LUND UNIVERSITY
School of Economics and Management

Department of Informatics

Enhancing User Research by Employing Artificial Intelligence

Designing and evaluating a method for User Experience professionals

Master thesis 15 HEC, course INFM10 in Information Systems

Authors: Fabrice Lindblom-Levy

Supervisor: Odd Steen

Grading Teachers: Osama Mansour
Avijit Chowdhury

Enhancing User Research by Employing Artificial Intelligence: Designing and evaluating a method for User Experience Professionals

AUTHORS: Fabrice Lindblom-Levy

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

PRESENTED: May, 2024

DOCUMENT TYPE: Master Thesis

FORMAL EXAMINER: Osama Mansour, Associate professor

NUMBER OF PAGES: 80

KEY WORDS: User Research, Artificial Intelligence, User Experience, Research Operations

ABSTRACT (MAX. 200 WORDS):

This thesis explores the potential of incorporating Artificial Intelligence (AI) into User Experience (UX) Research Operations (ResearchOps) within an organisational context. Design Science Research (DSR) was employed to develop and evaluate a method that incorporates AI to enhance user research activities. The research involved conducting qualitative interviews with UX professionals at Alpha to understand their perceptions and expectations of AI in a UX context. Based on these insights, a prescriptive method was developed and evaluated. The testing was done securely through Google Colaboratory which hosted a LLM and ASR model. The method was evaluated through a survey based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT). The results indicated that the devised method was very likely to be used in future projects. Notably, the findings highlighted a higher value placed on speed compared to accuracy. This study contributes to the academic literature on AI and UX by providing a structured approach to incorporating AI in user research, offering insights into the practical challenges and benefits of AI adoption in an organisational setting.

Future research directions are proposed to expand the study's findings and explore the long-term impacts of incorporating AI into user research.

Abbreviations

AI	Artificial Intelligence
ASR	Automatic Speech Recognition
DSR	Design Science Research
EE	Effort Expectancy
FC	Facilitating Conditions
GDPR	General Data Protection Regulation
IS	Information System
ISDT	Information Systems Design Theory
NLP	Natural Language Processing
LLaMA	Large Language Model Meta AI
LLM	Large Language Model
PE	Performance Expectancy
ResearchOps	Research Operations
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology
UI	User Interface
UX	User Experience

Author statement of integrity

This thesis was written in collaboration with an organisation that will be referred to as “Alpha” and involves compensation. For the sake of transparency, these were the central points in the agreement with Alpha:

1. The expected result from the research is a written summary of how currently existing AI can be used to benefit the UX/UI teams of Alpha and Alpha type of products.
2. The Student is not responsible towards Alpha for the Master Thesis’ applicability commercially or in any other manner.
3. Information received from Alpha which is to be included in the final Master Thesis shall primarily consist of non-confidential information. Should confidential information be of relevance for inclusion in the Master Thesis, such confidential information shall, in

co-operation with the Internal Supervisor, be made anonymous or processed so that it no longer is considered to be confidential when included in the Master Thesis.

In this thesis, none of the collected or used data was deemed confidential.

Content

Figures

Tables

1 Introduction

1.1 Context and Background

Recently, Artificial Intelligence (AI) has been the shared subject of interest for both professionals and scholars alike (Davenport & Mittal, 2023, p.118). Venkatesh (2022) attributes this growth in interest to the potential of "AI tools" to, amongst other things, integrate with and use existing technologies such as the Internet of Things and Big Data. Taking a socio-technical perspective on Information Technology (IT) is a central part of Information Systems (IS) as a field (Elrod et al., 2022). The importance of this perspective is highlighted by Davenport & Mittal (2023, p.29) when incorporating AI in the context of organisations in particular. Tying IS and AI together Collins et al. (2021) flag the lack of emphasis on strategic use of AI technologies and the "robot-human" interaction. Consequently, the study revolves around Human-Computer Interaction (HCI) in a business context.

Narrowing the scope further, in a recent study of 2000 IT decision-makers published by BlackBerry 75% of organisations are either in the process of deliberating or have already instituted bans on the use of generative AI like ChatGPT (Sussman, 2023). The predominant rationale, as identified by 67% of respondents, for these prohibitive measures is the perceived risk to data security and privacy (Sussman, 2023). To study this phenomenon, I applied for a master's thesis listing to collaborate with an organisation that will be referred to as "Alpha". This provided the resources and context to create a master's thesis exploring the creation and evaluation of a method that incorporates AI for an organisation that falls within these 75%; being that they banned the use of ChatGPT and the like for anything but learning purposes. The context and purpose of this opportunity was to explore how User Experience (UX) professionals can incorporate AI in their work.

Although user experience has been studied since the 1940s, the term UX was not coined until the 90s by Donald Norman (Norman, 2007). According to Nielsen & Moran (2023), of the Nielsen & Norman Group, we have entered a period where UX is being redefined and fuelled by the advancement of AI. With the turn of the decade, Nielsen & Moran (2023) argue, AI has become a focal point in the UX field. This, they further elaborate, applies in a professional and academic capacity. Previously, the use of AI in these fields predominantly centred around automating simple routine tasks, such as sorting data and generating layouts these have now become stock features of design software and services (Nielsen & Moran, 2023). Dell'Acqua et al. (2023) exemplify the potential productivity gain denoting a 33% improvement in productivity for consultants from the Boston Consulting Group when comparing groups with and without access to generative AI. This complements the survey made by Knearem et al. (2023) of UX professionals' sentiment regarding AI which found that it was generally positive. Furthermore, participants believed that AI had the potential to assist in more complex tasks such as understanding user behaviour, predicting trends and generating design elements dynamically. However, they also highlight the significance of taking reliability and bias into account when developing and working with AI (Knearem et al., 2023).

To promote the adoption of AI, Nielsen & Moran (2023) highlight the relationship between UX professionals and AI as a key driver. This, they state, is by virtue of AI's potential to enhance the performance of UX professionals and, in return, the potential of UX professionals to elevate

the usability of AI tools. This entails that there is high value in increasing adoption of AI among UX professionals to further the usability of AI tools. Bearing this in mind, on Alpha's behalf, the conducted research aims to create and evaluate a method that incorporates AI into user research activities that are supported by their Research Operations (ResearchOps). ResearchOps focuses on methods and strategies that aid UX professionals in designing, executing and utilising user research on a large scale (Kaplan, 2020). ResearchOps comprises six areas: Participants, Governance, Knowledge, Tools, Competency and Advocacy. To conduct this research it was necessary to facilitate the use of a method that incorporates "AI tools" in a way that aligns with the governance, knowledge and tool aspects of ResearchOps. Venkatesh (2022) underlines the ambiguity of AI tools as the term continues to evolve with the underlying technology. Therefore, it warrants a narrower definition, this will be defined in the delimitation subchapter.

1.2 Research Problem

Knearem et al. (2023) highlight that professionals in the UX field are wary of the risk of biased AI-generated output. They also acknowledge the need to consider ethics when implementing AI in UX activities. These concerns align well with the aforementioned study by BlackBerry that presented a significant trend within the global business community. As referenced earlier, 67% of respondents in Sussman's (2023) study perceived generative AI to be a risk to data security and privacy. This prevalent stance underscores a concern regarding the implications of AI on data security and corporate confidentiality, which subsequently hampers the adoption of AI.

In the IS field, the European Conference on Information Systems (ECIS) highlights "Design principles for digital practices integrating human and artificial intelligence" (ECIS, 2024) as a point of interest. Relating this to an organisational context Fügener et al. (2021) underscore the necessity of context-specific methods in AI integration and caution against one-size-fits all solutions. They suggest future research evaluate rules that distinctly outline the potential harms and benefits, for the unique context of an organisation. Collins et al. (2021) underline the need for further research in creating frameworks to realise the gains in productivity by using AI in both a professional and academic capacity. Stige et al. (2023) build on this sentiment by mapping out the use of AI in a UX capacity stating that there are continuously new gaps in knowledge due to the rapidly evolving nature of AI. Furthermore, Stige et al. (2023, p.35) state that *"...*future research can explore alternative ways in which UX designers implement their design process, or perhaps build on entirely new processes that incorporate AI". Finally, Bach et al. (2024) highlight the need for future research to observe trust of AI in different cultural contexts as their literature review found a majority of studies were conducted in the US & Germany.

With context-sensitive research on AI as a search criterion it is apparent that there are a multitude of studies and articles acknowledging the potential performance increase of AI in a variety of professional fields (Davenport & Mittal, 2023; Dell'Acqua et al., 2023; Knearem et al., 2023; Nielsen & Moran, 2023). However, developing and evaluating methods for employing AI for ResearchOps in UX represents an underexplored area, this is likely due to the novelty of commercial AI and the cautious stance a majority of companies have to using AI, as highlighted by Sussman (2023).

This gap in knowledge presents an issue for organisations such as Alpha and is a central reason for them requesting that this research be conducted. The absence of defined practices for incorporating AI into UX ResearchOps leaves organisations, like Alpha, at risk of inefficient incorporation or apprehensiveness among UX professionals.

This research aims to establish if there is value in incorporating AI in said context. Additionally, it aims to establish differences between the speed and accuracy of established user research methods and the devised method and the likelihood that the latter will be used going forward. To make the findings more generalisable the study aims to create a high-level framework which helps provide an overview for improving the proposed method or generating new methods to address similar use cases.

1.3 Research Question

How does a method that incorporates AI compare to established methods for user research activities in terms of speed and accuracy?

1.4 Research Purpose

The purpose of this study is to create and evaluate a method for employing AI for user research in an organisational context. This study, thereby, explores the creation of a novel way of approaching UX work, in this case user research activities. This is necessary in order to contribute to knowledge regarding the benefits and drawbacks of AI in a UX context. Additionally, it serves to supplement research on the trust in AI generated output outside of Germany and the US.

1.5 Delimitation

The study specifically explores AI tools centred around Automatic Speech Recognition (ASR) and Large Language Models (LLM) as derivatives of Natural Language Processing (NLP), excluding other AI technologies from the scope. The study concentrates on the domain of UX, specifically targeting UX professionals' interactions with AI in user research and does not explore AI's broader organisational impacts or applications in other professional domains. Whilst acknowledging the significance of ethical considerations and bias in AI, the study does not delve into these areas. Instead, the focus lies on designing a method that has practical applications within an operational context, like Alpha's, and evaluating it without compromising data security. Additionally, privacy aspects were also taken into consideration as they were observed as vital aspects that needed to be taken into account (Collins et al., 2021; Knearem et al., 2023),

2 Literature Review

2.1 Search Strategy

For the literature review the following search strategy was employed: several scholarly databases of IS were selected, which are accessible via Lund University Library's website. In the databases "Information Systems" was searched. Multiple databases were searched but the primary databases were ACM Digital Library and AIS eLibrary, supplemented by Google Scholar. The keywords used were User Experience, Artificial Intelligence, Large Language Model, Automatic Speech Recognition and data security combined with the Boolean operators "AND" and "OR". The criteria were specifically set to find peer-reviewed journal or conference articles published after 2020. This, in an attempt, to ensure that the knowledge used was contemporary and relevant. Additionally, requirements, applications and concerns brought up by participants and relevant findings from Chapter 4 were considered. This included establishing the objectives and requirements of AI in user research.

2.2 User Research

User research can be defined as the methodical study of target users, typically focusing on their needs and pain points, in turn this contributes to informed design decisions (IxDF, 2016). The research can be conducted using various methods, see Table 1, such as interviews, surveys or focus groups (Rosala & Krause, 2019). Less self-explanatory methods could be the creation of personas and user stories. These revolve around creating representations of users to use as points of reference (Rosala & Krause, 2019). Although user research is not exclusive to UX, being a comparatively novel field relative to for example the architectural field, it has been adopted and developed further as UX as a field has matured (Nielsen, 2023). It also resulted in a lot of new methods of working with users and design, as seen in Table 1. Furthermore, it sparked discussions of the benefits and shortcomings of User Centred Design (UCD) compared to the Scandinavian Participatory Design (PD) in UX (Wilkinson & De Angelia, 2014). Both approaches will be explained below and although the approaches differ, they share a commonality, the user. These two approaches are described in the following subchapters, highlighting the benefits and downsides of each. This leads into how AI can serve to reduce the defined downsides.

Table 1: Most common UX research methods (Rosala & Krause, 2019)

Top UX Research Methods	
Discovery	• Field study • Diary study • User interview • Stakeholder interview • Requirements & constraints gathering
Explore	• Competitive analysis

	• Design Review • Persona building • Task analysis • Journey mapping • Prototype feedback & testing (clickable or paper prototypes) • Write user stories • Card sorting
Test	• Qualitative usability testing (in-person) • Benchmarking testing • Accessibility evaluation
Listen	• Survey • Analytics review • Search-log analysis • Usability-bug review • Frequently-asked-questions (FAQ) review

2.2.1 User Centred Design

The growth of the UX field was preceded by UX researchers such as Donald Norman and Stephen Draper who, in 1986, conceptualised UCD in their book titled "User Centered System Design: New Perspectives on Human-Computer Interaction". This approach focuses on extracting data and insights from users to inform the design process, originally inspired by the architectural field (Norman & Draper, 1986, p.11). In their book they describe the essence of the approach with the following:

"To begin with, we do not wish to ask how to improve upon an interface to a program whose function and even implementation has already been decided. We wish to attempt User Centered System Design, to ask what the goals and needs of the users are, what tools they need, what kind of tasks they wish to perform and what methods they would prefer to use. We would like to start with the users and to work from there." (Norman & Draper, 1986, p.2).

Hasani et al. (2020) denote UCD's popularity as an approach to user research using the methods like user interviews and creating user stories and personas, as presented in Table 1. However, they do suggest that, outside of users, subject matter experts may play a role in determining the quality of the end-product. For smaller projects, or projects that have limited access to time, money and expert assistance Simonsen & Robertson (2012, p.22) express that UCD has a high likelihood of being the preferred approach.

2.2.2 Participatory Design

Participatory design is aptly named as it centres around the participation of the targeted users. Originating in the 1970s Scandinavia, it started off as a part of the workplace democracy movement (Simonsen & Robertson, 2012, p.2). This continued with the Participatory Design movements in the USA and Canada later, in the 1980s, with the formation of the Computer Professionals For Social Responsibility society (Simonsen & Robertson, 2012, p.11). This

could be seen as an approach that put more emphasis on the involvement and responsibility of users when compared to UCD and can be defined as follows:

"Participatory Design (PD) is an approach to the assessment, design, and development of technological and organizational systems that places a premium on the active involvement of workplace practitioners (usually potential or current users of the system) in design and decision-making processes."(CPSR, 2006)

This approach should, in theory, lead to the best alignment between users and the final product (Sharma et al., 2008). The drawbacks of this method are primarily the cost in time, resources as well as the difficulty in finding willing participants, especially of a wide range of age (Wilkinson & De Angelia, 2014). This is because of the requirements put on users to make an active commitment and take ownership of, at least, parts of the design process. Supporting this, Smith et al. (2017) argue that PD is on the rise as active engagement on for example social media and producing results that reflect user needs better.

2.2.3 Research Operations

Supporting UX researchers in conducting user research are research operations (ResearchOps). This framework exists to support user research within an organisation (Kaplan, 2020). This is becoming more relevant as the ResearchOps community has grown from hundreds of members in 2018 to 10,000 in 2022 and over 16,000 members in 2024 (ResearchOps Community, 2024), representing the growing adoption and engagement in the UX field. Therefore, ResearchOps can be defined as follows:

"ResearchOps is the people, mechanisms, and strategies that set user research in motion. It provides the roles, tools and processes needed to support researchers in delivering and scaling the impact of the craft across an organisation." (ResearchOps Community, 2024)

This has come as a result of the growth that the UX field has experienced as it has progressively become more legitimised in a broad range of settings (Nielsen, 2017). Kaplan (2020) depicts this using a cyclical model, see Figure 1, where each aspect affects and is affected by each of the other aspects (Kaplan, 2020).

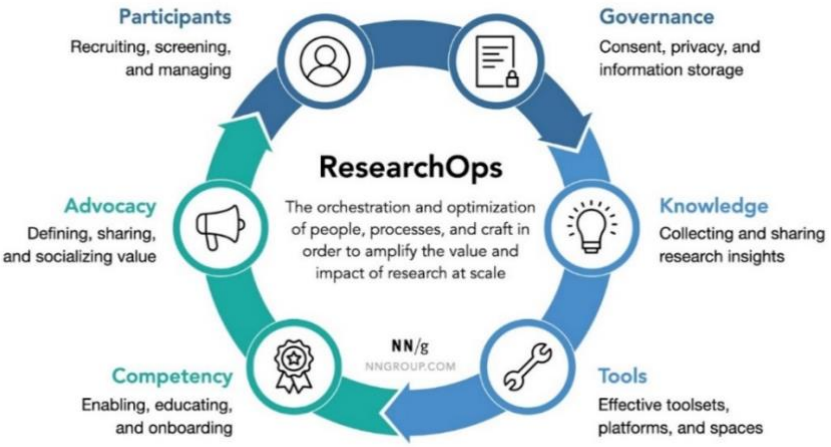


Figure 1: Research operations diagram (Kaplan, 2020)

In the field of UX, ResearchOps represents an initiative to support the demands of modern user research (Pernice, 2022). ResearchOps as a framework can be traced to 2017, a year which was characterised by a surge in digital product development and an accompanying escalation in the scale of user research (Johnson, 2023). Although ResearchOps is fairly new, Johnson (2023) states that the elements have always, in some shape or form, been present in user research. The genesis of ResearchOps within the UX community was a strategic response to this expansion, aiming to reduce the complexity inherent in large-scale user research endeavours (Kaplan, 2020). This operational focus allowed UX researchers to redirect their efforts towards more strategic and creative aspects of UX research, thereby elevating the overall efficacy of their work (Pernice, 2022).

Kaplan (2020) describes ResearchOps tools as the technologies and platforms that support research activities. These activities could, for example, involve conducting user interviews, transcribing data or data visualisation software. Meanwhile, Kaplan (2020) describes governance in ResearchOps as policies, procedures and standards that guide research practices. In turn, this ensures that research is conducted ethically, responsibly and in compliance with legal and organisational policies.

2.2.4 Summary

Summarising this subchapter, user research has been explored, highlighting its central role in shaping design. Commonly occurring methods such as interviews, surveys and focus groups as well as personas and user stories were exemplified to establish the practice of user research. The two predominant approaches within user research were briefly described: UCD and PD. These suit different use cases e.g. projects that are limited in duration and budget typically tend to use UCD. PD, on the other hand, provides the best alignment with user requirements but at the cost associated with increased user involvement. ResearchOps, in turn, was created to enable these approaches to be taken at a large scale in a structured and well-supported manner. This sets the premise for UX methods that may be suitable for the application of AI.

2.3 The State of Artificial Intelligence

2.3.1 The Turing Test

In 1950 Alan Turing proposed a way of testing intelligence with the “Imitation game”. This was built on the premise that language indicated intelligence (Russel & Norvig, 2021, p.20). Essentially the imitation game largely revolved around the ability for a human to distinguish between another human and a machine, purely through written conversation. In the case of the human failing to do so, machines should be considered as “thinking”. This, Turing believed, would become an uncontested fact by the turn of the millennia:

“I believe that in about fifty years’ time it will be possible to programme computers, with a storage capacity of about 10^9, to make them play the imitation game so well that an average interrogator will not have more than 70 percent chance of making the right identification after five minutes of questioning … I believe that at the end of the century the use of words and

general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted." (Oppy & Dowe, 2020, p.1)

Later referred to as the Turing test, a common point of reference when discussing intelligence and consciousness in computers, many different versions of the test use the premise that language can serve to define intelligence (Oppy & Dowe, 2020). This speaks volumes for the applications and the historical importance of NLP. Additionally, it highlights the potential of Language Models (LMs) in simulating and "understanding" human behaviour in speech to create convincing natural language. Further ASR serves as a potential way of turning spoken language into machine-readable text which is explored in the following subchapters.

2.3.2 Natural Language Processing

NLP is a developing intersection of linguistics, computer science and AI (Russel & Norvig, 2021, p.874). It is a field that expands beyond text analysis, from chatbots that handle customer inquiries to algorithms that interpret complex datasets (Khurana et al., 2023). Due to these capabilities in understanding, interpreting and generating human language Khurana et al. (2023) argue that there is now an unprecedented number of applicable use cases for NLP. This understanding forms a basis for the transition into the specifics of LMs and ASR models, two types of AI models that leverage NLP's foundational concepts.

2.3.3 Language Models

A LM has the ability to determine the likelihood of any string of words (Russel & Norvig, 2021, p.875). LLMs such as GPT-4, represent an application of NLP and deep learning algorithms, offering capabilities that extend far beyond basic language processing (Nvidia, 2023). These models have an ability to generate content that is indistinguishable from that written by humans, effectively passing the criteria of the original Imitation game, with reservations for their ability to reason (Biever, 2023). Although whether or not the Turing test has been passed is still up for debate, Gams & Kramar (2024) argues that ChatGPT represents an advanced and highly intelligent tool. This enables use cases like simulating human-like responses, offering insights into user behaviour and preferences without the challenges of arranging for example user interviews, surveys or focus groups. Companies like OpenAI which created the LLM ChatGPT, powered by GPT-4, DALL·E among other generative models allow you to communicate with it through APIs (OpenAI, 2024a). However, this does expose your data to their servers, as a public service and could lead to violations of data regulations such(Sussman, 2023) as the European Union's General Data Protection Regulation (GDPR) (Reuters, 2024). Additionally, running a model as capable as GPT-4 with its 1.76 trillion parameters would require a substantial investment in hardware, an open-source LM such as Meta's Large Language Model Meta AI (LLaMA) with 7, 13 or 70 billion parameters can be hosted on consumer grade hardware (Palazzolo, 2023). This allows for locally hosted instances of LMs, something that will be explored in subchapter 2.4.3.

2.3.4 Automatic Speech Recognition

ASR is another technology that exemplifies the practical application of NLP in interpreting and transcribing spoken language. Malik et al. (2021) highlight the great strides the technology has made with the development of voice-operated devices and virtual assistants that have become

commonplace. ASR models differ in their performance, especially in terms of accuracy, processing speed and their ability to adapt to various dialects and noisy environments (Dighe et al., 2024). This variability has a significant impact on their applicability and usefulness in user research. Today, industry standard applications such as Microsoft Teams offer built-in functions to record and transcribe audio while identifying the speakers (Microsoft, 2024). These serve well for online sessions but may have limited applicability in languages outside of English or simply when the interviews are captured outside of these applications. As an alternative Wang et al., (2024) highlight the potential of Whisper to translate and transcribe speech at a speaker-level in certain contexts. Furthermore, they highlight the potential for LLMs to assist in the correction of ASR models' misrepresented speech. This process can be conducted in a variety of ways but Dighe et al. (2024) depict a high level version in Figure 2 based on increasing the received data by giving the ASR model's n best approximations, aiming for a multi-agent system. Wang et al. (2024) suggest giving the LLM key contextual information before asking it to correct an AI generated transcript, giving it a higher likelihood to correct illogical sentences.

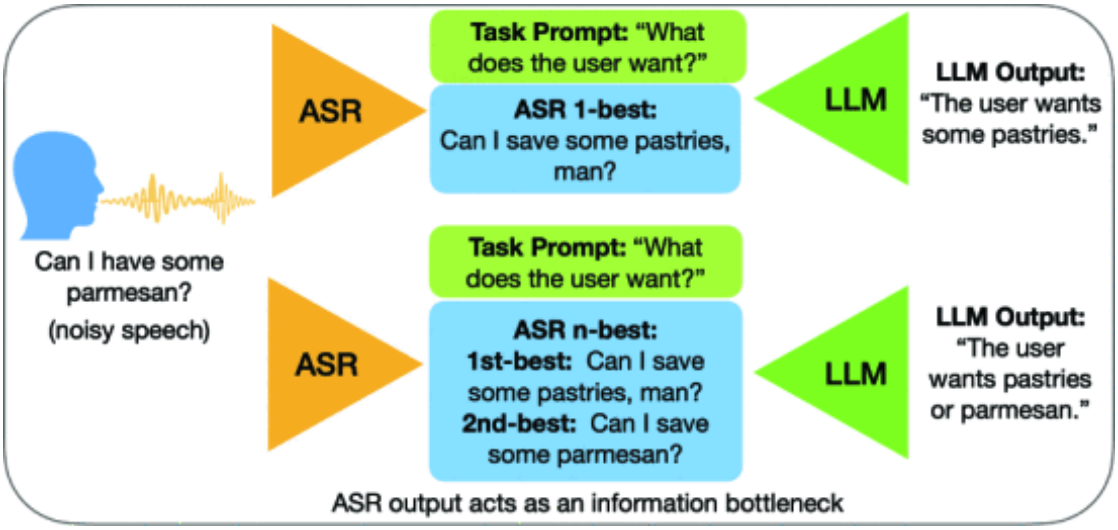


Figure 2: Multi-agent interaction ASR-LLM (Dighe et al., 2024, p.1)

2.3.5 Summary

Summarising this subchapter, a range of related subjects have been covered; these include the applications of AI based on NLP i.e. ASR models and LLMs and brief overview of the evolution in their ability to interpret and imitate human language. These are used to draw parallels between emerging applications in user research and highlight the evolving intersection of user research and generative AI. Next, the application of these technologies within an organisational context is explored.

2.4 Artificial Intelligence in an Organisational Context

2.4.1 Data Security and Artificial Intelligence

In the BlackBerry survey, it was noted that 75% of organisations have created, or are in the process of creating, policies to restrict the use of generative AI (Sussman, 2023). This prevalent stance underscores the concern regarding the implications of AI on data security and corporate confidentiality. Despite acknowledging the potential of AI in bolstering workplace efficiency, innovation and creativity, concerns regarding cybersecurity threats have lead decision-makers to adopt a cautious stance (Sussman, 2023). With 67% of respondents citing the perceived risk to data security and privacy as well as 57% identifying the potential of damaging corporate reputation (Sussman, 2023). This indicates that there is a clear need for alternative ways of using AI that address these concerns. Such developments form a crucial aspect of the discourse on AI and data security. This allows one to infer that the main issue for many companies, the concern of public AI services being a potential breach of data integrity.

Exploring this point further, Fui-Hoon Nah et al. (2023) describe the concern of each ChatGPT account storing all previous chat history. This would, in turn, give an individual with malicious intent easy access to all the data that has served as input for the AI, all being tied to an account. This is a feature of ChatGPT as it promotes quality of life for the users. However, there is an option to disable chat history which also, at the same time, removes the chats from the data used to train OpenAI's AI models (OpenAI, 2024c). This requires individual decision-making and is not an instant measure as it can be reverted with one click within 30 days (OpenAI, 2024c). This aspect of an AI platform particularly important when users deal with confidential data such as transcripts or audio recordings from interviews with users.

However, data security concerns are not only present in private companies and their AI services, like OpenAI's ChatGPT. Brewster (2024) outlines the increasing security risks that have become more prevalent for Open-Source Software (OSS) and AI models alike. Downloading an open-source AI model that is compromised or contains malicious files can lead to nefarious code being executed on your device. This, in turn, can lead to files being exposed and accessible to the wrong individuals.

2.4.2 Locally Hosted Artificial Intelligence Models

As mentioned, if an AI model is open-source, it can be downloaded and run on a local machine. This means that data no longer needs to travel to a third party to be processed by their computation, typically involving an array of Graphics Processing Units (GPU) (Nguyen et al., 2023). Unless the curator of the chosen model states otherwise, it should not use user input as training data. The drawback to this is that typically, although it promotes privacy, it requires a non-trivial investment in hardware to run a model of say GPT-4's capability. This is the reason for the existence of OpenAI's subscription model which partially funds the computational power needed to run the models (OpenAI, 2024b). Even though smaller models can run on computers with lower end specifications, they may require at least a dedicated GPU to reach moderate speeds (Merritt, 2023). It also means there is a risk that malware is downloaded on your own device, as highlighted in the last subchapter. This represents a barrier to entry for potential users of AI.

These problems have been indirectly addressed through a research project published by Google in 2017. This project was called Google Colaboratory or Colab for short and aimed to make Machine Learning (ML) education and research more accessible (Google, 2017). The same year Google also acquired Kaggle, a popular platform for experimenting with ML, to further its capabilities in the AI and ML field (Nicas, 2017). Colab, which is a cloud-based Jupyter notebook environment, provides access to free computational power through GPUs and Tensor Processing Units (TPU) which are tailored for AI applications (Sukhdeve & Sukhdeve, 2023). A Jupyter notebook, as explained by Sukhdeve & Sukhdeve (2023), provides a means of coding and executing Python, with access to a GPU or TPU accelerated runtime. This all happens on an ephemeral virtual machine with non-persistent storage. This allows the user to circumvent the need to download an AI model and its dependencies or execute any code on their own local machine (Bisong, 2019). Once the runtime terminates, because of the use of non-persistent storage, all data from the session is lost and irretrievable (Bisong, 2019). This presents the possibility for researchers to conduct their research at their own discretion.

2.4.3 Generative Artificial Intelligence in User Research

As previously noted, there are benefits and drawbacks to UCD and PD respectively, with each approach being more suitable for different scenarios. However, recent developments suggest that generative AI could reduce the gap in cost and time between the two approaches. In user research, methods such as user interviews, the creation of persona and user stories entail analysis of language whether it be a UCD or PD approach. Design Science Research (DSR) revolves around creating and evaluating an artefact in collaboration with potential users Hevner et al. (2004), approach to research shares overarching similarities with user research. These similarities are part of what Siddharth et al. (2022) highlight as main areas where DSR applies NLP technology. The common identified methodological directions that could apply to user research are: Domain-specific language models e.g. sentiment analysis, text generation e.g. requirements elicitation and statement generation and success metrics e.g. text comprehension or problem detailing. Aligning with these areas of application, Manning et al. (2024) describe the recent advancements in LLMs for simulating humans interacting with each other, stating:

“Researchers have shown that Large Language Models (LLM) can simulate humans as experimental subjects with surprising degrees of realism. To the extent that these simulation results carry over to human subjects in out-of-sample tasks, they provide another option for testing.” (Manning et al., 2024, p.2)**.**

This is a very novel concept, see Figure 3, however it sets a precedent for the potential of the technology to be used in a variety of fields. In this vein, Hannan (2023) presents “synthetic users” as a potential way of alleviating some of the constraints that can be associated with the most common research methods. This was done by comparing the responses between real respondents and AI generated ones, which Hannan (2023) noted gave mixed results depending on the use case. Regardless, this could potentially reduce the gap in quality between the UCD and PD. With this, Manning et al. (2024) highlights the potential of building personas, writing user stories and conducting interviews with or creating surveys for these synthetic users to complete.

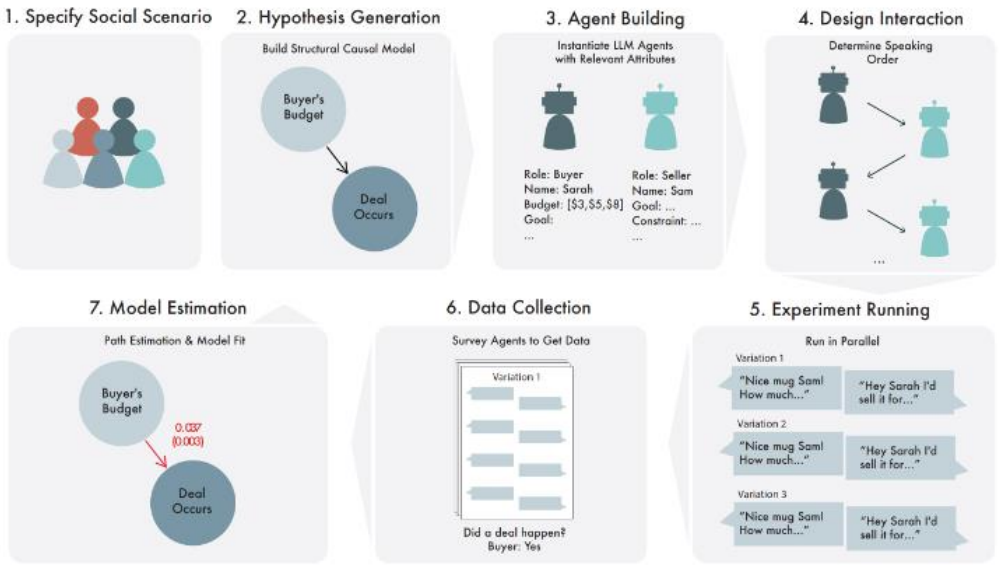


Figure 3: Automated multi-agent system (Manning et al., 2024, p.7)

2.4.4 Summary

Summarising this subchapter, it surveyed the state of data security in relation to public AI and locally hosted counterparts, along with their respective benefits and drawbacks. This highlighted the widespread data security concerns regarding AI while also flagging the limitations associated with using methods that promote data security. This presents a challenge in prioritising safety, capabilities and usability when incorporating AI in an organisational setting. Lastly, the potential of AI being incorporated into user research was explored. Furthermore, its potential in addressing the gap between the resource intensive nature of PD and the structured, analytical approach of UCD was described.

2.5 Technology Acceptance

Understanding user acceptance is essential for developing new technologies or incorporating new technology in an organisation. This need to predict user behaviour has led to the development of various models, one of which is the Technology Acceptance Model (TAM). TAM was developed by Fred Davis in 1986 and provides a framework that identifies the key factors influencing the acceptance of technology (Davis, 1989). Davis (1989) suggested that the factors Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are crucial in determining whether users will embrace or reject a technology. PU is the belief that using technology will enhance one's job performance, while PEOU refers to the belief that the technology will be easy to use (Davis, 1989). According to TAM, these two perceptions represent the user's overall attitude toward a technology and subsequently affects their acceptance of it. This forms the core of TAM's predictive capabilities. However, as technology advanced so has the study of technology acceptance.

Further refining the model, Venkatesh, Morris and Davis introduced the Unified Theory of Acceptance and Use of Technology (UTAUT), see Figure 4, in 2003 (Venkatesh et al., 2003).

With UTAUT Venkatesh et al. (2003) propose a model that included four key constructs: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC). Each of these constructs were defined to reflect updated understandings of how technological efficacy, ease of use, peer influence and conditions influence user acceptance and usage behaviour. Although the four prior constructs are said to play significant roles in determining user behaviour and acceptance Venkatesh et al. (2003) also denote four moderators. These are gender, age, experience and voluntariness that may play a role in acceptance.

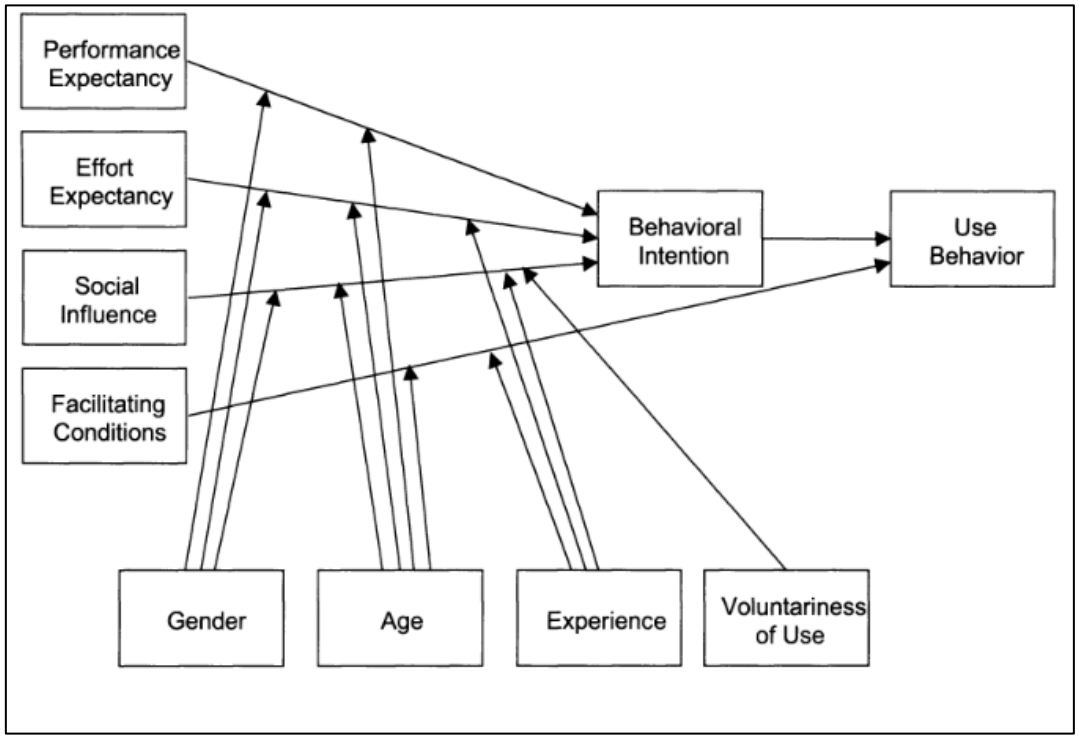


Figure 4: UTAUT model (Venkatesh et al., 2003, p.447)

While Sohn & Kwon, (2020) argue that the Value-based Adoption Model (VAM) is the most appropriate for understanding user acceptance of AI technology, for this study the focus lies on assessing the method of working with AI rather AI itself. Therefore, the constructs of the UTAUT model are used for the evaluation. UTAUT is used flexibly in IS and depending on the context and research objectives of the study the weight and relevance of each construct vary (Williams et al., 2015). Bearing this in mind, an adapted version of UTAUT is used for the evaluation phase of the method. Figure 5 depicts the constructs used to determine the effects of PE, EE and FC and their impact on behavioural intention in the context of AI being used by UX professionals. This adaptation removes the moderating factors and social influence construct which would likely be statistically insignificant given the limited sample size and timeframe of this study.

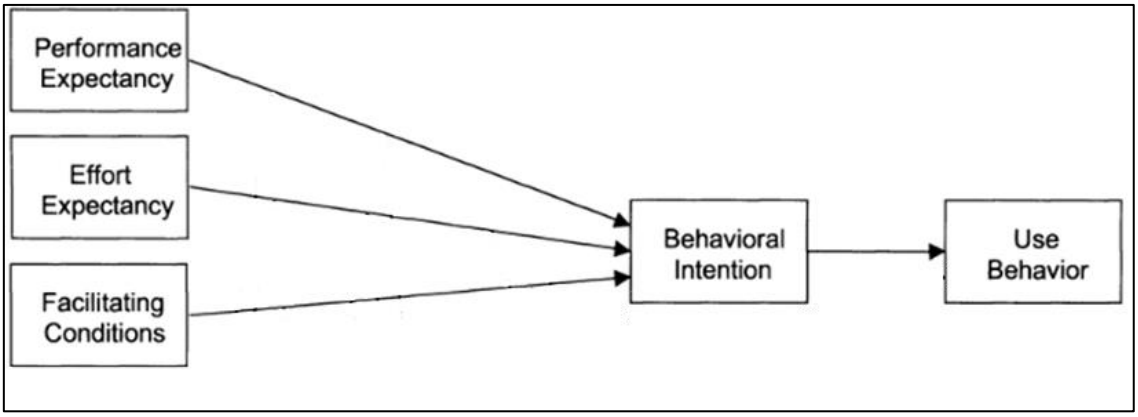


Figure 5: Adaptation of UTAUT model based on Venkatesh et al. (2003, p.447)

2.6 Overview of Literature Review

In this literature review the core components required to address the purpose of the research: to create and evaluate a method for employing AI in user research, have been explored. In developing a method that incorporates AI into the ResearchOps of an organisation, several core concepts should be considered. These include existing ResearchOps, current AI technology and its potential applications in user research as well the organisational context, such as policies surrounding the usage of AI. With these concepts being at the centre of the research, UTAUT provides an apt set of components to measure the acceptance of a method that involves a way of working with new technology (Venkatesh et al., 2003). This is important as without acceptance the potential benefits of incorporating a technology cannot be realised.

Kaplan (2020) describes ResearchOps as the framework and infrastructure needed to conduct user research efficiently at scale. It involves the management of tools, processes and strategies that facilitate the execution of user research activities. Advancements in NLP (Khurana et al., 2023; Russel & Norvig, 2021), LLMs and ASR models represent tools for automating data analysis and transcription (Manning et al., 2024; Wang et al., 2024). User Research focuses on understanding user behaviour, needs and preferences through various methodologies such as interviews, surveys as well as persona and user story creation (Rosala & Krause, 2019). By incorporating AI into ResearchOps and subsequently, user research, organisations could use AI for the analysis of user feedback and sentiment to potentially derive insights quicker and more accurately (Knearem et al., 2023). However, to facilitate a test with high fidelity i.e. true-to-life usage of a method that incorporates AI using potentially sensitive data, one would have to first address the security concerns. This possibility was explored with Colab as a hosting platform.

Together, these elements form a framework for the development and future improvement of a method that incorporates AI to support UX professionals in conducting user research. Drawing parallels to the findings of Siddharth et al. (2022) and employing AI in user research like exemplified by Manning et al. (2024) and Wang et al. (2024) there appears to be potential for organisations, such as Alpha, to increase the speed and or accuracy of user research methods.

3 Research Methodology

3.1 Research Philosophy

In this study, the research philosophy encompasses both epistemological and ontological dimensions. Hevner & Chatterjee (2010, p.214) argue that the pragmatic paradigm, often considered in conjunction with critical realism, is an apt approach to DSR. These paradigms are well-suited for addressing real-world problems and generating practical and actionable knowledge.

Goldkuhl (2012) describes epistemology as the nature and scope of knowledge and how it can be acquired. The epistemological disposition in this study is pragmatic, focusing on the utility of knowledge. It emphasises the creation of artefacts that solve practical problems and contribute to the body of knowledge in IS. This approach is informed by the works of Hevner et al. (2004) and Gregor & Hevner (2013), who emphasise the process of designing, developing and evaluating artefacts to enhance business processes.

Ontology pertains to the nature of reality and what constitutes reality (Goldkuhl, 2012). The ontological stance recognises the existence of a reality that is influenced and constructed by social, technical and organisational factors. This aligns with the socio-technical systems perspective, where technological and human elements interact (Hevner & Chatterjee, 2010, p.218). This study acknowledges that artefacts, in this case, a method that incorporates AI for user research, are embedded within an organisational context and that the impact is shaped by these interactions.

3.2 Research Approach

According to Hevner et al. (2004), the objective of DSR is to develop technology-based solutions to important and relevant business problems. Typically, the research question revolves around how to improve some type of operational process by employing an artefact that alters the process in a new or improved way (Gregor & Hevner, 2013). I contend that the method is a new solution for a known problem. To reiterate briefly, AI can be used to support processes in various ways; in the study, it centres around ResearchOps and consequently user research. However, due to data security concerns a substantial group of potential users, working in organisations, are not able to use AI for work; this can reasonably be used to infer explain the lack of studies demonstrating and evaluating the value of AI for specific use cases. Given its solution-centred nature, DSR aligns well with the research objective creating and evaluating a method for incorporating AI in user research. Conducting the research at Alpha also presented the opportunity to create rudimentary design knowledge around a solution based on a real-life problem. According to Gregor & Hevner (2013), this is what DSR is for, lending itself to research exploring solutions from a pragmatic perspective.

This study followed the six-phase model of the DSR process described and illustrated by Peffers et al. (2007) in Figure 6. Before starting the process, the research entry point was identified as it helps frame and set the sequence of the six-phase model for the research. The four entry points described by Peffers et al. (2007) are as follows: problem-centred initiation, objective-centred initiation, design- and development-centred initiation and client-/context-centred initiation. As Alpha supplied the setting for the research and requested an investigation into the possibility of a method that incorporates contemporary AI, the fourth phase of the six-phase model was initiated. Subsequently, to assure scientific rigour, all the phases were completed retrospectively (Peffers et al., 2007). This process will be explained and depicted in subchapter 3.2 where the structure of the study is described in relation to the DSR phases depicted in Figure

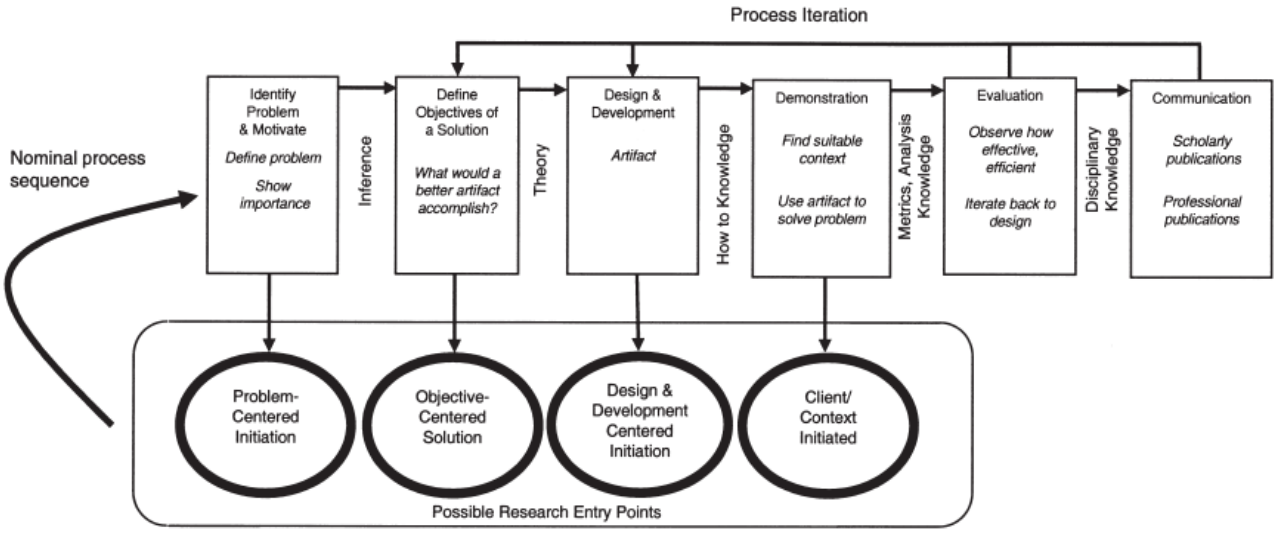


Figure 6: Six-phase process of Design Science Research (Peffers et al., 2007, p.54)

6.

The study encompasses both a phase where participants' thoughts and perspectives are identified and a phase where the developed method is evaluated. Highlighting the former phase of identifying the problem and motivation as well as the evaluation phase, Hevner & Chatterjee (2010, p.81) denote the relevance of ethnography. They argue that this is key when one is aspiring to design something "consumers", in this case UX professionals, want. To establish this one needs to determine what the concerns, pain points and requirements are. Hevner & Chatterjee (2010, p.81) further underline the importance of observing, listening and learning from your users' experiences, denoting qualitative research methods as a means of doing so. Qualitative research is an apt choice for exploring social phenomena and enables the collection of rich data (Recker, 2012, p.88). This in turn can provide insight into the participants' subjective experiences and viewpoints (Oates et al., 2022, p.267). This qualitative data can be obtained, for example, through interviews (Oates et al., 2022, p.266). In turn, this helped inform design decisions for the method and supplemented the novel research topic of AI incorporated in UX ResearchOps.

In describing the latter part of DSR, the evaluation, Hevner & Chatterjee (2010, p.109) highlight the importance of establishing the aim of the evaluation, the technical or socio-technical aspects. In this study the latter is evaluated, the collaboration between human and AI. For this purpose, Hevner & Chatterjee (2010, p.119) outline quantitative surveys as an apt data

collection method. Oates et al. (2022, p.104) describe quantitative research as numerical data which can be generated from, for example, quantitative surveys. This serves as an apt way of measuring, for example, effects of an independent variable on a dependent variable. In other words, in this context, the effects of the introduced method on respondents' perception of said method.

3.2.1 Information Systems Design Theory

To produce knowledge through DSR Gregor & Hevner (2013) suggest that one needs to draw relevant knowledge from the omega (Ω) and lambda (Λ) knowledge base, as seen in Figure 7. Knowledge from Ω includes justificatory theories related to the aim of the research, in this case UTAUT. Λ knowledge, on the other hand, can be represented by existing methods or systems used to solve the same or similar research problems, as highlighted in the literature review.

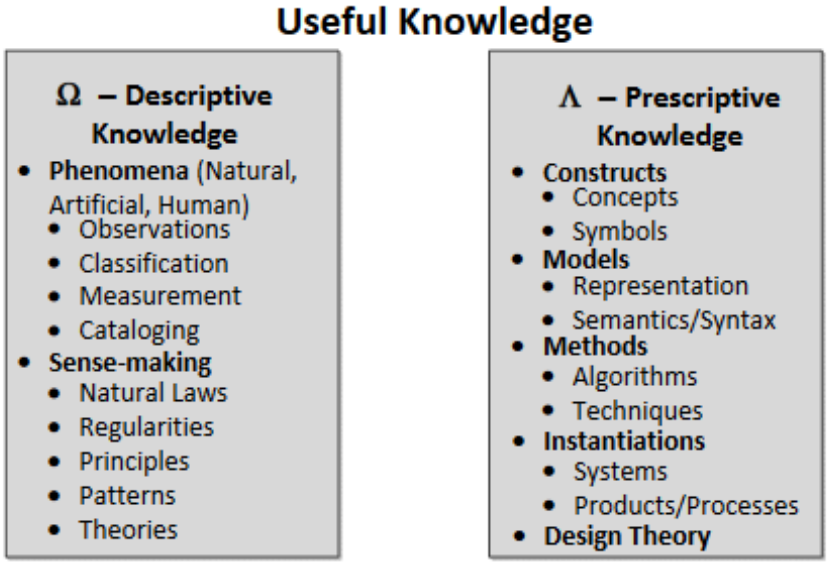


Figure 7: Ω and Λ knowledge bases (Gregor & Hevner, 2013, p.344)

To ensure that this knowledge contributes to cumulative knowledge in DSR in the Information Systems field Gregor & Hevner (2013) propose using eight components to define an Information Systems Design Theory (ISDT). The purpose of a design theory is to offer both a predictive and explanatory framework that can be widely applied. It helps in understanding why certain solutions work in specific situations and provides a basis for generating new solutions. Gregor & Hevner (2013) argue that the first six of the eight components they present are sufficient for creating an artefact, as shown in Figure 8. However, Gregor (2006) argues that, in the case of DSR, testable propositions, i.e. hypothesis is contingent on the purpose of the theory. In the case of a prescriptive theory, which are a possible product of DSR, a prescriptive statement is an appropriate component. This is described by Gregor (2006) as a statement that detail how one can accomplish something in practice e.g. develop a method.

Component	description
Core components	
1. Purpose and Scope	"What the system is for", the set of meta-requirements or goals that specifies the type of artifact to which theory applies
2. Constructs	Representation of the entities of interest in the theory.
3. Principle of form And function	The abstract "blueprint" or architecture that describes an IS artifact, either product or method/intervention.
4. Artifact mutability	The changes in state of the artifact anticipated in the theory, that is, what degree of artifact change is encompassed by the theory
5. Testable propositions	Truth statements about design theory
6. Justificatory knowledge	The underlying knowledge or theory from the natural or social or design sciences that gives a basis and explanation for the design (kernel theories)

Figure 8: Six components of an information systems design theory (Hevner & Chatterjee, 2010, p.41)

However, Hevner & Chatterjee (2010, p.53) also highlight the debate and disagreement surrounding the semantics of the words "Design" and "Theory" in an ISDT. Therefore, I decided to develop and refer to the abstraction of the method as a framework that serves as guidance for how the method was created, a prescriptive framework. The need for such a framework is rooted in the fact that there were no iterations in the design process due to the timeframe of the study. The components that are included in the produced framework will be the following: Purpose and scope, constructs, principles of form and function, prescriptive statement and justificatory knowledge i.e. the underlying knowledge that explains the design of the artefact.

3.2.2 Contributing to Information Systems Through Design Science Research

In discussing IS as a discipline Hevner & Chatterjee (2010, p.45) denote the idea of IS as an applied discipline, underlining that this does not necessarily mean that only applied research is valuable to IS. In this context, they highlight the importance of using the terms descriptive or prescriptive for different types of research. In describing Figure 9, Hevner & Chatterjee (2010, p.46) explain that on the conceptual level the focus lies on identifying and defining the essence of phenomena without assigning truth value to these definitions. Hevner & Chatterjee (2010, p.46) denote theoretical research in economics as an example, stating that it aims to establish causal relationships, which in turn, possess truth value. They use economic policy research to exemplify research that pragmatically seeks to identify means-end relationships to achieve specific outcomes.

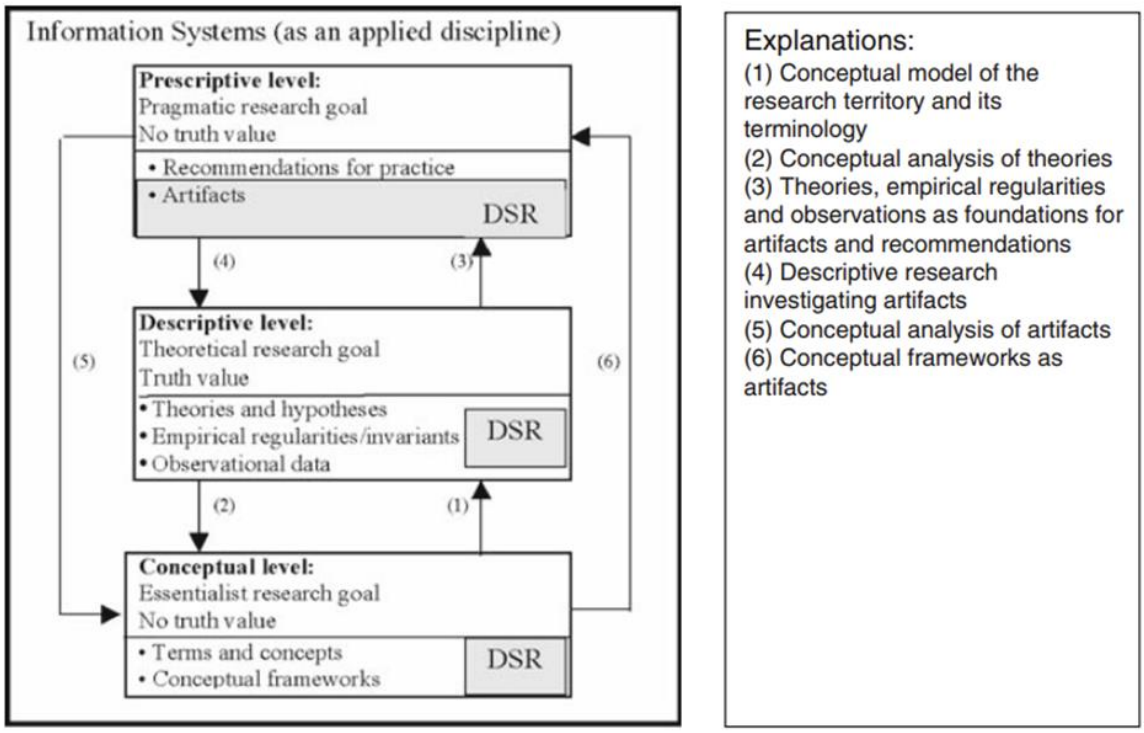


Figure 9: Three levels of research in information systems (Hevner & Chatterjee, 2010, p.46)

When applied to IS, Hevner & Chatterjee (2010, p.46) argue that these frameworks assist in exploring the essence of concepts at the conceptual level, describing current states at the descriptive level and formulating effective strategies and artefacts at the prescriptive level. Although the prescriptions themselves do not hold truth value, assessments of their effectiveness and efficiency do (Hevner & Chatterjee, 2010, p.46). This study takes the prescriptive approach in creating and evaluating the method.

3.3 Thesis Structure in Relation to Design Science Research Phases

The diagram, see Figure 10, illustrates the relation between the phases of DSR presented by Peffers et al. (2007, p.54) and the structure of this study. In this diagram, parallels are drawn between the phases of DSR, the sequential flow at the top, and the corresponding chapter or concept in this study. While the solid arrows point from a phase in DSR to the equivalent part in the study, master's thesis, the dashed arrows depict which chapters and their subsequent subchapters are related to each other. Chapter 3 Research methodology and Chapter 8 Conclusion are excluded as they describe the research decisions made and the final synthesis of the study, respectively.

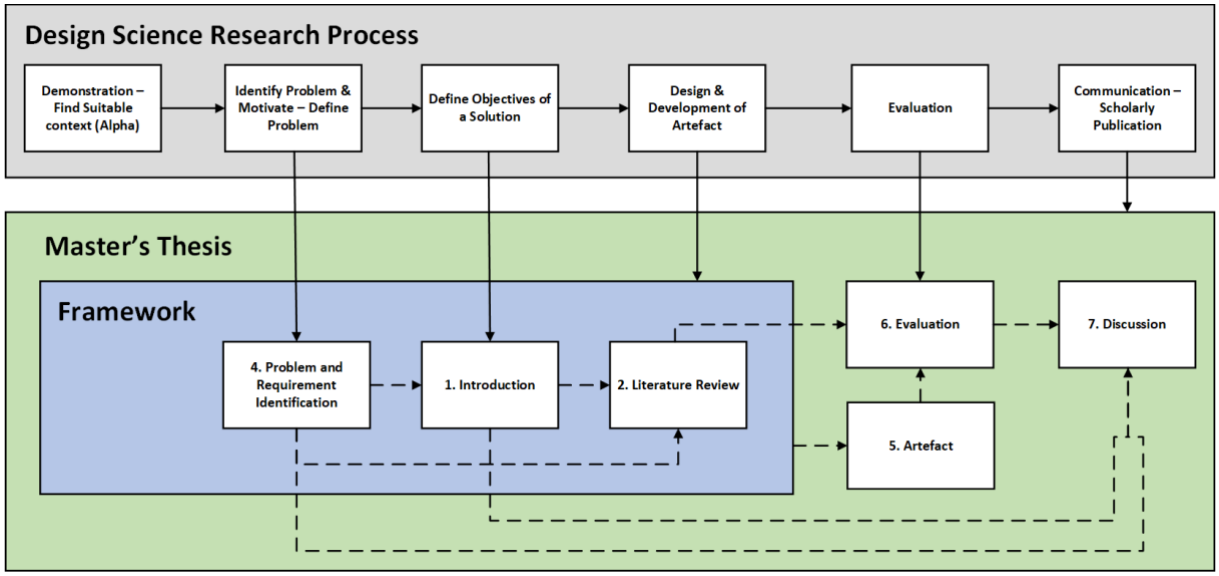


Figure 10: Thesis structure in relation to DSR steps presented by Peffers et al. (2007, p.54)

Given the identified entry point, which was the client-/context-centred initiation, the initial step was to find a suitable context, in this case Alpha. The second step was to identify and define the problem. This was explored in Chapter 4, where the requirements are identified through studying the organisational context and interview findings. The next step in DSR was to define the objective of the solution. This was based on the identified problem and requirements in Chapter 4 and set the objectives of the study and, subsequently, the solution. This is explored in subchapters 1.2 Research Problem, 1.3 Research Question, 1.4 Research Purpose and 1.5 Delimitation. The next step was the design and development of the artefact, i.e. the method. This was achieved by establishing justificatory knowledge. This is covered in subchapters 2.2 User Research, 2.3 The State of Artificial Intelligence and 2.4 Artificial Intelligence in an Organisational Context. These describe potential use cases related to the requirements and objectives brought up in Chapter 1 and Chapter 4. The evaluation was the penultimate phase before publication and is addressed in Chapter 6. This chapter is based on the constructs taken from UTAUT subchapter 2.5 Technology acceptance and the artefact itself which is described in Chapter 5 Artefact. Chapter 5, in turn, is based on the components that the framework is comprised of i.e. Chapters 1, 2 and 4. Finally, the requirements and problems identified from Chapter 4 and the objectives from Chapter 1 are discussed in Chapter 7. These are compared with the results from Chapter 6 Evaluation. These chapters comprise the master's thesis.

3.4 Data Collection Methods

3.4.1 Research Setting, Participant Selection and Sample Size

To gather a varied set of views on the AI in relation to ResearchOps at Alpha, all interviews were conducted with professionals working at Alpha. These participants were consultants at a consulting company that will be referred to as "Beta". The sampling used was convenience sampling. This means that the participants were selected because they were willing and able to participate (Patton, 2014, p.467). Although Venkatesh et al. (2003) highlight that gender as well as age can represent variables that affect acceptance of new technology. This was not

considered a selection criterion for these interviews, as they aimed solely to explore and identify usage and perceptions of AI. Individuals who worked as part of the UX team were emailed individually to arrange the date and time for the interviews.

For the evaluative phase, these individuals were contacted again, along with the Lead User Experience Researchers employed by Alpha. For this phase instructions, see Appendix 6, and files for the evaluation were sent via email. The survey was then sent out to all the participants from the interviews, the two Lead User Experience Researchers at Alpha and an additional five UX professionals from another Consulting company that will be referred to as ”Charlie”. The contact information for these five UX professionals was obtained from a personal contact. The consultants working at Charlie were sent a request first to determine if they were willing to partake. After receiving confirmation, they were sent the same emails as was done for the other participants.

3.4.2 Literature Review

Following the publication schema of Gregor & Hevner (2013) the literature review acts as justificatory knowledge for the framework. It denotes descriptive theories found in **Ω,** existing artefacts and any relevant knowledge related to the identified problem. Relating it to the six components presented in Figure 8, it provided a contextual backdrop that helped (1) define the problem space and justify the relevance of the artefact, (2) identified and defined key constructs that are crucial to the framework and (6) it served as a repository for justificatory knowledge that describes and correlates relevant information to the research aim. Therefore, the literature review included scientific publications and articles, aligning with the search strategy, as well as technical specifications for concepts and tools related to the problem.

3.4.3 Interviews

To establish the requirements of the method semi-structured interviews were conducted with the UX professionals from Beta. Recker (2012, p.90) highlights the semi-structured interview as an approach that allows for follow-up questions. The purpose being to observe the current use of, dispositions to and the perceived potential of AI among UX professionals, presented in Table 2. This approach captures experiences flexibly, accommodating different perspectives (Recker, 2012, p.90). This helped to define and ground the problems of UX professionals empirically while finding potential applications and requirements for AI. All the participants worked with UX or User Interface (UI) at Alpha. Their tenure and role at Alpha varied but all, except participant 4, had experience at other organisations prior to starting at Alpha.

Table 2: Participant and interview legend

Participant	Professional Title	Tenure at Alpha (Years)	Duration (Minutes:Seconds)	Appendix
P1	UX Designer	>1	33:52	11
P2	Senior Analyst Designer	2	21:22	12
P3	Interaction Designer	2	23:25	13
P4	UI Trainee	0.5	18:33	14
P5	Project Manager	>1	25:11	15

The interview guide was developed with the research question and purpose in mind, in line with Jacob & Furgerson (2012). Furthermore, the questions were designed to follow overarching themes that would complement the design process and problem identification, as recommended by Recker (2012, p.90). These were in turn informed by both previous related studies covering AI in different contexts (Collins et al., 2021; Knearem et al., 2023; Manning et al., 2024; Stige et al., 2023) and research of the current way of working at Alpha.

The interviews began with an introduction of the researcher and the purpose of the research followed by a reiteration of the participants' rights as detailed in the informed consent form, see Appendix 5. Due to the participants' locations all interviews were held online. With the participants' informed consent, all interviews were recorded and transcribed using Whisper, ensuring that the insights gathered were accurately represented. Table 3 illustrates the interview guide, questions and their relevance to key factors of this study.

Table 3: Mapping of themes and interview guide

Theme	Factor	Interview Question(s)
Artificial Intelligence	**Perception**	**4**
	Usage	**5**
	Concerns	**7**
Incorporation	**Key success factor**	**8, 10**
	Potential application	**6, 9**

Interview Guide
Introduction
1. Could you please describe your role and responsibilities at Alpha?
2. How long have you been in your role with Alpha?
3. Do you have any experience in a similar role at another workplace, if so how long?
Main Questions: Work Experience
4. How has your perception of AI evolved throughout your career, in relation to UX?
5. What is your previous experience working with AI in your role?
6. What applications of AI have you observed in your field of work?
7. What is your opinion about AI in the context of your profession? What are some challenges you have experienced or observed?
8. What have you done or, observed be done, to address these challenges?
Main Questions: Practical Application
9. How do you envision AI being incorporated into your research operations to address specific challenges or possibilities you have identified?
10. What do you consider as key factors to successfully incorporate AI in your work?
Closing part
11. To conclude, do you have any additional thoughts or comments related to the study?

3.4.4 Evaluative Survey

As mentioned, the final phase of DSR involved an evaluation of the method to determine how respondents received and perceived its utility. Gregor & Hevner (2013) state that the evaluation of an artefact can be conducted in a number of ways, one of which is a survey. They further state that there is flexibility in judging the extent of the evaluation needed. According to Gregor & Hevner (2013), this can depend on the novelty of the artefact, where even a proof of concept may suffice to demonstrate its value. In this case, the method was evaluated by examining the constructs of UTAUT to indicate its utility. This approach gauged PE, EE and FC in relation to the method. Helping to validate the different components of the prescriptive framework and provide grounds for its suitability in producing useful methods.

The evaluation was done through a quantitative survey, covering the chosen constructs of UTAUT: PE, EE and FC. Additionally, the respondents' experience with AI and Colab was observed as this could influence the results by directly affecting the use of the method. The PE questions aimed to assess the differences in measurable qualities between the devised method and the respondents' typically used methods. For EE, the aim was to establish how easily the method could be incorporated into the current way of working. The FC question, similar to the Respondent Experience questions, could significantly influence the results as it may determine the respondent's ability to use the method. These sections enable a comparison between currently used methods and the devised method for user research, aligning with the research question. This evaluation provided insights into the method's immediate utility and highlighted potential areas for further improvement. Table 4 represents the survey created to evaluate the overall utility of the proposed method, divided into sections representing the chosen constructs of UTAUT.

All the questions were close-ended and based on the Likert scale to assess the respondents' disposition to the questions. In total, the instructions and survey for the evaluation phase were sent to twelve individuals, whereof six completed the testing and survey, resulting in a 50% completion rate.

Table 4: Survey based on selected UTAUT constructs

Respondent Experience
1. **How Familiar Are You In Working With Artificial Intelligence (AI)?** (1 - Not Familiar, 5 - Very Familiar)
2. **How Familiar Are You In Working With Google Colaboratory** (1 - Not Familiar, 5 - Very Familiar)
Performance Expectancy
3. **To What Extent Do You Believe The ASR Model Increases the Speed of Transcription and Translation in User Research Compared to Previously Used Methods?** (1 - Not at All, 5 - To a Great Extent)

4. **To What Extent Do You Believe The ASR Model Increases The Accuracy of Transcription And Translation In User Research Compared to Previously Used Methods?** (1 - Not at All, 5 - To a Great Extent)
5. **How Accurate Do You Think The LLM Is In Mimicking Real User Interactions And Persona Creation?** (1 - Not Accurately, 5 - Very Accurately)
6. **How Accurate Do You Think The LLM Is In Analysing Sentiment?** (1 - Not Accurate, 5 - Very Accurate)
7. **How Fast Do You Think The LLM Is In Analysing Sentiment Compared To Previously Used Methods?** (1 – Not Fast, 5 - Very Fast)
8. **Do You Think That Working With LLM And ASR Models Provides Increased Utility Compared To Methods You Have Used Previously?** (1 - Strongly Disagree, 5 - Strongly Agree)
Effort Expectancy
9. **How Easy Do You Believe It Would Be To Incorporate The Presented ASR Model Into The Current User Research Process?** (1 - Very Difficult, 5 - Very Easy)
10. **How Easy Do You Believe It Would Be To Incorporate The Presented LLMs Into The Current User Research Process?** (1 - Very Difficult, 5 - Very Easy)
11. **How Would You Rate The Learning Curve Associated With The Presented AI Tools?** (1 - Very Steep, 5 - Very Gentle)
Facilitating Conditions
12. **Do You Have The Necessary Resources (e.g. Technical Support or Training) To Use These AI Tools Effectively?** (1 - Strongly Disagree, 5 - Strongly Agree)
Behavioural Intention
13. **How Likely Are You To Continue Using ASR Models, Like Described, In Your Future Projects?** (1 - Very Unlikely, 5 - Very Likely)
14. **How Likely Are You To Continue Using LLMs, Like Described, In Your Future Projects?** (1 - Very unlikely, 5 - Very likely)

Hevner et al. (2004, p.86) highlight the descriptive evaluation method as one way of evaluating a specific use case. This evaluation method entails creating specific scenarios supported by informed arguments.

Scenarios for LLM

- **Synthetic User Interaction**: You have a specific user or persona in mind and want to test your ideas against it. You ask the LLM to impersonate the user or persona and ask it questions.

- **Sentiment Analysis:** You have transcribed an interview and would like to get an opinion on the sentiment of the user on different questions you have posed.

Scenarios for ASR

- **Data Transcription:** You have interviewed a user on Teams or another platform and wish to have a more accurate transcription. Try transcribing an audio file or "Small Talk.mp3".

- **Data Translation:** You have held an interview in a user's native language but would like to easily transcribe and translate it to English simultaneously. Try translating an audio file or "Italian with Elisa.mp3".

The informed arguments use information from research to form an argument for the method's utility. For the method in this study five interviews were conducted with UX professionals at Alpha to provide context specific insights. Additionally, literature supporting the value of AI for a UX professional was reviewed. This involved searching for previous research that covered relevant aspects of user research related to the interview findings and met the criteria of the search strategy.

3.5 Data Analysis Technique

For the analysis of the interviews coding was used to identify patterns, themes and categorising the interview data (Patton, 2014, p.808). Recker (2012, p.92) describes coding as a frequently used method for deriving insights from data. It involves interpreting the data and assigning meaning. Further, Recker (2012, p.92) discusses open, axial and selective coding. Open coding involves uncovering concepts within the data. Although popular, open coding is inherently subjective and can introduce bias. To mitigate this bias, two researchers could code each interview independently. Given that there was only one researcher conducting the research in this study the transcripts were anonymised and given to LLaMA 3 hosted on Google Colab. After prompting the LLM to identify codes, they were compared for similarities and differences, as recommended by Recker (2012, p.105). This method of analytical triangulation enhances the credibility of the coding process. After establishing initial codes, axial coding helps in linking these codes. Patton (2014, p.808) emphasises that the human mind is inclined to recognise patterns through data interaction. Patterns in this context are descriptive findings, which can evolve into themes interpretating the meaning of the patterns (Patton, 2014, p.39).

During the selective coding stage, the aim was to pinpoint a couple of central themes from the related codes and delineate the connections between these themes. Through this coding procedure, the meaning from the empirical data was distilled into a few pivotal themes, subthemes and subcodes that were found, see Table 5. Using DSR, the codes were inductive, based on common occurrences in the interview transcripts.

Table 5: Main theme, subtheme and subcodes from interviews

Main Theme	Subtheme	Subcodes
Incorporation of Artificial Intelligence	Success Factors	Resources
		Organisational engagement
		Employee engagement
	Requirements	Capabilities
		Expectations
Usage of Artificial Intelligence	Tool-Specific Use	Platforms
	Workflow Automation	Experience
		Activity
	Research and Development with AI	Use cases
		Potential
		Experience
Impact of Artificial Intelligence on user research activities	AI Benefits	Creativity
		Speed
		Accuracy
	AI Limitations	Reliability Issues
		Integration Challenges
		Individual
Ethical use of Artificial Intelligence	Concerns	Data Protection
		Privacy
		Bias

These were then distilled into a couple of themes, concepts based on subthemes and codes, see Table 6, used for labelling the interviews.

Table 6: Themes and labelling codes

Main Theme	Subtheme	Code
Artificial Intelligence Incorporation and Usage	Success factors	SF
	AI in Workflow Automation	AIWA
	AI Tool-Specific Use	AITSU
	Research and Development with AI	RDAI
	AI Application Experience	AIAE
Artificial Intelligence Impact and Ethics	User Research and AI	URAI
	AI Benefits	AIB
	AI Limitations and Concerns	AILC
	Ethical Considerations	EC

Recker (2012, p.76) suggests statistical techniques for analysing the results of a survey. In this study, graphical representations of the data were created to highlight the statistical value, specifically the mode value. This was then interpreted in relation to the survey question and the underlying UTAUT construct.

3.6 Validity and Reliability

Oates et al. (2022, p.227) define the concept of research reliability as the ability to produce consistent and replicable results across various studies. They argue that the reliability of a study hinges on these outcomes being dependable over time. Further emphasising methodological rigour, Oates et al. (2022, p.188) advocate for constructing neutral interview guides. By ensuring questions are clear, unbiased and unambiguous, the influence of researcher bias on participant responses can be minimised. This, in turn, reduces the likelihood of misinterpretations occurring. In the interview and survey questions, language that could carry unintended connotations or influence responses was avoided.

Regarding validity, Oates et al. (2022, p.287) categorise it into two types: internal and external. They explain that internal validity is about ensuring that the study accurately measures what it claims to measure and that the findings are logically connected to the data. External validity, however, deals with the applicability of the study's findings to other contexts. Oates et al. (2022, p.288) state that this type of validity assesses whether the conclusions drawn from the research can reasonably be applied to other populations or environments.

In this study, the participants include both individuals working for Alpha and consultants from Beta. Additionally, for the evaluation phase the respondents include an additional group of UX consultants from Charlie. This lends itself to some degree of generalisability of the conclusions drawn. However, given the limited sample size there are limitations concerning external validity.

3.7 Ethical Considerations

Within academic research, ethical considerations can be viewed as a set of rules or principles that researchers are expected to follow (Recker, 2012, p.141). To address these ethical concerns the guidelines by Oates et al. (2022, p.56) were implemented. These guidelines highlight five rights: the right not to participate, to withdraw, to give informed consent, to anonymity and to confidentiality. The aim was to be as transparent with the participants as possible. After confirming their participation, an invitation with information and a consent form was sent to the participant, see Appendix 5. This provided detailed information about the researcher, the purpose of the study, the structure of the interview and the extent of it.

The principle of voluntary participation was upheld by informing the participants that they could withdraw from the study at any time without any consequences (Recker, 2012, p.144). This principle was further based on the notion that there should be mutual benefits for both parties when partaking in a study (Patton, 2014, p.728). The principles of anonymity and confidentiality, i.e. that participants cannot be identified through the collected data or research disclosures (Recker, 2012, p.143), were upheld. In accordance with Oates et al. (2022, p.65), pseudonyms were used for all participants serving as a reassurance that confidentiality was taken into account. Participants were also assured that their data and information would solely be handled by the researcher. For the evaluative stage, a link to the evaluative survey was sent via email, see Appendix 2, to individual participants with no identifiable information or identity related questions included. This was done to enable the participants to evaluate the artefact without concerns of being identified.

4 Problem and Requirement Identification

4.1 Artificial Intelligence in an Organisational Context

To devise an appropriate method to address the presented problem the study began by exploring the existing ResearchOps at Alpha. This was done by contacting the Lead User Experience Researcher responsible for ResearchOps at Alpha. To supplement the method's requirements, internal policy documents providing insight into relevant organisational factors were used as a point of reference. For this reason, a redacted version of Alpha's position statement on "Public Generative AI Services" is shared in Figure 11, found on the next page. This highlights the key aspects of why services like the LLM, ChatGPT, are a concern for an organisation like Alpha. These coincide well with the sentiment presented by Sussman (2023). Notably, Alpha states that employees "… ***may not*** register using sensitive Alpha credentials such as your main login password" as this could, firstly, directly link sensitive data to Alpha and, secondly, compromise other accounts belonging to the employee.

Furthermore, the invitation at the end of the position statement in Figure 11 was used to explore current internal AI related initiatives. A message was sent to the Enterprise Architecture team for guidance on what should be considered in the design process. These interactions took place through email and Microsoft Teams messages. This provided insight into what AI solutions they were evaluating on an organisational level and concerns they were taking into consideration. They also highlighted a specific concern they were investigating regarding open-source AI models: "One of the biggest risks we are looking into is model manipulation if unauthorized access to model takes place…". After becoming familiar with the ResearchOps at Alpha and the organisation's stance on the use of AI, the interviews with the UX professionals at Alpha were conducted.

Public services like *OpenAI ChatGPT* (https://openai.com/blog/chatgpt) are **not supported** directly by Alpha, but it is **not prohibited** to explore **for learning purposes**. However, it is **required** that:

You ***may not*** register using sensitive Alpha credentials such as your main login password.

You ***can only*** post/use either Alpha data that is classified **Public** as per Alpha Information Handling Procedure or test/simulated data. Real data that is not Public **must not** be used.

Do not post Customer-specific data and names.

Program code (and other content) generated by these services ***must not*** be used for internal or commercial purposes. Code output should be considered educational samples only.

Outputs from services like *OpenAI ChatGPT* ***must be validated*** when used for Alpha business purposes.

Decision making ***should not*** be directly based on generated content.

Trained models ***must*** remain intellectual property of Alpha.

You ***must never*** use services like *OpenAI ChatGPT* to produce harmful or unethical materials including but not limited to malicious software code, privacy-invasion, insensitive group characterizations, hate speech etc.

Paid services like *Open AI ChatGPT Plus* ***must*** be considered an IT cost and governed accordingly.

The Director of Enterprise Architecture is focused on getting the right balance between allowing room for 'playing and learning' while also maintaining our high standards on compliance and privacy.

"As a company we must keep in mind this is brand new territory everywhere, not just for Alpha," the director continues. "The AI landscape of opportunities has changed and made another leap forward that we've yet to understand. Many global companies have fully restricted any use of OpenAI services, like ChatGPT, until the regulatory and legal landscape get things figured out."

"The Enterprise Architecture team is ready and available to help develop, guide and support business development where IT and AI tools are solution alternatives" the director adds.

Figure 11: Alpha's position statement on public generative AI services like OpenAI's ChatGPT

4.2 Interview Findings

This chapter explores the experience the participants have had with AI, their usage, perceived benefits and the potential of AI within their work context. It also denotes their concerns and perceived limitations regarding the usage of AI. This served as a supplement to the objectives and requirements of the method. To identify the row of each quote a P, i.e. Participant, and two numbers separated by a period - Pn.n are used. The former number denotes the participant number and the latter the row which can be used to navigate the transcriptions in the appendix. The following subchapters are divided into the subthemes from Table 6.

4.2.1 Benefits and Workflow Automation and Success Factors

One participant explicitly noted the role of AI in accelerating tasks, stating, *"AI is only a tool that helps me or allow me to do something not better, but maybe faster."* (P2.14). They further elaborated on this by mentioning an AI-assisted workflow in design processes:

"Maybe faster brainstorming or faster workflow when you are designing the screens in a flow of the feature. If you have an AI assistant, you can do everything really faster, I would say." (P2.16).

These reflections underscore a common recognition of AI as a catalyst for efficiency, particularly in repetitive or data-intensive tasks that might otherwise require considerable effort and time.

While efficiency is a notable benefit, participants also underscored the importance of balancing speed with quality: *"We need to understand when we really need to be efficient and use AI to support the work versus being more, you know, focusing on being effective rather than just faster."* (P1.50). This perspective suggests a nuanced approach to AI application, aiming to enhance the overall quality of outcomes, not just to complete tasks quicker: *"And it will be helpful for me to suggest me, how can I do smarter something… Because maybe it was time to do a thing in a way, because I don't know the best way to do it."* (P4.20).

Participants expressed interest in the evolving capabilities of AI and its potential to further influence professional practices:

"I'm really interested to see the future about AI … I think the best thing that a designer right now can make is to know this reality and start to use it, to insert this possibility inside our workflow every day" (P3.10).

This reflects an anticipatory attitude towards AI, with professionals ready to explore and incorporate AI technologies.

The concept of AI as a collaborative tool, rather than a standalone solution, is a recurrent theme in the interviews, reinforcing its role as a supportive technology that augments human capabilities rather than replacing them: *"I never let the AI work alone, it's always a collaboration. But sometimes it suggests me what is the best practice…"* (P4.8). This statement highlights the importance of maintaining a collaborative relationship between AI and human professionals, ensuring that AI's contributions are appropriately incorporated and supervised.

Despite the enthusiasm for AI, there is also a recognition of its limitations, particularly in terms of the need for human oversight and the potential for error:

AI's incorporation touches on broader factors, as noted by participant 1 who observed a decline in job openings for writers and translators, attributing this trend to AI's increasing capability in these capabilities: *"So there was a decrease into the number of job openings, open position for writers and translators, because at the moment I see that's where the most impact AI is having"* (P1.20). This acknowledgment of both the potential upside and change AI is introducing in the industry. It also highlights a potential strength and area of application for AI.

The broad applications of AI in facilitating research and development were articulated:

"I use it for, yes, to make a diagram, to help me to find certain information, or to create some text that I use in my work, in my Figma. I use many types of artificial intelligence, because I don't have a preference. I want to use all to see what is the best." (P3.12).

This participant's approach, experimenting with various AI tools to determine the most effective, illustrates a proactive engagement with technology to optimise personal and organisational productivity. They also emphasise the importance of having instructions and examples documented as a point of reference, *"Yes, the documentation that explain how to use ... plus some example, because I'm thinking about the components for my work."* (P3.34). Participant 1 similarly reiterated the importance of engagement from the organisation and the professionals intended to use the AI: *"Probably there is an initial phase in which people should be trained to use it and integrate it in the workflow. And it's always a matter of allocating resources, right?"* (P1.44). This indicates the need for an investment of time to organise documentation and onboard people in a new way of working. For these success factors to be established there first needs to be an effort in creating the way of working that aligns with the organisation's stance on AI.

Lastly, participants 2, 3 and 4 highlighted the importance of having AI be incorporated into the same existing platform, in this case Figma, as a key factor of success. However, participant 5 denoted that these may not be of much value:

"... as a designer for sure, some plug-in inside the Figma, I know that the designer try some plug-in, but at the moment it's not useful, just for speed up the activity ... maybe it's a correct way for now, but regarding the quality of deliverable generated, you cannot make it and use it." (P5.18).

In sum, these reflections depict a dynamic and evolving interaction with AI within professional settings, highlighting its benefits in enhancing efficiency and prompting a revaluation of work processes. However, there is also a clear understanding of the need for mindful incorporation, ethical considerations and continuous human oversight to make use of AI's full potential while mitigating its risks. Further the importance of engagement from all involved parts, organisation and individual, is noted as a crucial factor for the successful incorporation of AI.

4.2.2 User Research and Development and Specific Tool Use

A notable innovation in AI applications involves the use of synthetic users to simulate real user interactions. As one participant noted:

"At the same time also, I've seen synthetic users as well. There are applications that simulate user personas, which I haven't used yet. I didn't have the chance to test. And I'm not sure it's going to be comprehensive, of course. But that's not the point. I don't see that that is the point at all. I think the point is to quickly understand or have an overview of what could be the things to investigate in a certain area, in a certain context, let's say." (P1.12).

This participant also comments on the importance of two characteristics, the speed and the accuracy, of an AI model in relation to the use case. They indicate that in certain use cases, speed may be more important than accuracy. Participant 3 described a similar application:

"… sometimes I talk to the bots to make them give me a reflection. Talking with someone that is not someone. ... I start to chat with the bots sometimes to talk of certain arguments and see what happens." (P3.16).

This method appears to be a way to brainstorm involving a persona or through a simulated user interaction. Participant 2 also describes another approach to using AI at work: "In the first part of the design, only benchmarking and brainstorming" (P2.22). This suggests that AI tools are used in the early stages to generate ideas and compare metrics. Another approach to AI in work is described by Participant 2, stating: "And in my work, for example, I use the AI for research, for benchmarking, for when I don't have any ideas of, I think, a pattern, a flow, I search, I do a search with the AI…" (P2.8). These approaches allow professionals to test and refine interfaces and experiences in a controlled yet realistic setting.

Participant 3 emphasised using multiple services such as Claude, Bard and ChatGPT, without a clear favourite. When asked if their usage of AI tools and if it was mostly for the design parts of their work or for interviews with users and documentation of user data, they answered the following: "No, it's more related to the second part, the second thing that you say. It's more related to documentation for the user interview or for UX research." (P3.16). This indicates the use of potentially using AI relation to user interviews, tying back to the simulated users. Further exploring AI's role in user research, another participant shared:

"... I imagine that the AI can be useful in quantity research, more than in quality research ... in order to create and test different patterns and discover what is the best one. We can try to discover what is a better solution based on an AI analysis of what users do when they test an application" (P2.26).

This reflection highlights AI's potential to transform large-scale data analysis into actionable insights, enhancing the understanding of user behaviour and preferences.

These excerpts collectively illustrate AI's incorporation of across different phases of user research and development, showcasing its expanding role in automating tasks providing quick insights and enhancing the creative capabilities of professionals. The emphasis remains on a balanced approach where AI supplements rather than supplants human expertise. Lastly, speed and accuracy are highlighted as a measure of utility in certain use cases.

4.2.3 Limitations, Concerns and Ethical Considerations

All participants raised concerns about the limitations of AI, emphasising the importance of human validation of all AI generated content AI:

“I think it's a real help to our work. But I think right now it's important to know your work when you use artificial intelligence, because not always the answer is correct…. So, you need to know what you ask the artificial intelligence. Because if you copy and paste the response, probably it's not a good way of work. It's not all good…” (P3.14).

This was also denoted as a new responsibility that is being observed in other contexts as well: *"... based on what others are publishing in articles that are using and experimenting with it: “It seems like it can't be reliable for final decision or final designs in the strict term."* (P1.18). These comments reflect scepticism about the reliability of AI outputs, underscoring the need for ongoing human engagement to interpret and validate AI-generated content.

The theme of collaboration between humans and AI was a recurring motif, encapsulated in remarks such as, *"I never let the AI work alone, it's always a collaboration."* (P4.8). Such insights highlight the prevailing view of AI as a supportive tool rather than a replacement for human expertise. However, it is crucial to note that the limitations of AI can stem from human error, meaning the responsibility for effective AI tool usage lies with the user: *"Yeah, the AI is only a tool, I think. So, it depends, the limitation and the improvement and the benefit depends on how you use it…"* (P2.20).

The ethical dimensions of AI use were prominently discussed, with one participant noting:

"What I'm seeing and what I'm believing also for the future is that the human part is going to be even more important from an analytical point of view, meaning that whatever the AI gives you, it will be still the job of a designer, of a human designer to evaluate that output in order to make sure that it's compliant, that it's not discriminative towards different group of people that doesn't have any bias." (P1.10).

This reflects an awareness of the ethical responsibilities that accompany the adoption of AI, especially concerning the potential for AI to perpetuate or even amplify existing biases if they are not considered. The discussion also extended to the integration of AI in user-centric research and its potential biases, with comments such as: *"It looks like the bias is still there. Yeah." (P1.26) and "But yeah, it was referring to the use of AI that was not taking into account how disabled people would do certain things."* (P1.28). These insights highlight the need for AI systems to be inclusive and considerate of diverse user needs, ensuring that the deployment of these technologies does not inadvertently marginalise or disadvantage any group.

Additionally, practical experimentation with AI tools within workflows was noted:

"It's quite interesting to see how people are … trying to experiment different tools and different way of including AI into, into their workflow. What I notice is that already there is an understanding and people are conscious about the fact that AI should be taken when it's appropriate to use it, not all the time." (P1.8).

This observation highlights a growing discernment among individuals about when and how to integrate AI technologies effectively, recognising that these tools are not universally applicable but rather situationally beneficial.

Finally, the cost and accessibility of AI applications were recognised as barriers to broader utilisation: *"There are some applications, because probably they are not free, so I haven't actually been pushed to use them so far. "* (P1.14). This reflects the practical limitations, financial cost, which limits the accessibility and in turn restricts the adoption of potentially beneficial AI tools.

In conclusion, the concerns and limitations were largely similar for the participants. There was a clear consensus on the need for a balanced approach that harnesses the benefits of AI while managing its challenges, ensuring that its integration into professional practices is both thoughtful and ethically grounded.

4.2.4 Summary

The interview findings reveal that most concerns and perceived limitations of AI revolve around the potential for erroneous or biased results. These are factors that are hard to circumvent and, as identified by the participants is largely up to the user of the AI to consider when working with AI. Highlighted use cases were brainstorming, translating, transcribing and creating synthetic users to discuss ideas with. This was contrasted with a discussion on two characteristics of AI: the speed and accuracy completing tasks and their implications for the use cases. Finally, proper documentation, examples and instructions, along with a solution integrated into a single platform were highlighted as key factors in successful implementation of AI.

5 Artefact

5.1 Artefact Description

The artefact devised through this study is a method i.e. a way of working, that enables UX professionals in the context of an organisation, such as Alpha, to perform user research activities assisted or performed by AI. Subsequently the method revolves around two central aspects The user research activity and the AI. This method was based on the activities such as sentiment analysis, persona creation, transcription and translation which were identified as potential areas of application. These were found through the conducted interviews and discussions with the Lead User Experience Researcher responsible for ResearchOps at Alpha. Although there may be additional use cases for AI in this context these were the focus during the development phase and aligned with the objective and requirement of the solution. These required little modification to be given as tasks to an AI the only difference being the fact that you would need to communicate what the activity entails, one way or another, to an AI. This way of working was detailed with examples of scenarios, inputs and their subsequent outputs in Appendix 6. These scenarios are repeated and briefly explored below.

Scenario for LLM

- **Synthetic User Interaction**: You have a specific user or persona in mind and want to test your ideas against it. You ask the LLM to impersonate the user or persona and ask it questions.

Manning et al. (2024) described the potential of an LLM to act as both the researcher and the subject in a research scenario. Prefacing this, Hannan (2023) created a comparison between real user interactions and synthetic counterparts illustrating that the difference is, in specific cases negligible. One can interact with a synthetic user by prompting a LLM to impersonate a user characterised by a provided list of traits, followed by any question you would like to ask. This detail in this process is highly dependent on the purpose of the interaction. In this scenario the goal is to create an alternative to a real user that can serve as an alternate way of receiving feedback on ideas or questions.

- **Sentiment Analysis:** You have transcribed an interview and would like to get an opinion on the sentiment of the user on different questions you have posed.

Siddharth et al. (2022) highlighted this use case, finding that sentiment analysis is one of the more common use cases when applying AI based on NLP in DSR. Sentiment analysis can be achieved by prompting a LLM to perform an analysis of a given text, for example a transcript and produce the desired format for the output. In this scenario, the objective is to generate a sentiment analysis of the text. These use cases were highlighted in subchapter 2.4.3 in the literature review.

Scenario for ASR

- **Interview Transcription:** You have interviewed a user on Teams or another platform and wish to have a more accurate transcription. Try transcribing an audio file or "Small Talk.mp3".
- **Interview Translation:** You have held an interview in a user's native language but would like to easily transcribe and translate it to English simultaneously. Try translating an audio file or "Italian with Elisa.mp3".

In these scenarios, the process involves an additional step compared to the automatic transcriptions typically available through software such as Teams. However, this method may provide more accurate transcriptions as previously discussed, with Wang et al. (2024) arguing that, in certain contexts, ASR models like Whisper can perform at the level of a human speaker. Here, the objective is to transform an audio file into text. These use cases were highlighted in subchapter 2.3.4 in the literature review.

5.2 Facilitating the Artefact

To enable the use of this method, part of the research revolved around creating a technical solution that suits an organisational context, primarily considering financial and data security aspects. This was important to simulate a plausible scenario where UX professionals can user use AI for their user research activities. For this reason, Colab was used to facilitate the private and free use of AI tools, specifically LLMs and ASR models. Colab supports Python code execution in a cloud-based environment for deploying these AI models securely, as highlighted in subchapter 2.4.2 in the literature review.

For this purpose, two Interactive Python Notebooks (IPYNB) compatible with Colab's Jupyter notebook environment were procured and amended. Firstly, the LLM IPYNB, "LLM_Colab", enables participants to use publicly accessible LLMs and interact with them in a private environment. Its ability to generate human-like text and perform complex language comprehension tasks makes it a useful tool for simulating user interactions, creating personas and analysing sentiment as was proposed in the scenarios. Hosting a LLM on Colab, ensures that all processing is conducted within a closed and controlled environment, which aligns with data security protocols at Alpha. Secondly the IPYNB using ASR model Whisper, "Whisper_Colab", which is a model developed by OpenAI that allows for quick and accurate transcription and translation of audio files, as highlighted in the ASR subchapter 2.3.4. This ASR model known for its robust performance across various languages and dialects (Wang et al., 2024). The use of Whisper through Colab allows for transcription or translation of any audio file in a safe and erasable manner.

The user interface for LLMs in Colab, shown in Figure 12, was designed for this purpose. Furthermore, the code based on the GitHub repository Oobabooga (2024) was amended for testing purposes. This was achieved by disabling any option for API calls or communication outside of the Colab environment after downloading the model, see Appendix 7. The user interface for the ASR model, shown in Figure 13, was designed and the code is visible in

Appendix 8. The process of using these and potential output is depicted in Appendix 6 which are the written instructions given to the participants during the evaluation phase.

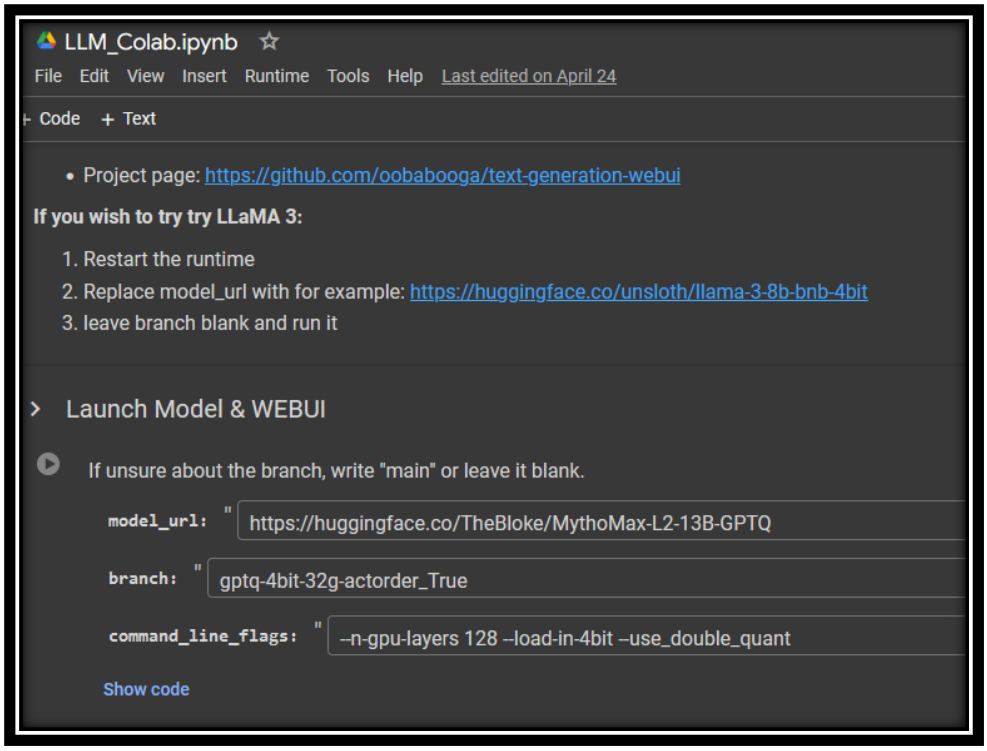


Figure 12: LLM_Colab user interface

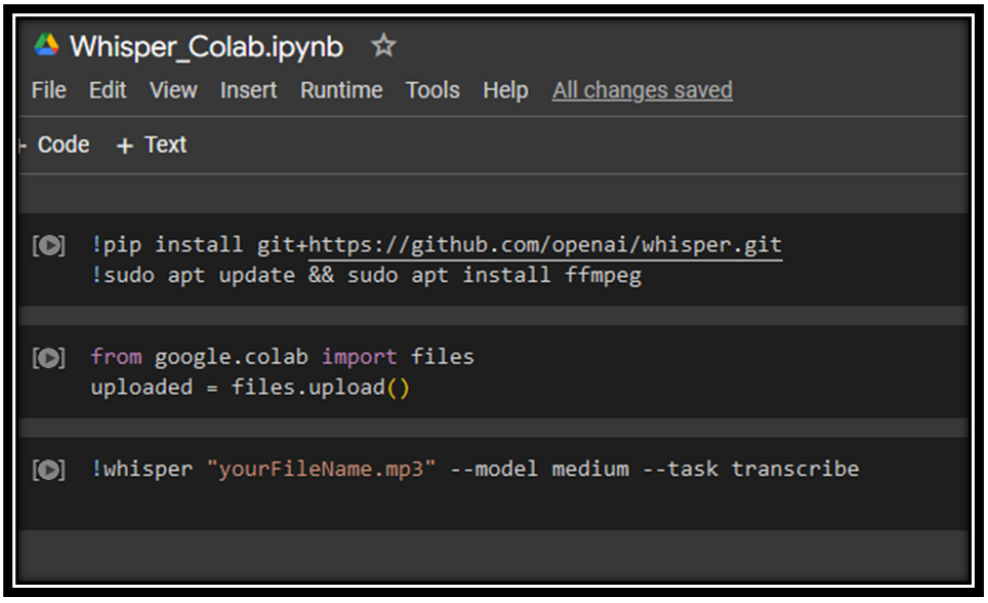


Figure 13: Whisper_Colab.ipynb user interface

Using Colab to host LLMs and ASR models enables the usage of these AI models while limiting data exposure (Sukhdeve & Sukhdeve, 2023). The need for employing Colab arises from the significant privacy concerns associated with using public cloud services (Reuters, 2024). It also eliminates the need to download software or models onto personal devices, thereby avoiding

potential malware (Bisong, 2019). Furthermore, the use of Google Colab facilitates the deployment of these AI tools without the requirement for upfront investment in hardware. In this way, users can use Jupyter notebooks that execute Python code, which can download the necessary dependencies and models to run tools such as Whisper or LLaMA. This is a way of working with AI to improve user research activities through a sandbox environment, making simulating real use possible without violating data security policies.

5.3 Artefact Framework

The components that are included in the framework are as follows: Purpose and Scope, Constructs, Principles of Form and Function, Prescriptive Statement and Justificatory Knowledge. The chapters that cover these components are also represented in Table 7. This should give the reader a comprehensive understanding of what is included in the creation of an artefact, such as the method developed through this study.

Table 7: Framework describing the different components

Component	Description	Chapter
Purpose and Scope	The purpose is to create a method that incorporates AI into user research activities. The scope includes the application of AI tools using ASR models or LLMs. Additionally, addressing concerns about data security and privacy is central.	1.1, 1.2, 1.3, 1.4
Constructs	Key constructs in this framework are AI tools based on LLMs and ASR, UX, UTAUT, ResearchOps and data security. These constructs comprise the artefact itself and surrounding aspects.	2.2, 2.3, 2.4.1, 2.4.3, 2.5
Principle of Form and Function	The form and function should comprise of capabilities equivalent to user research activities. These should be enhanced or modified through the incorporation of AI in a demonstrably beneficial manner.	2.3.4, 2.4, 4

Prescriptive Statement	The development of the artefact is based on identifying the objectives, requirements and potential applications seen by the participants in the study. Based on these findings the concepts to explore and delimitation can be established.	3.3, 3.4
Justificatory Knowledge	The artefact is based on literature on the impact of AI on productivity, technology adoption and security concerns. In addition to this, the findings from interviewing participants and studying the organisational context should serve as justificatory knowledge.	1, 2, 4

6 Evaluation

The evaluation phase was a process that took place over twelve days. The respondents were not expected to perform any specific amount of testing but were given the scenarios to use as points of reference for the survey in line with Hevner et al. (2004, p.86). The duration of this phase was a result of the timeline for the study but was considered to be sufficient time for them to test and evaluate the method.

The survey was divided into five sections: Respondent Experience as well as Performance Expectancy, Effort Expectancy, Facilitating Conditions i.e. PE, EE and FC respectively and, finally, the Behavioural Intention. These serve to determine the use behaviour and thus the utility of the method. To demonstrate the method's utility, the results from the questions regarding PE in Figure 15, EE in Figure 16 and consequently the Behavioural Intention in Figure 18 are presented on the following pages. These focus on the perceived value of the method in improving speed or accuracy of the described user research activities. In other words, how working with the presented AI models compared with previously used methods for e.g. sentiment analysis, persona creation and transcriptions or translation.

In this chapter the patterns in the responses are discerned for all the sections of the survey except the respondent experience, see Figure 14, and the FC section, see figure 17, which are discussed in Chapter 7.

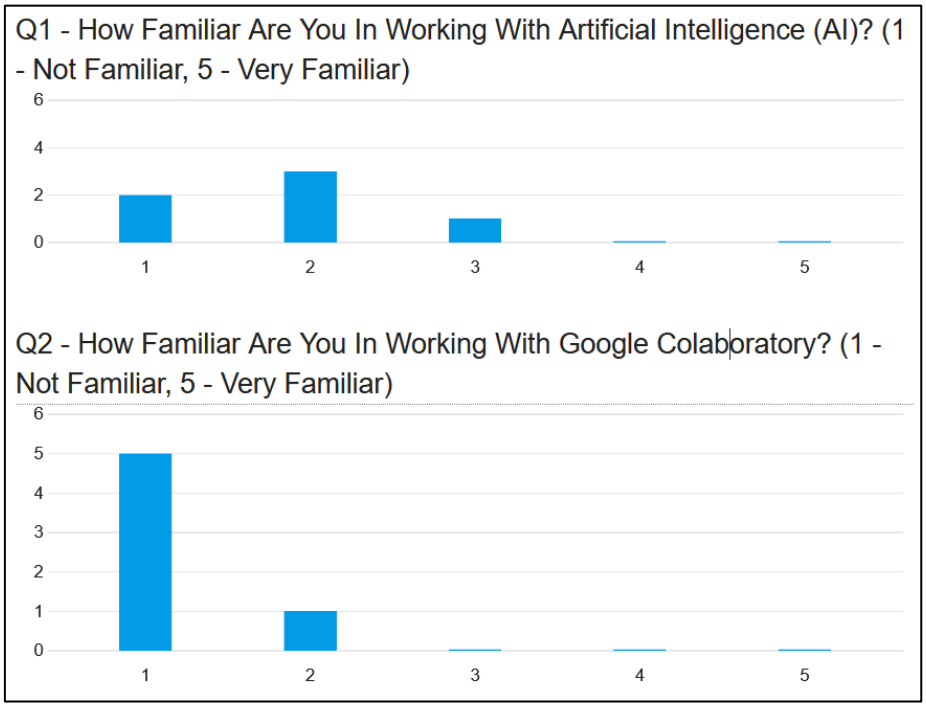


Figure 14: Respondent Experience survey results

Looking at the distribution of answers in Figure 15 demonstrates the difference in PE between the way of working with the ASR model and the LLM. For the former speed of transcriptions and translation was always rated less than 3 with a mode value of 2. The latter had a mode value of 4 and was not rated below 3. However, in accuracy the ASR model had mode values 3 and 4 while the LLM had a mode value of 3, with one occurrence of 4 and 5 ratings respectively.

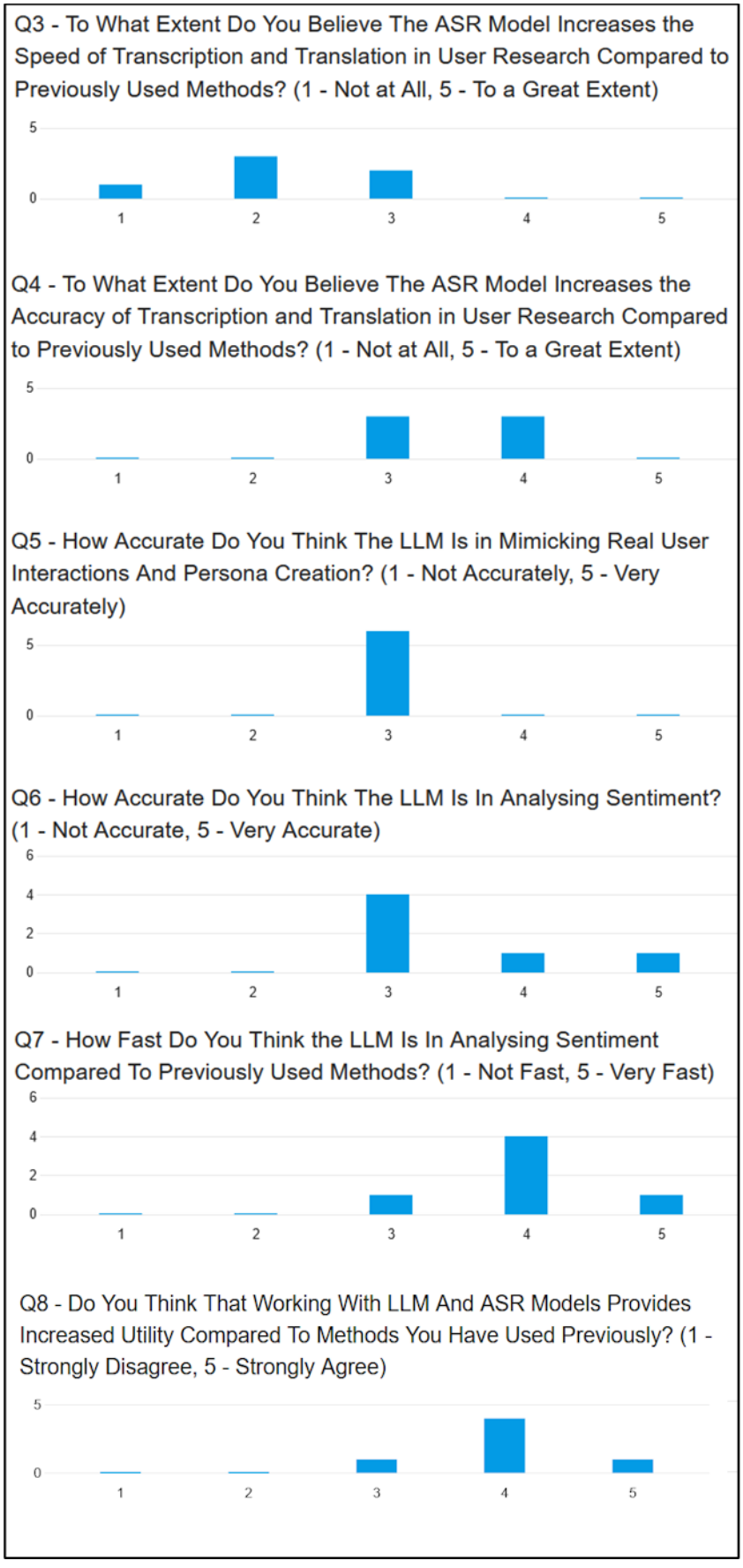


Figure 15: Performance Expectancy survey results

Incorporating these AI models into the current user research process seemed to be straightforward with all ratings being 4 and 5 as is seen in Figure 16.

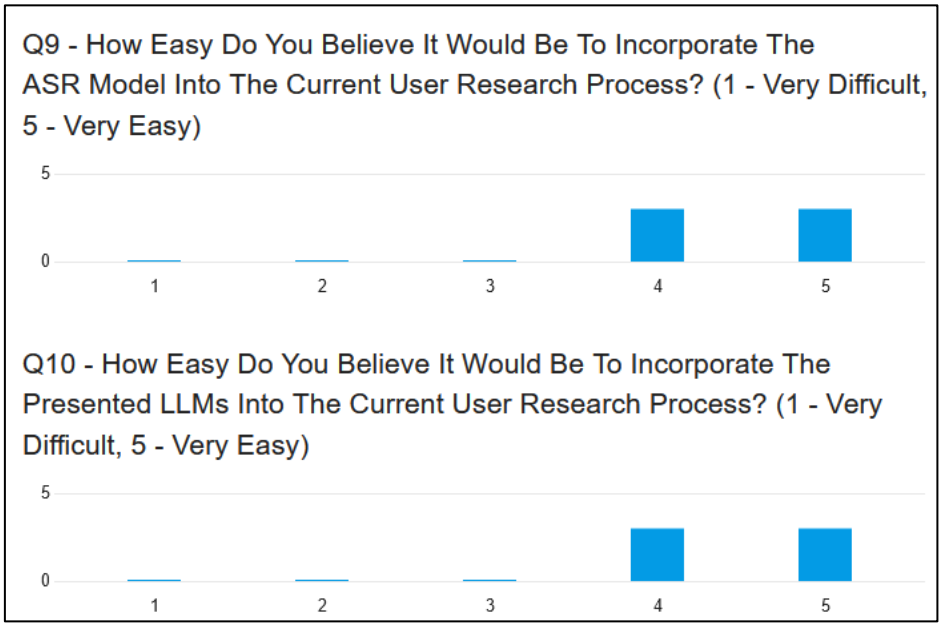


Figure 16: Effort Expectancy survey results

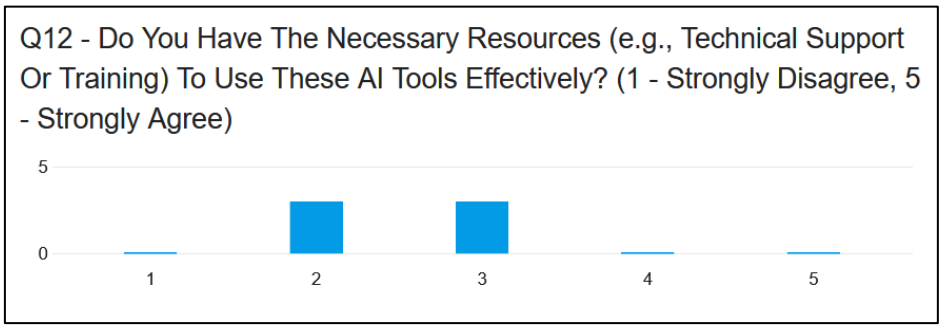


Figure 17: Facilitating Conditions survey results

In line with the results of the PE questions presented in Figure 15, question 8 indicates that there was believed to be potential for increased utility by working this way with AI. The results of the questions pertaining to the behavioural intention, presented in Figure 18, indicate that there is a difference between the two – ASR model and LLM with the latter being the more likely to be used among respondents for future projects.

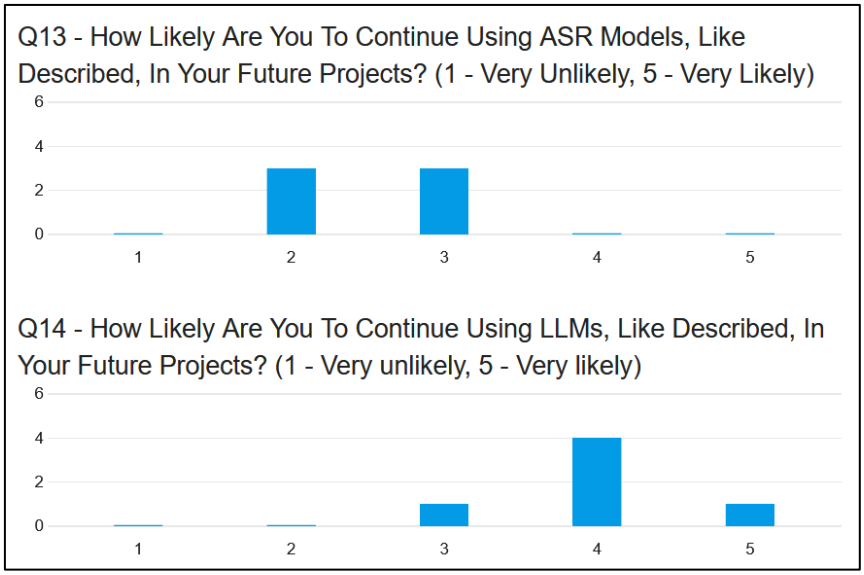


Figure 18: Behavioural Intention survey results

7 Discussion

7.1 Interview Findings

The interview findings from this study are directly tied to the requirements, objectives and potential. This reflects both a current representation of AI in professional environments and the specific concerns related to its use in supporting ResearchOps. These findings provide a practical dimension to the theoretical discussions presented at the outset, illuminating the real-world implications and challenges of incorporating AI in an organisational context.

In the introduction of this study, the interest in AI among professionals and scholars, noted by Davenport & Mittal (2023, p.118) and Venkatesh (2022), is highlighted. The interview responses underscore this interest but also bring to light practical challenges such as the need for strategic implementation and addressing human-AI interaction concerns, as mentioned by Collins et al. (2021). Participants in the interviews expressed optimism, recognising AI's potential to enhance work activities. According to Nielsen & Moran (2023), the advancement of AI is set to redefine UX, a notion that was supported by the interview findings. Participants noted that AI tools have begun to transform user research by automating routine tasks and enabling the analysis of large quantities of data. This, in turn, could lead to significant gains in productivity as exemplified by Dell'Acqua et al. (2023). However, they also pointed out the necessity of incorporating AI in a manner that respects user privacy and trust, aligning with the strategic use of AI technologies discussed by Collins et al. (2021). Simultaneously, they also emphasised the importance of maintaining control and understanding over AI systems to avoid bias and ensure ethical results, echoing the concerns noted by Knearem et al. (2023). Participants also described use cases that were parallel to those of Wang et al. (2024) with ASR models for translating and transcribing as well as Manning et al. (2024) and Hannan (2023) who presented a case for synthetic users in different contexts.

However, despite the interest in AI, the experience with working with AI, as indicated by the first question in the survey, was limited. This could potentially be related to the prohibitive measures against generative AI tools like ChatGPT, as described by Sussman (2023). Data security was considered a prerequisite of this study to create and evaluate the method in an apt way. While participants did not specifically concern themselves with safeguarding user data when working with AI, they were concerned about the ethics and validity of AI generated content. Data security was highlighted by the AI position statement made by Alpha and the Enterprise Architecture team who commented on the usage of open-source AI models as a potential security risk. This lack of emphasis from the participants' side was likely due to the quite limited experience in working with AI, see question 1 in Appendix 9. This could reasonably be assumed to be the cause of Alpha's position statement. This sentiment is echoed in the study conducted by Sussman (2023) and explains the limited work experience with AI as usage of generative AI is generally disallowed in organisations.

In conclusion, the interview findings not only corroborate the discussions in the introduction about the growing interest and potential benefits of AI in UX and broader organisational contexts but also illustrate the need for approaches that manage the risks associated with AI, especially concerning data security. These findings contribute to an understanding of how AI can be effectively incorporated into user research and highlight the importance of continued

exploration and adaptation. Furthermore, the findings contributes to the understanding, highlighted by Bach et al. (2024), of trust in AI outside of the US and Germany. As the observed disposition was broadly similar to Knearem et al.'s (2023) study conducted in the US, it serves to support the generalisability of their findings.

7.2 Survey Results

In this subchapter the results of the survey and their implications for the different parts of the method. The patterns highlighted in 7.2.1 Performance Expectancy and 7.2.2 Effort Expectancy and Facilitating Conditions serve as the basis for discussing how the method may impact the behavioural intention, which is covered in 7.2.3. This serves to highlight and explain patterns in the findings as well as identify potential areas where future research may be needed. As described the survey questions were close-ended and based on the Likert scale. The lower end typically meaning disagreement or no difference at all from previous ways of working. The higher end signifies agreement or high levels of difference from previous ways of working, this depends on subject of the question.

7.2.1 Performance Expectancy

For PE there was a mixture of results for the two different ways of working with the models. The respondents experienced that the ASR model provided accurate output compared to typically used methods with mode values of 3 and 4. However, the results for the speed were less convincing with a mode of 2. This could be due to integrated applications like Team having additional meta-data of the interview is included like e.g. the identity of the speaker, which saves time when transcribing (Microsoft, 2024).

In evaluating the way of working with a LLM the speed was perceived to be considerably higher than previously used methods with the mode value of 4. However, accuracy of persona creation and impersonation as well as sentiment analysis was less convincing with a mode value of 3. This aligns with the sentiment of the interview findings but also Hannan (2023) who states that substituting real users with synthetic ones does not appear to be viable yet, due to bias. In this context participant 1 explicitly mentioned that the accuracy of a created persona or synthetic user may not be the primary concern. Instead, quickly creating an understanding of or basis for a type of user is a more suitable use case.

7.2.2 Effort Expectancy and Facilitating Conditions

As observed with the participants 2, 3 and 4 an important factor for the successful implementation of AI was a platform that easily incorporates AI into current UX or UI activities. A frequent example of this was the design platform Figma. However, Participant 5 argued that although it was readily accessible it did not necessarily produce useful output. The method was facilitated by using Colab as the hosting platform which, according to the evaluative survey, only one out of six had at least heard of prior to this study. Despite this the observed results indicate that the ease of incorporating this artefact in current way of working was considered high. For both the presented AI models the mode values were 4 and 5. These results were recorded despite the poor responses to the question:

"Do You Have The Necessary Resources (e.g. Technical Support or Training) To Use These AI Tools Effectively? (1 - Strongly Disagree, 5 - Strongly Agree)".

For this question covering FC, the mode values were 2 and 3. The ease of applying these AI models is also reinforced by the results of the following question:

"How Familiar Are You In Working With Google Colaboratory? (1 - Not Familiar, 5 - Very Familiar)"

For this question the mode value for the was 1, signifying that a lack of experience with Colab did not reduce the ease of use.

Participant 3 also brought up the need for documentation on how to use and work with a new technical solution. This was also supported by participant 1 who underlined the importance of engagement from the different parts to successfully incorporate AI; the organisation itself and the employee. These comments, along with the low mode values for the FC question, suggest that while there is an expressed need for support, it may not be critical for the inherent ease of use of this type of method.

7.2.3 Behavioural Intention

Combining the findings and results of the questions pertaining to PE, EE and FC with the interview findings there is a pattern in the survey results regarding behavioural intention. Most participants showed their positive disposition to using AI in their work in general, even if there were some reservations about the quality and speed of the output. By highlighting and discussing the results from the previous sections of the survey, the reported behavioural intention can be better understood.

For the ASR model this way of working is unlikely to be used as the mode value of the results was between 2 and 3. This seems to indicate that in the context of user research the application may be limited or the output produced by AI does not contribute enough value to change methods. This could likely be attributed to the speed-related results of the ASR model which were quite poor. On the other hand, the method of working with a LLM appeared to be more likely to be used in future projects with a mode value of 4. This was despite the accuracy of the examined user research activities having a mode value of 3.

Comparing the results of the behavioural intention for the different scenarios it can be concluded that the speed in which a user research activity can be completed is, relative to accuracy, more important in this context. Furthermore, in relation to the research question, there appears to be value to be gained from incorporating AI in the selected user research activities, primarily for increasing the speed in which they are completed.

7.3 Contribution to IS

This study contributes to the field of IS through empirical insights and practical considerations for incorporating AI in user research activities. Aligning with Hevner & Chatterjee's (2010, p.45) conceptualisation of IS as an applied discipline, this study emphasises the value of both

descriptive and prescriptive research. Hevner & Chatterjee (2010, p.45) underline that applied research is valuable to IS not only for its practical applications but also for its theoretical contributions. They delineate research into descriptive and prescriptive types, where descriptive research focuses on defining phenomena without assigning truth value, while prescriptive research aims to develop artefacts to achieve specific outcomes. In this context, the study provides an understanding of methods that incorporate AI presenting empirical data that highlight both the benefits and limitations of AI tools based on LLMs and ASR models. While these tools can enhance the speed of tasks such as transcription and sentiment analysis, their accuracy still appears to be inferior to human capabilities, likely, partially due to a lack of trust. This insight is important for setting realistic expectations for AI. In turn, this is crucial for documenting use cases that Davenport & Mittal (2023, p.37) argue are required for getting buy-in from professionals and organisations. These factors were highlighted as crucial for the successful incorporation of AI in the study. Further, a high-level framework is provided for the purpose of creating prescriptive knowledge for the design of similar artefacts that aim to integrate AI into user research activities.

Finally, the study sheds light on the behavioural intentions of professionals towards using AI in their work. The positive disposition towards AI, tempered by concerns over accuracy and output quality, provides insights into user acceptance and the factors that influence it. By demonstrating how AI can support and enhance user research, the study expands the role of AI within ResearchOps. The automation of user research activities and the ability to analyse large quantities of data quicker can increase the speed of certain processes.

In summary, this study contributes to the IS field by providing an analysis of the integration of AI in user research. It aligns with Hevner & Chatterjee's (2010, p.41) framework by addressing the prescriptive level of research, creating and evaluating methods. These contributions advance academic knowledge and offer actionable insights for IS practitioners seeking to further this or similar areas of study.

8 Conclusion

To briefly reiterate, the purpose of this study is to create and evaluate a method for employing AI for user research in an organisational context. This study, thereby, explores the creation of a novel way of approaching UX work, in this case user research activities. This is necessary in order to contribute to knowledge regarding the benefits and drawbacks of AI in a UX context. Additionally, it serves to supplement research on the trust in AI generated output outside of Germany and the US.

To make the findings more generalisable a framework providing an overview of the different components and the chapters that inform them was created. This framework helps provide a basis for generating new solutions for similar problems. This is, ultimately, to support UX professionals in their interactions with users. To do this the aim was to answer the following question:

How does a method that incorporates AI compare to established methods for user research activities in terms of speed and accuracy?

After studying the existing ResearchOps at Alpha interviews were conducted with UX professionals working at Alpha. The consensus was that whatever an AI produces cannot be entirely trusted without being validated by a human. This was reflected in Alpha's position statement on public generative AI services like OpenAI's ChatGPT. However, it was also found that there was a substantial degree of enthusiasm when it comes to working with AI. Subsequently, a variety of interesting use cases were also brought up with synthetic users, persona creation, translation and transcription being mentioned by participants as potential areas of application. The prerequisites to allow UX professionals to try the method in their work were created. Importantly this was done in a manner that is within the confine of organisational policy, to accurately simulate real usage of the method.

As discussed previously, the validity in a prescriptive DSR study stems from the evaluation. The results from the evaluation stage indicated that there was value in incorporating AI when compared to previously used methods for the same user research activities. The research findings affirm that AI can, by virtue of LLMs and ASR models, enhance the process of conducting user research. The method developed in this study demonstrated potential in speeding up tasks such as sentiment analysis and persona creation and accuracy for transcription and translation. The results also indicated that, for these user research activities, speed is considered more important than accuracy, in the given use cases.

8.1 Limitations and Future Research

One primary limitation is the scope of AI technologies considered. The research focused specifically on ASR and LLMs within UX ResearchOps. This exclusion of other AI technologies may limit the generalisability of the findings to other AI applications and settings. Another limitation is the reliance on a relatively small sample size. This sample may not fully represent the perspectives and experiences of UX professionals across different industries or geographical locations. Furthermore, the study was conducted within the parameters of one

organisation's specific operational and data security guidelines, which may not be applicable or relevant to other organisations with different cultures or regulatory environments. The time frame of the study also poses a limitation. The relatively short duration necessitated a focus on immediate and observable impacts of AI integration within ResearchOps. This focus overlooks long-term effects, which are equally important for a comprehensive understanding of AI's role in UX and organisational practices.

To address these limitations, future studies could expand the range of AI models that were examined. Examples of this could be ML models that analyse visual content, predictive analytics tools and more advanced NLP systems. Researching a wider array of AI technologies would provide a more comprehensive view of the potential and challenges associated with AI in UX.

To capture the long-term implications of AI in ResearchOps, future research should consider longitudinal study designs. Such studies would track changes over time, providing insights into AI's impact on UX practices. This approach could also strengthen the evaluation phase of this study. Additionally, multiple reiterations of the DSR process, as suggested by Peffers et al. (2007), may lead to an improved artefact and a better understanding of it and its impact.

Another potential future study could be involve conducting similar research in a different organisational setting and across various industries to validate the findings and improve generalisability. Comparing AI's impact in diverse contexts would also shed light on how organisational culture, structure and strategy influence the adoption of AI tools.

Appendix 1: Interview Guide

1. **Could you please describe your role and responsibilities at Alpha?**
2. **How long have you been in your role with Alpha?**
3. **Do you have any experience in a similar role at another workplace, if so how long?**
4. **How has your perception of AI evolved throughout your career, in relation to UX?**
5. **What is your previous experience working with AI in your role?**
6. **What applications of AI have you observed in your field of work?**
7. **What is your opinion about AI in the context of your profession? What are some challenges you have experienced or observed?**
8. **What have you done or, observed be done, to address these challenges?**
9. **How do you envision AI being incorporated into your research operations to address specific challenges or possibilities you have identified?**
10. **What do you consider as key factors to successfully incorporate AI in your work?**
11. **To conclude, do you have any additional thoughts or comments related to the study?**

Appendix 2: Survey

1. **How Familiar Are You In Working With Artificial Intelligence (AI)?** (1 - Not Familiar, 5 - Very Familiar)
2. **How Familiar Are You In Working With Google Colaboratory** (1 - Not Familiar, 5 - Very Familiar)
3. **To What Extent Do You Believe The ASR Model Increases the Speed of Transcription and Translation in User Research Compared to Previously Used Methods?** (1 - Not at All, 5 - To a Great Extent)
4. **To What Extent Do You Believe The ASR Model Increases The Accuracy of Transcription And Translation In User Research Compared to Previously Used Methods?** (1 - Not at All, 5 - To a Great Extent)
5. **How Accurate Do You Think The LLM Is In Mimicking Real User Interactions And Persona Creation?** (1 - Not Accurately, 5 - Very Accurately)
6. **How Accurate Do You Think The LLM Is In Analysing Sentiment?** (1 - Not Accurate, 5 - Very Accurate)
7. **How Fast Do You Think The LLM Is In Analysing Sentiment Compared To Previously Used Methods?** (1 – Not Fast, 5 - Very Fast)
8. **Do You Think That Working With LLM And ASR Models Provides Increased Utility Compared To Methods You Have Used Previously?** (1 - Strongly Disagree, 5 - Strongly Agree)
9. **How Easy Do You Believe It Would Be To Incorporate The Presented ASR Model Into The Current User Research Process?** (1 - Very Difficult, 5 - Very Easy)
10. **How Easy Do You Believe It Would Be To Incorporate The Presented LLMs Into The Current User Research Process?** (1 - Very Difficult, 5 - Very Easy)
11. **How Would You Rate The Learning Curve Associated With The Presented AI Tools?** (1 - Very Steep, 5 - Very Gentle)

12. **Do You Have The Necessary Resources (e.g. Technical Support or Training) To Use These AI Tools Effectively?** (1 - Strongly Disagree, 5 - Strongly Agree)
13. **How Likely Are You To Continue Using ASR Models, Like Described, In Your Future Projects?** (1 - Very Unlikely, 5 - Very Likely)
14. **How Likely Are You To Continue Using LLMs, Like Described, In Your Future Projects?** (1 - Very unlikely, 5 - Very likely)

Appendix 3: Interview Request

Hi x,

I have been informed that you were available for an interview for my master's thesis. I really looking forward to beginning the process and your input is crucial for the kick-off! It should take approximately 30 minutes. Attached is an informed consent form that will tell you a bit about me, the researcher and the purpose of the research as well as your rights as a participant. In short, it cements your right to anonymity, to edit or redact any of your statements at any time. If you could sign this through e.g. Adobe Acrobat and send it to us before the interview that would be great!

Kind Regards,

Fabrice

Appendix 4: Evaluation Request

Hi x,

thank you for taking part in my research on how AI can be used for UX/UI! For the past couple of months I have conducted research into the potential of AI, specifically LLMs (Large Language Models e.g. ChatGPT) and ASR (Automatic Speech Recognition e.g. Whisper) to support the conduct of user research. This has been a process of communication with the people involved with UX/UI, the Enterprise Architecture team and reading publications in scientific journals in a variety of fields.

Summarising what I have found is that LLMs and ASR need to process data locally without the data being used to train an AI model in order to align with company policies regarding data security. However, since one often does not have the storage and processing power required to run an AI model on one's own computer, I have devised a method of circumventing this problem.

Google Colab was a research project published in 2017 aiming to provide researchers and students with computational power for specifically the purpose of promoting use of AI and ML. This works by downloading a model and processing the data on a virtual machine, terminating all data after the session ends. Using Google Colab I have designed a method (two notebooks used in Google Colab) that allow you to use privately hosted LLMs and ASR on a virtual machine.

I have attached a file with instructions with potential use cases (scenarios) it should take around 10 minutes to setup and another 20 minutes to test the functions. Lastly, I would ask of you to fill out a short survey (5-10 minutes) about your experience using the devised method, expressed on a scale of 1-5.

If you have any difficulty, issues or questions do not hesitate to reach out to me through email or by phone!

Kind regards,

Fabrice

Appendix 5: Informed Consent Form

Informed Consent Form - Master's Thesis

Date: March 2024

Title of the research:

Enhancing Research Operations Using Artificial Intelligence: Designing a method for User Experience professionals

Researchers:

Fabrice Lindblom-Levy, Master's Programme in Information Systems, Lund University, fa2888li-s@student.lu.se, +46 79 348 5880

Purpose of the research:

The aim of this research is to develop a method to assist UX professionals to use artificial intelligence in a safe and effective manner to assist them in their research operations. Your participation will contribute valuable insights into identifying apt areas and concerns that need to be considered when integrating artificial intelligence within your workflow.

What you will be asked to do in the research:
If you agree to participate, you will be asked to participate in an exploratory interview. The process is expected to take approximately 30 minutes of your time.

Risks and discomforts:
I do not foresee any risks or discomforts associated with your participation in my thesis.

Confidentiality:

Your identity will not be revealed in the thesis, nor will your name be used during or after the writing process. The content of our meeting will solely be to achieve the purpose of the research. Your contribution is exclusively shared between us and my supervisor at Lund University.

Benefits of the research and benefits to you:
This research aims to define an apt way of working with artificial intelligence to aid you, your colleagues and professionals working in the same field as you. Additionally, it may serve as reference point to contribute to the creation of a generalisable approach to creating workflows aided by artificial intelligence.

Voluntary participation and withdrawal:
Although your participation is greatly appreciated, it is entirely voluntary. You are free to decline to participate or withdraw and have your statements redacted, from the study at any time without any consequences. Please keep a copy of this form for your records.

Questions about the research:
If you have any questions regarding any part of the process do not hesitate in reaching out to either one of us.

Rights and signatures:

I consent to participate in the research conducted by Fabrice Lindblom-Levy. I have understood the nature of the study and I wish to participate and agree to the recording of the interview. I am not resigning any of my rights by signing this. My signature below indicates my informed consent.

Signature:

Participant:

Date:

Signature:

Researchers:

Date:

Appendix 6: Instructions For Evaluation Test

Requirements

- A Google account
- Availability of GPU in Google Colab (varies with time and usage)

LLaMA 2 / LLaMA 3 – Model 1

Model description: LLaMA 2 is, as of the 18th of April 2024, LLaMA 3's predecessor and is a version of Meta's open-source Large Language Model (LLM). Similar to ChatGPT it can process natural language, however, this model is limited in size. This reduces its capability but also, importantly, drastically reduces computational power needed to run it.

Potential Scenarios

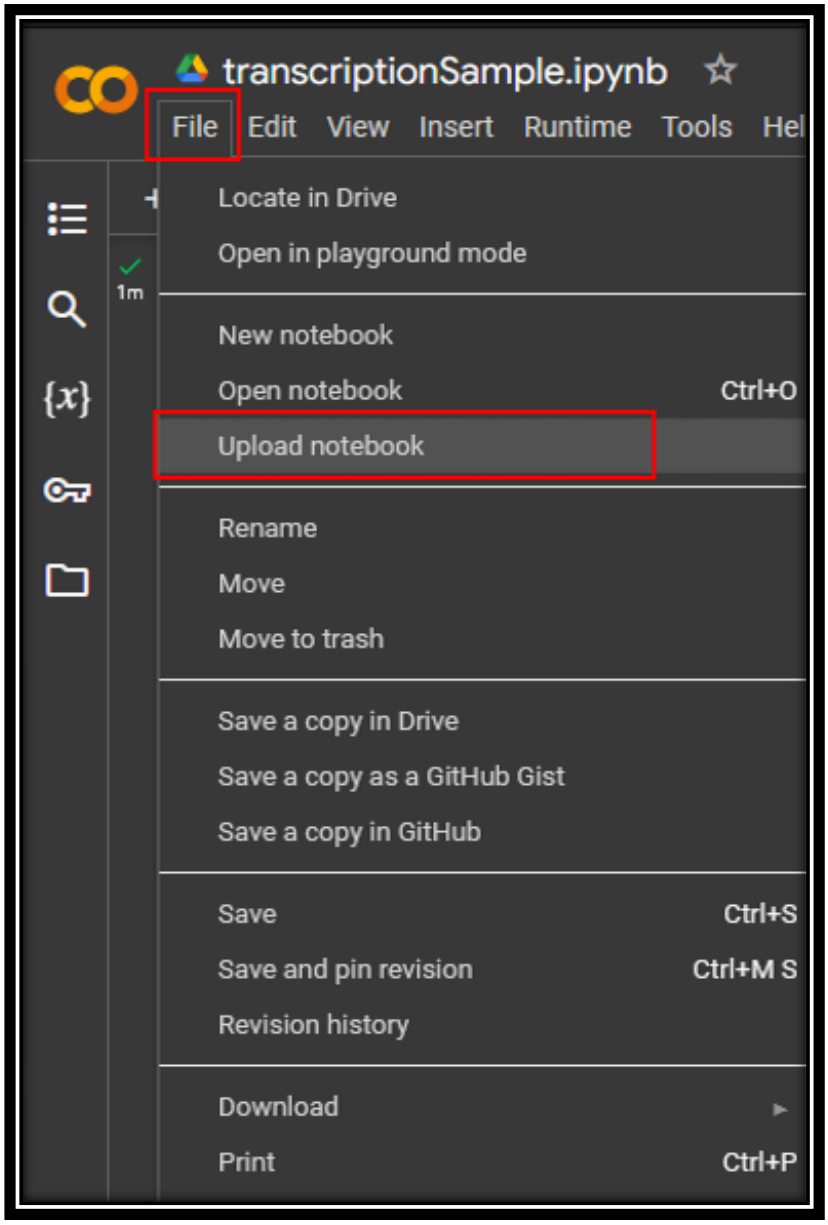
- **Synthetic User Interaction:** You have a specific user or persona in mind and want to test your ideas against them. You ask the LLM to impersonate the user or persona and ask it questions.
- **Sentiment Analysis:** You have transcribed an interview and would like to get an opinion on the sentiment of the user on different questions you have posed.

Attached Files

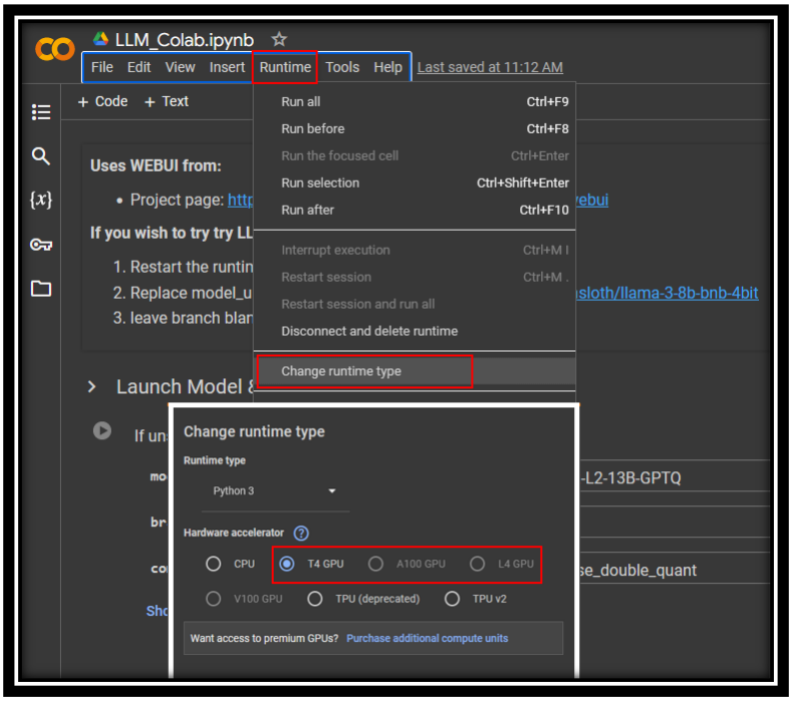
LLM_Colab.ipynb

Instructions

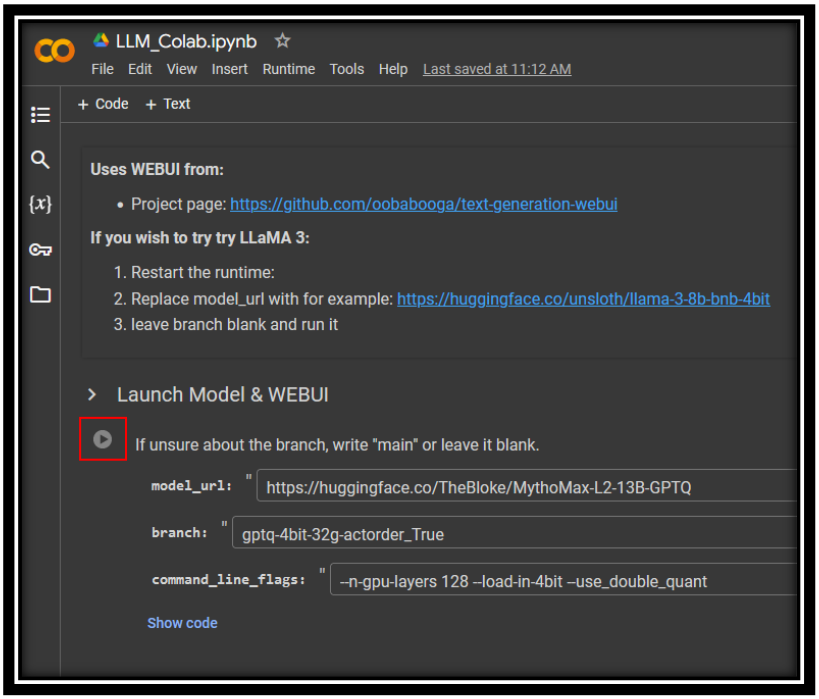
1. **Open the following link: https://colab.research.google.com/**
2. **Make sure you are logged into a Google account.**
3. **Upload the notebook in the attached files called "LLM_Colab", this should open the notebook.**

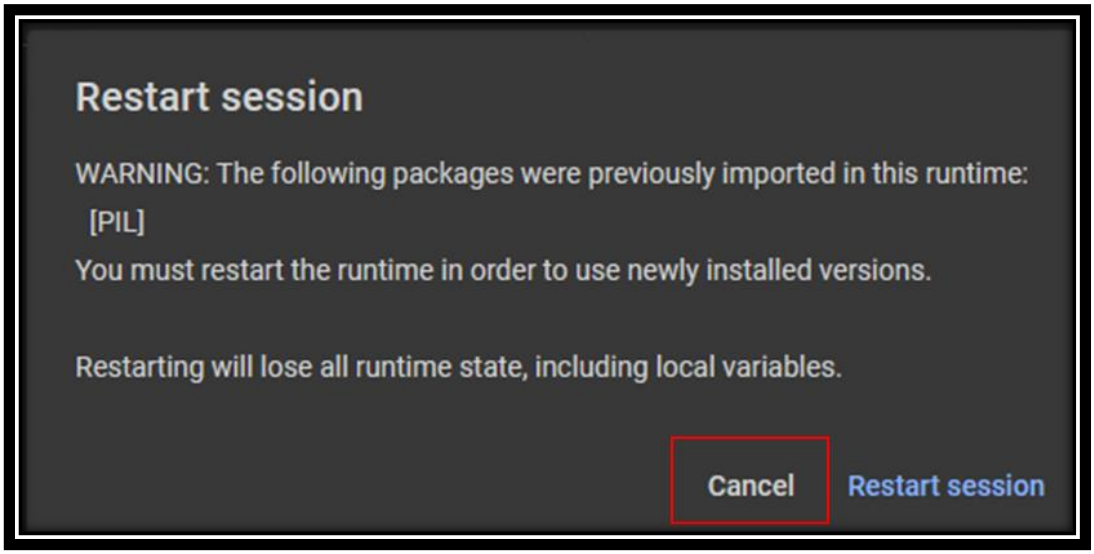


4. **Select one of the runtimes highlighted -T4 GPU (free account), A100 GPU or V100GPU and save:**

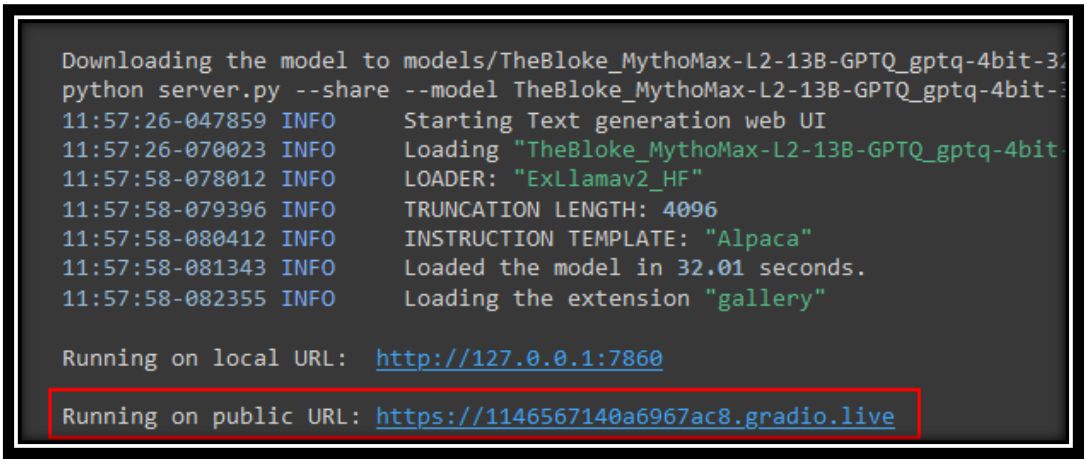


5. **Launch it and wait, it should take around 5 minutes.**





6. **If prompted with a restart prompt, press cancel and then use the link highlighted below.**



7. **Done, you should now see a typical UI for a chat room and be able to prompt the AI!**

Whisper - Model 2

Model description: Whisper is an ASR (Automatic Speech Recognition) AI model developed by OpenAI. It can be used to transcribe or translate audio recordings.

Potential Scenarios

- **Data Transcription:** You have interviewed a user on teams or another platform and wish to have a more accurate transcription. You try **transcribing** an audio file or "Small Talk.mp3" .
- **Data Translation:** You have held an interview in a user's native language but would like to easily transcribe and translate it to English simultaneously. You try **translating** an audio file or "Italian with Elisa.mp3".

Attached files

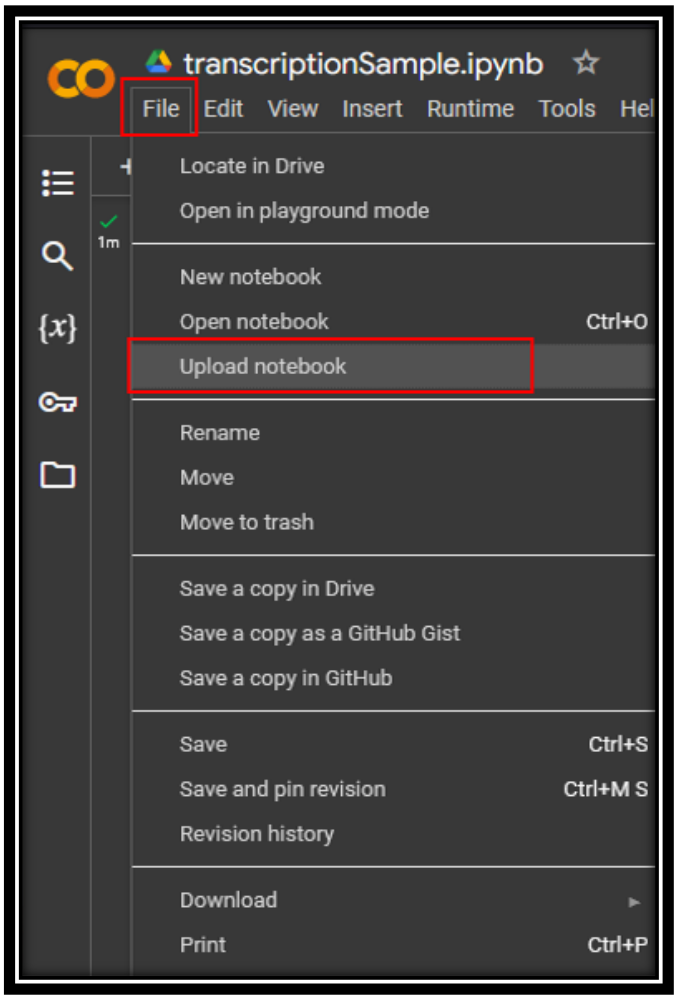

Whisper_Colab.ipynb


Small Talk.mp3


Italian with Elisa.mp3

Instructions

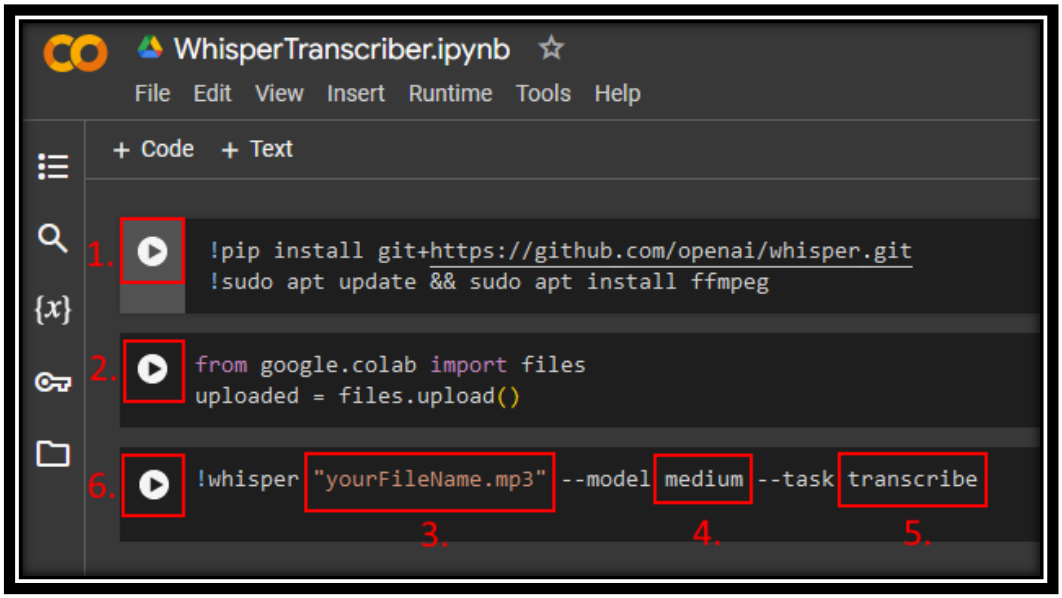
1. **Upload the notebook in the attached files called "Whisper_Colab", this should open the notebook.**



2. **Make sure you are using one of the runtimes highlighted in previous model instructions (step 4.).**

3. **Launch the initial cell (1. This installs the AI model which takes ~ 1 minute).**

4. **Launching the second cell (2.) will allow you to upload an audio file (.mp3) or video (mp4 – slower results) from your computer by browsing to it.**



5. **Type the name of your file within the quotation marks (3.), if you use one of the attached audio files for example it would say: "Small Talk.mp3" or "ItalianWithElisa.mp3".**

6. **If you want a larger (slower but more accurate) or smaller (faster but less accurate) model simply replace (4.) with "large" or "small". Lastly, if the audio is in another language than English but you want it to be translated to English replace (5.) "transcribe" with "translate".**

7. **Launch the last cell (6.) and the transcription starts. It will be available to download as a variety of files an example I attached (.txt file) below:**


I'm trying to relax.
Would you mind?
Hey kid, just come over here and sit down, would you?
What's your name, mister? My name is Adam.
You look like my grandpa, except he's not as old.
That's very rude.
I'm Adam. Who are you?
Joseph.
Where's your mother?
She's with her boyfriend.
I'm supposed to wait over here.
I'm eight and three quarters, mister. How old are you?
Mister, you're boring.
Hey, listen kid, I'd like some peace and quiet. Please?
You're grumpy, mister. Is that why that woman left you on the bench? Was she your girlfriend?
No. No, she wasn't. Listen, um...
I have a girlfriend, mister, and I'm only in the second grade.
Where's your girlfriend?
My wife, Elizabeth, is gone.
Well, where has she gone to?
She's gone. Gone. Dead.
Oh, that's sad. Well, my girlfriend, Katie, she's still really young.
Was she a good girlfriend? Katie's the best I've had.
Yes. Elizabeth was one of a kind.
Why? Have you ever had any other girlfriends?
Yesterday, I brought Katie a flower, and she gave me a kiss on the cheek.
Have you ever bought a girl a flower?
You've got a lot to learn about relationships. Have you ever looked into someone's eyes and had a whole conversation in an instant?
Laughed with someone? Kept laughing until you even forgot why you were laughing?
Have you ever cried when...
I cried last night when I said goodbye to Katie, but that was because I had scraped my knee badly.
Mister?
Yes?

Appendix 7: LLM_Colab Python Code

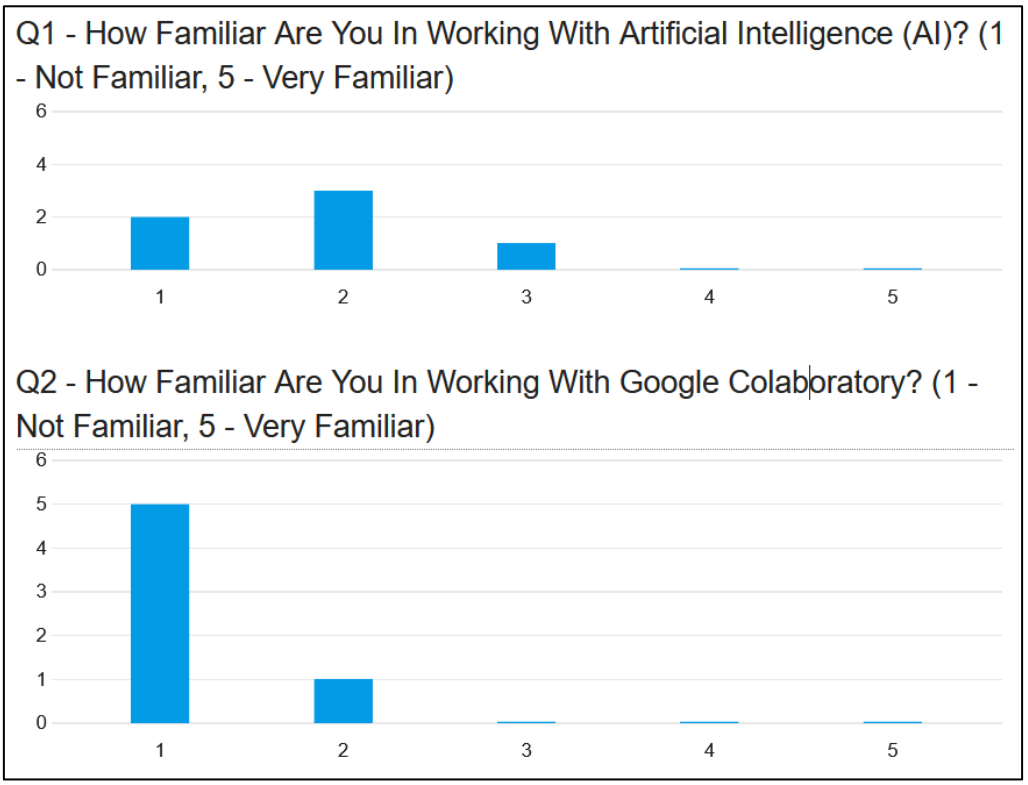
```
 import torch
 from pathlib import Path
 if Path.cwd().name != 'text-generation-webui':
  print("Installing the webui...")
  !git clone https://github.com/oobabooga/text-generation-webui --
branch "snapshot-2024-03-31"
  %cd text-generation-webui

  torver = torch.__version__
  print(f"TORCH: {torver}")
  is_cuda118 = '+cu118' in torver  # 2.1.0+cu118

  if is_cuda118:
    !python -m pip install --upgrade torch==2.2.1
torchvision==0.17.1 torchaudio==2.2.1 --index-url
https://download.pytorch.org/whl/cu118
  else:
    !python -m pip install --upgrade torch==2.2.1
torchvision==0.17.1 torchaudio==2.2.1 --index-url
https://download.pytorch.org/whl/cu121

  textgen_requirements =
open('requirements.txt').read().splitlines()
  if is_cuda118:
      textgen_requirements = [req.replace('+cu121',
'+cu118').replace('+cu122', '+cu118') for req in
textgen_requirements]
  with open('temp_requirements.txt', 'w') as file:
      file.write('\n'.join(textgen_requirements))

  !pip install -r temp_requirements.txt --upgrade
  try:
    import flash_attn
  except:
    !pip uninstall -y flash_attn

 # Parameters entered by the user outside of code in Google Colab
model_url = model_url.strip()
 if model_url != "":
    if not model_url.startswith('http'): model_url =
'https://huggingface.co/' + model_url
    # Download the model
    url_parts = model_url.strip('/').strip().split('/')
    output_folder = f"{url_parts[-2]}_{url_parts[-1]}"
```

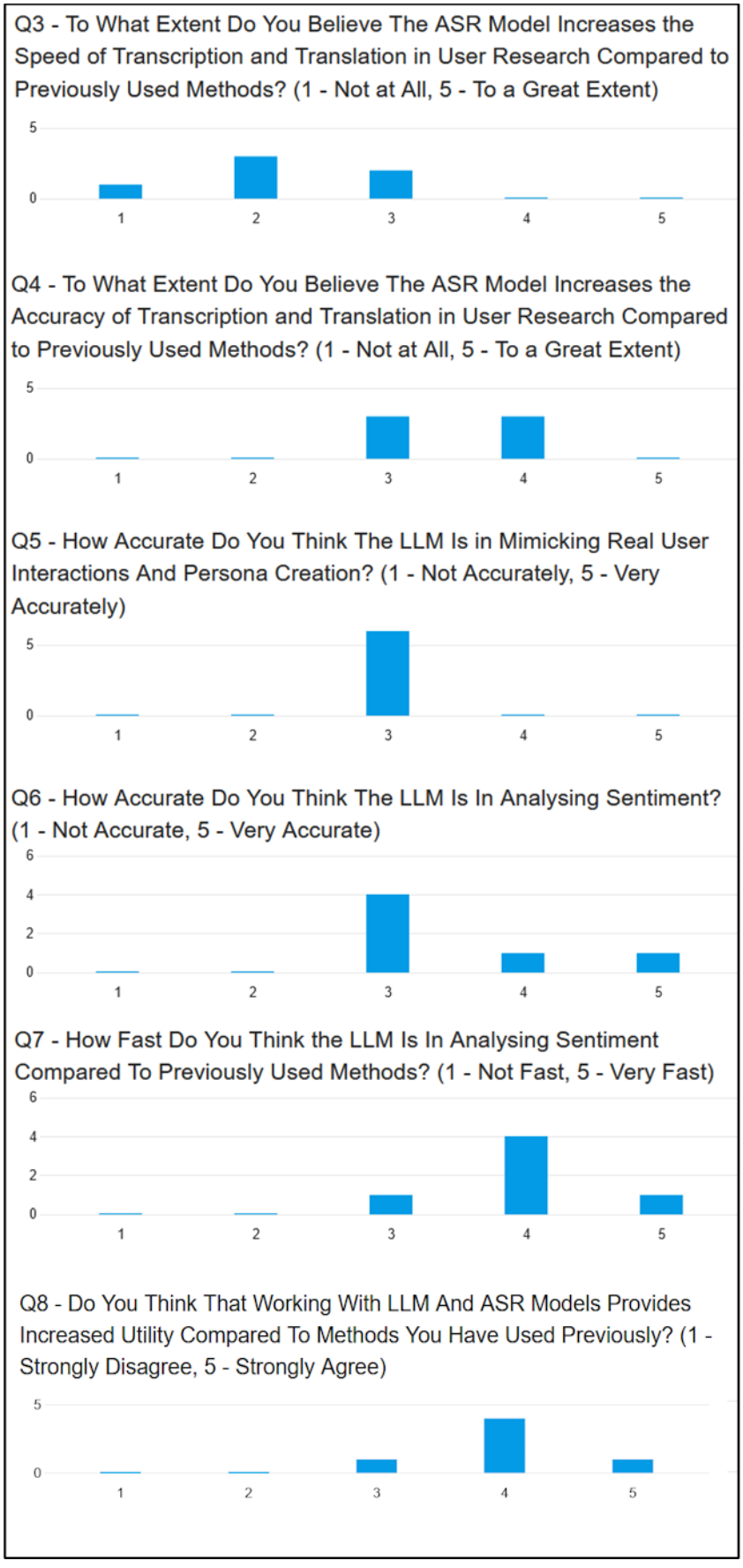
```
    branch = branch.strip('"\' ')
    if branch.strip() not in ['', 'main']:
        output_folder += f"_{branch}"
        !python download-model.py {model_url} --branch
{branch}
    else:
        !python download-model.py {model_url}
 else:
    output_folder = ""

 # Start the web UI
cmd = f"python server.py"
if output_folder != "":
    cmd += f" --model {output_folder}"
cmd += f" {command_line_flags}"
print(cmd)
!$cmd
```

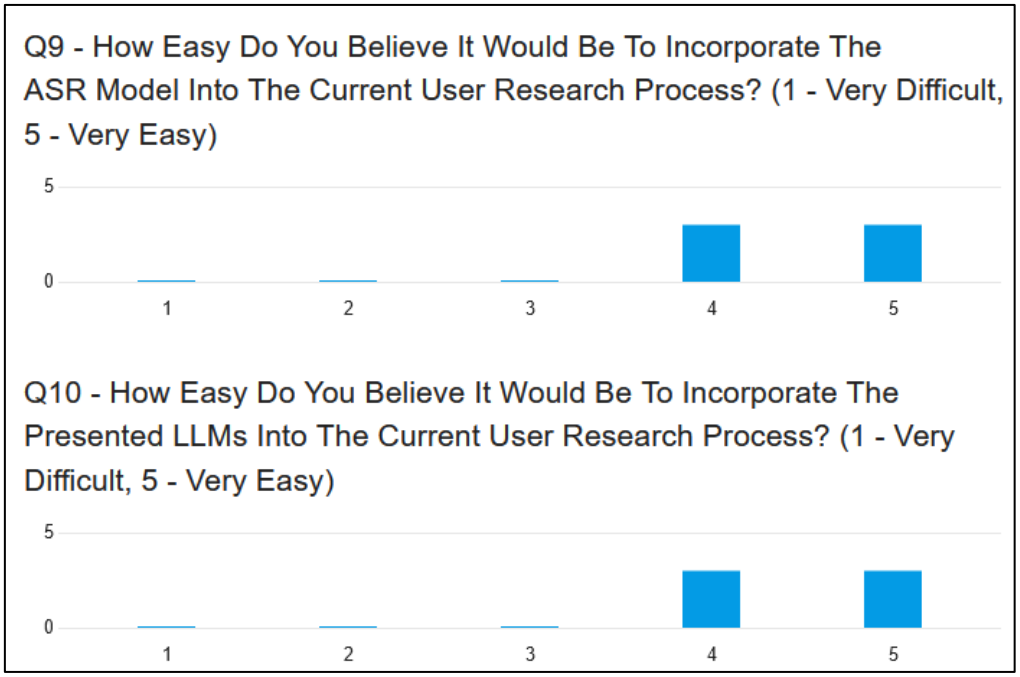
Appendix 8: Whisper_Colab Python Code

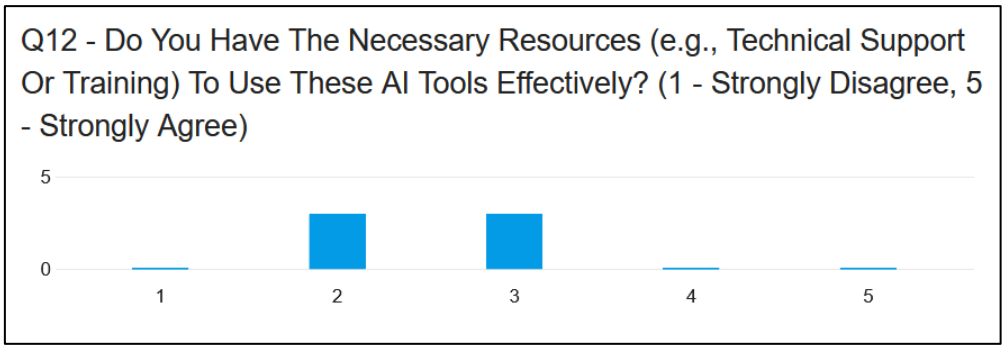
```
!pip install git+https://github.com/openai/whisper.git
!sudo apt update && sudo apt install ffmpeg

from google.colab import files
uploaded = files.upload()

!whisper "yourFileName.mp3" --model medium --task transcribe
```

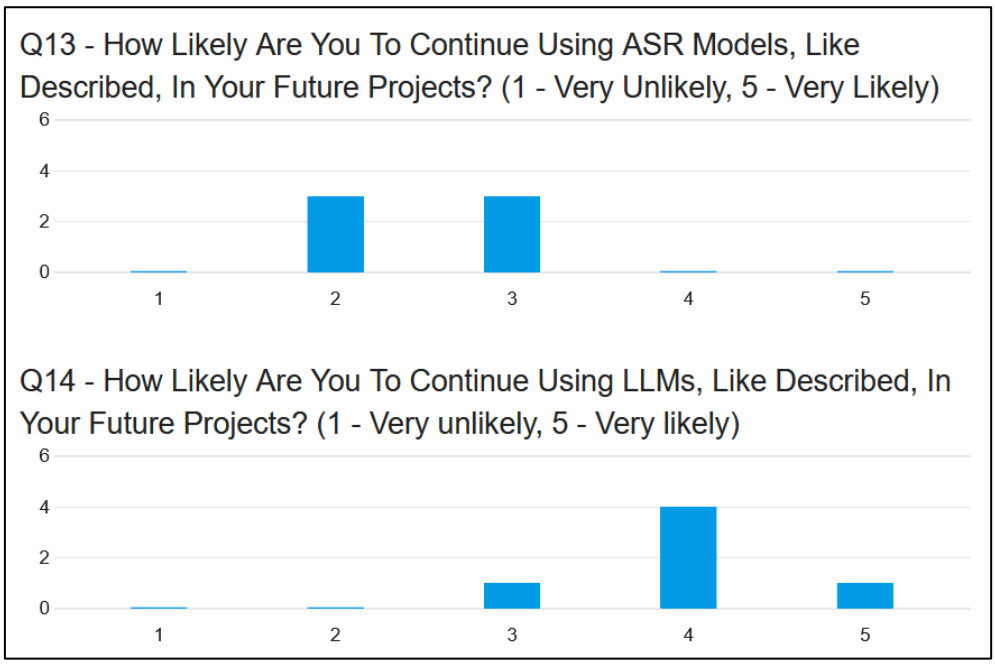
Appendix 9: Survey Results




Q3 - To What Extent Do You Believe The ASR Model Increases the Speed of Transcription and Translation in User Research Compared to Previously Used Methods? (1 - Not at All, 5 - To a Great Extent)
5
0
1
2
3
4
5
Q4 - To What Extent Do You Believe The ASR Model Increases the Accuracy of Transcription and Translation in User Research Compared to Previously Used Methods? (1 - Not at All, 5 - To a Great Extent)
5
0
1
2
3
4
5
Q5 - How Accurate Do You Think The LLM Is in Mimicking Real User Interactions And Persona Creation? (1 - Not Accurately, 5 - Very Accurately)
5
0
1
2
3
4
5
Q6 - How Accurate Do You Think The LLM Is In Analysing Sentiment? (1 - Not Accurate, 5 - Very Accurate)
6
4
2
0
1
2
3
4
5
Q7 - How Fast Do You Think the LLM Is In Analysing Sentiment Compared To Previously Used Methods? (1 - Not Fast, 5 - Very Fast)
6
4
2
0
1
2
3
4
5
Q8 - Do You Think That Working With LLM And ASR Models Provides Increased Utility Compared To Methods You Have Used Previously? (1 - Strongly Disagree, 5 - Strongly Agree)
5
0
1
2
3
4
5


Q9 - How Easy Do You Believe It Would Be To Incorporate The ASR Model Into The Current User Research Process? (1 - Very Difficult, 5 - Very Easy)
5
0
1
2
3
4
5
Q10 - How Easy Do You Believe It Would Be To Incorporate The Presented LLMs Into The Current User Research Process? (1 - Very Difficult, 5 - Very Easy)
5
0
1
2
3
4
5


Q12 - Do You Have The Necessary Resources (e.g., Technical Support Or Training) To Use These AI Tools Effectively? (1 - Strongly Disagree, 5 - Strongly Agree)
5
0
1
2
3
4
5


Q13 - How Likely Are You To Continue Using ASR Models, Like Described, In Your Future Projects? (1 - Very Unlikely, 5 - Very Likely)
6
4
2
0
1
2
3
4
5
Q14 - How Likely Are You To Continue Using LLMs, Like Described, In Your Future Projects? (1 - Very unlikely, 5 - Very likely)
6
4
2
0
1
2
3
4
5

Appendix 10: AI Contribution Statement

The only use of AI in this thesis was Whisper and LLaMA 3. The former was used for the transcription of the audio files generated from conducting the interviews. The latter was used for the coding process of the interview transcripts as there was no second author to compare codes with.

References

Bach, T. A., Khan, A., Hallock, H., Beltrão, G. & Sousa, S. (2024). A Systematic Literature Review of User Trust in AI-Enabled Systems: An HCI Perspective, *International Journal of Human–Computer Interaction*, vol. 40, no. 5, pp.1251–1266

Biever, C. (2023). ChatGPT Broke the Turing Test — the Race Is on for New Ways to Assess AI, *Nature*, vol. 619, pp.686–689

Bisong, E. (2019). Google Colaboratory, in *Building Machine Learning and Deep Learning Models on Google Cloud Platform: A Comprehensive Guide for Beginners*, [e-book] Berkeley, CA: Apress, pp.59–64, Available Online: https://doi.org/10.1007/978-1-4842-4470-8_7

Brewster, T. (2024). Hackers Breached Hundreds Of Companies' AI Servers, Researchers Say, *Forbes*, Available Online: https://www.forbes.com/sites/thomasbrewster/2024/03/26/hackers-breach-hundreds-of-ai-compute-servers-researchers-say/?sh=67a06472796c

Collins, C., Dennehy, D., Conboy, K. & Mikalef, P. (2021). Artificial Intelligence in Information Systems Research: A Systematic Literature Review and Research Agenda, *International Journal of Information Management*, [e-journal] vol. 60, Available Online: https://www.sciencedirect.com/science/article/pii/S0268401221000761 [Accessed 18 December 2023]

CPSR. (2006). Participatory Design, *Computer Professionals For Social Responsibility*, Available Online: http://cpsr.org/issues/pd/ [Accessed 5 April 2024]

Davenport, T. & Mittal, N. (2023). All-in On AI: How Smart Companies Win Big with Artificial Intelligence, Harvard Business Press

Davis, F. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology, *MIS Quarterly*, vol. 13, p.319

Dell'Acqua, F., McFowland III, D., Mollick, E., Lifshitz-Assaf, H., Rajendran, S., Krayer, L., Candelon, F. & Lakhani, K. R. (2023). Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality, Available Online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4573321# [Accessed 23 December 2023]

Dighe, P., Su, Y., Zheng, S., Liu, Y., Garg, V., Niu, X. & Tewfik, A. (2024). Leveraging Large Language Models for Exploiting ASR Uncertainty, in *ICASSP 2024 - 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, ICASSP 2024 - 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 14 April 2024, pp.12231–12235

ECIS. (2024). *Track Descriptions*, Available Online: https://ecis2024.eu/track-descriptions/ [Accessed 22 December 2023]

Elrod, C. C., Stanley, S. M., Cudney, E. A., Hilgers, M. G. & Graham, C. (2022). Management Information Systems Education: A Systematic Review, *Journal of Information Systems Education*, vol. 33, no. 4, pp.357–370

Fügener, A., Grahl, J., Gupta, A. & Ketter, W. (2021). WILL HUMANS- IN - THE-LOOP BECOME BORGS? MERITS AND PITFALLS OF WORKING WITH AI, *MIS Quarterly*, vol. 45, no. 3, pp.1527–1566

Fui-Hoon Nah, F., Zheng, R., Cai, J., Siau, K. & Chen, L. (2023). Generative AI and ChatGPT: Applications, Challenges, and AI-Human Collaboration, *Journal of Information Technology Case and Application Research*, vol. 25, no. 3, pp.277–304

Gams, M. & Kramar, S. (2024). Evaluating ChatGPT's Consciousness and Its Capability to Pass the Turing Test: A Comprehensive Analysis, *Journal of Computer and Communications*, vol. 12, no. 3, pp.219–237

Goldkuhl, G. (2012). Pragmatism vs Interpretivism in Qualitative Information Systems Research, *European Journal of Information Systems*, vol. 21, no. 2, pp.135–146

Google. (2017). Google Colaboratory, *Github*, Available Online: https://github.com/googlecolab/colabtools [Accessed 19 April 2024]

Gregor, S. (2006). The Nature of Theory in Information Systems, *MIS Quarterly*, vol. 30, no. 3, pp.611–642

Gregor, S. & Hevner, A. (2013). Positioning and Presenting Design Science Research for Maximum Impact, *MIS Quarterly*, vol. 37, pp.337–356

Hannan, M. (2023). A Comparative Analysis: Real vs. Synthetic Responses in B2B Research, *EmporiaResearch*, Available Online: https://www.emporiaresearch.com/case-studies/real-insights-or-robotic-responses-a-comparative-analysis-of-real-vs-synthetic-responses-in-b2b-research [Accessed 6 April 2024]

Hasani, L. M., Sensuse, D. I., Kautsarina & Suryono, R. R. (2020). User-Centered Design of e-Learning User Interfaces: A Survey of the Practices, in *2020 3rd International Conference on Computer and Informatics Engineering (IC2IE)*, 2020 3rd International Conference on Computer and Informatics Engineering (IC2IE), 15 September 2020, pp.1–7

Hevner, A. & Chatterjee, S. (2010). Design Research in Information Systems: Theory and Practice, Vol. 22, Springer

Hevner, A. R., March, S. T., Park, J. & Ram, S. (2004). Design Science in Information Systems Research, *MIS Quarterly*, vol. 28, no. 1, pp.75–105

IxDF. (2016). What Is User Research?, *Interaction Design Foundation*, Available Online: https://www.interaction-design.org/literature/topics/user-research [Accessed 8 April 2024]

Jacob, S. A. & Furgerson, S. P. (2012). Writing Interview Protocols and Conducting Interviews: Tips for Students New to the Field of Qualitative Research, *The Qualitative Report*, vol. 17, no. 42, pp.1–10

Johnson. (2023). What Is UX Research Ops?, *Lyssna*, Available Online: https://www.lyssna.com/blog/what-is-ux-research-ops/ [Accessed 19 April 2024]

Kaplan, K. (2020). ResearchOps 101, *Nielsen Norman Group*, Available Online: https://www.nngroup.com/articles/research-ops-101/ [Accessed 26 March 2024]

Khurana, D., Koli, A., Khatter, K. & Singh, S. (2023). Natural Language Processing: State of the Art, Current Trends and Challenges, *Multimedia Tools and Applications*, vol. 82, no. 3, pp.3713–3744

Knearem, T., Khawaja, M., Gao, Y., Bentley, F. & Kliman-Silver, C. E. (2023). Exploring the Future of Design Tooling: The Role of Artificial Intelligence in Tools for User Experience Professionals, in *ACM*, CHI: Conference on Human Factors in Computing Systems, Germany, 23 April 2023, Germany: ACM, pp.1–6, Available Online: https://dl.acm.org/doi/abs/10.1145/3544549.3573874 [Accessed 23 December 2023]

Malik, M., Malik, M. K., Mehmood, K. & Makhdoom, I. (2021). Automatic Speech Recognition: A Survey, *Multimedia Tools and Applications*, vol. 80, no. 6, pp.9411–9457

Manning, B. S., Zhu, K. & Horton, J. J. (2024). Automated Social Science: Language Models as Scientist and Subjects, 19 April 2024, Available Online: https://arxiv.org/pdf/2404.11794.pdf

Merritt, R. (2023). Why GPUs Are Great for AI, *Nvidia*, Available Online: https://blogs.nvidia.com/blog/why-gpus-are-great-for-ai/ [Accessed 22 April 2024]

Microsoft. (2024). View Live Transcription in Microsoft Teams Meetings, *Microsoft Support*, Available Online: https://support.microsoft.com/en-au/office/view-live-transcription-in-microsoft-teams-meetings-dc1a8f23-2e20-4684-885e-2152e06a4a8b [Accessed 11 April 2024]

Nguyen, J., Lee, J. & Hulseman. (2023). New Video: What Runs ChatGPT?, *Technical Blog*, Available Online: https://developer.nvidia.com/blog/new-video-what-runs-chatgpt/

Nicas, J. (2017). Google Acquires Kaggle for Its Cloud Business Kaggle Had Raised $12.8 Million in Venture Funding, *WSJ PRO VENTURE CAPITAL*, Available Online: https://www.wsj.com/articles/google-acquires-kaggle-for-its-cloud-business-1489059658 [Accessed 26 April 2024]

Nielsen, J. (2017). A 100-Year View of User Experience, *Nielsen Norman Group*, Available Online: https://www.nngroup.com/articles/100-years-ux/ [Accessed 10 April 2024]

Nielsen, J. (2023). 2023 Was a Bad Year for UX, But the Future Is Bright, *Substack*

Nielsen, J. & Moran, K. (2023). AI for UX: Getting Started, *Nielsen Norman Group*, Available Online: https://www.nngroup.com/articles/ai-ux-getting-started/ [Accessed 30 December 2023]

Norman, D. (2007). Peter in Conversation with Don Norman About UX & Innovation, Available Online: https://web.archive.org/web/20131207190602/http://www.adaptivepath.com/ideas/e000862/ [Accessed 28 December 2023]

Norman, D. A. & Draper, S. W. (1986). User Centered System Design: New Perspectives on Human-Computer Interaction, 1st edn, CRC Press

Nvidia. (2023). Large Language Models Explained, *Nvidia*, Available Online: https://www.nvidia.com/en-us/glossary/large-language-models/ [Accessed 9 April 2024]

Oates, B. J., Griffiths, M. & McLean, R. (2022). Researching Information Systems and Computing, SAGE Publications

Oobabooga. (2024). Text-Generation-Webui, *Github*, Available Online: https://github.com/oobabooga/text-generation-webui [Accessed 31 March 2024]

OpenAI. (2024a). Models, Available Online: https://platform.openai.com/docs/models/overview [Accessed 11 April 2024]

OpenAI. (2024b). *Introducing ChatGPT Plus*, Available Online: https://openai.com/blog/planning-for-agi-and-beyond [Accessed 21 September 2023]

OpenAI. (2024c). New Ways to Manage Your Data in ChatGPT, *OpenAI*, Available Online: https://openai.com/blog/new-ways-to-manage-your-data-in-chatgpt#OpenAI [Accessed 8 April 2024]

Oppy, G. & Dowe, D. (2020). The Turing Test, in *The Stanford Encyclopedia of Philosophy*

Palazzolo, S. (2023). Meta's Free AI Isn't Cheap to Use, Companies Say, *The Information*, Available Online: https://www.theinformation.com/articles/metas-free-ai-isnt-cheap-to-use-companies-say [Accessed 11 April 2024]

Patton, M. Q. (2014). Qualitative Research & Evaluation Methods: Integrating Theory and Practice, 4th edn, SAGE Publications

Peffers, K., Tuunanen, T. & Rothenberger, M. A. (2007). A Design Science Research Methodology for Information Systems Research, *Journal of Management Information Systems*, vol. 24, no. 3, pp.45–77

Pernice, K. (2022). The State of ResearchOps: Untapped Yet, *Nielsen Norman Group*, Available Online: https://www.nngroup.com/articles/researchops-state-untapped/ [Accessed 8 April 2024]

Recker, J. (2012). Scientific Research in Information Systems: A Beginner's Guide, Springer

ResearchOps Community. (2024). *About ResearchOps*, Available Online: https://researchops.community/about/ [Accessed 4 April 2024]

Reuters. (2024). OpenAI's ChatGPT Breaches Privacy Rules, Says Italian Watchdog, *Reuters*, 30 January, Available Online: https://www.reuters.com/technology/cybersecurity/italy-regulator-notifies-openai-privacy-breaches-chatgpt-2024-01-29/ [Accessed 11 April 2024]

Rosala, M. & Krause, R. (2019). User Experience Careers What a Career in UX Looks Like Today, 2

Russel, S. J. & Norvig, P. (2021). Artificial Intelligence: A Modern Approach, Global Edition, 4th edn

Sharma, V., Simpson, R. C., LoPresti, E. F., Mostowy, C., Olson, J., Puhlman, J., Hayashi, S., Cooper, R. A., Konarski, E. & Kerley, B. (2008). Participatory Design in the Development of the Wheelchair Convoy System, *Journal of NeuroEngineering and Rehabilitation*, vol. 5, no. 1, p.1

Siddharth, L., Blessing, L. & Luo, J. (2022). Natural Language Processing In-and-for Design Research, *Design Science*, vol. 8

Simonsen, J. & Robertson, T. (2012). Routledge International Handbook of Participatory Design, 1st edn, Routledge

Smith, R. C., Bossen, C. & Kanstrup, A. (2017). Participatory Design in an Era of Participation, *International Journal of CoCreation in Design and the Arts*, vol. 13, no. 2, pp.65–69

Sohn, K. & Kwon, O. (2020). Technology Acceptance Theories and Factors Influencing Artificial Intelligence-Based Intelligent Products, *Telematics and Informatics*, vol. 47, p.101324

Stige, Å., Zamani, E. D., Mikalef, P. & Zhu, Y. (2023). Artificial Intelligence (AI) for User Experience (UX) Design: A Systematic Literature Review and Future Research Agenda, *Information Technology & People*

Sukhdeve, Dr. S. R. & Sukhdeve, S. S. (2023). Google Colaboratory, in *Google Cloud Platform for Data Science: A Crash Course on Big Data, Machine Learning, and Data Analytics Services*, [e-book] Berkeley, CA: Apress, pp.11–34, Available Online: https://doi.org/10.1007/978-1-4842-9688-2_2

Sussman, B. (2023). Why Are So Many Organizations Banning ChatGPT?, *BlackBerry Blog*, Available Online: https://blogs.blackberry.com/en/2023/08/why-companies-ban-chatgpt-ai [Accessed 6 April 2024]

Venkatesh, V. (2022). Adoption and Use of AI Tools: A Research Agenda Grounded in UTAUT, *Annals of Operations Research*, vol. 308, no. 4, pp.641–652

Venkatesh, V. & Davis, F. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies, *Management Science*, vol. 46, pp.186–204

Venkatesh, V., Morris, M. G., Davis, G. B. & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View, *MIS Quarterly*, vol. 27, no. 3, pp.425–478

Wang, S., Yang, C.-H., Wu, J. & Zhang, C. (2024). Can Whisper Perform Speech-Based In-Context Learning?, ICASSP 2024 - 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 14 April 2024, pp.13421–13425

Wilkinson, C. R. & De Angelia, A. (2014). Applying User Centred and Participatory Design Approaches to Commercial Product Development, *Design Studies*, vol. 35, no. 6, pp.614–631

Williams, M. D., Rana, N. P. & Dwivedi, Y. K. (2015). The Unified Theory of Acceptance and Use of Technology (UTAUT): A Literature Review, *Journal of Enterprise Information Management*, vol. 28, no. 3, pp.443–488