are so many things you have to build before you even end up at something that is specifically AI. I guess looking at an app or website as a whole, any AI aspect would be fairly small, generally speaking. As I don't have a specific "interest" in doing AI development it means I haven't come across it that much. However, as a hobby photographer I've been thinking that it should be easier than it is to sort, group, find themes & sequences and such, with your photo library. So recently I started working on a side project to see if I can make an app that can help with that. And that seems like something that should be possible by using AI in terms of machine learning models. But it's still a pretty small amount of experience I've accumulated	Interaction, minimal use of AI, personal projects, work life balance	distant, selective
9	Interviewer	If you could choose a specific AI technology to use in your professional toolset, which one would use? Please explain why that would be the case	-	-
10	P1	I have actually started to use Chat-GPT instead of asking Google about things, related to work. It's a bit of an experiment, but it's evident that it has value outside of the information it provides, and that is that it's possible to have a dialogue with it. I think there is something that happens in your own brain when you have to explain a problem to someone, I think it's even a thing, "talking to a rubber duck". So that is quite interesting. But, just as with Google/ Stack Overflow, you still need experience to judge the information you find, because so far, it's been mostly wrong, just as people on stack overflow are. But it's possible to get a hint that helps	Trial and error, interaction, phrasing issue, scepticism,	experimental, unease

		solve the problem, just as a discussion with a colleague		
11	Interviewer	Do you welcome AI in your professional field?	-	-
12	P1	Well, if I think about it in doomsday terms with me losing my income because Chat-GPT has become an app developer, then it's a bit scary of course. But realistically speaking I think we still have some ways to go before it can build a whole application at today's standards and also that I guess I'd just have to learn something else. I try to think that for each thing we don't have to do, we can do something else, potentially more fun, rewarding, and valuable.	Concern, replacement, not yet a problem, retraining, alternative career, more rewarding	doubt, potential
13	Interviewer	Are you currently using AI tools in your personal life	-	-
14	P1	I struggle a bit with the term AI because people and companies tend to throw it around nowadays as a blanket term. Things that used to just be called an algorithm, or just some sort of code, are now [considered to be] AI. I use Apple Siri a little, which I guess qualifies as AI. I use Tibber for electricity price optimization (they call it AI; I think of it as just an algorithm). Obviously, as a software engineer, I must drive a Tesla - I guess it's full of AI in both known and unknown ways. Elon even claimed we'd have fully self-driving cars on the road at the end of 2020 or something, so that seems to be going well.	Reluctance, marketable, trendy, better naming alternatives, algorithm, code, automation, scepticism	hesitant, accessibility, misleading
15	Interviewer	Have you faced any challenges when using AI, if so, how did you overcome them?	-	-
16	P1	When Siri first arrived in Sweden, it was essentially useless because it didn't understand my accent. It has an easier time, even today, with my	Limited success, accent bias, impressed, misinformation,	potential for improvement,

		partner's accent which is more like TV-Swedish from Stockholm. And I think overall it just... I don't know, it's not that good. Chat-GPT, it's really impressive in the way it communicates, but it delivers false information etc. I think there is a bit of a mismatch between how people describe how fantastic AI is, and how fantastic it actually is in use. I think it needs very specific framing to bring real value.	limited understanding, need better product assessment	annoying, misleading
17	Interviewer	What are some of the benefits you have seen with AI in Software Development?	-	-
18	P1	I'd say mostly in machine learning as it really allows us to do certain features in apps and so, that really wasn't possible before. The speed at which images can be analysed for example, using apples CoreML running in the neural engine is quite impressive. I can see something like Github Copilot also bring a value, speeding up the workflow, but I haven't tried it.	New possibilities, speed, limited usage	potential, efficiency, distant
19	Interviewer	In your opinion, what are some of the most exciting AI technologies that are available today?	-	-
20	P1	Not sure, the language model thing like Chat-GPT is quite interesting of course, especially if a voice assistant would be as good as Chat-GPT. But I still think image analysis is one of the more interesting things. Couple with AR goggles it could be pretty interesting to get a proper sci-fi HUD. Also, making decisions that humans are more inclined to misjudge or be biased would be interesting, but of course there is the problem with the AI itself being biased etc.	Interesting possibilities, improve voice assistant, human input, trust, bias	untrustworthy, potential, fairness, misleading
21	Interviewer	Could using AI technologies influence how you feel about your work	-	-

22	P1	I could potentially see it watering custom work down to more standardised things, to make it work within the confines of being generated by AI. It might not make sense, but the best analogy I can think of is like auto tune for music. It kind of speeds up the process of making things, but it also loses some of its individuality because everyone just does the same and all output becomes very much alike.	Replacement, increased automation, indifferent	substitute, disinterested
23	Interviewer	Is it important to ensure that the AI technologies you use are ethical and unbiased in their decision-making?	-	-
24	P1	Yes, and I think a technology that is unbiased can really turn the looking glass at ourselves, as humanity. I think we can't quite see ourselves for what we are, but theoretically, an AI could. I heard the other day that we change the scale on which we measure normal hearing because we live in louder and louder environments, so our hearing gets worse and worse. So, we adjust normal hearing not after a natural baseline, but after the population as a whole. I think that is a good example of our blindness towards ourselves, because that just doesn't make any sense, we just adjust reality to fit.	Prefers unbiased technology, positive impact for humanity, useful reflection of ourselves	positive values, introspective
25	Interviewer	Do you believe AI art generation works against, or on the contrary enhances, the ability of professionals to be creative in the case of designing interfaces and products?	-	-
26	P1	This question in itself would warrant an essay. As a hobby musician and photographer, I think about this the most. I think it might show that what we've believed to be uniquely human - the creative outlet - is about to become "not unique" anymore, as AIs are able to replicate our work with such high fidelity. I mean, think about it, our creativity is what makes us human,	Personal life, thinks about AI and creativity, rivalry	selective, competitive, negative impact on creativity

		what does it do with our self-image when an AI creates work that can't be distinguished from our own? I think we might end up with a divide where some people will value the human aspect of a thing, over the innate value itself, if that makes sense. Like, a shitty painting done by a human, has a higher value than a great painting by an AI, just because it's human, authentic. Then there might be other people that don't give a [explicit], they just want "the best" and don't care about the process. We can see that even today with things like fast fashion for example, just imagine that times fifty thousand. Then there is the question of who the creator is. If I commission an artist to paint something from my description, I'd say it's clear to everyone that it wasn't me that is the artist. Yet, it seems that people that prompt Midjourney to create paintings are considered artists. Does that make sense? With movies, we have a reverse thing where the director often gets a lot of credit, yet they are not acting, not holding the camera, not grading the footage etc.		
27	Interviewer	Considering AI programming capabilities, do you believe that the number of employees that businesses will need to carry out projects will be impacted in the future?	-	-
28	P1	I think if we look at specific fields, or certain roles within a company, it might be affected. But I think that companies also must adapt as a whole, and perhaps change their offerings. That might then create new types of roles and so on, so I think it's hard to say for certain. I guess it's "yes and no".	Uncertainty, possible ramifications, Interactions, adapting	consequences, flexibility, confusion
29	Interviewer	How do you see the current state of AI evolving in the next few years?	-	-

30	P1	I don't know to be honest; I don't feel I'm qualified to have an opinion on that really. It'll surely get better and better, and judged on the current debates, I guess we either end up in panic or it turns out it wasn't that much of a difference. I'm not sure which I think is more likely. In any case, I think it'll stabilize within a few years. I mean the feelings around it, not the speed of improvement. I mean that people might calm down a bit. Or we're all dead by then, who knows?	Uncertainty, some optimism, stability, sarcasm	hopeful, confusion
31	Interviewer	Are you staying up to date on the latest developments and breakthroughs in AI technologies?	-	-
32	P1	I don't actively seek out AI-related news, but I do come across them during my normal news browsing moments of course. If something strikes me as especially interesting, I might read up a little more. As an example, when OpenAI release Chat-GPT 4 everyone seemed to be just freaking out, so I finally paid for a subscription so I could try it. It was cool but I didn't quite get it, it has a very natural language of course that could fool a lot of people, but when I used it for work it was quite evident that it gave me information that wasn't correct and/or outdated (which surely will change of course).	Not bothered, not pursuing, passing interest	disinterested
33	Interviewer	How can you see AI changing your job in the future? How do you feel about this?	-	-
34	P1	I think, and perhaps even hope, that it can act as a sort of assistant, but also as someone that knows more than I do. All through my career I've learnt most of what I know from asking someone that knows more, and then one day you become that person that knows more. And if you have a problem at that stage (which you do), it can be trickier to	wishful thinking, willingness to engage, interaction, pleasant	hopeful, involved

		find certain answers. What I've enjoyed the most with Chat-GPT is that dialogue form that I mentioned earlier. It's actually quite nice to "be able to talk to someone", it definitely feels more like asking that colleague that might know, for help. Take it with a grain of salt, not sure how to describe it, I think you get the point.		
35	Interviewer	On a more general level, what would you do differently regarding the development of AI?	-	-
36	P1	Don't know, I don't want to sit here and say how things should be done when I don't actually have that sort of experience. I think the only thing I'd wish is that we genuinely ask ourselves "should we do this" every now and then.	Uncertain, consider consequences, evaluate, reflect, reconsider	doubt, introspective, reflective
37	Interviewer	Can you think of any area in software development and design which would benefit or be further enhanced by AI?	-	-
38	P1	As mentioned, as some sort of assistant, like supercharged snippets, perhaps code analysis. If it can be trusted, it's also a great way to get an opinion. I was going back and forth between two different technical solutions the other day and couldn't quite make up my mind. I asked Chat-GPT which was the preferred way, considered its answer and made a choice, so that was pretty neat	Values opinion, interaction, engaged, responsive,	involved, helpful
39	Interviewer	Considering this interview, do you perceive AI as a good or a bad technology for software development? (Explain why)	-	-
40	P1	I think the "problem" and also [an] interesting thing with AI is that it's not good or bad. I think it is a bit shallow to just decide on that level. To me, it's much more of a political and	Complicated, political, depends on factors, Humans will adapt,	doubt, complex, liberating, adaptation

		philosophical question. Is it good or bad if AI would replace certain job descriptions? Well, it depends on what you think about those jobs. Is it even more important that a human can have a job, than the end result, even if an AI would do it better? Or is it more valuable to get it cheaper from an AI, even if a person would make it better? I think that as holes are filled by AI, new holes will pop up for humans to fill, and perhaps it'll even make some of us happier. I'm not really one of those that think AI will just end our reality, we'll find something to do. Perhaps we don't have to work at all anymore and can just go to exotic places and find ourselves all the time instead. Unless the machine presses the nuke button before that of course.	opportunist, greater automation, replacement less work, travel, relax	

Appendix: Second Interview Transcript (P2)

LINE	PERSON	CONTENT	OPEN	THEMES
1	Interviewer	Okay then so. First question. How old are you and how many years of experience do you have in the field of ICT?	-	-
2	P2	I am 26 years old, and I have a total of three years and a little bit more in the ICT field. All of that has been either as a first-line service desk or service desk specialist.	N/A	N/A
3	Interviewer	Well, the second question is what is your current professional title and what does that role involve?	-	-
4	P2	So, it changed this month, but due to our company restructuring, but my current title is 'Service desk OS - 24/7 specialist'. It's basically a fancy way of saying service desk 24/7. First-line service desk 24/7 with a little bit extra to it. But yeah.	N/A	N/A
5	Interviewer	Okay. okay and how familiar would you say you are with the concepts of Artificial Intelligence (AI)?	-	-
6	P2	Lukewarm at best, I'm aware of the discussion going on. I like to follow the general, being in the know-how about it and we are starting to see it a little bit in our workspace and uh, I have not done any formal research. I've not done any hands-on work with it besides like just messing around with Chat-GPT for fun or other similar programs, but surface, mostly surface level a little bit	Limited understanding interested, surface level knowledge	Basic comprehension, engaged

		above your 'average joe' I would say but not much.		
7	Interviewer	Yeah. Okay. Okay. Well, this trails perfectly into the next question. What experience do you currently have with Integrating AI technologies into your projects?	-	-
8	P2	We have used Chat-GPT in our workflow. So, I am first line service desk, that is to say, a customer calls in, they have an IT issue and I'm the person on the phone and I decide if I can solve it today or if I move it up within our organization. That's my job. So, AI we have I'm talking for myself and a little bit about my team because we don't get a lot to do these days because it's pretty calm. But we have seen a little bit of a surge in AI specifically, I had a co-worker who just searched up in ChatGPT, "All right this is what the user's problem is. Let's see if they can fix it. If Chat GPT could give us a proper answer". We found it to work pretty well with IT problems that are super general and wide. A lot of them [are] Microsoft 365 issues because every day if there's a problem with 365 it's usually not unique to that specific customer. It's everywhere like someone online has had that problem before and we found that Chat-GPT is very useful to just scrape that information. Chat-GPT is technically just a very good search engine scraper and a little bit, a lot more than that, but in the just laymen's sense, that's what it is. Yeah, a fantastic job finding like and localising the outlook issue we were having on a person's computer and giving us a pretty good, "oh try this try this"	AI Adoption, customer service, solves issues, relaxed environment, soon to adopt some AI assistance, common problems, efficiency, presentation, solution, communication, cannot be replaced by AI, hopeful, team meeting, chatbot implementation, assist customers	reliable, calming, accepting, understanding, irreplaceable, optimistic, resourceful

		like step-by-step guide and follow and even though it wasn't something we already didn't know to try. It was very nice to see it being presented by an AI like oh, this is a proper solution and that's, so that's how we integrated specifically. Our team and we're trying we're trying a little bit more. But because my work is mostly communication that's still my job is still not gonna be replaced yet. Yet “knocking on wood here” and on that note of being replaced. One of our teams had a meeting the other week actually we were the teams are like, "Oh we're thinking on our services landing page on the website to have like a Chat-GPT little box where you can like just where the customer can just type in their problem". So, we're working on integrating the Chat-GPT API into our landing page for the customer to maybe help solve one or two issues or something like that.		
9	Interviewer	Oh, nice.	-	-
10	P2	Yes, so that's it hasn't been integrated yet, but it is, yeah, it's something in the pipeline and interested to see how it works. We're gonna try it out a little bit in the coming weeks when the development team is done with it.	Yet to implement product, interested to see it, gradual launch	interested, curious
11	Interviewer	Mm-hmm interesting. So, if you could choose a specific AI technology to use in your professional toolset, which one would you use?	-	-
12	P2	Chat-GPT for sure. None of the image the generating one's work within our field but specifically Chat-GPT is fantastic because it's	Would use generative AI more at work, better search	Welcoming, embracing, better alternative,

		better. At this point it's a better search engine than Google at some things and you're on a call with a person who is having this problem with the computer. It's not working. It's giving me this specific error. If I have not seen that error before and I Google it [it] can be very frustrating to find an answer quickly and help for the user. Google these days, the first three landings are like weird ads and the next website is some weird really ad-filled lists website, which has written like the worst article you've ever used to clickbait we've ever written. So, I will personally probably try out a lot more to use Chat-GPT and specifically this Bing Edge thing to find the answer way more quickly because when you type in the issue to the Chat-GPT, it gives you, not the website, but it literally just gives you the condensed answer and that's what I want. To help my job be easier and help the customer gets the service faster. And so that's probably how I'm gonna integrate it into my job.	engine option, speeds up process, cannot trust google, too many advertisements, will try more generative AI at work	trustworthy,
13	Interviewer	So, what would I be right in saying efficiency then?	-	-
14	P2	Absolutely, it brings efficiency to information gathering first-hand, and yeah, yeah, the efficiency in that.	Saves time, speed,	efficiency
15	Interviewer	Okay and so you sort of answered this question already, but do you welcome AI in your professional field?	-	-
16	P2	In my professional field. Absolutely. I find it to be interesting. It's because my job, due to the human-to-human contact that is needed for most	Welcomes AI in their professional field, human contact still	Welcoming, humanity is irreplaceable, communication is key,

		people who call in. My job is never gonna go away you're always gonna have it's like yeah, some older woman calls in and they're like "My computer is not turning on" and I'll suggest turning it on and off again and then it works. She could have Googled that problem on her phone. But that's not what she's looking for, [rather] she's looking for the human contact, to be like, "Hey, I'm too stressed can you take this issue from me?" And I'm like "Sure here I am" over the phone. So, my job is never gonna disappear. But I think just using AI as a tool in our toolbox is gonna help us out a lot more. I'm just, I'm welcoming it to my specific field, and I am also a bit on the sceptic side because I know the limitations of it. It's so easy to fool an AI. Specifically, Chat-GPT will just lie if it doesn't know the answer. I do not know if you've seen it, but it will just answer to save face. So be aware of the limitations. During a meeting, we had the other week about it. They talked a little bit to the scripting team, the people who write the script and they told them "You are allowed to you to get simple scripts as long as you can understand everything that it says in that script". Yeah, so that's very interesting for their field. I'm not a coder but I know for a fact that this entire thing is completely turning the entire coding industry upside down at the moment. What [time] it would normally take for a coder to write the code, like an hour or so? Can be done a lot quicker. So that's interesting to see. I'm also very scared towards the	required, cannot be replaced by AI, people prefer speaking to other people, human assistants won't be replaced, scepticism, recognises AI limitations, generative AI will lie just to answer question, developers still need to know programming, can use AI for completing tasks, big impact on coding industry, cannot personally code, speeds up process, scared about AI art impact, hobbies, creativity, has personal art projects, Pro AI replacing white collar jobs, against AI replacing artists, AI can replace the boring jobs	doubt, cannot always be trusted, confident, irreplaceable, still need to understand subject, open minded, efficiency, saves time, worried, hinders creativity, anxious

		artist's side of things. I do a lot of art on the side. The discussion regarding the AI Arts is very I'm not sure I like that side of it because yeah. It's yeah, it's weird. It's weird to see because I'm Pro AI taking away white-collar jobs but not artistic jobs if that's fine. Yeah, and some very unarticulated of me. But yeah, AI was supposed to help us get rid of boring jobs and focus on our jobs not taking away our jobs.		
17	Interviewer	Yeah. Yeah, we might be returning to that subject slightly later on but that's interesting. So, are you currently using AI Tools in your personal life? Tools, so not just Chat-GPT?	-	-
18	P2	Hmm. Not in my personal life, not all. We have a Dungeons & Dragons group. When we play in our personal lives and one of our players, every time someone makes up a character or something they bring up an AI image generator. Just so we have a picture of that character. They use AI to make the play session a bit more visual every time. So that's the only part of my personal life or AI is used. It's like, oh, it's cool. A bit more visual than what a pen and paper is capable of.	Doesn't use AI in personal life, has friends who use AI, AI assists in character design, helps visualise ideas	Limited interaction, creative potential, useful, assists with visualising
19	Interviewer	Yeah, yeah that's really interesting stuff and have you faced any challenges when using AI and if so, how did you overcome them?	-	-
20	P2	Faced any challenges when using AI... I've only used surface-level stuff. So, I haven't really dug deep in the trenches of like trying to test its limits for me it's mostly like I try to explain a problem to it or something and it gives me, not a nothing answer, but like I	Surface level interaction with AI, wrong input produces incorrect results, needs to perfect how to	Limited interaction, better inputs needed, experience needs

		describe the problem to it, and it just sort of just describes the problem again back. Because it's using search engine data, so it'll just say what a lot of the top sites are saying, which is just describing the problem again, so it could be me just wording the prompt wrong since you know, I haven't figured out the perfect language it likes. So, I don't think I have a good answer to that question. Unfortunately.	engage with AI, unsure	improved, undecided
21	Interviewer	Totally okay. So, let's see, so what are some of the benefits you have seen with AI in software development, but also extending to yourself and your work?	-	-
22	P2	Oh yeah. Speed. Absolutely. Speed. Speed efficiency. Because you can just bring something up real quick on that end. I know software developers as they said in that meeting "If I just want to have like a basic starting script or something that quick. Then they can just start working afterwards." For software developers, it's been a game changer, but they still need to know what it is saying. But on my end, we're seeing some interesting stuff because all of my co-workers are trying it out left and right. Not all of us working on it because it doesn't apply to every single situation, but for those general situations where somebody calls in with a non-specific problem it speeds up the process quite well, let's say and because if you don't already know the text, but it's like you sort of have a hum on what to do and it's like we can sort of utilize Chat-GPT to speed up a little bit. Like “What do I do?”. Well not specifically what I do here, oh and	Speed, game changer for developers, not applicable to everyone, cannot be used for every situation, speeds up process	efficiency, impactful, limited value, time saver

		outlook view issue or displays this how to restore or something like that and it'll give us "Oh in this setting, this setting, this setting is right". Speed is primary.		
23	Interviewer	Yeah. Okay then. So, in your opinion what are some of the most exciting AI technologies that are available today?	-	-
24	P2	The most exciting... Just as a workflow and stuff like that Chat-GPT obviously is very exciting. But as someone who just likes to be entertained. I saw earlier this morning, this thing. There are these that are trying to with image generation voice. They're trying to make videos that are so uncanny valley, but you can there through prompts and testing you people trying to make full-length commercials and stuff using AI and it looks very entertaining in a very look how bad this looks kind of way. Is it exciting? It's exciting to me personally because it's fun. So, to give context, I saw earlier on the internet today. Someone made a Pizza commercial, a commercial for a pizza place, but made by an AI. It's so funny to see it trying to make a human video. None of the hands, none of the arms move as they should and they're trying to eat the pizza. But like, it's just that, they're eating the cardboard because they can't see a difference. It's exciting to see what it's become so far and so fast. And [to] see where it's gonna peak and as we see with most technology where it's like, oh, this is the best it's gonna be or is gonna stifle out or if it's just gonna go up from here. So, I'm excited to see where that takes us. Yeah, just for fun. Yeah, because	Entertainment value, uncanny valley, creativity, experimental, fun, AI creativity, limited success, obvious flaws, potential, excited for the future, weird possibilities	Amusing, creepy, uncertain, artistic, unsuccessful, flawed, interested for the future, potential

		[with] my specific work I don't, we don't see a lot of AI changing anything else other than making our life the customer easier. So, I couldn't say what excites me the most but yeah, yes as an entertainment aspect just seeing weird, weird stuff on the internet is fun		
25	Interviewer	Yeah, yeah fair enough and so through using AI Technologies influence how you feel about work? So, on an emotional level?	-	-
26	P2	On an emotional level, very very neutral. It's like it, I welcome it specifically to this, to my work. I welcome it quite a lot and everyone else at the company is quite on board with it, even though we need to talk about the limitations. Know that it's just a very good hammer but sometimes you need a screwdriver instead.	No emotions from AI, very neutral, welcoming of AI, good tool not a good replacement	Doesn't react, resourceful, valuable, embracing
27	Interviewer	Yeah.	-	-
28	P2	So, we're very welcoming in our field because when it's just data entry and stuff. I look forward to seeing how it handles that. Just the automation of that is so much easier. It's gonna take quite a while but having AI take over onboarding. Every day we get a company being like "Oh, we have a new employee. Please onboard according to this Excel sheet". Then we just create a new user interactive directory and add all the data and stuff like that. In this day and age, you'd have to create a proper script to get that going but since we have so many customers coming in and out and they change the routines all the time. It's not peaceful to have a script to onboard all of it. So, we do it manually, but with an AI	Very welcoming, automation makes things easier, wants AI to replace certain manual tasks, AIs ability to adapt is useful, looking forward to future automation	Open minded, improves workload, interested

		who can sort of adapt that would be exciting to see just the data entry process be streamlined a lot better. If that day comes that's gonna be exciting for me. Yeah.		
29	Interviewer	Yeah. Is it important to ensure that AI technologies that you are using are ethical and unbiased in their decision-making?	-	-
30	P2	Yes. Well, that's my personal opinion that of course, yes, it needs to be ethical. Regarding our work, not super much because we are doing first-line service desk, we are just information gathering and that's like there's not much ethics in question with AI like it's just gathering information. But personally, with the image and gathering specifically, the AI, I am a bit more with the image things. I'm a bit more very anti the inefficacy of it because and DALL·E. DALL·E specifically, which made a lot of headlines last year, that one and a lot of the similar image generating. They just trained themselves on a lot of images, a lot of copyrighted images, steal art styles, steal all of that from an artist's copyright or something like that. And that kind of is unethical. I'm not like "Oh copyright lawyers are the real heroes here." No, they're not but it's um, very unfortunate for artists to have their work almost completely upended and stolen. Just by somebody who is typing. We're hopefully gonna see some regulation with that but that's where I draw a line. That's not cool because it's stealing people's creativity and people's craft that they've worked 20 years on mastering and that's that's where I	AI must be ethical, no ethical concerns in their current work, against generative AI using artists work, stealing, unethical, not in favour of copyright lawyers, something must be done, unfortunate for artists, hoping for regulation, protect creativity, personally its unethical, professionally it has its advantages, may be useful for improving skills, can be used as inspiration, humans abusing the potential of AI	Moral compass needed, against replacement, human creativity must be protected, unethical, good reference, resourceful, must not be manipulated,

		draw a line. I don't want to use any of those for that and so on a personal level if it's unethical I won't use it but on a professional level with specifically my work. There's not a lot of unethical conflicts that can arise. So, I can use it without feeling bad at work. But in my personal life if I were to use it for like something I know if I were to try to practice my art again, some people have suggested I need some art reference of this specific like arm and this post or whatever, some people are like, "Oh ask an image generator for that and they can get that for you" but that still feels a bit... you know, I've tried that but you know... it feels a bit wrong in a weird way because people are profiting from its people. It's in a weird grey area. Because we are seeing some projects, especially scam artists on the internet these days. Yes, straight up countless, countless, countless headlines. This famous art competition got upended because it got spammed with people just entering with AI pictures so they were like, "Oh, yeah, we're not holding it this year until because yeah, we can't agree on what's AI" and so it's weird. We live in a very interesting time, right?		
31	Interviewer	Strange, strange, but you were saying that you think at home you're strongly in favour of it being ethical...	-	-
32	P2	Exactly.	Personally, favours ethical AI	AI must be ethical
33	Interviewer	...But at work there's a bit more flexibility with everything?	-	-

34	P2	Specifically, for me, because of the way we've used it, there is no ill intent because we're using it, specifically Chat-GPT as a very curated search engine. Yeah, so that's what we use. Basically, it's just like asking a librarian, "You've read all of these books can give me a summary of these?" and they give them to you. There's nothing unethical about that. It would be unethical if I were to be on a writer's side and ask the librarian, "Hi, give me fifteen pages that I'm gonna enter into my work instead." So, I think yeah, it's exactly like that in my work. I'm a little bit more flexible as my work doesn't involve using others' work as my own [work]. It's more like me observing other people's information. ...It's a little bit grey when I put it like that but yeah.	Uses AI at work for simple tasks, innocent requests, not required to create at work, observes other people's information, can be flexible	Solves problems, not indispensable
35	Interviewer	Yeah, interesting. Well touching on what you were mentioning in the prior question. Do you believe AI art generation works against or on the contrary enhances the ability of professionals to be creative, in the case of say designing interfaces or products?	-	-
36	P2	I follow a lot of artists online and they have a lot of takes on it, but personally, it can be used to get an idea of what you want. But that itself should never be the problem like the final thoughts. I wouldn't say it's a complete hinder like it stops creativity. It can be used as a tool to help you. Instead of drawing a sketch, you need an outline say, "I want to know how this post is gonna work, how this background is gonna look with this light or this colour or something." You can use AI	Follows many online creators, artists have a lot of opinions towards AI, can be good inspiration, it can hinder creativity, possibilities of AI, great for creating mood boards,	Engaged, opinionated, good reference, resourceful, hindrance, AI art is not art

		generation to get a vague idea of what you want. It's fantastic for bringing like creating mood boards. It's fantastic for that because then it's like "Oh I kind of want to like this. Cool. Then you start work". So, there is usefulness for that absolutely. But AI itself, the generated images should never be in the art, In the end product itself. In my personal opinion.	usefulness, AI art is not art	
37	Interviewer	Right.	-	-
38	P2	So, both for and against you could say.	Mixed feelings	Mixed emotions
39	Interviewer	Yeah, yeah that's fair enough. Considering AI programming capabilities. Do you believe that the number of employees that businesses will need to carry out projects will be impacted in the future?	-	-
40	P2	Companies are always trying to cut corners. So yes. That's not even me being negative or anything, that's gonna happen, straight up. Companies a lot of higher-ups because they don't understand programming just want to judge the value of the work based on the result and not on the quality or on the quality. A lot of higher-ups because they don't understand programming just want to judge the value of the work based on the result and not on the quality or on the quality. Um... They want results as cheap as possible. Understandable, they are a corporation. That's so money works. So, we're probably gonna see that but not a complete replacement. We're gonna see a lot less of because of this because they did AI can handle the simple scripting that they would normally have done. So that's probably	Corporate greed, quantity over quality, lack of understanding, companies want results as cheap as possible, human developers will be affected, layoffs, less human employees required, less positions, harder for junior developers, less entry level positions, companies can rely on AI for	Benefits companies, could replace humans, harder to join industry,

		what we're going to see a lot less of. Instead of having teams of fifty programmers on a project, you might see ten or eight or something like that. It's not gonna completely go away. Personally, I believe not yet but in the future like two to four years from now. You can see the amount of programmers getting hired for entry-level positions being a lot less I'll happily eat those words, happily eat those words, but knowing corporations trying to get as much bang for the buck as possible. And that's probably what we're going to see.	entry level tasks,	
41	Interviewer	Right. Okay. How do you see the current state of AI evolving in the next few years? So just AI, generally speaking, evolving.	-	-
42	P2	Uh, yeah, that's a good question. I think, right now we live in the complete Wild West. It's unregulated. It's just open it's everywhere and like it's like seeing the early days of the internet a little bit again. Where people are just trying to test the boundaries of what can be made. What can we do here? And a lot of people are going fast and breaking stuff as we see in big tech news. If you follow the curve of other similar technologies, like when the internet, Web 2.0 started being a proper thing and when others such as social media started being a thing, you see the trend of those industries and technologies having their Wild West days and then teetering out a little bit as regulation came out and the limitations were understood more. I'm going to go I'm just talking here at this point. What I'm trying to say is, I think we live in the	Currently lacking regulation, anything goes, similar to the early days of the internet, people are trying to find the limitations, test the boundaries of AI, a few more experimental years before regulation is implemented, crazy new headlines about AI, the landscape will transform again in a few years, AI will eventually waiver, more	Needs regulation, chaotic, lawless, inevitable interference from private sector, unsure,

		Wild West days now and that's really exciting to see I think we're still gonna have there are still gonna be some crazy new thing because we're seeing crazy headlines left and right. Here's an AI that created an entire Seinfeld-esque rom-com showing 24/7. We're still gonna see some new AI stuff pop up in the next year or next two years that's gonna change the landscape again. After that, I think it's gonna dwindle back a little bit. Same as when the internet was Web 2.0 because that was the wildest. Everyone just doing everything, and then major corporations came in and people started sticking with one or three websites or whatever. Probably going to see that a little bit with AI. The smoke will settle down a little bit. Maybe not the best answer for the question of like "Oh what do you see in the future?" It's going slow down and be less exciting in four years, still be pretty cool until then. I could be completely wrong though, because AI has been around for quite a while and stuff like that. It's just we're seeing yes development of that development right now... I'll happily eat every word I said.	regulation, corporations will get more involved, there will only be a few popular sites, hard to predict, AI longevity,	
43	Interviewer	[Laughs] Are you staying up to date on the latest developments and breakthroughs in AI Technologies?	-	-
44	P2	Not particularly, not that much. I like to be informed. I like to be online quite a bit to see what the discourse is, maybe a bit too much being online, to be honest, and I hear a lot from colleagues. You know, we work in the IT field and people talk. But not	Informed but not following developments, active online, listens to colleagues, IT industry community, not	Limited engagement

		more than surface though. Not more than surface level since we're not knee-deep in the development of it.	fully involved in development	
45	Interviewer	Yeah, and how can you see AI changing your job in the future? And how would you feel about this?	-	-
46	P2	Um, I could've given you a concrete answer when we integrate... Remember earlier when I talked a little about how we're integrating Chat-GPT into our landing page? I could've probably given you a proper answer once we've seen like ten lists of these tickets or whatever. I can see it's improving the workflow. I can see it lessening that's what I'm gonna say. I'll see it less than the amount of tickets we get. Not a significant margin but a little bit. I wish I could give you concrete data, and we'll see once we get the landing page Chat-GPT up and running. Affecting my specific workplace and workflow by 'X' many tickets less every month or every week. In IT, the less work we have the better a job we're doing, and I want to work less. Yeah, of course. That's what we're all there for.	Hard to say, improves workflow, lessens demand, less pressures on staff equals better results, wants less work, everyone wants less work	Uncertain, AI is resourceful, improves quality of life
47	Interviewer	So, sort of like work-life balance a little bit? You just want to balance it out and stuff?	-	
48	P2	Yeah, and currently I have a pretty good work-life balance. There's not a lot to do these days. But other people in my field at other workplaces back when I worked the IT for hospitals. There was a lot of demand and there were constantly things going on. And in those fields, I hope AI can	Good work-life balance, not a lot of work to do, demanding in other sectors, pressure in the medical field, hopefully AI can assist the IT	Relaxed, not stressed, AI can benefit other industries, need for more automation adoption

		help lessen the amount of workflow because the workload was overwhelming.	staff in hospitals, needs more automation	
49	Interviewer	Oh right.	-	-
50	P2	So many users need immediate support at that moment. So, I'm hoping the AI can help those fields specifically and my old colleagues to have less work to do, they deserve it.	Users need support, AI can assist, lessen the workload for staff	greater support needed, valuable, AI is resourceful
51	Interviewer	Right.	-	-
52	P2	That's what I'm hoping for you. So yes, lessen the workload.	Reduce the work expected of staff	improves workload
53	Interviewer	Yeah.	-	-
54	P2	It's not gonna disappear, but the workload is going to be better.	Reduce workload, easier to manage	improve workloads
55	Interviewer	Okay. On a more general level, what would you do differently regarding the development of AI?	-	-
56	P2	Is there anything you would do differently if you were in charge [of developing AI]? I would try to have the 1980s outlook on AI being like, you know in the old science fiction book. It was like, oh AI is gonna make all of our lives easier that I would still have and so we can focus on our arts or focus on you know, the old pictures of robots doing all the tasks while people would be like slaying in a field that sort of 1960s Utopia thing. We're trying to make people's lives easier and that should be the end. That's my outlook on life and I would have that in mind when developing a product and the AI to have one	Developed AI differently, more utopian, science fiction idea of AI, make everyone's lives easier, reduce the need for labour, make life on earth easier, AI is currently too corporate, profit based, current AI is built for companies not people, anti-	Consider humanity, reduce human labour, quality of life improvement, benefits corporations, must aid humanity,

		goal to make everyone's lives easier. Being better humans to ourselves and other life on this planet. But at the moment most of the AIs are corporate, profits driven in a weird way. It's mostly built to help out big corporations earn more money and have less employees. It's more profit margin. Yes, AI is not built for people. It's built for corporations. That's right. If that makes sense. I would have made it for people to make their lives easier. Nowadays it's for corporations to make their jobs easier. The 1960s Utopia version I would have that.	capitalist sentiment	
57	Interviewer	Can you think of any area in software development and design which would benefit or be further enhanced by AI? Like something that might not be touched on that needs work done. Maybe more AI integration in that area?	-	-
58	P2	I'm not sure I can give you a proper answer to that one.	Does not know	Unsure
59	Interviewer	That's fine. So, the last question, considering this interview do you perceive AI as a good or bad technology for software development?	-	-
60	P2	I see AI as a good toolbox. I see it as a good tool to use. It is never a person, it's never a pilot, but it is a very good steering wheel.	AI can assist but not replace us, human input needed	Humanity cannot be replaced, humanity contribution has value
61	Interviewer	Yeah.	-	-
62	P2	That what I want you to take away is that it's a very good steering wheel, not a good pilot. I have a mostly positive outlook on	AI can assist but not replace us, human input needed, positive	Resourceful, only a tool, human input still needed,

		the technology as a whole. I have a bit of a negative outlook on some corporations that make it as a whole. We should definitely use AI as a tool. It's a very good hammer, nothing more than that.	towards technology, negative outlook towards corporations, anti-capitalist sentiment	technology is positive, anti-business
63	Interviewer	So, to clarify would you say in the context of software development then, that it still very much requires input from developers? Not just the AI as you're saying driving or piloting.	-	
64	P2	Absolutely. They said at one of my work meetings [directly] to the scripting team. "You may use it to create the script, but you need to be able to read and understand everything it says".	Knowledge of coding needed, only use AI if you understand coding	Humans cannot get lazy, still a need for knowledge
65	Interviewer	Hmm. Yeah, that's the end of the questions. So yeah, very good. Thank you.	-	-
66	P2	Thank you so much for having me.	N/A	N/A

Appendix: Third Interview Transcript (P3)

LINE	PERSON	CONTENT	OPEN	THEMES
1	Interviewer	How old are you? How many years of experience do you have in the field of ICT?	-	-
2	P3	Twenty-five years old with three years of experience working in Web Development.	N/A	N/A
3	Interviewer	What is your current professional title? What does your role involve?	-	-
4	P3	I'm a Web Developer. My work involves Full-Stack Development for clients which involves creating websites for clients and tools that allow the client to manage those.	N/A	N/A
5	Interviewer	How familiar would you say you are with the concept of Artificial Intelligence (AI)?	-	-
6	P3	I have a basic understanding from university.	Higher Education, basic AI comprehension	Basic understanding
7	Interviewer	What experience do you currently have with integrating AI technologies into your projects?	-	-
8	P3	I have experience using machine learning for image recognition when creating robot eyes, for analysing big data and [for] developing game AI for personal projects.	Creating appliances, big data, game development, personal projects	Creativity, designing, personal value
9	Interviewer	If you could choose a specific AI technology to use in your professional toolset, which one would use? Please explain why that would be the case.	-	-

10	P3	Use of Big data would have the most immediate value in my field as it would allow for more user-specific data-driven features on sites, allowing the site to better support the user in finding the tools they need.	Benefits with AI adoption, enhanced User Experience	Positive impact, enhances engagement
11	Interviewer	Do you welcome AI in your professional field?	-	-
12	P3	I would be interested to use AI tools at work to enhance the quality of products however the cost of supporting AI services would likely make it non-profitable.	Open to using AI at work, not currently used at work, could improve end products, AI too expensive	Willing, improvement, cost consideration
13	Interviewer	Are you currently using AI tools in your personal life?	-	-
14	P3	Not personally no.	Not using AI privately	No personal value
15	Interviewer	Have you faced any challenges when using AI, if so, how did you overcome them?	-	-
16	P3	Getting AI to return in a useful and relevant way can be difficult. However, feeding it more data.	AI cannot always offer the right assistance, requires more data to complete tasks	Limited resourcefulness, demanding
17	Interviewer	What are some of the benefits you have seen with AI in Software Development?	-	-
18	P3	AI can be used to better analyse user test data and better direct development.	AI can assist in assessing test data, improves project development	Helpful, beneficial

19	Interviewer	In your opinion, what are some of the most exciting AI technologies that are available today?	-	-
20	P3	I've used Chat-GPT to plan trips, that saves a lot of personal time.	Assistance booking flights, saves time	Speed, efficiency
21	Interviewer	Could using AI technologies influence how you feel about your work?	-	-
22	P3	Not really. It's just another tool.	AI is only a tool	Assists, AI is resourceful
23	Interviewer	Is it important to ensure that the AI technologies you use are ethical and unbiased in their decision-making?	-	
24	P3	I would include human oversight when moral issues are involved.	AI cannot judge, complex issues, human input required	Untrustworthy, fairness, human consideration
25	Interviewer	Do you believe AI art generation works against, or on the contrary enhances, the ability of professionals to be creative in the case of designing interfaces and products?	-	-
26	P3	I think AI art helps emphasise the uniqueness of some artists.	AI art, value of human creativity	Demonstrates human talent
27	Interviewer	Considering AI programming capabilities, do you believe that the number of employees that businesses will need to carry out projects will be impacted in the future?	-	-
28	P3	Yes, if production increases employment will decrease.	Layoffs, greater workload, AI preferred over humans	Replacement

29	Interviewer	How do you see the current state of AI evolving in the next few years?	-	-
30	P3	I think it will get better at handling requests.	Improved performance, improved response	Evolving, will improve
31	Interviewer	Are you staying up to date on the latest developments and breakthroughs in AI technologies?	-	-
32	P3	No.	Lack of engagement, not interested	Disinterested
33	Interviewer	How can you see AI changing your job in the future? How do you feel about this?	-	-
34	P3	It will get smarter and more commonplace. I think it will be interesting to see if it is used to improve day-to-day life for people.	Greater comprehension, interested in future developments, adoption in day-to-day life	Interested, expansion,
35	Interviewer	On a more general level, what would you do differently regarding the development of AI?	-	-
36	P3	I would like it to be handled by people with more humanitarian goals.	Humanitarian goals, more considerate of users	Doesn't benefit humanity, more user consideration,
37	Interviewer	Can you think of any area in software development and design which would benefit or be further enhanced by AI?	-	-
38	P3	It could be used to shorten development cycles by analysing time complexity and offering alternative coding options.	Speeds up process, handles complex tasks	Efficiency, smart, useful

			provides alternatives	
39	Interviewer	Considering this interview, do you perceive AI as a good or a bad technology for software development? (Explain why)	-	-
40	P3	I think AI is good as it will help people create greater and more advanced projects.	Positive towards AI, improves project development	Hopeful

Appendix: Fourth Interview Transcript (P4)

LINE	PERSON	CONTENT	OPEN	THEMES
1	Interviewer	How old are you and how many years of experience do you have in the field of ICT approximately?	-	
2	P4	I am, that's a good question, 20, 26, 20, 27, yes 26 is my age and I have around 10 years of experience. Yes, but let me just... Yeah, nine years of experience.	N/A	N/A
3	Interviewer	Okay. Fantastic. And so, what is your current professional title?	-	-
4	P4	My current professional title is simply consulting engineer, it's a management level position.	N/A	N/A
5	Interviewer	Consulting engineer. Awesome. So, what does that role involve, say, on a day-to-day basis?	-	-
6	P4	So, that role is like a bit of an oversimplification really to what I am actually doing. But on a day to day basis I am more under what one might call a cyber security engineer. So I am on a day to day basis holding a lot of meetings with suppliers and with other stakeholders in order to manage requirements for software applications.	N/A	N/A

7	Interviewer	Okay, so you're mentioning software here. What would you say is your experience specifically narrowed down to software development itself?	-	-
8	P4	I mean I've got about 8 years of experience as a software developer previous to, yeah every role I've had prior to this one has been strictly, well not strictly, but has been primarily software development. Yeah this role is sort of the exception where I'm looking more into the security than actually developing it.	N/A	N/A
9	Interviewer	Would say you also develop software in your personal life?	-	-
10	P4	Definitely and within the role I do I certainly develop some software. It's just not like a primary activity.	N/A	N/A
11	Interviewer	Fantastic, all right. Is there any particular tool that you use more often something that you want to show for the record that's maybe your main tool or software that you use?	-	-
12	P4	I mean I have sort of two answers to that the one is VS Code and the other one is Microsoft Teams	N/A	N/A
13	Interviewer	Understood, how familiar would you say you are with the concept of artificial intelligence?	-	-
14	P4	Very. Yeah very.	confident	self-confident, understands AI
15	Interviewer	Would you like to expand on that?	-	-

		Why would you say you're very familiar with AI?		
16	P4	I would say I'm very familiar with AI because I think I'm, firstly I have on a university level experience developing AI tools, especially yeah developing and training AI models and also an understanding of how it works from a university education. And then I also have more university education, not using it, come to think of it. But yeah, I'm like personally interested in it. So I have done a lot of like personal research into how it works. I have like experimented with it both in various roles. Of course ChatGPT that everyone's used. I've also used like Dall-E and some other AI image generation tools and yeah tried in a previous job that I had like five or six years ago and we were trying to implement AI to make business decisions for state enterprises, I guess, state enterprises. But basically, the point was that I understand how they work and how they can be used.	higher education, personal projects, thrilled	Basic understanding, relevant, widespread use of AI
17	Interviewer	what experience do you currently have with integrating AI technologies into your projects specifically? What kind of impact do you see there	-	-

		from an AI perspective? Do you think that's something that comes often your projects or that's something that's occasional, sporadic?		
18	P4	In my personal projects it's definitely often, especially with tools like Github Copilot. I use that regularly. But in a professional capacity, we have a ban on using AI products for anything that might be released to the public, but only allowed to use AI tools for internal experimentation and for tools that would be used or anticipated only to be used within our team or other teams that we directly communicate with and so I have only built one piece of software at work using AI assistance.	personal use, professional restrictions	personal involvement, unable to use AI officially, restrained
19	Interviewer	Yeah okay so that's very interesting actually what would you say is your stance on the matter? Do you think this is legitimate? Do you think that there is a genuine reason to be concerned? Or do you think we could actually maybe use them a bit more for public releases of software?	-	-
20	P4	Yeah, so I think they have a legitimate concern primarily because you need with AI, like the tools that are currently available, you definitely need to review the output. And I've seen people who put too much faith into it and just accept like its output as being	distrust, verification, incorrect, personal reassurance, legal reassurance, unsure, questioning	untrustworthiness, confusion, overly trusting, business focused on legal aspect

		correct, which isn't 100% the case. So you have like that aspect of, yeah, you need some kind of assurance that the developers are actually reviewing the output. And then the second issue which is the main one that the company bases their judgement on is they want some more assurance like from a legal perspective that the work is theirs, that's produced, they're concerned, that work that's based on open source work could be in violation of open source licensing, which is a legitimate concern. I'm not a legal expert to solve that one myself. One instance, I cannot remember where it was. I would have no chance of finding the source. But I did see one instance where someone claimed that it output like a working API key, which obviously raises the question, did it like generate it? And coincidentally, it worked, because there are only so many possibilities with that length of characters or did it actually like spit out one directly from a source, which is where the concern comes in, right?		
21	Interviewer	So, are we touching on, therefore, some sort of security or vulnerability from the tool?	-	-
22	P4	I mean, I'm more focusing just on, is it generating something new, or is it directly reusing	questioning, uncertainty,	concern for plagiarism,

		something that is read or processed in some way? Because, yeah, if it's generating something new, it's like more other's work, right? Even if it's inspired by other work, but if it is just putting a copy of something, then it falls into place or something more. Whatever that's called. When it's on a legal level.	concerned, plagiarism	originality, legal implications
23	Interviewer	If you could choose a specific AI technology in total freedom to use in your professional toolset, which one would you use? And please explain why that would be the case.	-	-
24	P4	I mean, if it had to be one, I would definitely choose like ChatGPT with the GPT-4 model, it's quite capable of writing code but it also can answer more generic questions like, it's not limited to outputting code and also when I was experimenting with it seemed to like understand the bigger picture so it could sort of yeah basically you could give it more input for that before getting the output so I found it could give like more seemingly thought out output.	powerful, bigger picture, context	powerful, need for context,
25	Interviewer	Would you say that you welcome AI in your professional field or do you feel like that would be the opposite?	-	-
26	P4	Yeah I have something of an arrogant view.	arrogance, isolated, superiority,	arrogance, restrained, untrustworthiness

		I welcome it to some degree but I also, where I said arrogance, kind of feel like I'm in the minority in using it properly and that most, the majority of people, just accept any output that it gives and because of that I'm not overly welcoming myself. I agree when companies impose restrictions.	reticence, restrict	
27	Interviewer	Absolutely, would you say therefore that's a trust issue or would you say that's trusting blindly the tool or would you say it's about maybe just learning how to use the tool?	-	-
28	P4	I think it's primarily, I guess learning is actually it because the answer is blind trust but I think that comes from not knowing how to use it and not understanding how it works, I guess, really. Because if you understand how it works, then you understand the importance of reviewing itself.	unknown, lack of familiarity	steep learning curve, untrustworthiness, need for familiarity
29	Interviewer	Have you faced any challenges when using AI? If so, how did you overcome them?	-	-
30	P4	I mean, I've definitely faced some issues where it has produced code that has both not worked at all or has been very different to what I described. And then when I tried to get it to correct it, it sort of got in a circle of saying "oh, this is the problem" and then I would say "this isn't the problem" and then it would say "oh, this is	not working, unusable, argumentation with the tool, feels more competent than the AI	unpredictable, dissatisfied, enhanced abilities,

		the problem" and then I would say "it's not that" and then after a few iterations it like circled back to the original problem and then just like randomly sort of went through those problems which was none of them. And in that case I solved it by, yeah, being a competent developer myself just identifying the actual problem which I then like told the tool was the problem and it acknowledged that that was really the problem. It was very weird moment.		
31	Interviewer	Do you feel like you would have spent less time not using the tool than using it in that instance?	-	-
32	P4	To solve the specific error, definitely I would have solved it quicker myself. But it was also like the entire... I was very much like experimenting with the tool like for the whole day. So I would say that I still was more productive over the course of the day with the tool than without it. Even though like, yeah, and I kind of realised that it couldn't solve that problem quite early on, but I was trying to get it to solve it out of interest more than dependence. Generally speaking, it was an improvement.	Perceived les time needed to learn, feeling more productive, curiosity	Time saving, performance

33	Interviewer	What are some of the benefits you have seen with AI in software development?	-	-
34	P4	The biggest benefit is when it comes to like writing boilerplate code and I mean it can write up all the code very quickly which yeah without [AI] it is a big time saver that's definitely the biggest yeah time saver that I can think of, or that I've experienced because that's also a case where you sort of have less dependence on it, you know you could just have written it yourself, but it would have taken substantially longer.	Saving time, tool doing things the developer already knows how to do	Time efficient, less efforts
35	Interviewer	So, these tasks, how would you qualify them?	-	-
36	P4	Definitely repetitive, boring tasks. Yeah, it's definitely supportive in those cases. I just also thought this is another case but it was again like I was just trying to instead of like creating a configuration tool, I just wrote out a massive JSON file of configuration myself and then I found that an AI tool was able to pick up the pattern in what I had written and then complete it with me not sort of writing in all the brackets and the tabs and like the actual like id sequential id numbers I just sort of said like these are the rest of the options complete the file and it actually like so in that case it sort of wrote sort of like it multiplied my writing sort of 10x but just with generic repetitive code.	Repetitive tasks, good at detecting patterns, takes care of semantics	less boring, reduced manual labour, pattern recognition

37	Interviewer	Do you think that we need to really train on programming where we have to put every bracket? Or do you think once we understand where they should go, we could use an AI tool and that should be enough?	-	-
38	P4	I mean, I think it's important to understand like the logic and how things are written. Or like, yeah, how, and sort of how computers process a code. But yeah, I don't see any need really with things like brackets and indentation. I mean, I have been using tools even before AI became so mainstream. like for example a tool called Prettify, which how it worked was once you had sort of the right brackets, it would then fix all the indentation and new lines for you just on like a following rules kind of level. So yeah I don't see any reason why developers really need to worry about like formatting the code.	Important to understand how code processing works, tools helping before AI too	requires conceptual understanding, non-AI tools existed before
39	Interviewer	In your opinion what are some of the most or the most exciting AI technologies that are available out there today? All of them, you can select multiple if you want to.	-	-
40	P4	Well, it's Midjourney. Like the output that it generates, completely in my opinion like outclasses things like Dall-E from OpenAI it generates very like lifelike	Excited about art generation, looking forward to future improvements, aware of tools	Creative possibilities, thrilled about AI art, personally involved, AI art curiosity, appreciative of

		convincing images in many different cases so I think that's like the most exciting yeah hands down. And then yeah like GPT-4 and ChatGPT based on that I think is sort of second and then when you get to like Copilot it's sort of although it was exciting when it came out it's sort of already being outpaced by by tools like GPT4. So yeah you feel like Github Copilot is already getting outpaced that things are moving really quickly or yeah yeah because everything is moving so quickly I've seen they discussed Github Copilot X where they intend to bring these like GPT4 features into Copilot but I haven't seen like a working example of it yet With Copilot X, I saw they were discussing how you could have sort of a second window where you're like having a text-based conversation with a co-pilot so that you can give it sort of more input in guiding it into what you're actually trying to create. More context, I guess.	which are not released, interested in conversation-based tool, context improves usage	human-like computer interaction, context is valuable
41	Interviewer	More context?	-	-
42	P4	Yeah…	N/A	N/A
43	Interviewer	Do you feel like context is important in this instance? How impactful is context in this instance?	-	-
44	P4	Context is absolutely critical. If you ask an AI to write your for loop, it can do that for sure.	believes context is important for accuracy	context is valuable

		The more context you give it and the more... yeah, the more is it the same as with the human, it's able to understand... understand, perhaps a debatable term but I'll just use it anyway, the more context you give it, the more it can understand like what you're trying to achieve and therefore the more optimally it can achieve that for you.		
45	Interviewer	And how would you say is Midjourney impactful in software development specifically?	-	-
46	P4	I haven't actually considered how Midjourney might be used in software development beyond like, in front end development, replacing sort of those stock image tools. Limited to software development, I would remove it from the top position in most exciting.	didn't consider AI art much for software development, initial thought is tool's utility in front-end, not considering art generation top tool in software development	AI art minimal contribution for software development
47	Interviewer	But you do feel like it's an important technology at large?	-	-
48	P4	Definitely.	Confirms importance of AI art generation in general	Generally valuable
49	Interviewer	So, do you think that the advent of AI in software development has changed your perspective on your work?	-	-

		How has that influenced your perception of your work, essentially?		
50	P4	Yeah, so here I have like two hats, the ones as a software developer where it's sort of... It's a bit difficult to describe because I mean it's obviously made sort of... It sort of handles the generic tasks for you, or at least like hypothetically if it works perfectly. But, so it makes my role as a software developer more focused on what I'm trying to achieve and rather than actually like writing the code, it's more concept based. And as a cyber security engineer, yeah, it's more focused on sort of the risk of developers using the tool incorrectly and they are bringing in security risks especially when you are using third party tools where you don't actually know their motivations. Likely not to say that it's my own opinion but it's fully possible that a tool could be sort of influenced by a government organization to introduce backdoors. Not to say that any of them are doing that, but it's sort of the kind of risk that could happen because, especially being in Europe and using these tools that are generally American, there's a lot of like political, yeah.	Difficulty describing professional role, perceived increased focus, argues activity shifts to more conceptual, finds users relying on AI represent a potential security issue not the tool itself, political implications of AI	Ability to do more, conceptual understanding, user security risk, social consequences

51	Interviewer	Is it then important to ensure that AI technologies are ethical and biased in decision making? It's okay if it's not important as well, it can be important or it can not be important as well. What do you think?	-	-
52	P4	I definitely think that AI ethics are very important and I kind of guess this might get into your next question but I have also seen a lot of problems in AI ethics in recent times.	Perceived importance of AI ethics,	Values ethics
53	Interviewer	Right, how did that make you feel to see these ethical problems? Did you feel nervous? Did you feel some apprehension or maybe you didn't feel any of these as well? How did that make you feel?	-	-
54	P4	Yeah, mostly concerned for how it's going to progress because if it sort of proceeds says like a downward spiral where everyone's racing to the bottom of the ethics pit. It's obviously quite problematic. But I wouldn't go so far as to say that we're there yet. So I don't feel much yet.	Perceived negative outlook of future AI ethics	dystopian future, ethics
55	Interviewer	Okay. Okay. Okay. Well, going back to Midjourney and the likes then, do you believe that AI art generation works against or on the contrary enhances the ability of professionals to be creative in the case of design interfaces or products?	-	-
56	P4	Yeah, that's an interesting question because my initial	Initial perception of threat to creativity	creativity at risk, software development safe

		reaction is definitely that it works against it. But then I immediately sort of came back to that I don't have the same opinion when it's applied to my own field. So perhaps it sort of comes down to my perspective. So yeah, my opinion is that it works against it, -but I see how it's a contradiction.	coming from AI art generation at large, stating not a threat for software development	
57	Interviewer	Great, so considering AI programming capabilities, do you believe that the number of employees that businesses will need to carry out projects will be impacted in the future?	-	-
58	P4	I definitely see a possible reduction because if individuals are more efficient, obviously you can achieve more, the same amount with less people. But then there's the alternative of, perhaps companies could aim to achieve more within the same number of people. So either way, it's like less number of people the output but there's no direct need to get rid of developers, you could instead aim to achieve more.	Comparison with more productivity and less employees	Ability to do more, workforce changes
59	Interviewer	How does that make you feel? What's your take on this?	-	-
60		So, I had briefly thought about it fairly recently where I sort of feel that it's definitely a threat to the industry	Perceived AI to be a threat to less experienced developers, states more pressing job	Job market entrants more at risk, other concerns to care about

		But I see it more as a threat to inexperienced developers and lower skilled developers. I don't really see it as a threat to myself yet. Because I definitely see myself being able to contribute in that kind of environment. Especially that I could for example pivot into developing AI tools myself. But I also have sort of had those threats sort of erased from my mind recently because we have more immediate challenges where the company I'm working for has financial problems. they're going to be laying off like a thousand three hundred people in the next six months. So I guess AI kind of took a backseat. Although it's not so relevant to the study.	security issues shift the focus	
61	Interviewer	No, no, no, I mean that's a semi-structured interview, we go sideways, that's fine.	-	-
62	P4	It seemed like obviously the link to for example IBM recently announced not a layoff as I understood it but just the intention to replace people with AI and I did sort of see the link especially with the timing but the claim from the company is that it's purely a cost saving measure. They didn't go so fast to say that they are replacing people with AI. So, I haven't speculated yet.	Perceived untruthfulness as to company's restructuring for cost saving reasons, believes coincidental with growth in AI	Correlation between layoffs and AI implementation

63	Interviewer	How do you see the current state of AI evolving in the next few years? What do you feel we can expect from AI?	-	-
64	P4	Yeah, I mean it's a bit difficult to judge if we look at what's happened in the last year. If we're talking about multiple years into the future, it could be anything basically. But what I would like to see is more of a refinement on what we have in terms of taking tools like GPT-4, MyJourney and Dali and improving the quality, like working on the accuracy of the answers that it's providing rather than sort of just charging forward into like new features that yeah people continue to like rely on more than they perhaps should and like, yeah, with questionable actual output, because the, yeah, I mean the catch is that these tools are fully confident regardless of when they're right and wrong.	Difficulty emitting an opinion, perceived improved accuracy in work, stating tools are not fully trustable	Hesitant, ability to be more accurate, distrust
65	Interviewer	Are you staying up to date with the latest developments and breakthroughs in AI technology? Are you regularly going out of your way to get that information to look out for new things in the world of AI?	-	-
66	P4	I wouldn't say I go out of my way, but relative to most other people, I do stay quite up to date. Especially with the YouTube algorithm, it speeds me up.	Awareness of where AI updates come from, perceived profession as	professional interest, informative virtual environment

		Yeah, and also within my work environment as being more on a management level, it's something that's discussed around the office.	reason to stay up to date	
67	Interviewer	How would you see AI affect your job or change the way you work, your job, your current occupation? How would you see it being affected? Also, what kind of changes do you think you could see in terms of what you do daily?	-	-
68	P4	Yeah, I mean, so one of the tasks that I do daily is sort of supporting other cyber security engineers in understanding like regulations and yeah, especially regulations and that's something where an AI could directly replace that task instead of someone asking me about regulation and me looking through documentation to understand it and explain it in AI should be able to process the same document, especially with being a text document and respond to the queries.	Stating AI can digest lots of data on their behalf	proficient with data, time efficiency, ability to do more
69	Interviewer	Okay. On a more general level, what would you do differently regarding development of AI? If you were in complete control of the development of AI, what would you do differently, what would you not do differently, if anything at all?	-	-
70	P4	I would increase the focus on ethics and quality and if I was fully in control I would reduce this competition between companies and somehow make the goal to produce the best	States concerns about AI ethics	ethical issues

		tool and not to be the first to release it all.		
71	Interviewer	Can you think of any area in software development and design which would benefit to be further enhanced by AI? Some areas that which may or may not have been catered for so far, and you really see could benefit from it.	-	-
72	P4	One of the big areas that I can see benefiting is like within testing and within like CI/CD continuous integration and deployment. But especially with testing you have like a much high level of quality requirement if you're now not only relying on the AI tool to develop the software but also to test the software. Yeah you need to have some kind of assurance that it's accurate because it's the same as anything like having someone or some tool just there and work is questionable.	Perceived increased benefits in DevOps, Questions assurance of accordance, Perceived distrust	professionally beneficial, distrust, needs assurance
73	Interviewer	Considering this interview, considering everything you think and you know about, generally speaking or overall do you believe AI to be a rather good or bad technology or in other words do you feel like you're seeing AI as a positive or negative innovation in the world today?	-	-
74	P4	Currently I see it as a very positive innovation, but I also see risk of it becoming negative if it's not developed and managed correctly going forward.	States mixed stance with partial benefits and partial ramifications,	Mixed feelings, pros and cons

Appendix: Fifth Interview Transcript (P5)

LINE	PERSON	CONTENT	OPEN	THEMES
1	Interviewer	How are you doing?	-	-
2	P5	I'm doing good, thank you. Glad to be here for the interview.	N/A	N/A
3	Interviewer	Okay, so please tell us how old are you, and how many years of experience do you have in the field?	-	-
4	P5	All right, so I'm currently 26 years old and I have about three years of experience in in FinTech	N/A	N/A
5	Interviewer	Okay, brilliant. So, what is your current professional title and what does your role involve?	-	-
6	P5	So, I recently joined as a compliance officer. So, my role really involves transaction monitoring. So, I work for a management organisation that is involved in managing and handling the accounting and the administrative side of international companies. The businesses that do business in Europe, Africa, or Asia, but they handle their finances in Mauritius. So, my role involves primarily following up on transactions, which is flagging suspicious transactions or making sure they are compliant with where the money comes from, where the money is going, who it passes through, who it goes through, who it goes to. Now, it also involves software development where we use Python for a multitude of reason, be it visualisation, crunching through a lot of data and numbers, and other things too.	N/A	N/A

		We also look into onboarding clients. So we have to make sure that whatever clients are going to join onboard, we need to know how clean they are, what type of reputation they have. So, we do checks in terms of the clients, the companies, and also the area of business that they're going to be in.		
7	Interviewer	Excellent, work us a little bit then through your day, I mean, you already did sort of work us through what you do, but how much of that is involved in your day to day work?	-	-
8	P5	Okay, so the most common tasks involved specifically is a mix of transaction monitoring and python programming. So, we have to do transaction monitoring for every company that is onboarded into the management group. Every company, so most companies, they use Mauritius as a hub. So, they use the banking of it, just they don't do transactions, they bank the money here that's all. But then, some of them are involved in activities. So, the money goes through the Mauritian companies. So, they have, it's usually like a little, a semi-complex layer. There's a company here in Mauritius, then there's a company where they're doing business. The money is situated in Mauritius, then it has to go to purchases or supplies, and it has to go to customers. So it comes from customers, go to producers or suppliers and the hub is here.	N/A	N/A

		We have to verify who's paying for this product, where are we sending the money to? I'll also sit in front of VS Code for certain periods of time to find ways to automate some of the things we do, or assist us in going through a lot of data. We also use software like Excel, we use Excel to tally all the transactions, then we also use platforms like Refinitiv, Refinitiv helps us do background checks on our suppliers, background checks on the customers who buy the products or engage with the company. So this is mainly the type of tools that we use.		
9	Interviewer	Good, good. How familiar would you say you are with the concept of artificial intelligence?	-	-
10	P5	This is a good one, okay I think I'm fairly familiar with that we use it slightly, not very much but it's a useful tool that is used in terms of programming and crunching number, because since there's a lot of transactions and there's a lot of assessments that have to be done. Sometimes using artificial intelligence is a good way of like organizing the data yeah and pick up like the most notable points in a faster.	Perceived AI tools as useful, facing a lot of work, perceived AI as useful to organise	Basic understanding, usefulness, time efficiency for organising
11	Interviewer	So, okay, if you could choose a specific AI technology to use in your professional toolset, which one would you use? And please explain maybe why that would be the case, or why exactly do you think that's a good for your professional toolset?	-	-
12	P5	Okay, for now we use GPT 3.5. This is what we use currently for work. So why we use this one specifically is because of the ones that we have, it seems to be	Perceived generative AI as being analytical,	analytical support, organisational distrust,

		the most analytical in terms of handling a lot of data, handling a lot of information mathematics. So, but not officially. You know, the financial sector, you know, it's very, it's sensitive, you cannot say you use it just because there are so many, like, regulations. But yeah, so when you take information from other programs and plug it into it, it's very good at analysing that data, analysing the mathematics, analysing the numbers without getting things jumbled up. So in terms of user usability, it's very very good. It's easy to use, it's quick, you can tell it, "Can you rearrange this thing in a more presentable way?" It's very user-friendly, It's the easiest tool so far that we've managed to find. We also use it to help us programme, give us suggestions or find errors in our python code, but it's not like officially. We don't use it officially, but in reality we do, we just don't say anything about it.	states AI is note used officially, perceived finance as legally sensitive	personal involvement, legal concerns, ethics
13	Interviewer	When you program in Python, do you use any particular tool like Github Copilot or Tabnine to program?	-	-
14	P5	Yes, we use Copilot a lot. We tried a couple, but Copilot is the one that was the most accurate. Plus it lives in your IDE so it's, like, it's so easy to just go on and about with your code.	Perceived output accuracy, perceived ease of use	More or less accurate, ease of use
15	Interviewer	Would you say that you welcome AI in your profession?	-	-
16	P5	Yeah, I believe it's a welcomed addition in terms of analysis and programming because if you use it for suggestions.	Perceived benefits of suggestions, stating ability	Proficient with data, context is valuable,

		It's also good to use for subjective means because it can digest a lot of data very quickly. So as a tool, it is really useful in terms of analysing a lot of data, spotting some trends, spotting issues, spotting outliers, suggesting code, and yeah, yeah also using context in your code so it knows, it knows how to, it knows what should come next. That's the good part of it. But as well as there's also some drawbacks that can be linked to having it in our field where I would think because maybe that's the problem with OpenAI is they tend to give suggestions and suggestions can be misleading especially if it's in finance and the code isn't always good. So in a way it's useful as a tool, a software tool aid, but in other cases where we don't want it to take over because in a way, this is not an example, this is someone's life, you know, so this is realistic, this is a lot of money involved and you can't blame AI when decision-making goes wrong.	to deal with lots of data, stating use of context to derive suggestions, stating misleading aspect, facing burden of responsibility on human	distrust, unclear onus
17	Interviewer	I see, I see. Sorry, can you still hear me?	-	-
18	P5	Oh, yes, yes I can.	N/A	N/A
19	Interviewer	Oh yeah, there was a hiccup or something. Have you faced challenges, I mean, also considering the challenges you have mentioned previously when you used AI, how did you choose to overcome such challenges?	-	-
20	P5	When I was faced with these challenges it was very frustrating because in a way it kind of gave you that confused look because you're wondering… Okay, so the thing with mathematics and the thing with finances is we use some,	Stating frustration due to tool's confusion, stating specific needs of finance and	Discontentment, mathematical potential, unclear onus, feeling guilty on behalf of

		certain codes or formulas to calculate things. So if you input a code then it calculates, it uses the code that you've given it, but it brings you the wrong answer. This is kind of frustrating because you're trying to wonder, okay, did I input the code wrong? Or is it analysing something else within the code? You know it's missing parameters that it's supposed to follow. So that was very very frustrating and how I managed to overcome this was just I just decided okay look I'm not going to let it calculate anything anymore. I would do my own calculations and I'd rather make it analyse or give, you know, give, analyse, give suggestions or opinions on the information that it sees. So, in a case I can be like okay you know this is the revenue of one company this is the profits these are losses, what does the comparisons between these five companies tell you? Instead of me saying, okay, can you calculate like the return on this asset or the value of this asset? Because I know that sometimes the calculation that it will give you, even though it claims it uses the formulas that you've stated or the formulas that are universal, the answers still somehow come out different. I have no way to explain why so far, but that's what I've experienced so far.	mathematics, stating confusion, perceived fault from user, emphasised frustration, stating impossibility to explain result	tool, lack of explainability
21	Interviewer	Okay, and so would you say that it has made you overall gain time or lose time?	-	-
22	P5	In a way at first I thought I'd gain time because I was like okay wow all I have	Stating initial trust, perceived	anticipated usefulness,

		to do is just plug this information or write this line of comment in the code, and it's going to sort out everything for me and give me the right code snippet I need, it's a lifesaver you kick back, you put your information in it's okay. Then when I realized okay no no no and these are not the answers or these are not the correct valuations you're supposed to be getting from these figures you put so in in the first initial projects. So, sometimes the code snippet was about some other functionality and didn't understand my comment. I kind of lost time because you had to go back you had to assess which mistake is it, is it my error is it its error? Then you realize, okay look, you might have to design a software that follows specific parameters, but in this case I can't really edit the way it calculates. So, I'm like, okay, what I'll do is I'll limit and I'll just use it for analysis perspectives or to provide simple code, nothing too complex. Just give me an analytical perspective on the figures, that I put into it, then whatever it draws out, I take some of it, if it makes sense, it's a good guideline, guide tool. But in any case, it hasn't really changed my timeline anymore. At first I, thought it was going to be a very big time-saver, but now I'm using it with a bit of hesitancy.	simplicity, facing wrong outputs, perceived waste of time, faces usage restrictions	unmet expectations, realising limitations, time consuming, restricted use
23	Interviewer	Understood, would you say then that there was also maybe a little bit of a learning curve, or that would have maybe made the tool not as easy to use as advertised?	-	-

24	P5	No, definitely. There was a bit of, maybe they weren't stating it as the way that I would have assumed, but I would have expected it to be able to do some simple calculations. So, you ask for a code snippet or suggestion, you expect it to give you say an updated version of the code that uses the right version of the documentation, for the framework you're using or, or, yeah, but it doesn't. But it gives you wrong answers. So I guess maybe this is a stage that is still being developed, they're working on. But yeah, in a way, I was disappointed on that front. But I've just realized that to not take the value that it does have, but also you know realize that there are still some limitations to some things that need to be updated and improved you can't really be dependent on it not yet it was still a bit far from that from that stage yet.	Stating disappointment due to expectations, perceived potential for improvement	Unmet expectations, strong potential
25	Interviewer	Thank you for that, by the way if I if I don't speak whilst you speak it's because I must stay quiet for the transcribing software to really be able to pick up what you say. So that's why I'm leaving you the monologue and you can really say whatever you have on your mind.	-	-
26	P5	Sure, sure, sure, that's cool, thanks.	N/A	N/A
27	Interviewer	I mean, what are some of the benefits that you have seen with AI in software development?	-	-

29	P5	I think it's very, very useful in software development, even though it's not perfect. It's very useful in terms of giving you suggestions, analysis. So you are definitely faster and more focused when writing code right, the only issue, you know, you can't always trust it. So yes you go fast, but you also, I guess, you also always have to, well, double check what it gives you, so not as fast as you'd, well, as you'd expect.	Perceived usefulness in development, perceived potential to analyse, perceived increased focus, perceived increased speed, perceived distrust	useful for software development, analytical support, ability to do more, time efficiency, distrust
30	Interviewer	So now in this instance therefore with consideration to all that was said, what are some of the most exciting AI technologies that are available today?	-	-
31	P5	Okay. What I've noticed so far is, well this is an area that I haven't necessarily had first-hand experience with, but I was following these podcasts, these videos. They were showing us how AI software can be utilized in FinTech. So, one of the biggest like issues, I wouldn't want to say issues, but one of the biggest challenges is when you're doing mathematical analytics, you have to crunch a lot of numbers. You have to crunch a lot of historical data. So, like for companies you might have to go back five, ten years, you know. So this is, these can be hundreds of pages of numbers that need to be assessed. So, but with AI now, what can take you days or weeks can be done within minutes.	Stating actively staying informed, perceived automation, stating reduced manual interaction, perceived reduced time wasting, perceived sense of increased performance	active interest, reduced manual labour, time efficiency, ability to do more

		So you don't it doesn't necessarily take away your job but it just makes it easier in the sense that it kind of makes things into patterns, it groups things in a more usable way. So this is an area I think will be very, very useful. It kind of eliminates the primary phase, the primary stage. That is not very... the word for it would be... it's not very... manual side. It removes the manual side that is not required in terms of... you don't have to be knowledgeable. It leaves a layer that you can now end up using as own assessment. You now use the right kind of steps to get those kind of answers. It's just taking away that the core primary part that you know that in a way is a big time waster but it's part of the job. I would qualify them as repetitive tasks. Most of the stuff is repetitive tasks you know it can be if there was a way of just eliminating all these repetitive tasks because it's very, very simple. We do that, we can become more productive in the workplace, you know, within our tasks. We can look at things that actually require more assessment, more creative mindsets, or more creative thinking.		
32	Interviewer	I see, I see. Could using AI technology influence how you feel or your perspective, about your work?	-	-
33	P5	Like in terms of eliminating the manual part of work, I think that's something that is very welcome and this is	Comparison of workplace perception with less	reduced manual labour, improved workplace

		something that I think would make me feel way better about my workplace. Knowing that instead of, there are some jobs that, you know, you don't, the answer is four or five steps away, four or five stages away. If the first two, three stages take the bulk of your day but AI can do this within minutes, that'll be a very, very welcome option, that's a very welcome solution or tool because what it's essentially doing is not taking away my job in a sense, it's just making it quite easier. Like back then, people used to have pen and paper and calculator, you can't say Excel took your job because everything can be pasted into Excel and you can make the calculations faster, you can use analytical tools that can put chats and tables. AI, in this case, is just taking that step a bit further and making that process through Excel even more productive.	manual tasks, perceived improved opinion of the workplace, comparison of advent of Excel with advent of AI,	esteem, AI just like other game changing tools
34	Interviewer	Interesting, do you feel like you see your job differently?	-	-
35	P5	I think the more we utilise AI in a way that is secretarial, let's say secretarial, the more we get to be more productive in what the goals that we need. So I think I will feel much better knowing that, okay, I have tools that can save me so much time, so much headache, because we know with mathematics and programming, it's with finance and fintech, it's very very data sensitive, it's very very sensitive to errors. ¨ So if you know, okay, instead of me spending five, ten hours doing one task because I have to be very careful with the numbers, this thing can be done in a	Comparison of AI tools with secretarial functions, perceived finance sensitivity to errors, perceived time saving.	AI assistive role, accuracy vulnerability, time efficiency

		few minutes and I just have to review it, which makes you feel better.		
36	Interviewer	Awesome, okay, that's great. Then that leads me to the next question, which is going to be very interesting. Do you believe AI generation works against, or on the contrary, enhances the ability of professionals to be creative in the case of, say, designing interfaces, products, or the artistic side of software development?	-	-
37	P5	Well, I think in this case, I've got a split opinion. I think it works for those who are not as knowledgeable. Because look, if you don't have a lot of experience and you're starting up, having a tool that can give you professional looking results, very early on is a major plus. I think it's then the other side of it is like you know creatively AI kind of, AI is not in a sense original in the way that we want to imagine art. It takes its creativity from other sources and other you know other platforms other artists doesn't credit them so in that aspect I think okay look um this is where it's kind of lacking you know it's, it's essentially borrowing all these pieces of creativity from somewhere else, and it's pasting it onto what you're using. So it's kind of making it-- it saturates the market very, very much so creatively speaking. I think it's not very good in terms of its application in that scenario, that aspect.	Stating mixed feelings, perceived usefulness early career, perceived AI art as unoriginal, perceived negative impact of AI art	Mixed feelings, AI is resourceful, beneficial for job market entrants, AI art unwelcomed, plagiarism
38	Interviewer	Do you believe, I mean, considering AI programming capabilities, do you believe that the number of employees that businesses will need to develop	-	-

		software projects will be impacted in the future?		
39	P5	Oh, definitely they're going to be impacted. Like what we said, you know how the structure, structure is dynamic at work. The junior levels are always the biggest number of employees that are there. Even with, even with it lacking the ability to replace a programmer completely, you still work so much faster. So know, work that is done within weeks instead of months. Things like tractors, you know, they increase production, what, thousandfold, whilst reducing costs within the same kind of, you know, narrative than AI. So it's just going so be the exact same thing in projects, number of employees employed, because it's going be able to do the primary stages very very easily, very very quickly, very very cheaply. As time goes on, not as many jobs are going to be necessary, but they're still going to be needed.	Convinced of impact on the workforce, perceived improved performance, stating number of jobs will decrease but not disappear	affects the workforce, ability to do more,
40	Interviewer	Okay great. Now how do you see the current state of AI evolving in the next few years? How do you see it go, especially when we talk about for example FinTech or software development, how do you see that evolving? Do you think it's going to be different from that?	-	-
41	P5	Okay, well I think it's just going to keep on improving. So, the problems that I see, I'm very sure other developers see this, and other	Perceived potential for improvement, stating trust will increase,	potential, anticipated improved trust, more dependent

		programmers they also see that, okay look, we have issues, we have drawbacks, we have shortfalls of AI that need to be corrected. So I see AI developing and becoming more and more user-friendly, more and more dependable, more accurate. I fear that, in a way people are going to be dependent on AI in terms of requiring it to be... so I see it evolving in the application in the workplace, so it's going to be more... it's going to make things easier in terms of usability, in terms of dependency, but also I think the side effect of this. We won't necessarily know how we get to the answers that we have. But that's maybe a problem in the future.	anticipated increase in dependency	
42	Interviewer	Absolutely. So, are you staying up to date with the latest developments and breakthroughs in AI technologies or is that something that happens passively? Or are you actively looking for these AI news of sorts?	-	-
43	P5	Okay, well, AI is an interesting topic and actively is a strong word, but I think I follow it fairly enough. And I am interested in how the world is developing, how well the technologies are making advancements. So yes, I would say fairly enough.	Stating actively stays informed, affirming interest	actively informed, personal interest,
44	Interviewer	How can you see AI changing your job in the future? How do you feel about this?	-	-
45	P5	So in my case, so I think right now I'm still positioned in the kind of place where I think I can use AI as a wave and	Comparison of usefulness for experienced	Job market entrants more at risk, usefulness,

		it will help me go along my journey within my job, within my position, within my industry. But for those that are coming up now, I think they might face that same wave challenging now because it's going to eliminate a lot of the jobs or the requirements that we used to get into the jobs that we're doing now. So as an entry level or entry tool, I think a lot of people might have to reassess the kind of skills that they would end up requiring or needing for the same positions that we have today, because AI is going to eliminate most of these tasks.	practitioners and threat for new entrants, perceived need to learn new skills	changes in required skills
46	Interviewer	Okay, then maybe on a more general level, then, what would you do differently regarding development of AI? If you had full control over how AI develops from now on, what would you change with AI?	-	-
47	P5	I think I would limit the amount of... I would limit the way it gives suggestions. Because I feel sometimes these suggestions can, it might not be as objective as you're required to be. So, in terms of AI development, I'd rather have it be more suited to analysis, be more suited to not making up its own answer but be more suited to enhancing my idea. So, in terms of its development, I think, okay look, let's take it away from scenarios where it's not as useful. Let's put it in places where we need repetitive tasks and tests that take a long time, that manual that are hard, that are long, and let's try to take away these layers, these layers of, you know, of secretarial work. I don’t need to need to	Perceived distrust for output, stating preference for support than replacement, perceived contribution to organisational growth,	distrust, assistive role, contributes to common growth

		remember where each bracket of code lives, let the AI fix it for me and move on. Let's make it better suited for these kind of tasks. And in a way, we can advance. So, in a way, we don't only eliminate jobs and make the industry a bit more stoic or stringent, but we make the industry a bit more advanced in terms of the requirements that people need to enter the industry a bit more beneficial or useful. So, we kind of regrow, we are more dynamic in terms of like what do we need to advance. We grow as an industry, we use AI as like the way that we need to give us that kind of fuel to go further.		
48	Interviewer	Okay, that's nice. Can you think of any area in software development and design which would benefit or be further enhanced by AI? Now this area can be software development in FinTech, can be software development elsewhere, whichever you would like to delve further into.	-	-
49	P5	In terms of the ability to handle, handle the connections to databases or using APIs or specific, say, the specifics of frameworks that exist, there's a lot really, that can be done there. I could also say like in other areas that I've noticed, personal areas, I think things like social media, okay, for instance, it's just a throwback there, I think AI can be more useful in terms of being able to spot hate speech, negative data, negative media, negative reports, maybe used to spot fake news, you used to spot things that are a bit more negative for the population.	Perceived potential for complex tasks, stating potential use for doing good, stating potential for unwanted occupations, potential for policing,	ease of complexity, takes care of less desirable jobs, authoritative role,

		So, I think it'd be more suited to spotting those things, making it a bit more... it's policing, maybe policing the internet would be a good way of, you know, will be further advanced.		
50	Interviewer	And then last but not least, considering this interview, and everything that has been said, do you perceive AI as good or as a good or as a bad technology for software development or for fintech? Do you think it's going to be bringing more benefits than drawbacks or the other way around? Or you think it's neither good nor bad but rather also in the middle.	-	-
51	P5	I think in terms of FinTech it's going to be very very beneficial. It's a game changer. It's a game changer. In terms of effectiveness, productivity, it's gonna change these skills. as more we get used to using it, applying it into day to day, it's just going to create this competitive environment that we're going to benefit from. So, tasks that require this big labour force days or weeks to do, we're going to shrink that down. It can be done within hours, minutes, it can be done within a day. Tasks that needed a team of ten people cannot be done by two or one person so we're going to be able to utilize resources better. And I think in the world of fintech it's going to be very very useful because for people with ideas there's no more limitations to the labour force now. It's going to be easier for you to scale up. So yeah, it's going to open new markets, definitely it's going to open new markets, it's going to give us new ideas, it's going to help us be better used, better	perceived benefits, stating strong impact, perceived reduction in the workforce, stating improve utilisation of resources, stating there are negative aspects, perceive adaptability from users, perceived benefits outweigh the negatives.	beneficial, impactful, diminished workforce, resource efficient, consequences, users need to adapt, more good than bad

		use, it's going to give us a better use of resources. And all in all, I think we're going to develop, I think the world of finance is going to become more and more developed as time goes on, as we utilize AI, we're going to become better with it. The bad part, of course, is always going to be negatives, is that technology is going to wipe a lot of jobs out because the primary part of this whole primary stage is going to be wiped out. But in all cases, people adapt, people become better, people become more useful. So I think, yeah, in all sense, it's better. It's more useful than it is bad in the world of fintech.		
52	Interviewer	Well, I mean, that is essentially all the interview we had. I would really like to thank you for your time. And I think it was great talking to you. We have a little more insight into software development from someone in fintech now, rather than pure software development on just pure software.	-	-
53	P5	Thank you for having me. Thank you very much.	N/A	N/A

References

Abedin, B. (2021). Managing the Tension between Opposing Effects of Explainability of Artificial Intelligence: A Contingency Theory Perspective, Internet Research, vol. 32, no. 2, pp.425–453. doi:10.1108/INTR-05-2020-0300

Abedin, B., Meske, C., Junglas, I., Rabhi, F. & Motahari-Nezhad, H. R. (2022). Designing and Managing Human-AI Interactions, Information Systems Frontiers, vol. 24, no. 3, pp.691–697. doi: 10.1007/s10796-022-10313-1

Aldridge, J., Medina, J. & Ralphs, R. (2010). The Problem of Proliferation: Guidelines for Improving the Security of Qualitative Data in a Digital Age, Research Ethics, [e-journal] vol. 6, no. 1, pp.3–9, Available Online: http://journals.sagepub.com/doi/10.1177/174701611000600102 [Accessed 28 December 2022]

Anyoha, R. (2017). The History of Artificial Intelligence, Harvard University, Science in the News, Available Online: https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/ [Accessed 12 May 2023]

Baird, A. & Maruping, L. M. (2021). The Next Generation of Research on IS Use: A Theoretical Framework of Delegation to and from Agentic IS Artifacts, MIS Quarterly, vol. 45, no. 1, pp.315–341. doi:10.25300/MISQ/2021/15882

Barnham, C. (2015). Quantitative and Qualitative Research., International Journal of Market Research, [e-journal] vol. 57, no. 6, pp.837–854, Available Through: Business Source Complete https://ludwig.lub.lu.se/login?url=https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=bth&AN=110871412&site=eds-live&scope=site

Baskerville, R. L. & Myers, M. D. (2002). Information Systems as a Reference Discipline, MIS Quarterly, [e-journal] vol. 26, Available Online: https://www.jstor.org/stable/10.2307/4132338?origin=crossref [Accessed 28 December 2022]

Benda, N. C., Novak, L. L., Reale, C. & Ancker, J. S. (2021). Trust in AI: Why We Should Be Designing for Appropriate Reliance, Journal of the American Medical Informatics Association, vol. 29, no. 1, pp.207–212. doi: 10.1093/jamia/ocab238

Bhugin, J., Hazan, E., Ramaswamy, S., Chui, M., Allas, T., Dahlström, P., Henke, N. & Trench, M. (2017). Artificial Intelligence The Next Digitial Frontier?, Discussion Paper, McKinsey Global Institute

Bird, C., Ford, D., Zimmermann, T., Forsgren, N., Kalliamvakou, E., Lowdermilk, T. & Gazit, I. (2022). Taking Flight with Copilot: Early Insights and Opportunities of AI-Powered Pair-Programming Tools, Queue, vol. 20, no. 6, pp.35–57. doi:10.1145/3582083

Bitkina, O. Vl., Jeong, H., Lee, B. C., Park, J., Park, J. & Kim, H. K. (2020). Perceived Trust in Artificial Intelligence Technologies: A Preliminary Study, Human Factors and Ergonomics in Manufacturing & Service Industries, vol. 30, no. 4, pp.282–290. doi:10.1002/hfm.20839

Blanco, J. Z. & Lucrédio, D. (2021). A Holistic Approach for Cross-Platform Software Development, Journal of Systems and Software, vol. 179, pp.1-18. doi:10.1016/j.jss.2021.110985

Bond, R. R., Mulvenna, M. & Wang, H. (2019). Human Centered Artificial Intelligence: Weaving UX into Algorithmic Decision Making

Braun, V. & Clarke, V. (2022). Thematic Analysis: A Practical Guide, London; Thousand Oaks, California: SAGE

Bruneliere, H., Muttillo, V., Eramo, R., Berardinelli, L., Gómez, A., Bagnato, A., Sadovykh, A. & Cicchetti, A. (2022). AIDOaRt: AI-Augmented Automation for DevOps, a Model-Based Framework for Continuous Development in Cyber–Physical Systems, Microprocessors and Microsystems, [e-journal] vol. 94, p.104672, Available Online:

https://linkinghub.elsevier.com/retrieve/pii/S0141933122002022 [Accessed 29 December 2022]
Burgess, J., Connell, J., Nankervis, A. & Montague, A. (2021) The Fourth Industrial Revolution: What Does it Mean for Australian Industry? Singapore: Springer Nature Singapore. doi:10.1007/978-981-16-1614-3.
Butt, S., Khan, S. U. R., Hussain, S. & Wang, W.-L. (2023). A Conceptual Model Supporting Decision-Making for Test Automation in Agile-Based Software Development, Data & Knowledge Engineering, vol. 144, pp.1-31. doi:10.1016/j.datak.2022.102111
Bygstad, B. (2004). Controlling Iterative Software Development Projects: The Challenge of Stakeholder and Technical Integration, in 37th Annual Hawaii International Conference on System Sciences, 2004. Proceedings of The, 37th Annual Hawaii International Conference on System Sciences, 2004. Proceedings of The, Big Island, HI, USA, 2004, Big Island, HI, USA: IEEE, p.10 pp., Available Online: http://ieeexplore.ieee.org/document/1265607/ [Accessed 24 May 2023]
Cardona, F. (2019). Timeline: The 30-Year History of the World Wide Web, Visual Capitalist, Available Online: https://www.visualcapitalist.com/30-year-timeline-world-wide-web/ [Accessed 18 May 2023]
Chen, C.-Y., Hsu, P.-Y. & Vu, H.-N. (2023). Collaborative Process Tailoring in Evolutionary Software Development: A Teamwork-Quality Perspective, Software Quality Journal, vol. 31, no. 1, pp.89–119. doi:10.1007/s11219-022-09597-y
Chen, Z., Chen, L., Zhao, Z. & Wang, Y. (2020). AI Illustrator: Art Illustration Generation Based on Generative Adversarial Network, in 2020 IEEE 5th International Conference on Image, Vision and Computing (ICIVC), 2020 IEEE 5th International Conference on Image, Vision and Computing (ICIVC), Beijing, China, July 2020, Beijing, China: IEEE, pp.155–159, Available Online: https://ieeexplore.ieee.org/document/9177494/ [Accessed 24 May 2023]
Cheng, R., Wang, R., Zimmermann, T. & Ford, D. (2023). 'It Would Work for Me Too': How Online Communities Shape Software Developers' Trust in AI-Powered Code Generation Tools, arXiv:2212.03491, Available Online: http://arxiv.org/abs/2212.03491 [Accessed 23 May 2023]
Chubb, J., Cowling, P. & Reed, D. (2022). Speeding up to Keep up: Exploring the Use of AI in the Research Process, AI & SOCIETY, vol. 37, no. 4, pp.1439–1457. doi:10.1007/s00146-021-01259-0
Coursera. (2023). 4 Types of AI: Getting to Know Artificial Intelligence, Available Online: https://www.coursera.org/articles/types-of-ai [Accessed 24 April 2023]
Cramer, H. & Kim, J. (2019). Confronting the Tensions Where UX Meets AI, Interactions, vol. 26, no. 6, pp.69–71. doi:10.1145/3364625
Czerwinski, M., Hernandez, J. & McDuff, D. (2021). Building an AI That Feels: AI Systems with Emotional Intelligence Could Learn Faster and Be More Helpful, IEEE Spectrum, vol. 58, no. 5, pp.32–38. doi:10.1109/MSPEC.2021.9423818
Dakhel, A. M., Majdinasab, V., Nikanjam, A., Khomh, F., Desmarais, M. C., Ming, Z. & Jiang. (2023). Github Copilot AI Pair Programmer: Asset or Liability?, arXiv:2206.15331, Available Online: http://arxiv.org/abs/2206.15331 [Accessed 5 May 2023]
Dégallier-Rochat, S., Kurpicz-Briki, M., Endrissat, N. & Yatsenko, O. (2022). Human Augmentation, Not Replacement: A Research Agenda for AI and Robotics in the Industry, Frontiers in Robotics and AI, vol. 9, pp.1-5. doi:10.3389/frobt.2022.997386
Del Giudice, M., Scuotto, V., Orlando, B. & Mustilli, M. (2023). Toward the Human – Centered Approach. A Revised Model of Individual Acceptance of AI, Human Resource Management Review, vol. 33, no. 1, pp.1-10. doi:10.1016/j.hrmr.2021.100856
DeMarrais, K. B. & Lapan, S. D. (2004). Foundations for Research: Methods of Inquiry in Education and the Social Sciences, Mahwah, N.J: L. Erlbaum Associates
Dempsey, M. (2022). A Mind-Reading Combat Jet for the Future, BBC News, Available Online: https://www.bbc.com/news/business-62289737 [Accessed 5 January 2023]
Denne, M. & Cleland-Huang, J. (2004). The Incremental Funding Method: Data-Driven Software Development, IEEE Software, vol. 21, no. 3, pp.39–47. doi:10.1109/MS.2004.1293071

Doherty, E. (2020). What Is Object-Oriented Programming? OOP Explained in Depth, Educative, Available Online: https://www.educative.io/blog/object-oriented-programming [Accessed 18 May 2023]

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., Medaglia, R., Le Meunier-FitzHugh, K., Le Meunier-FitzHugh, L. C., Misra, S., Mogaji, E., Sharma, S. K., Singh, J. B., Raghavan, V., Raman, R., Rana, N. P., Samothrakis, S., Spencer, J., Tamilmani, K., Tubadji, A., Walton, P. & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary Perspectives on Emerging Challenges, Opportunities, and Agenda for Research, Practice and Policy, International Journal of Information Management, vol.57. doi:10.1016/j.ijinfomgt.2019.08.002

Espiner, T. (2023). BT to Cut 55,000 Jobs with up to a Fifth Replaced by AI, BBC News, Available Online: https://www.bbc.com/news/business-65631168 [Accessed 18 May 2023]

Flick, C. & Worrall, K. (2022). The Ethics of Creative AI, in C. Vear & F. Poltronieri (eds), The Language of Creative AI, [e-book] Cham: Springer International Publishing, pp.73–91, Available Online: https://link.springer.com/10.1007/978-3-031-10960-7_5 [Accessed 24 May 2023]

Flick, U. (2007). Managing Quality in Qualitative Research, [e-book] 1 Oliver's Yard, 55 City Road, London England EC1Y 1SP United Kingdom: SAGE Publications, Ltd, Available Online: https://methods.sagepub.com/book/managing-quality-in-qualitative-research [Accessed 2 January 2022]

Fortuna, P. & Gorbaniuk, O. (2022). What Is behind the Buzzword for Experts and Laymen: Representation of "Artificial Intelligence" in the IT-Professionals' and Non-Professionals' Minds, Europe's Journal of Psychology, vol. 18, no. 2, pp.207–218. doi:10.5964/ejop.5473

Frey, J. H. & Fontana, A. (1991). The Group Interview in Social Research, The Social Science Journal, [e-journal] vol. 28, no. 2, pp.175–187, Available Online: https://www.tandfonline.com/doi/full/10.1016/0362-3319%2891%2990003-M [Accessed 5 January 2023]

Garvey, C. M. & Jones, R. (2021). Is There a Place for Theoretical Frameworks in Qualitative Research?, International Journal of Qualitative Methods, vol. 20, pp.1-7. doi:10.1177/1609406920987959

Gheondea-Eladi, A. (2014). IS QUALITATIVE RESEARCH GENERALIZABLE?, Journal of Community Positive Practices, [e-journal] vol. 14, no. 3, pp.114–124, Available Through: SocINDEX with Full Text https://ludwig.lub.lu.se/login?url=https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=sih&AN=108795519&site=eds-live&scope=site

Gkinko, L. & Elbanna, A. (2022). Hope, Tolerance and Empathy: Employees' Emotions When Using an AI-Enabled Chatbot in a Digitalised Workplace, Information Technology & People, vol. 35, no. 6, pp.1714–1743. doi:10.1108/ITP-04-2021-0328

Goberna Caride, C. (2021). Respecting the GDPR in Online Interviewed Focus Groups, Journal of Audiovisual Translation, [e-journal] vol. 4, no. 2, Available Online: https://jatjournal.org/index.php/jat/article/view/175 [Accessed 3 January 2023]

Goldkuhl, G. (2012). Pragmatism vs Interpretivism in Qualitative Information Systems Research, European Journal of Information Systems, vol. 21, no. 2, pp.135–146. doi:10.1057/ejis.2011.54

Greenhouse, S. (2023). US Experts Warn AI Likely to Kill off Jobs – and Widen Wealth Inequality, The Guardian, Available Online: https://www.theguardian.com/technology/2023/feb/08/ai-chatgpt-jobs-economy-inequality [Accessed 8 May 2023]

Gruetzemacher, R. (2022). The Power of Natural Language Processing, Harvard Business Review, Available Online: https://hbr.org/2022/04/the-power-of-natural-language-processing [Accessed 8 May 2023]

Hays, D. G. & McKibben, W. B. (2021). Promoting Rigorous Research: Generalizability and Qualitative Research, Journal of Counseling & Development, [e-journal] vol. 99, no. 2,

pp.178–188, Available Online: https://onlinelibrary.wiley.com/doi/10.1002/jcad.12365 [Accessed 5 January 2023]
Hintze, A. (2016). Understanding the Four Types of AI, from Reactive Robots to Self-Aware Beings, The Conversation, Available Online: http://theconversation.com/understanding-the-four-types-of-ai-from-reactive-robots-to-self-aware-beings-67616 [Accessed 2 May 2023]
Holzinger, A., Saranti, A., Angerschmid, A., Retzlaff, C. O., Gronauer, A., Pejakovic, V., Medel-Jimenez, F., Krexner, T., Gollob, C. & Stampfer, K. (2022). Digital Transformation in Smart Farm and Forest Operations Needs Human-Centered AI: Challenges and Future Directions, Sensors, vol. 22, no. 8, p.3043. doi:10.3390/s22083043
House, J. (2018). Authentic vs Elicited Data and Qualitative vs Quantitative Research Methods in Pragmatics: Overcoming Two Non-Fruitful Dichotomies, System, [e-journal] vol. 75, pp.4–12, Available Online: https://linkinghub.elsevier.com/retrieve/pii/S0346251X18301520 [Accessed 3 January 2023]
Huang, M.-H., Rust, R. and Maksimovic, V. (2019) 'The Feeling Economy: Managing in the Next Generation of Artificial Intelligence (AI)', California Management Review, 61(4), pp. 43–65. doi:10.1177/0008125619863436
IBM. (2023). Explainable AI, Available Online: https://www.ibm.com/se-en/watson/explainable-ai [Accessed 2 May 2023]
IBM. (2023). What Is Software Development? | IBM, Available Online: https://www.ibm.com/topics/software-development [Accessed 8 May 2023]
Imai, S. (2022). Is Github Copilot a Substitute for Human Pair-Programming?: An Empirical Study, in Proceedings of the ACM/IEEE 44th International Conference on Software Engineering: Companion Proceedings, ICSE '22: 44th International Conference on Software Engineering, Pittsburgh Pennsylvania, 21 May 2022, Pittsburgh Pennsylvania: ACM, pp.319–321, Available Online: https://dl.acm.org/doi/10.1145/3510454.3522684 [Accessed 24 May 2023]
Jarrahi, M. H., Lutz, C. & Newlands, G. (2022). Artificial Intelligence, Human Intelligence and Hybrid Intelligence Based on Mutual Augmentation, Big Data & Society, [e-journal], Available Online: https://journals.sagepub.com/doi/10.1177/20539517221142824 [Accessed 8 May 2023]
Jaworski, M. & Piotrkowski, D. (2023). Study of Software Developers' Experience Using the Github Copilot Tool in the Software Development Process, arXiv:2301.04991, Available Online: http://arxiv.org/abs/2301.04991 [Accessed 24 May 2023]
Johnson, A. (2023). Here Are The Best AI Image Generators, Forbes, Available Online: https://www.forbes.com/sites/ariannajohnson/2023/04/28/here-are-the-best-ai-image-generators/ [Accessed 2 May 2023]
Joshi, N. (2019). 7 Types Of Artificial Intelligence, Forbes, Available Online: https://www.forbes.com/sites/cognitiveworld/2019/06/19/7-types-of-artificial-intelligence/ [Accessed 3 May 2023]
Kanade, V. (2022). Narrow AI vs. General AI vs. Super AI: Key Comparisons, Spiceworks, Available Online: https://www.spiceworks.com/tech/artificial-intelligence/articles/narrow-general-super-ai-difference/ [Accessed 2 May 2023]
Kaplan, A. & Haenlein, M. (2019). Siri, Siri, in My Hand: Who's the Fairest in the Land? On the Interpretations, Illustrations, and Implications of Artificial Intelligence, Business Horizons, vol. 62, no. 1, p.17. doi:10.1016/j.bushor.2018.08.004
Koetsier, J. (2022). Generative AI: The Future Is AI Writing Its Own Code, Forbes, Available Online: https://www.forbes.com/sites/johnkoetsier/2022/11/08/generative-ai-the-future-is-ai-writing-its-own-code/ [Accessed 2 May 2023]
Korzeniowski, Ł. & Goczyła, K. (2019). Artificial Intelligence for Software Development — the Present and the Challenges for the Future, Bulletin of the Military University of Technology, vol. 68, no. 1, pp.15–32. doi:10.5604/01.3001.0013.1464
Labs Qubit. (2022). How Many Programmers Are There in the World and in the US? [2023], Qubit Labs, Available Online: https://qubit-labs.com/how-many-programmers-in-the-world/ [Accessed 2 May 2023]

Lauriola, I., Lavelli, A. & Aiolli, F. (2022). An Introduction to Deep Learning in Natural Language Processing: Models, Techniques, and Tools, Neurocomputing, vol. 470, pp.443–456. doi:10.1016/j.neucom.2021.05.103

Leddy, C. (2019). New Collaboration Sparks Global Connections to Art through Artificial Intelligence | MIT News | Massachusetts Institute of Technology, Available Online: https://news.mit.edu/2019/mit-collaboration-sparks-global-connections-art-artificial-intelligence-0205

Liang, J. T., Yang, C. & Myers, B. A. (2023). Understanding the Usability of AI Programming Assistants, arXiv:2303.17125, Available Online: http://arxiv.org/abs/2303.17125 [Accessed 24 May 2023]

Lin-Hi, N., Haensse, L., Hollands, L. & Blumberg, I. (2023). The Role of Ethics in Technology Acceptance: Analysing Resistance to New Health Technologies on the Example of a COVID-19 Contact-Tracing App, Journal of Decision Systems, pp.1–31. doi:10.1080/12460125.2023.2171390

Malgonde, O., Saldanha, T. & Mithas, S. (2023). Resilience in the Open Source Software Community: How Pandemic and Unemployment Shocks Influence Contributions to Others' and One's Own Projects, MIS Quarterly, vol. 47, no. 1, pp.361–390. doi:10.25300/MISQ/2022/17256

Malterud, K. (2001). Qualitative Research: Standards, Challenges, and Guidelines, The Lancet, [e-journal] vol. 358, no. 9280, pp.483–488, Available Online: https://linkinghub.elsevier.com/retrieve/pii/S0140673601056276 [Accessed 3 January 2023]

Mansour, O., 1983 & Ghazawneh, A. (2009). Research in Information Systems: Implications of the Constant Changing Nature of IT in the Social Computing Era, Selected Papers of the 32nd Information Systems Research Seminar in Scandinavia, [e-journal] pp.121–136, Available Through: SwePub https://ludwig.lub.lu.se/login?url=https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=edsswe&AN=edsswe.oai.DiVA.org.vxu.6395&site=eds-live&scope=site

Marr, B. (2021). Understanding the 4 Types of Artificial Intelligence (AI), LinkedIn, Available Online: https://www.linkedin.com/pulse/understanding-4-types-artificial-intelligence-ai-bernard-marr [Accessed 24 April 2023]

McKinsey & Company. (2022). The State of AI in 2022—and a Half Decade in Review, Available Online: https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2022-and-a-half-decade-in-review [Accessed 16 May 2023]

Mero-Jaffe, I. (2011). 'Is That What I Said?' Interview Transcript Approval by Participants: An Aspect of Ethics in Qualitative Research, International Journal of Qualitative Methods, [e-journal] vol. 10, no. 3, pp.231–247, Available Online: http://journals.sagepub.com/doi/10.1177/160940691101000304 [Accessed 3 January 2023]

Meske, C. & Bunde, E. (2020). Transparency and Trust in Human-AI-Interaction: The Role of Model-Agnostic Explanations in Computer Vision-Based Decision Support, in H. Degen & L. Reinerman-Jones (eds), Artificial Intelligence in HCI, [e-book] Springer International Publishing, pp.54–69, Available Online: http://link.springer.com/10.1007/978-3-030-50334-5_4 [Accessed 7 May 2023]

Microsoft Azure. (2023). What Is DevOps? DevOps Explained, Microsoft Azure, Available Online: https://azure.microsoft.com/en-in/resources/cloud-computing-dictionary/what-is-devops [Accessed 18 May 2023]

Monteiro, E., Constantinides, P., Scott, S., Shaikh, M. & Burton-Jones, A. (2022). Qualitative Research Methods in Information Systems: A Call for Phenomenon-Focused Problematization., MIS Quarterly, December, pp.1714-1743. doi:10.1108/ITP-04-2021-0328

Morandini, S., Fraboni, F., De Angelis, M., Puzzo, G., Giusino, D. & Pietrantoni, L. (2023). The Impact of Artificial Intelligence on Workers' Skills: Upskilling and Reskilling in Organisations, Informing Science: The International Journal of an Emerging Transdiscipline, vol. 26, pp.39–68. doi:10.28945/5078

Morgan, G. & Smircich, L. (1980). The Case for Qualitative Research, The Academy of Management Review, [e-journal] vol. 5, no. 4, p.491, Available Online: http://www.jstor.org/stable/257453?origin=crossref [Accessed 4 January 2023]

Movement, Q. ai-P. a P. W. (2023). Artificial Intelligence Jobs: How Will AI Change The Job Market?, Forbes, Available Online: https://www.forbes.com/sites/qai/2023/02/15/artificial-intelligence-jobs-how-will-ai-change-the-job-market/ [Accessed 5 May 2023]

MSV, J. (2022). 5 AI Tools That Can Generate Code To Help Programmers, Forbes, Available Online: https://www.forbes.com/sites/janakirammsv/2022/03/14/5-ai-tools-that-can-generate-code-to-help-programmers/ [Accessed 2 May 2023]

Munn, L., Magee, L. & Arora, V. (2023). Truth Machines: Synthesizing Veracity in AI Language Models, arXiv:2301.12066, Available Online: http://arxiv.org/abs/2301.12066 [Accessed 24 May 2023]

Murphy, M., Killen, C., Burnham, R., Sarvari, F., Wu, K. & Brown, N. (2022). Artificial Intelligence Accurately Identifies Total Hip Arthroplasty Implants: A Tool for Revision Surgery, HIP International, vol. 32, no. 6, pp.766–770. doi:10.1177/1120700020987526

Naveed, M. H., Hashmi, U. S., Tajved, N., Sultan, N. & Imran, A. (2022). Assessing Deep Generative Models on Time Series Network Data, IEEE Access, vol. 10, pp.0-18. doi:10.36227/techrxiv.17296235.v2

Nieto-Rodriguez, A. & Vargas, R. V. (2023). How AI Will Transform Project Management, Harvard Business Review, Available Online: https://hbr.org/2023/02/how-ai-will-transform-project-management [Accessed 3 May 2023]

Nowell, L. S., Norris, J. M., White, D. E. & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria, International Journal of Qualitative Methods, [e-journal] vol. 16, no. 1, p.160940691773384, Available Online: http://journals.sagepub.com/doi/10.1177/1609406917733847

OpenAI. (2023). GPT-4 Technical Report, Available Online: https://cdn.openai.com/papers/gpt-4.pdf

Patton, M.Q., 2014. Qualitative research & evaluation methods: Integrating theory and practice. [e-book] Sage publications. Available at: Google Books: books.google.com [Accessed 5 January 2023]

Paul, J. W., Rodrigues, R. B. & Cicek, J. S. (2021). Pair-Coding as a Method to Support Intercoder Agreement in Qualitative Research, in 2021 IEEE Frontiers in Education Conference (FIE), 2021 IEEE Frontiers in Education Conference (FIE), Lincoln, NE, USA, 13 October 2021, Lincoln, NE, USA: IEEE, pp.1–5, Available Online: https://ieeexplore.ieee.org/document/9637248/ [Accessed 4 January 2023]

Peng, S., Kalliamvakou, E., Cihon, P. & Demirer, M. (2023). The Impact of AI on Developer Productivity: Evidence from Github Copilot, arXiv:2302.06590, Available Online: http://arxiv.org/abs/2302.06590 [Accessed 24 May 2023]

Preston, R. (2023). 7 Phases of the System Development Life Cycle (With Tips), Indeed, Available Online: https://www.indeed.com/career-advice/career-development/system-development-life-cycle [Accessed 4 May 2023]

Qu, S. Q. & Dumay, J. (2011). The Qualitative Research Interview, Qualitative Research in Accounting & Management, [e-journal] vol. 8, no. 3, pp.238–264, Available Online: https://www.emerald.com/insight/content/doi/10.1108/11766091111162070/full/html [Accessed 5 January 2023]

Raja, A. K. & Zhou, J. (2023). AI Accountability: Approaches, Affecting Factors, and Challenges, Computer, vol. 56, no. 4, pp.61–70. doi:10.1109/MC.2023.3238390

RedHat. (2019). What Is Open Source?, Available Online: https://www.redhat.com/en/topics/open-source/what-is-open-source [Accessed 2 May 2023]

Restrepo, L., Aguilar, J., Toro, M. & Suescún, E. (2021). A Sustainable-Development Approach for Self-Adaptive Cyber–Physical System's Life Cycle: A Systematic Mapping Study, Journal of Systems and Software, vol. 180, pp.1-17. doi:10.1016/j.jss.2021.111010

Roth, E. (2023). Amazon Offers Free Access to Its AI Coding Assistant to Undercut Microsoft, The Verge, Available Online: https://www.theverge.com/2023/4/13/23681796/amazon-ai-coding-assistant-codewhisperer-microsoft [Accessed 5 February 2023]

Rouse, M. (2023). Generative AI, Techopedia, Available Online: https://www.techopedia.com/definition/34633/generative-ai [Accessed 17 May 2023]

Russell, S. J., Norvig, P. & Davis, E. (2009). Artificial Intelligence: A Modern Approach, 3rd ed., Upper Saddle River: Prentice Hall

Sharma, A., Lin, I. W., Miner, A. S., Atkins, D. C. & Althoff, T. (2023). Human–AI Collaboration Enables More Empathic Conversations in Text-Based Peer-to-Peer Mental Health Support, Nature Machine Intelligence, vol. 5, no. 1, pp.46–57. doi:10.1038/s42256-022-00593-2

Škiljić, A. (2021). When Art Meets Technology or Vice Versa: Key Challenges at the Crossroads of AI-Generated Artworks and Copyright Law, IIC - International Review of Intellectual Property and Competition Law, vol. 52, no. 10, pp.1338–1369. doi:10.1007/s40319-021-01119-w

Sravan, S. S., Sai Ganesh, C., Kiran, K. V. D., Aakash Chandra, T., Aparna, K. & Vignesh, T. (2023). Significant Challenges to Espouse DevOps Culture in Software Organisations By AWS : A Methodical Review, in 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 17 March 2023, Coimbatore, India: IEEE, pp.395–401, Available Online: https://ieeexplore.ieee.org/document/10113021/ [Accessed 24 May 2023]

Strickland, E. (2021). The Turbulent Past and Uncertain Future of Artificial Intelligence, IEEE Spectrum, Available Online: https://spectrum.ieee.org/history-of-ai [Accessed 12 May 2023]

Team Tabnine. (2022). Github Copilot vs. Amazon CodeWhisperer, The Official Tabnine Blog, Available Online: https://www.tabnine.com/blog/Github-copilot-vs-amazon-codewhisperer/ [Accessed 23 May 2023]

Techliance. (2023). Types of Artificial Intelligence: Categories of AI, Available Online: https://blog.techliance.com/types-of-artificial-intelligence/ [Accessed 3 May 2023]

Torrington, E. (2021). Reproducibility, Scientific Rigor and Responsibility, BioTechniques, [e-journal] vol. 71, no. 2, pp.400–402, Available Online: https://www.future-science.com/doi/10.2144/btn-2021-0066 [Accessed 5 January 2023]

Vallance, C. (2022). 'Art Is Dead Dude' - the Rise of the AI Artists Stirs Debate, BBC News, Available Online: https://www.bbc.com/news/technology-62788725 [Accessed 17 May 2023]

Vallance, C. (2023). ChatGPT: Microsoft to Invest Billions in Chatbot Maker OpenAI, BBC News, Available Online: https://www.bbc.com/news/technology-64374283 [Accessed 2 May 2023]

Vicsek, L., Bokor, T. and Pataki, G. (2022) 'Younger generations' expectations regarding artificial intelligence in the job market: Mapping accounts about the future relationship of automation and work', Journal of Sociology. doi:10.1177/14407833221089365.

Vincent, J. (2022). The Lawsuit That Could Rewrite the Rules of AI Copyright, The Verge, Available Online: https://www.theverge.com/2022/11/8/23446821/microsoft-openai-Github-copilot-class-action-lawsuit-ai-copyright-violation-training-data [Accessed 3 May 2023]

Virvou, M., Tsihrintzis, G. A., Bourbakis, N. G. & Jain, L. C. (eds). (2022). Handbook on Artificial Intelligence-Empowered Applied Software Engineering: VOL.2: Smart Software Applications in Cyber-Physical Systems, Vol. 3, [e-book] Cham: Springer International Publishing, Available Online: https://link.springer.com/10.1007/978-3-031-07650-3 [Accessed 2 May 2023]

Vorobeva, D., El Fassi, Y., Costa Pinto, D., Hildebrand, D., Herter, M. M. & Mattila, A. S. (2022). Thinking Skills Don't Protect Service Workers from Replacement by Artificial Intelligence, Journal of Service Research, vol. 25, no. 4, pp.601–613. doi:10.1177/10946705221104312.

Waltl, B. & Vogl, R. (2018). Increasing Transparency in Algorithmic- Decision-Making with Explainable AI, Datenschutz und Datensicherheit - DuD, vol. 42, no. 10, pp.613–617. doi:10.1007/s11623-018-1011-4

Wang, R., Cheng, R., Ford, D. & Zimmermann, T. (2023). Investigating and Designing for Trust in AI-Powered Code Generation Tools, arXiv:2305.11248, Available Online: http://arxiv.org/abs/2305.11248 [Accessed 23 May 2023]

Whang, S. E., Roh, Y., Song, H. & Lee, J.-G. (2022). Data Collection and Quality Challenges in Deep Learning: A Data-Centric AI Perspective, arXiv:2112.06409, Available Online: http://arxiv.org/abs/2112.06409 [Accessed 5 May 2023]

Wiggers, K. (2022). Code-Generating AI Can Introduce Security Vulnerabilities, Study Finds, TechCrunch, Available Online: https://techcrunch.com/2022/12/28/code-generating-ai-can-introduce-security-vulnerabilities-study-finds/ [Accessed 5 May 2023]

Willcocks, L. (2020). Robo-Apocalypse Cancelled? Reframing the Automation and Future of Work Debate, Journal of Information Technology, vol. 35, no. 4, pp.286–302. doi:10.1177/0268396220925830

Wingström, R., Hautala, J. & Lundman, R. (2022). Redefining Creativity in the Era of AI? Perspectives of Computer Scientists and New Media Artists, Creativity Research Journal, pp.1–17. doi:10.1080/10400419.2022.2107850

Xu, W. (2019). Toward Human-Centered AI: A Perspective from Human-Computer Interaction, ACM: Digital Library, vol. 26, no. 4, pp.42–46. doi:10.1145/3328485

Yost, M. (2019). A Brief History of Software Development, Medium, Available Online: https://medium.com/@micahyost/a-brief-history-of-software-development-f67a6e6ddae0 [Accessed 5 May 2023]

Zirar, A., Ali, S. I. & Islam, N. (2023). Worker and Workplace Artificial Intelligence (AI) Coexistence: Emerging Themes and Research Agenda, Technovation, vol. 124, pp. 1-17. doi:10.1016/j.technovation.2023.102747