AALBORG UNIVERSITY

Users motivation in saving, and re-finding YouTube videos from the lens of Personal Information management and possible challenges

Supervisor: Thorkild Hanghøj

Course title: Information Studies

Full name of authors: Mahima Mannan Mili,
Oluwamuyiwa Damilare Soile,
Summa Binta Alam

Semester: Master´s Thesis

Date of delivery: 9 June 2023

Number of words: 24650

Number of pages: 77

Abstract

In this thesis, we investigated how a design solution could facilitate the user experience on YouTube for saving and re-finding their videos within Personal Information Management (PIM) by examining the strategies adopted by different user groups while saving and re-finding their YouTube videos. To validate the findings from the literature review, a contextual inquiry was conducted to gain deeper insights and enhance the overall user experience. Through the application of thematic analysis, distinctive patterns and indicators concerning different motivations under which user groups save and re-find their videos on YouTube were identified. These findings contribute to a better understanding of the motivation behind saving and re-finding YouTube videos in line with PIM practices. an interactive/design thinking method was deployed to come up with additional features that could possibly increase users' engagement regarding saving and re-finding of videos on YouTube. Participants appreciated our proposed functionalities for saving and re-finding videos but there were concerns regarding the design of filtering functionality and the notification feature was highly welcomed. Our prototypical solution demonstrated the value of providing these functionalities in a user-friendly way based on the test results and participant input.

Keywords: YouTube, personal information management, PIM, video organization, re-find videos, keeping videos.

Table of Contents

1. Introduction ***5***

1.1 Problem Statement **7**

1.2 Research questions **7**

2. Theory ***7***

2.1 PIM (Personal Information Management) **8**

2.2 Motivation behind the adoption of PIM **13**

3. Literature review ***16***

3.1 Related work on PIM **16**

3.2 YouTube **20**

4.Methodological frameworks ***23***

4.1 Philosophy of science **23**

4.2 Quantitative and Qualitative method **26**

4.3 Sampling in qualitative research **27**

4.4 Methods for data collection **28**

4.4.1 Contextual Inquiry 28

4.4.2 The Procedure of Contextual Inquiry Session 30

4.5 Data analysis **33**

4.5.1 Thematic Analysis 33

4.5.2 Study Participants 37

4.5.3 Analysis 39

4.5.3 Project management 46

4.5.4 Design framework 47

4.5.5 Participatory design 48

4.5.6 User innovation Management 49

4.5.7 Interaction Design 50

4.5.8 Selection a design framework 50

5. Design Thinking Theory 51

5.1 Discover 54

5.2 Create 55

5.3 Evaluate 55

5.4 Empathy 55

5.4.1 Diary studies 56

5.4.2 Interview 57

5.4.3 One on one interview 57

5.4.4 Focus group interview 58

5.4.5 Eye tracking 58

5.5 Selection of empathy tool or methods 58

5.5.1 Define 59

5.5.2 User story 60

5.5.3 Personas 60

5.6 Selection of tools and method 62

5.6.1 Ideate 62

5.6.2 Prototype 64

5.6.3 Test 71

6. Discussion 74

6.1 Motivation for saving and refinding YouTube videos. 74

6.2 Saving and re-finding of YouTube videos 75

7. Limitation & Future work 77

8. References 79

9. Index 86

1. Introduction

Personal information management (PIM) is the study and application of how individuals acquire, organize, maintain, and retrieve information (Barreau, 1995). The administration of information (such as files, emails, and bookmarks) by an individual in support of his or her roles and responsibilities is known as personal information management (PIM). Millions of individuals regularly engage in it every day, whether consciously or unconsciously (Jones, 2007).

One of the main objectives of PIM, according to Jones et al. (2017), is to have easy access to necessary personal information at the appropriate time, in the proper format, and in enough quantity and quality to meet current demands. This ideal aim of personal information management is a long way from being a reality for most individuals especially on a social space such as Facebook, Twitter, and YouTube etc. There are several difficulties that come with the application of personal information management in some social media platforms, one of which could be because of the plethora of information that is being generated. People might not have access to the appropriate information at the appropriate moment to suit their needs according to Jones et al. (2017). They might not have access to the data they require, or it might arrive too late to be useful. Even if they take the time to preserve the information for later use, people may forget to use it (Ratnam, 2022).

Among these social media platforms is YouTube which is a popular site to watch videos. YouTube was launched in 2005 and is currently ranked the third most popular website worldwide behind Facebook and Google. YouTube offers the chance to share contents with a huge audience of website visitors because its content is diversified and international (Khan, 2017). In recent years, YouTube has come to represent the possibilities of digital culture. The Web's fastest-growing website, YouTube promises countless new prospects for viral marketing, amateur video, political campaigning, entertainment formats, and other genres (Snickars, P., & Vonderau, P. (Eds.), 2009). Thanks to the improvements in internet technologies, millions of people may now watch videos on their PCs, portable laptops, and mobile devices (Nacak et al., 2020). YouTube has a varied user base and appeals to a wide range of demographics. Users can engage with YouTube in a variety of ways, which gives engagement on the platform a deeper significance (Khan, 2017). Several studies have been carried out on YouTube's crucial importance in numerous contexts of both learning and entertainment.

However, a great deal needs to be learned about the reasons why different user groups watch, save and re-find YouTube videos, and also, likely challenges they might be encountering regarding the saving and re-finding videos in relation to their personal information management.

We aim at studying PIM behavior of professional inclined individuals and students who tend to be tech-savvy, regular, and real users of YouTube on their motivation for saving and re-finding YouTube videos. According to Salminen et al., (2022. p.2), real users are study participants that are drawn from the specific target population. The target group here means the entire group of people that a researcher is interested in studying and analysing. This is so essential because sampling real users for user studies is vital for ensuring a user study’s validity, usefulness, and applicability (Salminen et al., 2022.).

Therefore, in this thesis, we will explore the motivation behind different user groups' video saving and re-finding behaviors and their challenges for doing so while designing better UI features to facilitate users' experiences on YouTube from a PIM viewpoint.

1.1 Problem Statement

We formulate the following problem statement to direct guide our research and exploration:

What motivates different user groups to engage in keeping and re-finding YouTube videos in relation to their PIM, and how can we design more meaningful UI features to provide them with better user experiences on YouTube?

In order to address our problem statement, we suggest five research questions that we look at in more detail.

1.2 Research questions

- What tasks or needs encourage different user groups to save videos on YouTube?

- What motivates professionals and students in re-finding YouTube videos in relation to their PIM?
- How do YouTube UI features facilitate the saving and re-finding of videos on YouTube?

- What are the challenges faced by different user groups while saving and re-finding videos on YouTube?

- How can we design new UI features on YouTube to enhance the user's video saving and re-finding process?

2. Theory

The initial part of the following section defines the concept of personal information in the context of Personal Information Management (PIM).

We employed Personal Information Management (PIM) to investigate and comprehend user behaviors connected to saving and re-finding videos on YouTube. PIM allows us to investigate how people interact with the platform, how they save their video collections, and

the tactics they use to efficiently re-find saved videos. The second section is concerned with the theory of Self-Determination Theory, in which we will investigate several characterizations of prospective Self-Determination. Motivation theory is used to analyze the underlying motivation behind users' PIM activities. This theory assists us in dissecting the psychological reasons that lead people to save and re-find videos, such as intrinsic incentives such as personal interest, curiosity, and enjoyment, as well as extrinsic motivations such as information seeking, instructional goals, or entertainment value. We can gain important insights about user habits, preferences, and motives by investigating PIM activities on YouTube.We accumulate a full insight of how users interact with YouTube by merging PIM and motivation theory, which can inform the development of more effective features and personalized recommendations to improve the overall user experience.

2.1 PIM (Personal Information Management)

Personal information management (PIM) is the practice and study of the activities people engage in to acquire, organise, maintain, retrieve, use, and control the distribution of information items such as documents (paper-based and digital), Web pages, and email messages for everyday use to complete tasks (work-related and not) and fulfil a person's various roles (as parent, employee, friend, member of community, etc.). The term "Personal Information Management" was coined in the 1980s (Lansdale 1988a, b) amid widespread excitement about the personal computer's potential to greatly improve human ability to process and manage information. The 1980s also saw the introduction of so-called PIM tools, which provided basic support for managing appointments, to-do lists, and contact information (Jones, 2007).

According to Bergman (2021, as cited by Jones and Teevan, 2007; Bergman and Whittaker, 2016) personal information management (PIM) is the activity of storing and retrieving personal information items. Files, emails, Web favourites, contacts, and notes are examples of such information items. Early PIM research was predominantly qualitative and exploratory, based on interviews and observational investigations. While such methodologies were useful for revealing fundamental PIM phenomena, as the discipline evolves, there is a rising demand for discoveries to be supported by more rigorous quantitative procedures that examine statistical relationships across variables (Bergman et al., 2021).

PIM has grown in popularity in recent years; it is now not only just a hot topic but also a serious area of study, bringing together the best work from a wide range of disciplines such as cognitive psychology, human-computer interaction, database management, information retrieval, and library and information science. The renewed interest in PIM is a double-edged sword. On the one hand, the rate of advancement in various PIM-relevant technologies gives us reason to believe that some PIM visions will be released soon. Digital storage is inexpensive and abundant. Improved search support can make it easier to find the information we need. Because of the pervasiveness of computing and the miniaturisation of computing devices, we can carry much of our information with us wherever we go.

However, renewed interest in PIM stems from a recognition of the issues that new technologies can cause. The information that Benjamin Franklin struggled to order on paper is now dispersed in multiple versions, including paper and digital copies, and isolated in separate applications and devices. Even seemingly simple actions, such as responding to an email request, can quickly escalate into a time-consuming, error-prone task that necessitates gathering information from disparate collections of paper and electronic documents, emails, Web pages, and other sources (Jones, 2007).

Jones mentioned in his studies how personal information can be used in a variety of ways, including:

1. The information that a person saves for personal use, either directly or indirectly (via software applications). This information is under the person's control, at least nominally. Nonetheless, ownership rights to portions of this information are frequently contested. It is frequently unclear who owns what information in the context of a person's work within a company or in collaboration with others.
2. Information about a person that is held by and controlled by another party. For example, medical professionals and health organisations that maintain information on a person, as well as tax authorities and credit bureaus, are examples of organisations that maintain personal information.
3. Information that a person experiences but may not always have control over. Some types of personal (or personally experienced) information include books that people browse (but then put back) in traditional libraries and web pages that people visit. Further personally relevant information "out there" that the person might desire to encounter can be added to this category.
4. Information directed at a specific individual. This category includes emails that arrive in the inbox as well as pop-up notifications that a new email has arrived. Alerts

> generated by a person's computer, the "push" of advertisements on a visited Web page, television or radio, and the ringing phone are all examples of information directed toward a person. The information itself may or may not be relevant to you. However, the intended effects of directed information are unquestionably personal (Jones, 2007).

According to Barreau's (1995) research, personal information management is divided into five stages namely: acquisition, organisation, maintenance, retrieval, and output.

Acquisitions

In personal information management, the question of what personal information to retain and how to do so has a big impact on navigation, storage, and organisation. According to Marshall (2007), the decision to maintain information is based on predicting its "future value," which is a fundamentally challenging task given how information meaning and value vary over time (Lush, 2014). According to Jones, with a PIM system, the user is typically the one who chooses the information and the entities to be included in that system. Their issues, needs, and queries are inputs to the system. This isn't always the case because every setting has some limitations. Some of the limits that may affect choices on what to include in the system include company-selected hardware or software, restrictions on access to electronic information sources, and demands to build on work already done by others. Notwithstanding limitations, a user generates a large portion of the data collected by a PIM system or adds value to it. The subjects and formats of information entities can vary greatly, including professional documents that must be polished, precise, and accurate; casual notes and messages that allow for irregular spelling and formatting; data files; spreadsheets and tables; images; and computer tools, among others (Jones, 2007). Lush mentioned in the article that Jones' research is contradicted by Whittaker and Hirschberg's (2001) findings, which show that people distrust external information sources like the internet and hold onto things on the assumption that it won't be simple or possible to discover it again. While Whittaker and Hirschberg (2001) also point out that information accumulates because of individual temporal constraints impeding immediate processing, these findings concur with

Marshall's (2007) theory that people hold knowledge because they cannot estimate its future usefulness (Lush, 2014).

Organization and Storage

Tools and processes that categorize, identify, organize, and store information in a location for later retrieval are known as mechanisms for organizing and storing information. The item attributes in a PIM system are frequently fine-grained and quite personal, making it challenging to recognize and describe them. The individual's environment is dynamic, changing priorities and workloads, which makes this challenge even more challenging. For PIM systems, a number of distinctive characteristics have been proposed, and it is generally agreed that numerous access points are required. According to Lush, (2014, as cited by Malone, 1983) has discovered that having documents on a desk in an office setting frequently functions as a reminder to the person. One of the most well-known models of information organisation, filing vs. piling, was developed as a result of Malone's (1983) observations of how people organise paper-based information in their workplaces and on their desks. Information is filed when it is given a name, put in a folder structure (typically hierarchically), and then accessed on that basis. Although there is no order in piling, retrieval depends on location (Lush, 2014). The position of the documents was determined by their usage or importance to the person, not by their physical traits or attributes. Malone also discovered that people would put objects together because it was difficult to categorise them; as a result, objects were discovered together that did not fit well anywhere else, even though they might not have shared any other characteristics. This demonstrates a person's use of a satisfying method to avoid exerting the cognitive work needed to make a decision (Barreau, 1995).

Maintenance

Maintaining information systems is an important function that is frequently overlooked in ISAR system design. Regular system backups and routines for updating incorrect or out-of-date information are universally accepted requirements, but deletion or migration rules differ greatly from system to system. There has been a tendency to allow systems to grow in an era of inexpensive memory and storage devices and fast processors. Individuals who want a

thorough treatment of a subject must keep as much information as is relevant and feasible. Unfortunately, due to the time required to make such determinations, growth may occur with little assessment and review of the relevance or quality of the information. Growth can continue as long as information storage keeps up with the tools for organizing and retrieving it and as long as system performance and individual productivity are not hampered. Efficiency depends on decisions about what to delete and when to migrate to secondary storage, but these decisions are usually made at a time and under circumstances that are determined more by chance than by rule (Barreau, 1995).

Retrieval

Within ISAR systems, information retrieval is based on user-defined queries and system access characteristics, and one indicator of performance is how well the system can translate the user's request into its retrieval language. The translation of the user's query in a PIM system is not a simple matter, as it is with any information system. In a PIM system, the retrieval procedure is heavily influenced by the circumstance or event, the information demand, that triggers the search. For ease of use, formal ISAR systems rely on restricted vocabularies, structured files, and complex filing processes. Each user's vocabulary is "managed" within a PIM system because it is particular to them. A subset of one's vocabulary must be chosen with discipline, especially when the work involved in doing so prevents one from finishing a task. On the other hand, individuals have access to retrieval cues in their own systems that formal systems do not. Dates, file sizes, and context information from the user's environment when the document was generated or last used are some of the signals that can be combined to trigger someone's memory and help them find something or recall a fact. Even the actions of identifying, categorizing, and saving a document to disk take place in the context of other tasks and may even turn out to be helpful for retrieval in the future (Barreau, 1995). People manage their files mostly for retrieval, information cannot be used unless it can be obtained again, therefore retrievals must be both effective and successful (Bergman et al., 2021).

Output

Output is one of the most crucial components of an information system's structure. Users ask questions or seek answers from the system, and the system's capacity to fulfill the request depends heavily on the output quality. The output of PIM systems must be criterion-based and tailored to each user's wants and goals rather than being normalized to broad tasks for many users as in conventional ISAR systems. While evaluating PIM systems, flexibility and output variability become crucial factors. The distinctive, situational feature of the working environment is one characteristic of PIM systems that distinguishes them from standard ISAR systems. As an item is obtained, created, categorized, saved, or retrieved, the context in which a person works, including the nature of the task, the subject matter, the tools at hand, the intended audience for the work, and the intended use for the information are all elements that come into play. Effective PIM systems, as well as the software used to create them, should take situational aspects into account to make the systems easier to use (Barreau, 1995).

2.2 Motivation behind the adoption of PIM

Self-Determination Theory

Motivation has frequently been classified as either intrinsic or extrinsic. A person can also be completely unmotivated, a condition known as motivation. When a person is motivated by intrinsic factors, he or she engages in "an activity for the sake of the pleasure and satisfaction derived from participation." Extrinsic motivation occurs when a person "engages in an activity as a means to an end rather than for its own sake. “An individual displaying extrinsic motivation is one who engages in secure actions purely out of organizational necessity. An example of intrinsic motivation is engaging in secure activities solely out of a personal desire to safeguard organizational data.

Additionally, SDT states that views of autonomy, competence, and relatedness have an impact on a person's self-determined motivation. According to SDT, one's perspective of how much freedom they have to engage in activities they want to be considered their level of autonomy. The degree to which a person feels competent in interacting with their environment to bring about desired results or avoid unintended consequences is defined as competence. One's perspective of how much they feel linked to other people is known as their relatedness (Menard et al., 2017).

Most motivation theorists concur that motivation is a multidimensional concept, with one's willingness to put in attentional effort serving as its fundamental element. Depending on the setting of the investigation, different alternative operationalizations of motivation have been used at the measurement level. Several studies in the information systems (IS) field examined factors primarily related to the concepts of extrinsic motivation in the form of reward, reputation, and image and intrinsic motivation in the form of enjoyment of helping others, enjoyment of learning, and sense of self-worth to focus on the motivational aspects of information use (Dubovi & Tabak, 2021a).

The popularity of social media sites such as YouTube, has encouraged social interaction and participation on an unprecedented scale. YouTube allows content to be shared, embedded, and discussed (Burgess & Green, 2013). YouTube offers a variety of functionalities besides uploading and video viewing, that encourage both active and passive user engagement (Khan, 2017). According to Lehmann et al(2012, p.1) User engagement is the quality of the user experience that emphasizes the positive aspects of the interaction, and in particular the phenomena associated with being captivated by a web application, and so being motivated to use it. Crucial to understanding the future of social media is studying the characteristics that make these sites appealing or motivating people to use them. Such sites are increasingly becoming a single platform for social interaction, information, news, and entertainment (Khan, 2017).

A great deal needs to be learned about why and how users participate and consume information on various online sites but in the case YouTube. Users of social media such as YouTube are motivated by various factors that directly influence and improve their engagement with it. . Engagement has been defined as “a user-initiated action (Gluck, 2012, p. 8). Hollebeek (2011) also viewed engagement as a multidimensional concept that comprises not only behavioral (actions) but also cognitive (thoughts), and emotional (feelings) aspects. Engagement may be viewed as an individual's interaction with media.

Uses & gratifications framework can help to uncover and accurately measure the motivation that ultimately increases user engagement of YouTube videos, saving and re-finding. Uses & gratifications framework is a widely used framework in media research, shedding light on the important question of why and for what people use media (McQuail, 1983 as cited by Khan,

2017, p.3). The three essential objectives of the Uses & gratifications framework are: to explain how people use the media to gratify their needs; to unearth the motives for media use; and to identify the positive and negative consequences of media use (Katz, Haas, & Gurevitch, 1973). One of the core premises of the U&G framework is that the audience is active and seeks to fulfill its needs and receives satisfaction when a need is met (McQuail, 2005). U&G is a broad framework to help understand user motivations, and it has been refined over the years by various media scholars (Khan, 2017).

Katz et al. (1973) originally developed 35 needs of mass media and subsequently classified them into five main categories:
1) cognitive needs (acquiring information, knowledge, understanding).
2) affective needs (emotion, pleasure, feeling).
3) personal integrative needs (credibility, status, stability).
4) social integrative needs (interacting with family and friends); and lastly,
5) and tension release needs (escape and diversion) (Khan, 2017, p.3).

McQuail (1983 as cited by Khan, 2017) also provided four main reasons for media use: information, personal identity, integration and social interaction, and entertainment. This is to show that over the years, U&G framework has been commonly employed in understanding user motives for media use. In terms of YouTube use, there are very few studies that have attempted to probe motives for site use. Haridakis and Hanson (2009) employed the U&G framework to understand YouTube motivations in terms of viewing and sharing. They discovered that videos were viewed for information seeking and shared for entertainment, co-viewing, and social interaction.

In the content of YouTube and other social media, many users choose to view a video, save videos, and oftentimes re-find YouTube videos based on many reasons. These reasons among other things are what we want to uncover. In doing so, this study applies a motivational construct to unpack the motives of user's participation and consumption of YouTube videos in relation to personal information management most importantly motivation behind the saving and re-finding of YouTube videos by the users.

3. Literature review

3.1 Related work on PIM

The main focus of our literature review is to unravel the existing knowledge on personal information management in practice, YouTube as a source of information and how different user groups interact with YouTube videos in relation to saving and re-finding phases of personal information management, users´ motivation behind saving and re-finding YouTube videos if there any.

Since Google Scholar is extensively used in academic research and also acts as a sizable general database, we will use it as our database search engine. Due to how it functions, Google Scholar differs from the majority of other academic databases. Because they concentrate on more scholarly and technical literature, IEEE Explore, ACM Digital Library, and AAU Library databases are also explored in addition to Google Scholar. In order to narrow the search in these queries, we would then eliminate several terms that would otherwise be required.

A few studies have been carried out in different contexts on personal information management that looked into how users re-find information, what techniques they naturally use to re-find information, and how domain artefacts and contextual information can be leveraged to help the re-finding process in order to effectively support users' re-finding requests. In user research that Capra and Perez-Quinones (2003) conducted with pairs of participants, one participant served as a retriever, assisting the other participant to re-find information by phone. The outcome demonstrated that re-finding is a two-step iterative procedure. Users first try to identify an information source (search), and once they do, they begin to explore for the exact information they need (Deng & Feng, 2011).

According to Deng & Feng (2011), browsers also enable the way users maintain track of their history lists of automatically visited web pages. Users can browse and choose the appropriate URLs to re-access web pages based on that. Contextual web history (CWH), a browser history substitute created by Won et al. (2009) in response to the observation that few people use the current web browser history functionality to re-find previously visited web pages, increases the visibility of the history feature. By delivering a set of clues, such as the time of visit and visual appearance, CWH enhances the content of a page. The web history can also

be searched for using text. A tool called Search Bar was created by Morris et al. (2008) to organize a user's web access history in a hierarchy, which includes the user's most recent search topics, queries, results, and notes on the topics. The user can review prior search data (such as queries, results they viewed, and their notes) by perusing the hierarchy of access history. Users can find previously visited web content more easily by keeping track of their browser history data (Deng & Feng, 2011).

Pu and Jiang (2011) studied how people locate previously identified results on a second search after conducting their initial web search. In order to compare users' search performance across various search tasks based on users' search purposes, frequencies of exposure to the search tasks, familiarity with the search topics, and the types of information searched, the authors set up a two-staged (finding and re-finding) experiment and utilized a variety of methods (such as experiments, observations, interviews, and questionnaires). The findings indicated that, occasionally, the search performance of re-finding is unexpectedly worse than that of finding, highlighting the need for effective solutions to support users' re-finding needs (Pu & Jiang, Feb 08, 2011).

According to studies done as part of the Keeping Found Things Found project, memory issues made it difficult for participants to re-find all of their important documents, (Jones et al., 2002; Jones, Bruce, & Dumais, 2003; Jones, Bruce, Foxley, & Munat, 2005; Bruce et al., 2004). If they remembered to seek it, participants were mostly successful in returning to a requested information item (such as an electronic document, email, or website). Participants lamented, however, that they frequently overlooked looking for a piece of knowledge until after its utility had expired (Jones et al., 2005). In their 2002 study of people's memory for common computing tasks, Czerwinski and Horvitz discovered that users frequently forgot computing-related events that they had thought were crucial to remember later. Additionally, Czerwinski and Horvitz discovered that although consumers originally had a great recollection for the chronological order of events, this memory drastically deteriorated over time. Additionally, a number of researchers have discussed how interruptions might interfere with users' primary work when using computers in both PIM and non-PIM contexts (Czerwinski, Chrisman, & Schumacher, 1991; Renaud 2000). When this occurs, people have trouble continuing with this activity since they can't recall the context of earlier tasks (Elsweiler & Ruthven, Jul 23, 2007).

Elsweiler and Ruthven addressed about and focused on overcoming the challenges associated with conducting PIM evaluations. Due to the personal character of PIM, it is challenging to design trials with balanced participant populations because each participant has their own distinct collections that they self-generated by doing other tasks. The effectiveness of systems or users should be assessed when users accomplish tasks on their own collections, according to our suggestion, in order to incorporate the personal components of PIM in assessments. This method has issues on its own since it is challenging to create tasks for personal collections; researchers are largely ignorant of the kind of re-finding tasks people engage in and are unaware of the information contained in specific personal collections. In this work, they discussed solutions to these problems in order to enable task-based PIM user assessments (Elsweiler & Ruthven, Jul 23, 2007).

Previous studies have emphasised the relationship between PIM activities and the processes and functions of human memory. The connection may have been made for the first time by Carroll (1982), who demonstrated how eight-character file names can trigger a detailed recall of a file's content. While Lansdale (1988) was also interested in the psychological aspects of information management and described office organisation problems as problems of categorization, recognition, and recollection, Case (1991) proposed that memory and metaphor have an impact on how historians manage their resources. PIM has recently been found to be hindered by memory problems and limitations on human memory (Elsweiler et al., 2008).

The connection between PIM activities and the processes and functions of human memory has been highlighted in earlier studies. The connection may have been made for the first time by Carroll (1982), who demonstrated how eight-character file names can trigger a detailed recall of a file's content. While Lansdale (1988) was also interested in the psychological aspects of information management and described office organization problems as problems of categorization, recognition, and recollection, Case (1991) proposed that memory and metaphor have an impact on how historians manage their resources. PIM has recently been found to be hindered by memory problems and limitations on human memory (Elsweiler et al., 2008).

Studies that explicitly focused on the data that individuals tend to recall have been conducted in light of these findings. While Goncalves and Jorge (2004), Blanc-Brude and Scapin (2007), and Goncalves and Jorge (2004) explored people's memories for various kinds of

computer files, Elsweiler et al. (2005) focused on what people remember about their own photos. These studies demonstrated how important context is to memory: participants not only had a propensity to recall fragments of the contexts in which the information is created or used, but also had a propensity for context-dependent recollections, which meant that the specifics of what they remembered varied depending on the type of information they were recalling. There is still a lack of knowledge on users' memories of their personal information despite these three different forms of research. Even less is known about how memories are used and what they mean in terms of re-finding performance, as well as the relationship between memory and PIM. There has, however, been some useful study. In a 2007 study, Kalnikaite and Whittaker compared a user's organic memory to several prosthetic memory devices such as pen and paper notes, dictaphones, and a prosthetic that integrated written and voice notes on a handheld computer. The primary finding of this study was that in order to be useful, a prosthetic memory device, like any other PIM collection, needs to be in sync with the user's memory. Kelly et al. (2008) used theoretical performance metrics to examine what one person remembered about the context in which his information was used and the influence that employing these contextual recollections had on re-finding performance. They discovered that including recollection information may improve re-finding performance (Elsweiler et al., 2008).

Studies on the affective experience of PIM have found that some people feel as though they are losing control of their digital information, are anxious and overwhelmed by the amount of information available, find it difficult to deal with the overload of information, and engage in distressing and anxious-inspiring digital hoarding behaviors. The first focuses on the functional aspects of the interaction and describes PIM as the ability to organise and store data for later retrieval. This technique assumes that as PIM advances through its various stages, emotional reactions to personal information and its management take place. These phases involve locating and re-finding information, safeguarding information items, organising information in the personal information space, and retrieving information as needed. These steps are not usually sequential. People may repeat or skip some (such as never retrieving an information item). When anything goes wrong, these phases frequently only elicit an emotional reaction. People may feel helpless, overburdened, and frightened when dealing with a lot of information in a short amount of time, especially if the knowledge is "actionable" or needs a specified action over a certain period of time. After creating, receiving, or discovering knowledge, people must choose how to store it, including whether

to keep, share, or discard it. In the platform where it was transmitted or received, an item can be removed, saved in a folder or pile, or left "as is". The retrieval phase also induces emotional reactions. The two main tasks in this phase are "searching" and "navigating between folders." Emotions generally come to the surface at this stage when retrieval fails, and the information item cannot be found. This can make users irritated or concerned about the information's long-term stability and storage capability (Alon & Nachmias, 2020).

Numerous research on personal information management have been undertaken in different contexts. An extensive literature search was done to gain an understanding of prior PIM investigations. Our investigation discovered a considerable gap in the academic literatureconcerning the motivation for saving and re-finding YouTube videos, as well as the strategies for saving and re-finding videos from the standpoint of Personal Information Management (PIM) or information behavior. Notably, prior studies generally missed this particular area, creating a significant void in our understanding.

3.2 YouTube

YouTube has successfully become a great depository for videos both for education and entertainment purposes. Studies have established that millions of people on a daily basis venture on YouTube for many personal reasons, mostly for information seeking and entertainment purposes. For this reason, there is a need to look into YouTube from the lens of personal information management, and the reasons that underpinned different activities that users engage in on YouTube.

YouTube, particularly in the context and light of Personal Information Management (PIM), has seen limited research and development. While YouTube has revolutionised the way we consume and share video content, it lacks robust features and knowledge on why users carried out some activities that are related to PIM such as saving and re-finding videos for personal use. Research in this area is crucial to address the challenges users face in saving and re-finding videos based on their personal preferences and interests. Enhancing the YouTube platform with advanced PIM capabilities would empower users to create personalized video collections and have better control over their video libraries.

YouTube has evolved as a huge and prominent social media site during the last 15 years, spawning a 'platformed media system' within its technical and regulatory infrastructures.

Since its debut as a website for video sharing in 2005 and integration with Google the following year, YouTube has developed into a powerful platform that contains millions of channels and billions of videos, reaching more than two billion active viewers each month (Rieder et al., 2020).

Google purchased YouTube in 2006 after it was established in 2005. Although the original goal of YouTube was to allow regular individuals to broadcast their own videos, it has since transformed into a professional media outlet that combines free and subscribed material on a platform that encourages advertising (Burgess & Green, 2009; Kim, 2012). At the moment, it primarily serves professionally developed content (Kim, 2012). Users frequently post user-copied versions of professional work, which is another typical practice (Ding et al., 2011). The type of experiences people can have on YouTube are influenced by its user interface (Blythe & Cairns, 2009; Buie & Blythe, 2013). Understanding the current YouTube interface is essential for understanding the findings of the study, therefore we will go over it here. The web interface and the video player page are the focal points of the viewing experience. Mobile applications and a mobile web site are two examples of parallel, alternate interfaces for mobile devices. Basic statistics and media (video, thumbnail, and title) are two aspects of YouTube video entries that are consistently displayed together (Liikkanen & Salovaara, 2015).

Although the majority of empirical YouTube study has concentrated on particular content producers, genres, texts, and subcultures, research has always been motivated by a need to "map" the platform in order to account for what is available. Burgess and Green (2009) presented the first comprehensive overview of YouTube's popular culture in the late 2000s by undertaking a content analysis of the most popular videos, and Paolillo (2008) explored the social network structure of YouTube early on. However, in the second edition of their book, the authors acknowledge that their empirical methodology could not be applied today because YouTube has changed from a website for sharing videos to a major media company with a focus on channel monetization. The phrase "social media entertainment" was first used by Cunningham and Craig (2017) to refer to the popular YouTube video. It is also evident that a wide range of actors produce and upload videos, from amateurs sharing intimate details of their daily lives to famous YouTubers with millions of subscribers to well-known television networks and record labels who use the platform to reach a wide audience, particularly younger viewers (Rieder et al., 2020).

Halvey and Keane [2007] examined social interactions on YouTube by browsing user pages and concentrating on social interaction strategies enabled by websites. They discovered that people prefer to watch videos rather than contribute to them (on average, each user had 966 views compared to 11 submissions). Additionally, they discovered a general failure in utilising the online community resources. These findings are crucial to consider when creating a recommendation or personalization system for YouTube viewers because passive user behaviour may not be sufficient to provide predictions for a group of users (Oliveira et al., 2010). Similar findings were made by Gill et al. [2008], who used a similar methodology and discovered that different users had varying surfing habits depending on the reason for their visit and that most users do not upload movies (51% of sessions did not transfer any videos, for example). Finally, Maia et al.'s [2008] description of a more in-depth profiling of YouTube users included the collection of a sizable dataset that included numerous aspects of the individuals' system interactions. After that, users were divided into 5 categories. Only 23% of the users in their sample were classified as content producers, who are people who frequently use their accounts and have a disproportionately high volume of uploads, watches, and channel views (Oliveira et al., 2010). For a number of reasons, Dubovi and Tabak's 2020 research on YouTube is a main focus. First off, it deserves consideration and research as one of the top three platforms for social media and content broadcasting (Alexa Internet Inc., 2020; Perrin and Anderson, 2019). Second, there is an opportunity to examine a wide range of audiences with regard to public involvement with science due to the abundance of material possibilities and scope of use. The post-video comment section offers a setting where discussion and thought may be watched and evaluated (Dubovi & Tabak, 2021b).

Elsweier and Ruthven (2007) demonstrated that establishing personal information management systems to support human memory features can improve users' performance when re-finding information. Deng & Feng (2011), study emphasises users' information re-finding behaviors and requirements and examining the natural way of re-finding in human memory. We intend to investigate what motivates users to save and re-find YouTube videos. Furthermore, we are intrigued by the techniques they use for saving and re-finding as well as the difficulties they have in doing so.

4.Methodological frameworks

In this section, we provide a detailed explanation of the methods, adopted methods, and the reasons for their adoption. For the overall methodological framework, we will be adopting a qualitative methodological approach in this work. However, before we go into details of what a qualitative method is and how we applied it in this work, we will briefly discuss the philosophy of science and its relation to our work.

4.1 Philosophy of science

For any research work to be considered as good work, it must be predicated and rooted upon a sound philosophy of science. Social research and its associated methods do not take place in a vacuum (Bryman, 2016) Social research is a product of philosophies and theories which the social scientists use to understand the social world having great influence on the direction of what is been researched on and how the research findings are interpreted, in other words, the topics that are investigated are profoundly influenced by the available theoretical ideas (Bryman, 2016). Bryman (2012, p. 5), also buttress what is studied and how the research results are interpreted are influenced by the theories social scientists use to understand the social environment (Bryman, 2012).

Talking of theory, Bryman (2006), emphasised the importance of theory because of its ability to provide a backcloth and justification for the research that is being conducted, and it also provides a framework within which social phenomena can be understood and the research findings can be interpreted (Bryman, 2016)

In its simplest form, theory is an explanation or set of an explanation of observed regularities that seek to give detailed explanation of a particular phenomenon (Bryman, 2016) And this explanation I is based on empirical evidence. Theory helps guide and influence the collection and analysis of data. In other words, research is done in order to answer question posed by theoretical considerations (Bryman, 2016)

There are two approaches to theory which are deductive and inductive.

In inductive theory, researcher infers the implications of his or her findings for the theory that prompted the whole exercise (Bryman, 2016) Bryman (2016, p.21) further stressed that the

findings of the research are fed-back into the stock of the theory and the research findings associated with a certain domain of enquiry.

While a deductive theory represents the commonest view of the nature of the relationship between theory and social research, whereby the researcher draws on what is known about in a particular domain and on relevant theoretical ideas in order to deductive a hypothesis that must then be subjected to empirical scrutiny (Bryman, 2016) This form of theory is principally used in sociology to guide empirical inquiry (Bryman, 2016).

Deductive theory always gives theoretical reflection on a set of data that has been collected in order to establish the conditions in which a theory will and will not hold.

Our study tilts heavily towards a deductive approach because the study is theoretically driven.

It is highly needful for researchers to consider the epistemological and ontological issues regarding any research and the method or approach to data collection. An epistemological issue concerns with the question of what is (or should be) regarded as acceptable knowledge in a disciple (Bryman, 2016)

Traditionally, ontology and epistemology comprise discrete dimensions of the branch of philosophy called metaphysics (Rawnsley, 1998) According to Rawnsley (1998. p. 2), metaphysics is a philosophy that is concerned with the description of the ultimate nature of things as they are. Metaphysics helps in probing the reality and the existence of things in order to establish the understanding of the fundamental nature of the same reality and the universe.

Epistemology is rooted in the philosophy that is concerned with the study of knowledge and belief asking questions to establish what knowledge really is, how it could be acquired, limitation to knowledge and the several factors that facilitate what we know. Epistemology helps to examine the relationship between knowledge and the researcher during the discovery, in order words, it therefore refers to how a researcher comes to know what he/she knows (Killam, 2013)).

Ontology on the other hand is concerned with the nature of social entities. According to Bryman (2016, p.28), the central point of orientation is the question of whether social entities can and should be considered objective entities that have a reality external to social actors, or

whether they can and should be considered social constructions built up from the perceptions and actions of social actors. These two positions are referred to respectively as objectivism and constructionism (Bryman, 2016).

Killam (2013), also tried to explain from the perspective of a researcher and as a philosophical term. According to him, in research, ontology could refer to the researcher's beliefs about the nature of reality, and as a philosophical term, it refers to the study of our existence and the fundamental nature of the reality or being i.e., beliefs about what is real or true determine what can be known about reality (Killam, 2013).

In nutshell, ontology refers to the claims regarding nature and structure of being or things including the theories that explicate the phenomenon of what exists.

In this very study, we tried as much as possible to be more practical in our approach in determining and unveiling users' motivation in engaging and exploring YouTube video resources, the path tech-savvy users often engage in keeping and re-finding YouTube videos in relation to PIM, and how can we provide this set of users with tailored and better UI features to enhance their user-experiences on YouTube platform.

Being practical in our approach led us to the adoption of pragmatism as a defining paradigm.

According to Killam (2013, p.28 as cited by Datta, 1997) to adopt a pragmatic stance means to believe that; The essential criteria for making design decisions are practical, contextual, responsive, and consequential. Practical implies a basis in one's experience, of what does and does not work. "Contextually responsive" involves understanding the demand, opportunities, and constraints of the situation in which the inquiry will take place. "Consequential" [means]… that the trust of a statement consists of its practical consequences, particularly the statement's agreement with subsequent experience (p.24, emphasis in original). Furtherance, pragmatism presents a very practical and applied research philosophy that is oriented toward action (Killam, 2013).

Pragmatism also places great emphasis and importance on experience, experimentation, and practical considerations in determining the truth or true value of an idea.

This assertion was also supported by Killlam (2013, p.26), who said that pragmatism emphasizes the importance of experimenting with new ways of living searching for

alternative and more liberating vocabularies and opening an array of possibilities for human action (Rorty, 1987 as cited by Killam 2013, p.26).

This is the main reason we decided to adopt this philosophical approach. Our findings were based on experiences, practices, and experimentation in order to establish patterns users engage in keeping and re-finding YouTube videos in relation to PIM, and how we can provide this set of users with tailored and better UI features to enhance their user-experiences on YouTube platform.

4.2 Quantitative and Qualitative method

Quantitative and Qualitative are two major approaches or methods of gathering and conducting research.

According to Lakshman et al, (2000, p.369) Quantitative methods examine the effects of specified circumstances (independent variable) on an outcome of interest (dependent variable) in ways that can be expressed numerically. In these settings, causal inferences are drawn either from direct observation, as in true experiments, or from associations established through statistical analysis (Lakshman et al., 2000). In other words, quantitative research methods involve using numerical data, statistical analysis, and mathematical model to investigate and give explanation to a phenomenon.

In these settings, causal inferences are drawn either from direct observation, as in true experiments, or from associations established through statistical analysis (Lakshman et al., 2000). This approach allows easy quantification of data, and aggregate results are presented more concisely (Lakshman et al., 2000). Sophisticated statistical methods can be used to assess relationships between the variables measured. In addition, surveys are fairly easy to design and quick to implement (Lakshman et al., 2000). The approach is also often used to test hypotheses, examination of cause-and-effect relationships which make predictions easier. Data is collected through structured surveys, experiments, and sometimes, via observational studies. Questionnaire forms are often standardized, thereby increasing the reliability, comparability, and precision of data from one region or time frame to another (Lakshman et al., 2000)

While qualitative approach according to Hennink et al (2020, p.10) qualitative research is a broad term that covers a wide range of techniques, philosophies and approach that allow a researcher to examine peoples' methods such as in-depth interviews, focus group discussions, observation, content analysis, visual methods, and life histories or biographies. One of the unique features of qualitative approach is the fact that it allows a researcher to identify issues from the perspective of study participants and understand the meaning and interpretation that they give to behaviour, events or object (Hennink et al., 2020) For a researcher to be able to extract quality data from the participants, he /she must be open minded, curious and empathic, flexible and able to listen to people telling their own story (Hennink et al., 2020)

Qualitative research approach involves the collection and analysis of non-numerical data such as interview, observation, and textual analysis used to often gain a deeper understanding of human interaction, behaviors, and social processes. With this approach, researchers are able to study participants in their natural settings to identify how their experiences and behaviour are shaped by the context of their lives. This approach also helps in the adoption of an interpretive, naturalistic approach to the world (Denzin & Lincoln, 2008), meaning there is allowance to study things in their natural habitat or setting, attempting to make sense of, or interpret phenomena in terms of the meanings participants of people bring to them (Hennink et al., 2020)

These attributes of qualitative research approach fit perfectly with our study compare to quantitative approach, and also for the fact that qualitative research approach is most revealing when contextual forces are ill-defined, uncontrolled or situational according to (Lakshman et al., 2000), just like in our study, formed our opinion on the adoption of qualitative approach as appropriate approach to our study.

4.3 Sampling in qualitative research

In contrast to quantitative approach where large size of representative cases is needed, qualitative research approach requires a small number of participants selected purposively. This assertion was supported by (Nielsen, 1994) who gave a heuristic evaluation in an attempt to give a complete explanation on the number of samples needed to establish or uncover usability issues or facts. According to him,

O= does not explain the problem at all.

1 = may superficially address some aspect of the problem.

2 = explains a small part of the problem, but there are major aspects of the problem that are not explained.

3 = explains a major part of the problem, but there are some aspects of the problem that are not explained.

4 = fairly complete explanation of why this is a usability problem, but there is still more to the problem than is explained by the heuristic.

5 = complete explanation of why this is a problem.

And also, according to (Ratnam,), recruiting just five participants is adequate to uncover 80% of the issues. However, in our study, we aim at recruiting at least 9 participants and ensure that data saturation is used to characterise the point in the testing phase when no new information is discovered, or the data begins to repeat.

4.4 Methods for data collection

4.4.1 Contextual Inquiry

For data collection, we adopted contextual inquiry among all methods that we could have used for data gathering such as survey/questionnaire etc. The reason for the adoption of contextual inquiry is that oftentimes, it goes well with qualitative methods, having the capacity to dig deep into the behavioral disposition of the participants extracting quality data that cannot otherwise be gotten by interview or survey. In order to conduct sound qualitative research, a researcher needs more than a yes/no answer. Contextual inquiry creates a platform to have a deepest form interview and at the same time observe the participants as they interact or relate with a phenomenon at their natural habitat, giving the researcher opportunity to ask follow-up questions in order to match their behavior to their activities.

Moreover, contextual inquiry (CI), is a qualitative method which helps in comprehending and learning about how individuals carry out certain activities in context, to explore the PIM behaviours of YouTube users with reference to saving and re-finding YouTube videos. Contextual Inquiry is a qualitative data collection and analysis method that was adopted from the sociological, psychological, and anthropological disciplines. Contextual Inquiry essentially entails monitoring and conversing with users while they are performing actual work in their workplaces (Raven & Flanders, 1996). "The interrelated conditions within which something occurs or exists" is one definition of context according to Raven & Flanders

(1996). Contextual inquiry proponents are aware that it is impossible to fully comprehend what people are doing or why they are doing it without first being able to observe and possibly even experience the complex contexts in which they operate or use the items in issue (Raven & Flanders, 1996).

There are many benefits to choosing CI over more established techniques like interviews, and surveys. According to Holtzblatt & Beyer (2014), a key distinction between CI and a structured interview is that CI contains dialog as well as questions, which can assist reveal information about the user's practice that was previously concealed or undetected (Ratnam, 2022).

Observing and talking with participants in the context of performing specific tasks helps researchers to gather data that is different from the type of data researchers get from a questionnaire or a telephone survey. The questionnaires and telephone surveys usually provide summary data and abstractions, while data from Contextual Inquiry is usually more concrete because it is based on in the experience (Raven & Flanders, 1996, p.2).

As contextual inquiry data is based on actual experience, it is typically more concrete than other sources or methodologies. The kind of information or data obtainable in contextual inquiry is unique and distinct compared to information or data gotten from questionnaire or telephone survey as it gives the researchers the opportunity to observe, converse and ask follow-up questions, if need be, with the participants as they work or carry out their daily routine.

As contextual inquiry data is based on actual experience, it is typically more concrete than the summary data and abstractions that are typically provided by questionnaires and telephone surveys (Raven & Flanders, 1996).

Conforming to Holtzblatt & Beyer (2014), a relationship between the researcher and the user is necessary for contextual inquiry. The user now has an equal voice in the discussion and the topic may be considered together. In contrast to structured interviews, when questions are asked, the researcher should try to start a conversation with the user during CI. This can assist in bringing to light previously concealed or invisible information regarding the user's practice (Ratnam, 2022). A contextual inquiry is based on a focus, which is a perspective or collection of concerns, as opposed to a standard survey, which asks each respondent to answer a specific set of questions. When an interview is based on a focus rather than a

predetermined series of questions, the interviewer has more freedom to pursue a potential line of inquiry that might not have been covered by the list of questions (Raven & Flanders, 1996). And lastly, contextual Inquiry differs from a traditional interview in that traditional interviews have an interviewer who is usually in charge of the topics and flow of conversation. Contextual Inquiry is based on the premise that the inquirer and the participant are equals (Raven & Flanders, 1996, p.2).

Depending on the project's scope and information demands, contextual inquiry can be applied in a variety of ways. There isn't a single method for carrying it out (Raven & Flanders, 1996). In accordance with Raven & Flanders (1996), the three basic principles form the foundation of contextual inquiry:

1. The users' work must be taken into account when acquiring data.

2. The user and the data collector collaborate to explore problems.

3. Instead of being based on a list of specific questions, the inquiry is focused; that is, it is based on a clearly defined set of issues.

4.4.2 The Procedure of Contextual Inquiry Session

For both pilot interviews and the main contextual inquiry, we used the Zoom platform, we conducted 3 online pilot contextual inquiry interviews on the Zoom platform. Zoom is a collaborative, cloud-based videoconferencing service offering features including online meetings, group messaging services, and secure recording of sessions (Zoom Video Communications Inc., 2016). As with comparable platforms like Skype, Zoom offers the ability to communicate in real time with geographically dispersed individuals via computer, tablet, or mobile device (Archibald et al., 2019).

A key advantage of Zoom is its ability to securely record and store sessions without recourse to third-party software. This feature is particularly important in research where the protection of highly sensitive data is required. Other important security features include user-specific authentication, real-time encryption of meetings, and the ability to backup recordings to online remote server networks (“the cloud”) or local drives, which can then be shared securely for the purpose of collaboration (Zoom Video Communications Inc., 2016 as cited by Archibald et al., 2019).

We persuaded our participants to share their computer screens so that we could have access and the opportunity to see, understand the participants' thought processes and observe their various activities and behavior on YouTube just to have deeper insights. To help the participants and ensure that all the data would be collected under the same circumstances, we prepared an interview guide as a preliminary step before conducting the semi-structured interviews (Goodman et al., 2012)

The interview guide was created with a list of open-ended questions that are precisely defined, allow interviewees to respond freely rather than rely on predetermined answer options, and enable the interviewer to ask follow-up questions (Bryman, 2012). According to Goodman et al. (2012, p. 129), an interview should be structured so that basic information is given first, followed by specific questions, and finally a summary (Ratnam, 2022). The interview guide's goal is to get a comprehensive viewpoint, and the questions are based on our research questions.

To test the tasks and questions, we ran a pilot test with three participants. The language used for every session was English. The insights obtained from the pilot contextual inquiry interviews helped in refocusing our questions and identify questions that are vulnerable or too weak to wield preferred knowledge we were hoping to establish. This is supported by Bryman (2012,p. 263) assertion who said that 'a pilot study can help identify un-understandable and unanswered questions'. The pilot study also provides how well the questions flow and whether any of them need to be rearranged to improve for the CI session (Bryman, 2012, p. 264).

Bryman (2012, p. 264), also opined that a pilot study can also easily identify the questions that make participants feel uncomfortable or lose interest thereby helping researchers avoid such questions (Bryman, 2012, p. 264). In addition, it is paramount to highlight some of the reasons that underpinned the conduction of our pilot testing which is to establish if there are any different user experiences while exploring YouTube on different devices such as phones, laptops, tablets etc. Furthermore, we changed the wording of some questions to make them simpler for participants to understand. The pilot study helped us tremendously in preparing interview guides for the main contextual inquiry session.

To acclimate the participants for the main section, we opened the session with a series of general questions. After explaining the study's objectives and getting their informed consent,

we questioned our participants about how frequently they watch YouTube videos and what kind of devices they use in watching YouTube videos. We also inquired about their motivation for watching YouTube videos, and their most watched videos on YouTube. In the primary section of the interview guide, we divided our questions into two of Barreau's five characteristics of personal information management: organization, storage, and retrieval. In the organization and storage stage, participants were asked how frequently they save YouTube videos as well as to demonstrate their method for doing so. Furthermore, in the retrieval stage, they were questioned about how often they re-find YouTube videos and were also asked to show us their technique for doing so. Besides, we wanted to know about their motivation behind saving and re-finding videos.

In addition, we looked into the issues the participants encountered with saving and re-finding videos on YouTube as well as the differences while using YouTube on different devices. Finally, participants were asked questions regarding the new design of features intended to make saving and re-finding videos on YouTube easier. In order to strengthen internal validity, we asked pertinent clarification questions to the participants as we came to a close.

Participants

A small number of participants were enlisted to conduct in-depth explorations regarding their PIM practices due to the qualitative nature of contextual inquiry (CI). Overall, nine participants were recruited and successfully participated in this research work. Three participants were female and six were male. Participants in this study were between the ages of 25 and 32. Two participants were professionals -a make-up artist and a brand manager while the rest were students of computer science and related fields. All the participants were consistent users of YouTube which we strongly believe would yield profound insights into the usage and exploration of YouTube. The justification for using this sampling frame is predicated upon the fact that these participants were tech-savvy, regular, and real users of YouTube.

Materials

Seven CI sessions were conducted online, and the other two were conducted in person. Each session was recorded with the consent of the participants. Every CI session was held in the participant's home setting. Participants were always in complete control of their own devices, and we only requested that they share information that they felt at ease doing so. Participants

were informed of the purpose of the study and the process that would be followed at the start of the CI session. This involved outlining the facets of their PIM practices that we were interested in examining as well as the kinds of difficulties they encountered while engaging in those PIM behaviors.

4.5 Data analysis

4.5.1 Thematic Analysis

According to Braun & Clarke (2006, p.4), thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data. It minimally organises and helps to describe data set in (rich) detail (Braun & Clarke 2006, p.4). Thematic analysis involves the searching across a data set be that a number of interviews or focus groups, or a range of texts to find repeated patterns of meaning.

Thematic analysis provides a flexible and useful research tool, which can potentially provide a rich and detailed, yet complex, account of data.

A theme helps to capture something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set (Braun & Clarke 2006, p.7). Coding is an important aspect of thematic analysis. An important question to address in terms of coding is: what counts as a pattern/theme?

Themes or patterns within data can be identified in one of two primary ways in thematic analysis: in an inductive or 'bottom up' way (eg, Frith and Gleeson, 2004 as cited by Braun & Clarke 2006, p.8), or in a theoretical or deductive or 'top down' way (eg, Boyatzis, 1998; Hayes, 1997 as cited by Braun & Clarke 2006, p.8).

There are two main approaches to data analysis in thematic analysis which according to Braun & Clarke (2006, p.8) are inductive and deductive approaches.

An inductive approach means the themes identified are strongly linked to the data themselves. In this approach, if the data have been collected specifically for the research (eg, via interview or focus group), the themes identified may bear little relation to the specific questions that were asked of the participants. They would also not be driven by the researcher's theoretical interest in the area or topic. Inductive analysis is therefore a process of coding the data without trying to fit it into a preexisting coding frame, or the researcher's

analytic preconceptions. In this sense, this form of thematic analysis is data-driven (Braun & Clarke 2006, p.8).

While a 'deductive or theoretical' thematic analysis would tend to be driven by the researcher's theoretical or analytic interest in the area and is thus more explicitly analyst driven. This form of thematic analysis tends to provide less a rich description of the data overall, and more a detailed analysis of some aspect of the data (Braun & Clarke 2006, p.8).

Deductive analysis is therefore a process of coding the data where researchers try to fit it into a pre-existing coding frame, or the researcher's analytic preconceptions. With deductive analysis, researchers could code specifically for research questions (which maps onto the more theoretical approach.

Braun & Clarke (2006, p.87), provided six phases guide outlines for proper thematic analysis. These are not rules, and, following the basic precepts, will need to be applied flexibly to fit the research questions and data, and also, analysis is not a linear process of simply moving from one phase to the next. Instead, it is a more recursive process, where movement is back and forth as needed, throughout the phases. It is also a process (Braun & Clarke 2006, p.87).

These guide outlines are as follows according to Braun & Clarke (2006, p.87).

Phase 1: Familiarizing yourself with your data.

Either the data was collected or given to the researcher, it is important that the researcher goes through the data thoroughly in order to adequate understanding of the data he/she is working with.

If the researcher collected data through interactive means, he/she will come to the analysis with some prior knowledge of the data, and possibly some initial analytic interests or thoughts. Regardless, it is vital that a researcher immerse himself in the data to the extent that you are familiar with the depth and breadth of the content. Immersion usually involves 'repeated reading' of the data and reading the data in an active way searching for meanings, patterns and so on. It is ideal to read through the entire data set at least once before you begin your coding, as ideas and identification of possible patterns will be shaped as you read through (Braun & Clarke, 2006). Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas is the main focus here.

Phase 2: Generating initial codes.

This stage begins when researchers have read and familiarized themself with the data and have generated an initial list of ideas about what is in the data and what is interesting about them.

This phase involves the production of initial codes from the data. Codes identify a feature of the data (semantic content or latent) that appears interesting to the analyst, and refer to 'the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon (Braun & Clarke, 2006).

The process of coding is part of analysis (Miles and Huberman, 1994), as you are organizing your data into meaningful groups (Tuckett, 2005).

Oftentimes, coding will, to some extent, depend on whether the themes are more 'data-driven' or 'theory-driven' in the former, the themes will depend on the data, but in the latter, you might approach the data with specific questions in mind that you wish to code around. It will also depend on whether the researchers are aiming to code the content of the entire data set, or whether you are coding to identify particular (and possibly limited) features of the data set. In nutshell, this phase involves coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.

Phase 3: Searching for themes.

This phase involves collating codes into potential themes. Gathering data relevant to each potential theme is the major activity that takes place in this phase. Here, the researcher re-focuses the analysis at the broader level of themes, rather than codes, which involves sorting the different codes into potential themes, and collating all the relevant coded data extracts within the identified themes (Braun & Clarke, 2006).

Essentially, the researcher starts to analyse the codes and consider how different codes may combine to form an overarching theme. It may be helpful at this phase to use visual representations to help you sort the different codes into themes (Braun & Clarke, 2006).

Phase 4: Reviewing themes.

Collapsing, merging, or breaking down of themes takes place here. This phase begins when you have devised a set of candidate themes, and it involves the refinement of those themes. During this phase, it will become evident that some candidate themes are not really themes (eg, if there is not enough data to support them, or the data are too diverse), while others might collapse into each other (eg, two apparently separate themes might form one theme). Other themes might need to be broken down into separate themes. The main objective of this phase is checking if the themes work in relation to the coded extracts and the entire data set, generating a thematic 'map' of the analysis (Braun & Clarke, 2006).

Phase 5: Defining and naming themes.

At this phase, the researcher works on the ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme. Define and refine', mean identifying the 'essence' of what each theme is about (as well as the themes overall), and determining what aspect of the data each theme captures This is done by going back to collated data extracts for each theme, and organizing them into a coherent and internally consistent account, with accompanying narrative. For each individual theme, there is a need for a researcher to conduct and write a detailed analysis (Braun & Clarke, 2006).

At this juncture, it is necessary to consider the themes themselves, and each theme in relation to the others. It is important that by the end of this phase you can clearly define what your themes are and what they are not. One test for this is to see whether you can describe the scope and content of each theme in a couple of sentences.

Phase 6: producing the report.

This phase entails producing a comprehensive and convincing report on thematic analysis. The task of the write-up of a thematic analysis, whether it is for publication or for a research assignment or dissertation, is to tell the complicated story of the researcher's data in a way which convinces the readers of the merit and validity of the researcher's analysis. It is important that the analysis (the write-up of it, including data extracts) provides a concise, coherent, logical, non-repetitive and interesting account of the story the data tell within and across themes (Braun & Clarke, 2006). This phase gives researchers the final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts,

relating back of the analysis to the research question and literature, producing a scholarly report of the analysis (Braun & Clarke, 2006).

4.5.2 Study Participants

Our participants were divided among two user groups, i.e., professional inclined individuals who mainly use YouTube video for their profession or work purposes and students, who explore YouTube videos for academic purposes and functions. In total, we interviewed 9 participants. Averagely, most of the participants have 2 or more devices - laptops, mobile phones and tablets etc- they use in exploring YouTube videos.

	Gender	Age	Occupation	Devices	Frequency of using YouTube	Most watched videos	Common strategies for saving videos	Common strategies For re-finding videos	Difficulties in saving & re-finding videos
P1	Male	25	Master's Student	Phone, laptop	Everyday	Technical videos, programming languages tutorial, productive videos etc.	Playlists	History, Playlists, liked videos	Save to the latest used playlists by default
P2	Male	28	Software Engineer	TV, phone, laptop	Everyday	Science/Engineering videos, comedy sketches, news.	Watch later	Liked videos, search	No way to find deleted videos
P3	Male	30	Software Engineer	TV, phone, laptop, Ipad	Everyday	Music videos, science videos, tutorials for diets etc	Channel subscription, playlists, liked videos	History	No way to find out "Continue watching" unfinished videos
P4	Male	28	Master's Student	Phone, laptop	Everyday	Travel vlogs, music videos, tutorials, news, documentaries etc.	Watch later, Playlists	History lists, playlists	Finding out specific videos within the history lists
P5	Female	32	Brand manager	Phone and laptop	Everyday	Videos on branding, musical videos	Watch later, Playlists	Watch later, Playlists/ Watch later list	Often forgetting of saved videos
P6	Female	27	Makeup artist	Phone and laptop	Everyday	Makeup videos	Playlist/Watch later list	Playlist/Watch later list/ History list	Incessant advert
P7	Male	25	ICT student	Laptop and Phone	Everyday	ICT related videos/cyber security related videos/Musical videos	Created folders, watch later list/Playlist	Created folders, watch later list/Playlist/ history list	forgetting of saved video
P8	Female	28	ICT student	Laptop and Phone	Everyday	Musical videos, videos on ICT/Movies	Playlist/Watch later list/downloading	Playlist/Watch later list/downloading	Difficulty in locating videos from history
P9	Male	25	ICT student	Laptop and Phone	Everyday	ICT related videos/cyber security related videos/Musicvideos	Playlist/Watch later list/created folders	Download folders, Playlist/Watch later list/created folders	forgetting of saved video

Table 1**: Table of Participants**

4.5.3 Analysis

Overall, nine participants were recruited and successfully participated in this research work. Two participants were professionals, a make-up artist, and a brand manager while the rest were students of computer science and related fields. All the participants were consistent users of YouTube which we strongly believe would yield profound insights into the usage and exploration of YouTube. The justification for using this sampling frame is predicated upon the fact that these participants were tech savvy, regular and real users of YouTube.

The following are the major findings and highlights from the thematic analysis of the data, contextual inquiry and series of interviews that were conducted of the participants.

Devices used in exploring or watching YouTube Videos

Our findings established the fact that all our participants explored or used YouTube on more than one device. All participants have YouTube applications on their phones which made it easier for them to have access to YouTube videos. Many also have either laptops or tablets apart from their handphones which they also use consistently in YouTube related activities. According to the findings, we can categorically say that all the participants had at least 2-3 devices from which they watched YouTube videos.

One of our participants said she uses 3 devices *'I have laptop, tablet, and an iPhone which I use, but mostly I use my iPhone because it is always in my possession: on the train, in the car etc. but anytime I'm home or in the office, I use laptop because of the bigger screen and moreover, it is more comfortable compare to phone viewing.*

Another participant said *'I use my phone and laptop to browse YouTube but more of phone browsing to laptop because I'm most of the time on the move*.

Talking on devices, *I actually use 3 devices, I make use of my phone, laptop and I also watch YouTube videos on my tv set, said a participant. He also added that ' I often use laptop when I'm in the office for more serious work or at home when other are watching tv, and I use my phone for quick check and you, something, it's just easier and more convenient to use mobile phones because it is easily accessible or something…, or when I'm on the move and tv for musical video at home for relaxation'*.

The choice of the kind of device to use is predicated upon what the participants want to do, accessible to the devices, the environment, and the purpose.

This was attested to by many of the participants, one of whom said, *'I use my phone more consistently to browse YouTube videos because it's always within the proximity where I can easily access it'.* Another said *'I guess it is more convenient for me to browse with my phone especially when I'm in public places such as inside buses, trains, parks, beaches etc.*

Most watched YouTube videos.

From our data and the responses from our participants, we were able to identify the most watched YouTube videos by the participants. The most watched YouTube videos by the participants are divided into two main categories which are education i.e, educational/instructional oriented videos and entertainment-oriented videos. We regard educational/instructional videos as those videos geared towards a profession or course of study such as videos on branding, videos specific courses i.e., networking etc. while entertainment videos are those videos that are meant for entertainment purposes such as musical videos, comedy videos, football video etc.

From our findings we discovered that our participants watched more educational/instructional YouTube videos to entertainment videos.

One of the participants said,

"I watch mostly educational videos, and sometimes, at my leisure hour I watch entertainment video skits like comic videos', however, the educational videos I watch outweigh the entertainment videos.

The participants also added that he also watches movies on YouTube.

Another participant said, 'because I see YouTube as an integral part of my handy information resources, mostly search and watch videos on branding just to generate and know different ways of doing things and to keep myself abreast of the trends in my field, and I do watch musical videos and movies also. If I'm to categorise the videos I watch in line with purpose or aims, educational videos would come, followed by entertainment be it musical videos, then some random videos also said one of our participants.
I like to watch instructional videos, one participant said.

One participant also said that *"I watch mostly technical videos, for example programming languages, practices of programming languages, productive videos, if i want to learn something i search it on YouTube ".*

Another participant said '*he mostly watches 'music channels, new song releases, news, science videos, tutorials for learning, diets, formula one videos, Dj stuffs, cars.* Another participant said mostly watches Science/Engineering videos, comedy sketches, News. Another one said "*I usually watch travel vlogs because I am into travelling. I do watch various tutorials, music videos and also sometimes I watch news and documentaries too".*

Method of saving videos and the most saved videos

Here, we were able to establish the method mostly adopted by the participants in saving YouTube videos and the kind of videos commonly saved.A significant number of the participants said they often saved videos relating to their fields or instructional/educational videos, and sometimes musical videos on either their playlists or watch later lists.

One participant said *'I save video on branding and musical videos more often, sometimes I even download some of these videos or add videos to either my playlist or watch-later list.*

Another participant said *'Yeap, I save videos, I save videos on my playlist folder on YouTube itself, videos on my job or on my information that I think are worth saving. I rarely save musical videos or movies; I prefer to just watch them online*'. Many attested to the fact that they do either add videos to their playlist /watch-later list or in some cases download videos.

"I saved it to my playlist," said one of the participants. *'I add preferred videos to my watch later list or create another list which I can add them to, ' said* many of the participants.

I normally create playlists where I save the videos, said another participant.*I save to either a watch-later list or playlis*t *or add to the queue.*

Method re-finding videos on YouTube

Most of the participants save YouTube videos more often in order to have easy access to such videos. In re-finding saved videos, most of the participants agreed that they either go to their playlist, watch later list or historylist to in order to retrieve or re-find videos.

"I re-find videos that I didn't save through the history list or by searching for it again," said a participant. *If I have adequate knowledge of where I saved the specific video I'm looking*

for, better for me, but oftentimes, I save videos on my playlist or watch later list, said a participant.
In the folder where I think i can find it or play list, watch later list or even history list if it hasn't been long i viewed the video said another participant.
Another participant said, "*I normally go to the playlists or watch later lists".*

Sometimes, I download videos on my devices, so I find YouTube videos in my downloading folder on my devices, watch later list/play list or history list said another participant.

Mostly the history if the history is far down then i search it again".
One participant said "I *usually search videos in History, here's a video on Sports News that I watched the other day and now if I want to watch it again, I will just go to the History list and see. Yeah, here, I found it again. It's quick because I just watched it yesterday".*
Another one said, *"From my liked videos, or searching its description".*

According to one of them, she said, *'my first point of contact is my playlist or watch later list'.* Another said. *'If I remembered saving it, I would go straight to either my playlist or watch later list depending on where I saved it or start searching again and if I'm lucky, I might find it on my home page*'.
Another participant responded that playlist is the deal, or he starts searching afresh. *'Playlist, watch later list, history list or even download list because I download sometimes, said another participant'*.

Motivation for watching YouTube videos.

From our findings, we were able to establish that the motivation for watching YouTube videos, for saving or keeping YouTubes videos, and for refinding YouTube videos are almost the same.
According to an interviewee "If it has re-watch-ability (entertaining).

My motivation for watching YouTube videos is to upgrade my skill set in my field and to get inspiration as a brand manager, one participant said.

For me, it is the same motivation for watching YouTube in the first place, increasing my technical know-how of programming language or for entertainment purposes, says another participant.

I watch YouTube videos for either educational or entertainment purposes- a participant said

To acquire new knowledge and for entertainment, another participant.

For me, the search for information leads me to YouTube and the exploration of videos., and also entertainment is another major motivating factor, said another participant.
"My motivation for searching or re-finding is purely for educational purposes and musical videos or movies just for entertainment purposes," said another participant.

Motivation behind re-finding and saving videos on YouTube.

Motivation here is seen as a factor influencing humans' participation in and commitment to achieving the prescribed results (Halepota, 2005). This factor helps influence human activities resulting in higher productivity. According to our findings, the motivating factor behind the saving and refinding of YouTube videos by most of our participants was the perceived usefulness of the videos for either educational or entertainment purposes.

Majority of the participants acknowledged that they keep videos based on the information content of the videos, perceived usefulness of the video to their information need and the tendency that the videos could be useful in the nearest future by them in line with their profession or course of study. The goal of storing information is for the individual to be able to re-access and utilise the information if it is needed later (Bruce et al., 2004).

One said "Well, I save videos when I find it interesting and informative.
"I keep videos that I envisage could be useful in no distant time" said one participant.
Another participant said, *"I keep videos for easy accessibility and for studying, especially educational videos."*

I rarely save musical videos, but I do save videos related to my work or ICT related videos just for knowledge acquisition purposes, said one participant.
If I need to know something or upgrade my technical know-how, I go on refinding videos, said another participant.
Another one said "*my motivation behind saving videos is if I found the videos very useful.*
One of the participants said, *'The motivation behind re-find or saving videos is because it's easier for me to listen to the music that I enjoy, so I saved them'.*
"I keep videos whenever I find very useful videos and I keep videos so as to go back to them later in the future" said one of the participants. I *re-find videos when there is a need for me to retrieve some information from it,* the last participant added.

Difference users´ experiences while using YouTube on different devices.

One of the participants replied when asked if there is any major difference along the device, she uses in watching YouTube videos*, "it's more relaxing on TV, the screen side is the same with laptop compared to phone screen, so for me, it's pretty much the screen size.*
With my phone, I can stream videos anywhere because it is more handy and more comfortable, said another participant.,
It is more convenient to use a phone anywhere compared to a laptop or other devices for me, said one participant.
There are some functions or features that are not captured or hidden in the phone YouTube application on phones compared to the website which I believe is one of the major differences, said another participant.

Problem associated with keeping and re-finding videos on YouTube.

A good number of the participants acknowledge the fact that they sometimes forgot they had saved or added some videos to their playlist or watch later list. which could be disheartening at times considering the rigour they went through just to retrieve or re-find such videos. Memory issues made it difficult for participants in studies done by Jones et al. (2005) as part of the Keeping Found Things Found study to relocate all of their crucial documents again (Elsweiler et al., 2007).

One participant lamented that and said *'it is so frustrating to have spent good minutes looking for a video that one could have gotten easily within a few seconds in my playlist/watch later list.*

Another said, *"A couple of times, I have gone through difficulty of searching for some videos that I already have in my list, so disheartening at times."*

Many of the participants attested to this problem as a major one they face often in retrieving or re-finding videos on YouTube.

One of the participants said, *"No, I don't find any difficulties, but one thing bothers me and that is, when I save any video to the playlist, it automatically gets saved to the last default playlist*.

Another participant said saving to Watch Later is pretty straight forward.

One of the participants said, *'when I'm saving a new video from my phone it is automatically saved to the last used playlist*.

Another participant said "sometimes, *it is difficult to find a specific video if I can't remember the title of that video. It happens mostly when I look for videos that I have watched a long time ago. So, it's hard to relocate it within the large history list.* And also, there is no search filtering function that can ease search in the watch later list, *which means searching with keywords or other parameters is not possible. So, it's tough when you can't search for it".*

Feature to make it easier to save and retrieve videos on YouTube.

I believe a playlist/history list with advanced search function would greatly ease refinding of YouTube videos said one of the participants.

Another one said *"I would consider adding other playlists for different topics and interests besides the Watch Later playlist that already exists there. For example, if there is already a playlist called music videos, then I will be able to just easily save my preferred music to that playlist. Right. I think it would be less time consuming to save than the regular playlist that we create"*.

One of the participants said, *'the videos he has watched don't globally synced in all the devices into his account, especially when he knows he haven't finished it, does not save where he left off, it starts showing from the beginning on different devices, also in his history feature if he searches the videos, he can't find it even if he knows he have watched it before'.*

Another participant said, *"it could be difficult at times to find specific videos within a large history list. So, I think it would be a bit easier if there are options to you know to filter out the videos in the Watch History, I mean filtering functionality* or something which *I believe would be helpful in re-finding videos quickly".* One of the participants said, *'i would prefer something like a netflix feature "continue watching" so that when I couldn't finish watching video then it should be in his home page so that I can easily continue watching it from where I stopped and do not t need to re-find it again somewhere else'.*

4.5.3 Project management

Procedural models for project management can be differentiated into plan-driven methods which follow a classical waterfall process and agile methods which follow an iterative, test-driven approach (Thesing et al., 2021, p. 746).

A procedural model organises the methods and tools of project management into project phases or processes in a standardised manner. Procedural models for project management can be roughly divided into (1) plan-driven methods. which follow a classical waterfall process; and agile methods (such as Scrum and Kanban), which follow an iterative, test-driven approach (Thesing et al., 2021, p. 747).

The waterfall approach is known as the traditional or sequential project management methodology which is a linear and structured approach to project management. It follows a process of planning and execution where expected results are communicated relatively clearly by the client at the beginning of the project (Thesing et al., 2021).

This helps the project to be "worked through" in a goal- and plan-oriented manner, it is planned holistically, from kick-off to completion, with work packages, responsibilities, and deadlines (Thesing et al., 2021). The focus here is on implementing the initial plan as precisely as possible. This provides stability and structure, predictable resources, and documented planning (Thesing et al., 2021).

Waterfalls rely heavily on linear and sequential flow, and it does not create room for iteration.

On the other hand, agile project management approach which originated from software development does not focus on comprehensive advanced planning and the linear, exact "execution" of a plan, instead, a project team develops a solution step by step and coordinates respective (Thesing et al., 2021).

Agile approach is a flexible methodology that emphasises iterative and incremental development, collaborative teamwork and most importantly highly user centric.

Interim results are constantly shared with the customer in very short cycles to get feedback. One reason for adopting this method is that the customer or user of the project result specifies general requirements but cannot specify these in detail in early project phases (Wysocki, 2011). On the other hand, the steps required to achieve the objectives may be unclear. The agile approach also defines goals or a vision for the project, but it does so at a relatively low level of detail and with a shorter planning horizon (e.g., two to four weeks) and less commitment (Thesing et al., 2021). Flexibility in the case of change requests is more important than rigid adherence to the initial plan, as expectations regarding the result are concretized during project implementation (Wysocki, 2011).

The project process is not linear in successive phases, as in the classical waterfall process. Rather, multiple iterations may be used to approach the desired result in a test-driven manner. Agile project-management methods provide flexibility in project management, thereby enabling companies to react quickly to changing customer requirements (Wysocki, 2011).

The features especially the iterative – the ability to front and back-, flexibility and user centric -involvement of the users at different phases of the development features of agile management methodology made us to adopt it.

4.5.4 Design framework

A design framework can be said to be a structured approach that helps to define, guide, and coordinate several phases and processes of creating a design. According to Creswell (2003. p.3) a design framework can be adopted to provide guidance about all facets of the study. Also, according to Mishra (2002, p. 493.). A design framework provides a basis for designing instruction and sometimes, it is referred to as philosophy or the theory behind a specific

design (Mishra, 2002). According to Ratnam (2022. p.26 as cited by Batterbee,2020), a design framework helps structure the process, develop new ideas, and foster collaboration.

Furthermore, design framework helps in assessing the general philosophical ideas behind the inquiry and detailed data collection and analysis procedures and situate plans in ideas that are well-grounded in the literature (Creswell, 2003).

In nutshell, a design framework helps provide a set of principles, established guidelines, and best practices to ensure that design projects are planned, executed, and successfully evaluated.

The following are a few from the plethora of design frameworks or methodologies that could be adopted in this research work with their pros and cons after which we present our chosen framework or methodology.

4.5.5 Participatory design

Participatory Design represents a new approach towards computer systems design in which the people destined to use the system play a critical role in the designing it (Schuler & Namioka, 1993).

Originates from Scandinavian software development traditions participation of stakeholders with different areas of expertise. It advocates for collaboration of researchers, developers, workers, and management to produce workable designs for users Iterative prototyping of ideas, and codetermination of technologies and work practices. Participatory design focuses on preserving existing social systems and attempts to manage technology development and rollout in a humanistic fashion.

Participatory Design emphasises the active inclusion, engagement and involvement of individuals that are meant to use the product in the design phases of the product. Leaving out the users is not just undemocratic in nature, it has serious consequences on the usability and ease of use of the end product (Schuler & Namioka, 1993). Diverse participatory design methods adopted from and inspired by Scandinavian participatory design projects have been practiced in North America and elsewhere since the mid-1980s (Gregory, 2003).

Participatory design supports democracy and democratization, values in design, and conflict as a resource in design (Gregory, 2003) It does this entail collaborative partnerships and co-construction of knowledge in analysis and co-construction of changes in social practices

(Gregory, 2003). Participation is essential to social interaction and good design (Schuler & Namioka, 1993; and Gregory, 2003).

According to Gregory (2003. p.62) user participation in design is desirable for several reasons with mixed motivations which are improving the knowledge upon which systems are built; enabling people to develop realistic expectations and reducing resistance to change; and increasing workplace democracy by giving the members of an organization the right to participate in decisions that are likely to affect their work.

Participatory design methods are diverse including but not limited to `design-by-doing,' `mock-up envisionment', future circles, future workshops, organizational games, co-operative prototyping, ethnographic field research, and democratic dialogue (Gregory, 2003. p.63). Participatory design approaches seek to include future users in most parts of the design process, even as co-designers (Gregory, 2003). In summary, participatory design is user driven design methodology.

4.5.6 User innovation Management

User innovation Management (UIM) is a method based on more than 10 years of research of cooperation with users in design processes (Kanstrup & Bertelsen, 2011). User innovation Management is a method used to cooperate with users in the design process. Just like participatory design methodology, user innovation management advocates for heavy inclusion of end-users into the design phases because of the wealth of their experiences. Innovation is driven and grounded in users' needs and values.

Just like participatory design, in user innovation management, end user involvement and input into the design and evaluation of information systems has been recognized as being a critical success factor in the adoption of information systems (Kushniruk & Nøhr, 2016). In order use, it involves actively engaging with users, empowering them to contribute their knowledge, experiences, and perspectives and integrating their inputs into the innovation. User innovation management helps in the process of systematically capturing, evaluating, and leveraging ideas, insights, and feedback from users or customers to drive innovation.

According to Kanstrup & Bertelsen (2011, p.13), user innovation management is about creating and managing spaces to enable users to participate in and contribute towards

innovation at an early stage in the design process. It was assumed by Kanstrup & Bertelsen (2011, p.13) that users are a tremendous treasure of knowledge because they live the practice that the designers aim to design for. User innovation management aims to center innovations around the values, needs and dreams of the users. Users are at the core of user innovation management and therefore, they need to be managed carefully (Kanstrup & Bertelsen, 2011, p.13).

The underlying lesson of user innovation management is that all the processes that a researcher would have engaged in have given valuable results that the researcher wouldn't have come close to without engaging in user innovation (Kanstrup & Bertelsen, 2011).

4.5.7 Interaction Design

According to Löwgren and Stolterman (1998), interaction design entails creating fresh user interfaces and outlining concepts on how artefacts could be used in the future. It is challenging to learn, define, and teach how to create representations of such future interaction since the design object is so ethereal and illusive. Conceptualising working settings and having empathy for users are key points made by Reimann (2008) and Saffer (2006). Löwgren (2002) says that the "only way to learn such conditions, to comprehend the linkages between design choices and resulting use, is still largely by practice and apprenticeship" and that interaction design is about "building conditions for good use of digital designs" (Ramberg et al., 2013).

Often, the goal of interaction design is to make it easier for people to engage with artefacts or with one other through artefacts. The focus on "behaviour, function, and information", distinguishes the field of interface design. Some descriptions of interaction design highlight that it should be as independent of a specific implementation as possible while still focusing on interactions and behaviours, for example (Benyon 2010). Dan Saffer (2007) makes a similar argument, saying that interface design should be "technologically agnostic" and that it is concerned with the behaviour of products and services as well as how they function (Karlgren et al., 2016).

4.5.8 Selection a design framework

Out of the plethora of design frameworks, we decided to adopt interactive design methods using design thinking phases. The reason for the adoption of interactive design method is more entrenched in Human computer interaction and in the field of information studies, and also, we aim at coming up with a design that based on the understanding of the capabilities and desires of the people while design thinking theory will give us nonlinear and iteration feature needed to come up with user centric design.

Also, all aforementioned design methodologies are suitable design frameworks and could easily be adopted in this research work because they all promote and focus more on the involvement of the end-users, their opinions and understandings which could be adopted by the designers in fostering development and designing of products and services. End-users' involvement in participatory and user innovation management often time comes in form of feedback, opinion, and comments which the designer can decided to use or not whereas, users' involvement is the driving force in interactive design/design thinking approach start with the empathy building just to have adequate understanding of the user's predicament, needs and goals. For this reason, we decided to opt for interactive/design thinking methods because it is more geared toward a problem-solving approach that involves empathizing with the users. And also in design thinking, potential users are engaged in hands-on projects that build empathy, promoting a bias toward action, encouraging ideation, and fostering active problem solving (Paracha et al., 2019). Out of the design frameworks, it is only design thinking that begins with the people that one is designing for and ends with new solutions that are tailor-made to suit their needs. Design thinking consists of five phases starting with building a deep understanding and empathy with those that will ultimately be the users of any new social project, service or product that is developed (Lunch & Koningstein, 2017 as cited by Paracha et al., 2019).

5. Design Thinking Theory

According to Jones (1979), design is a process of devising and experiencing a process of rapid learning about something that does not yet exist by exploring the inter-dependencies of problem and solution, the new and the old. In other words, design entails all the coordinated intellectual activities that are geared together to proffer a solution or come up with invention or innovation. Simply put, designing is a process of creation – creation of a new thing or modification of a thing that has already been in existence.

In the words of Nelson (2014) “Every design process is a process of inquiry, and every inquiry is unique. Design inquiry is, therefore, a process that begins with unlearning old answers and starting with a new mind or beginner’s mind open to new learning, exciting new possibilities, and rewarding new insights — in other words, starting with a letting go” (Nelson, 2014)

While thinking on the other hand is the reasoning processes that allow the human cognitive system to go beyond the information readily available in the environment (Markman & Gentner, 2001).

Thinking can also be said to be a series of mental processes of considering, reasoning and reflecting on a thing, information, ideas, concepts etc with the sole aim of having solid comprehension which could lead to other series of events or actions. Cognitive aspects of thinking such as perception, attention, memory help to analyze and synthesize information and come to conclusions or make decisions. Thinking can be conscious and unconscious, deliberate, or automatic.

The coming together of design and thinking to form a concept first appeared prominently in a book authored by Peter Rowe (1987), a professor of architecture and urban planning at Harvard’s School of Design (Liedtka, 2018). However, the emergence of design thinking as a concept to prominence can be traced back to an innovation consulting firm IDEO and its leadership, founder David Kelley (Kelley & Littman, 2001; 2005, Liedtka, 2018). Design thinking popularity soars with the publication of his book titled "The Art of Innovation".

Design thinking has successfully evaded a singular generally accepted definition, resulting in a plethora of definitions to capture design thinking as a concept. Several authors, professionals and individuals in the design industry have come up with what they believe best captures or explains the concept from their perspective.

Luchs (2015), said design thinking can be construed as a creative problem-solving approach—or, more completely, as a systematic and collaborative approach for identifying and creatively solving problems. He also argued that design thinking is a framework that helps to guide designers in coming up with a solid innovation targeted toward or built with the end user in mind.

Seidel & Fixson (forthcoming,2013) see design thinking as "the application of design methods by multi-disciplinary teams to a broad range of innovation challenges. Another definition that best captured the concept is that of Cooper.

Cooper et al., (2009) said design thinking is "a human-centered innovation process that emphasizes observation, collaboration, fast learning, visualization of ideas, rapid concept prototyping, and concurrent business analysis.

Design Thinking (DT) is a process that foresees steps to allow participants to analyze, synthesize, diverge, and generate insights from different domains through drawing, prototyping and storytelling (Brown, 2009 as cited Paracha et al.,2019). It is an approach to learning that focuses on developing people's creative confidence (Goldman et al., 2009). Potential users are engaged in hands-on projects that build empathy, promoting a bias toward action, encouraging ideation, and fostering active problem solving. Using one's imagination is central in design thinking; it begins with the people that one is designing for and ends with new solutions that are tailor-made to suit their needs (Paracha et al., 2019). Design thinking consists of three phases starting with building a deep understanding and empathy with those that will ultimately be the users of any new social project, service or product that is developed (Lunch & Koningstein, 2017 as cited Paracha et al.,2019).

Design thinking can also be seen as an approach that helps to tap into capacities that is already in existence but are overlooked by more conventional problem-solving practices (Brown & Wyatt, 2010)

Design Thinking is regarded as a system of three overlapping spaces, in which viability refers to the business perspective of DT, desirability reflects the user's perspective, and feasibility encompasses the technology perspective (Chasanidou et al., 2015).

The central idea of design thinking is to come up with an innovation or a product that is user centric.

Luchs, (2015), is of the opinion that design thinking is best applied in situations in which the problem, or opportunity, is not well defined, and/or a breakthrough idea or concept is needed, that is, an idea that has a significant and positive impact, such as creating a new market or enabling significant revenue growth.

Design thinking methods as a system of generating new insight in the business world or improving on an existing product has been deployed successfully in different ways within business including new venture creation, business model design, and process improvement (Luchs, 2015).The application of design thinking approach to the right situations is more likely to lead to better solutions that address the most important customer needs and do so more efficiently than traditional NPD approaches alone (Luchs, 2015).

Reason for this according to Luchs (2015) is that "design thinking helps to avoid the trap of investing too many resources too early in any project work. And also, one of the most powerful features of design thinking is its emphasis on identifying the right problems to solve in the first place".

Design thinking explores and proffers solutions through iteration. Iteration is the going back and forth among design thinking modes thereby limiting the proclivity of making mistakes and at the same time, increasing insight to developing more befitting and user-centric products. Design thinking helps designers to generate possible solutions, come up with simple prototypes and then iterate on these initial solutions—informed by significant external feedback—toward a final solution (Luchs, 2015).

Nonlinear nature of design thinking contradicts the linear process such as traditional Stage-GateTM new product development (NPD) process, in which prototyping is typically done toward the end of the process to reflect the culmination of the development phase and to explore manufacturability, rather than as a mechanism for gaining market feedback (Luchs, 2015).

According to Luchs, (2015), the following are the three modes that form a design thinking framework.

5.1 Discover

Discovery precedes and it is indeed the mother of any innovation. The purpose of the first mode of the design thinking framework is to discover new customer insights which play an important role in inventing a customer tailored product. The Discover mode can be characterized by the development of an expanded understanding.

of the customer—their thoughts, feelings, experiences, and needs. A quest for breakthrough ideas often begins with an open exploration of customer needs—especially latent,

undiscovered needs that may be difficult to articulate—also referred to as customer insights (Luchs, 2015). Ideas and insights are generated through well-intended research about the customers or end users of the intended product.

5.2 Create

According to Luchs (2015) "the purpose of the Create mode of design thinking is to develop a concept or set of concepts that can be shared with the target market for feedback and that, through iteration, can be improved upon. While customers can respond to an idea on its own, the best feedback will result from their engaging with a rough prototype of a concept since a good prototype can provide an experience to respond to and another opportunity for designers to observe actual behaviors. Thus, the two primary activities of the Create mode are idea generation and prototyping. A simple schema to consider might include (a) desirability -from the customer's perspective-, (b) feasibility -the ability to deliver the product-, and (c) viability -the ability for sustained business benefit, either financial or strategic-. It is important, however, to remain focused on the identified customer insights and to avoid filtering ideas too much based on other criteria, since the idea is still nascent at this point and can be improved upon during the next activity, prototyping (Luchs, 2015).

5.3 Evaluate

This mode emphasizes the importance of assessing and measuring the effectiveness, quality, value or even the understanding of the prototype by the users. Here, the designers get feedback on concept prototypes, and the ideas and assumptions embedded within them. It is important to appreciate that the purpose of the feedback is initially as a mechanism to learn more rather than merely to validate (Luchs, 2015).

In a way to better understand design thinking, Stanford University d. school expanded upon the Luchs' three modes into now popular phases of design thinking.

5.4 Empathy

Empathy is the ability of designers to assume the position of users or customers in order to understand and share or have firsthand taste of their feelings, emotions, their understanding of the world and their perspective of reality. It helps designers to connect with their users on a deeper level, feeling their pain, joy etc. which in turn helps the designers to respond in a compassionate and supportive way. This assertion was substantiated by Plattner et al., (2015,

p10.) who said ‘Design thinking is about people and about finding innovative solutions for people based on their needs’ (Plattner et al., 2015).

Glen et al., (p.186, 2015) said, ‘The most powerful means for students to develop empathy is through direct, in person, observation and interviews of the target population in the context of their lives or work’. By observing and interacting with potential users, one can view the physical actions, hear the words and inflections, and experience the challenges or confusions (Glen et al., 2015).

Empathy is done through an interview which entails asking a plethora of questions, active listening, and observation. The essence of this is to foster mutual understanding in order to gain insight which in turn could lead to discoveries that can propel innovation.

There are plethora of ways or methods a designer can adopt to understand the intended end-users of a product and services. The following are some of the ways.

5.4.1 Diary studies

The diary study is a method that has its roots in both psychological and anthropological research. In its simplest form, it consists of a representative sample of subjects recording information about their daily lives for a given period (Gillham, 2005, p.4).

The diary study is a method of understanding participant behaviors and intent.

The psychological diary studies tend to require that participants record the frequency of events in their daily lives which are of interest to the researcher (Gillham, 2005, p.4).

This is highly effective in allowing researchers to understand not merely the events that one can observe in a given time with the participant, but the importance and impact of events to the participant due to the frequency with which they occur in their everyday life (Gillham, 2005, p.4).

The data captured can then be analyzed in a variety of ways depending upon the nature of the data, although most often this will take some form of taxonomy of user behaviors (Brown et al, 2000). Diary studies can take many different forms and have been widely used in such varied domains of application as medicine, education, and architecture, as well as technology use.

5.4.2 Interview

According to Kvale & Brinkmann (2009, p. 1) one of the best ways to know how people understand their world and their lives is by talking to them. Conversation is a basic mode of human interaction. Human beings talk with each other; they interact, pose questions, and answer questions. Through conversations we get to know other people and learn about their experiences, feelings, attitudes, and the world they live in. In an interview conversation, the researcher asks about, and listens to, what people themselves tell about their lived world. The interviewer listens to their dreams, fears, and hopes; hears their views and opinions in their own words; and learns about their school and work situation and family and social life.

A qualitative research interview attempts to understand the world from the participants' points of view, to unfold the meaning of their experiences, to uncover their lived world prior to scientific explanations (Kvale & Brinkmann, 2009, p. 1).

A research interview can come in the form of structured or unstructured/semi-structured interview. The choice of interview to be adopted is dependent on the kind of research to be carried out either quantitative or qualitative research.

According to Bryman (2016b, p.466), qualitative interviewing tends to be less structured than interviewing in quantitative research. In quantitative research, the interview is structured to maximize the reliability and validity of measurement of the key concepts because the research has a clearly specified set of research questions to be investigated. The structured interview is designed to answer these questions while in qualitative interviewing, initial research ideas are more open-ended and there is an emphasis on interviewees' own perspectives. And also, there is greater interest in the interviewee's point of view which gives insights into what the interviewee sees as relevant and important (Bryman 2016b, p.466).

Interviews can either be one on one interview or focus group interview.

5.4.3 One on one interview

This form of interview is a meeting or conversation that occurs between a researcher and a participant. In this type of an interview, the researcher -who is the interviewer- pose a direct question to the participant -who is the interviewee- who then responds with his/her answer or opinion based on the question asked. The purpose of the interview varies depending on the context, but it is also generally used to learn more about the participant's background, skills,

experience etc. this form of interview can be conducted in person, over the phone or even through video conferencing.

5.4.4 Focus group interview

The focus group is a form of group interview in which there are several participants (in addition to the moderator/facilitator); there is an emphasis in the questioning on a fairly tightly defined topic, and the accent is upon interaction within the group and the join construction of meaning, and as such, the focus group contains elements of two methods; the group interview in which the interviewees are selected because they are known to have been involved in a particular situation and are asked about that involvement (Bryman 2016b,p.500).

Kvale & Brinkmann (2009, p. 1) itemized what they called seven stages of research interview irrespective of the form the interview takes. The stages are (1) thematizing an interview project, (2) designing. (3) interviewing, (4) transcribing. (5) analyzing, (6) verifying, and (7) reporting. Any form of research interview passes through these stages.

5.4.5 Eye tracking

Eye-tracking is a technique that is often adopted in recording or measuring the eye movement and gaze behaviors of the participants. According to Webb & Renshaw (2008, p.35), understanding how people look, what they look at gives an insight into how they think especially in the area of cognition such as attention. Eye-tracking helps to gather information in real time and to a high level of detail (Webb & Renshaw 2008, p.35). The eye movement recorded by eye tracker is a combination of two main behaviors: fixation, where the eye is relatively still; and second, saccades, where the eye moves rapidly between fixations (Webb & Renshaw 2008, p.35). A specialized equipment such as eye tracking software and hardware is used to analyze eye movements as a participant looks at a particular visual stimulus.

5.5 Selection of empathy tool or methods

The primary objective of selecting a befitting empathy tool for data collection is to facilitate and promote better understanding of the users and their activities. This in turn makes it possible to provide tailored information services to the users.

The cost-effective nature of focus groups and the task of gathering participants together in a location is feasible but could be tasking (Freitas et al., 1998, p. 9). And also, the dairy studies are a longitudinal method (Salazar, 2016), which means that an efficient result can only be obtained in a long-term study (Ratnam, 2022b, p.23). However, we opted for contextual inquiry because of the exploration nature of contextual inquiry and its capacity to observe and interview the participants in their natural habitat as they do real work yielding deep insight into their activities. We also believed that contextual inquiry as an instrument of data collection will give us great possibility of gathering more accurate insight which we could use in developing tailored made recommendations or service.

5.5.1 Define

The define phase is where the researcher uses observations from the empathy phase.
to define the problem the researcher wants to address (Ratnam, 2022b, p.29).

At this stage, there is analysis and synthesis of the information that was collected from the previous stage which is the empathy stage to determine the extent of the problem in a way to proffer solution to the problem.

According to Kolko (2010, p.15) designers, as well as those who research and describe the process of design, continually describe design as a way of organizing complexity of finding clarity in chaos. Define is all about synthesizing data.

Synthesis requires a designer to forge connections between seemingly unrelated issues through a process of selective pruning and visual organization. Because of the vastness of data gathered in even a simple design problem, the quantity of data that must be analyzed is often too large to hold in attentive memory at one time, and so a designer will externalize the data through a process of spatialization (Kolko 2010, p.17,). Synthesis is an abductive sensemaking process. Sensemaking is an action-oriented process that aims to make sense of the world by integrating experiences into understanding the world around us (Kolko 2010, p.17; Ratnam, 2022b, p.30). According to Kolko (2010, p. 17), through induction, the researcher attempts to learn from the data; through deduction, the researcher develops hypotheses or theories and applies them to the world: and through abduction, the researcher attempts to infer what might be. In abductive research, the researcher is not trying to find the truth but the best explanation (Kolko 2010, p.17; Ratnam, 2022b, p.30). There is plethora of

tools that could make synthesizing of data at this stage seamlessly. These tools help the designer gain a strong mental model of the design space; the externalization of the research data allows for a progressive escape from the mess of content that has been gathered (Kolko 2010, p.17). These tools are the following.

5.5.2 User story

A user story describes functionality that will be valuable to either a user or purchaser of a system or software. User story can also be said to be a concise and simple description of a feature or requirement from the perspective of the end-users.

According to Lucassen et al. (2016), User Stories are used in software development
to specify needs from the user's perspective (Ratnam, 2022b, p.33). User stories are part of an agile methodology that helps focus on user requirements (Lucassen et al., 2016). They streamline the requirements definition process by focusing on the business needs rather than the solution to those needs (Lucassen et al., 2016).

User stories are composed of three aspects according to Cohn (2004, p.4).

- a written description of the story used for planning and as a reminder.
- conversations about the story that serve to flesh out the details of the story.
- tests that convey and document details and that can be used to determine when a story is complete.

5.5.3 Personas

Personas are descriptive models of potential users that represent their behaviours, motivations, needs, goals, and tasks. Persona is a technique for enhancing user understanding and improving the user-centred design of digital products. Personas are effective instruments used for focusing on core users in the absence of an immediate contact with the end-user (Floyd et al., 2008; Jansen et al., 2021).

It helps crystallise a specific user type into a profile that can be read and understood even by people that otherwise lack the interest or skills for user analytics (Jansen et al., 2021).

The generic benefit of personas arises from summarising user information into an intuitive representation that can be communicated with little effort within organisations, teams,

departments, and external stakeholders (Holtzblatt et al., 2005; Matthews et al., 2012, and Jansen et al., 2021).

In theory, personas provide an engaging description of the users' needs and wants in the form of another human being that is more memorable than numbers (Jansen et al., 202, p.1). At their best, personas become shared mental models that stakeholders rely upon when making decisions that concern a specific user type (Cooper, 2004). Personas give a human context for decision-makers to discuss experiences and backgrounds different from their own (Miaskiewicz & Kozar, 2011). Since Cooper's seminal work, personas have been employed by designers and software developers, and have disseminated to other domains, such as marketing, cybersecurity, health informatics, and video game studies (Jansen et al., 202, p.1). According to Laubheimer (2020, as cited by Ratnam, 2022b, p.31), there are three personas for different purposes: proto-personas, qualitative personas, and statistical personas.

Qualitative personas

According to Laubheimer (2020, as cited by Ratnam, 2022b, p.31), qualitative personas are ideal for developing personas by conducting exploratory qualitative research with a small to medium sample size and segmenting people based on shared attitudes, goals, pain points, and expectations. Qualitative personas are accurate and provide critical insights into users' motivations, expectations, and desires that are difficult to glean from analytics data, demographic information, or assumptions alone (Laubheimer, 2020). It also means that they are a time-consuming process.

Statistical Personas

According to Laubheimer (2020, as cited by Ratnam, 2022b, p.31), statistical personas are the most time-consuming method of persona creation. It involves collecting data from a large sample of the user base via a survey and then performing statistical analysis to identify clusters of similar results. This persona form requires some exploratory qualitative research to determine which survey questions should be included (Laubheimer, 2020). Creating statistical personas requires a mix of qualitative and quantitative research methods.

5.6 Selection of tools and method

Here, we opted for qualitative personas because it offers insights into the motivations and expectations of the participants based on their pains and goals. And also, it is not time consuming compared to statistical personas. In order to capture the expectations and goals of all the participants, we developed three qualitative personas (Appendix 1,2,3).

5.6.1 Ideate

Ideating is an act of brooding upon the problem and analyzing data gathered during interviews, observation and so on in order to come up with ideas and possible solutions. ideating is an idea generating technique.

Glen et al., (p.188, 2015) substantiated this assertion when they said 'Brainstorming is both a specific idea generation technique that has been around for some time, as well as a broad category of techniques for generating new ideas, patterns, interpretations, solutions, and opportunities. One of the keys to successful brainstorming is to pose a stimulus question to frame the process. The stimulus question from the visualizing and sense making phase may be the "job to be done" statement, or the needs of the "character profile." A simple device called HMW, or "How might we...", can help kick off the idea generation (Bootcamp Bootleg, 2010). For example, "HMW keeps babies warm to reach the hospital", or "HMW makes the job of grocery shopping something to look forward to" (Glen et al., 2015).

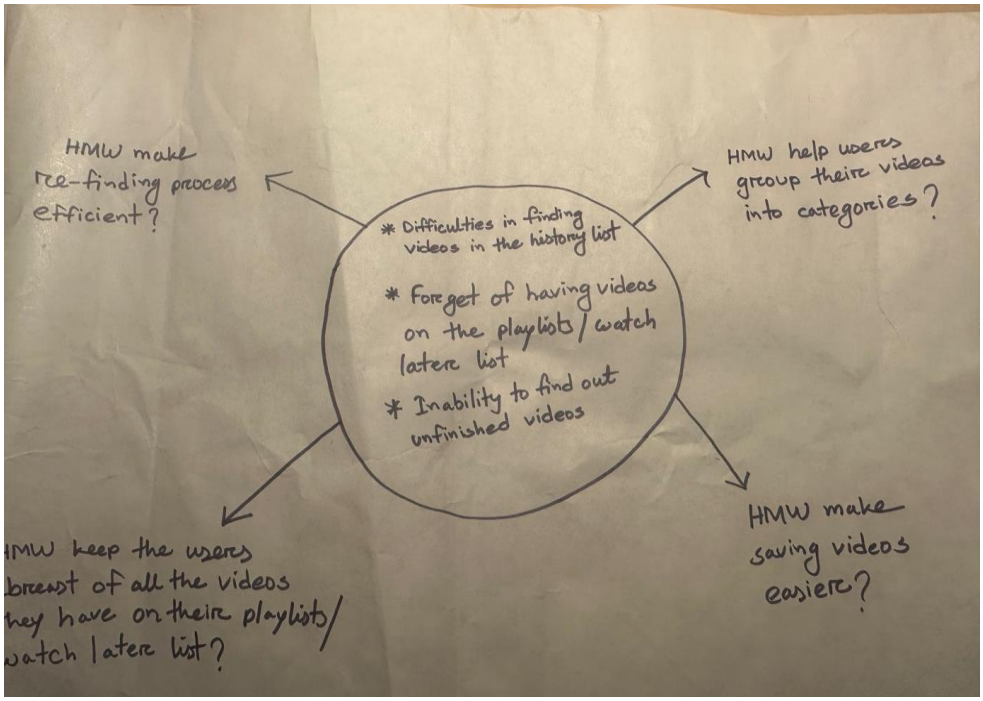

Figure 1: Sketch of HMW

Mind mapping

A Mind Map diagram represents words, tasks, items, or concepts linked to and arranged within a central idea using a non-linear graphical layout. It allows the designer to structure an intuitive framework. In a mind map, a designer can check all the relevant issues and how they are connected. It aims to solve different arising problems and quickly obtains a general idea of the whole situation and its aspects coming up from the solution (Mueller et al., 2002).
Some of the benefits of mind mapping are;

- This practical tool enhances productivity and creative thinking to become more efficient in managing mind concepts.
- The tool lets us identify relationships, and generates more ideas among different information and data, and effectively improves retention and memory.
- The method is excellent for organising and categorising the ideas that you brainstorm and identify in relationships.
- The use of images, colours, and keywords in mind map further enhances the attractiveness and memory related to the ideas.
- It provides an excellent and different manner to sort ideas and thoughts.

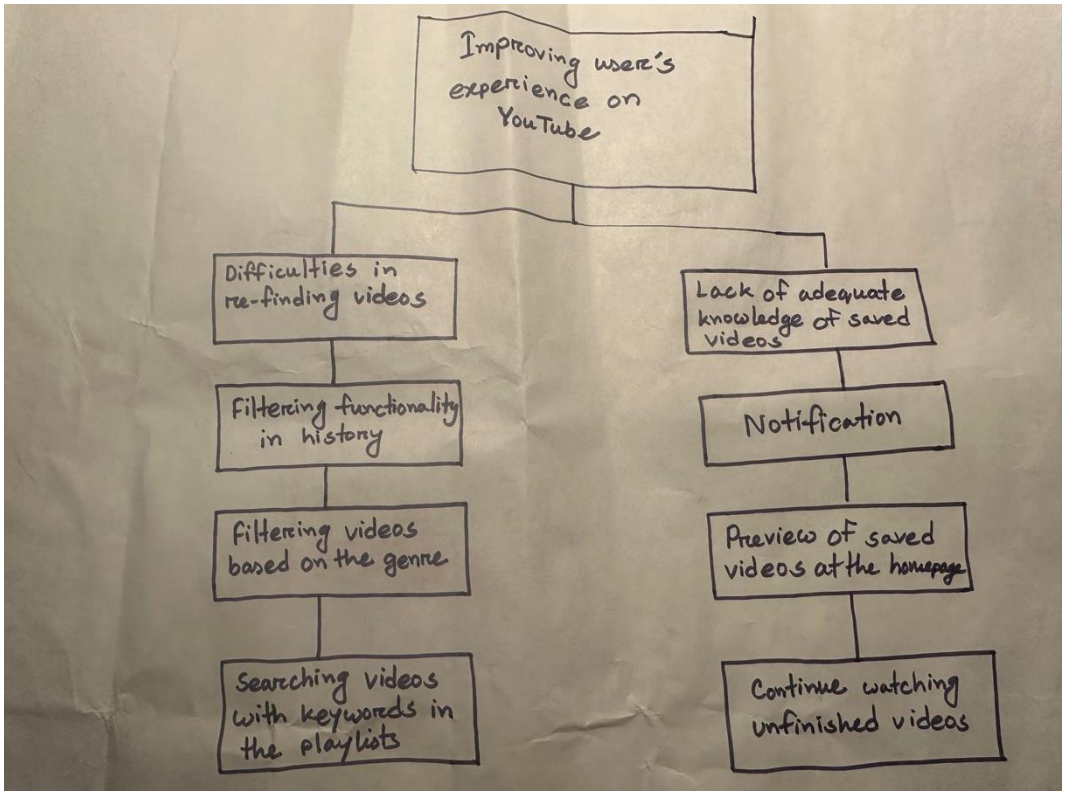

Figure 2: Sketch of Mind map.

5.6.2 Prototype

A prototype is one manifestation of a design that allows stakeholders to interact with it and to explore its suitability (Rogers et al., 2023, p3).

"Prototypes" are representations of a design made before final artifacts exist. They are created to inform both the design process and design decisions. They range from sketches and different kinds of models at various levels — "looks like," "behaves like," "works like" — to explore and communicate propositions about the design and its context (Buchenau & Suri, 2000, p.1). Prototyping is a key activity within the design of interactive systems. It is limited in that a prototype will usually emphasize one set of product characteristics and de-emphasize others.

Prototype is any kind of representation, in any medium, that is designed to understand, explore or communicate what it might be like to engage with the product, space or system we are designing (Buchenau & Suri, 2000, p.1). In fact, a prototype can be anything from a

paper-based storyboard to a complex piece of software, and from a cardboard mockup to a molded or pressed piece of metal.

Prototypes are useful when discussing or evaluating ideas with stakeholders according to Rogers et al., (2023, p.4); they are a communication device among team members and an effective way for designers to explore design ideas (Rogers et al., 2023). Prototypes answer questions and support designers in choosing between alternatives.

Prototypes are highly useful in helping to test the technical feasibility of an idea, to clarify some vague requirements, to do some user testing and evaluation, or to check that a certain design direction is compatible with the rest of product development (Rogers et al., 2023). The purpose of a prototype will influence the kind of prototype that is appropriate to build. So, for example, to clarify how users might perform a set of tasks and whether the proposed design would support them in doing this, a paper-based mockup might be produced (Rogers et al., 2023).

In design thinking, prototyping is an act of generating an iterative and throwaway model with the minimum fidelity needed to gain critical feedback from the end user of a product (Glen et al., 2015).

Having a lot of quick prototypes and frequent tests can facilitate a better solution and save endless hours of discussion about a product's success or failure. One method that has proven useful is to create a simple storyboard with a brief presentation (Glen et al., 2015).

Through prototyping, the design thinking process seeks to uncover unforeseen implementation challenges and unintended consequences in order to have more reliable long-term success (Brown & Wyatt, 2010).

According to Buchenau & Suri (2000, p.) who identified the three different kinds of activities within the design and development process which make Experience Prototyping valuable which are:

- Understanding existing user experiences and context
- Exploring and evaluating design ideas
- Communicating ideas to an audience

Experience Prototyping here is applied to demonstrate context and to identify issues and design opportunities (Rogers et al., 2023). One way to explore this is through direct experience of systems — the prototyping goal is to achieve a high-fidelity simulation of an existing experience which can't be experienced directly because it is unsafe, unavailable, too expensive, etc (Buchenau & Suri, 2000, p.2).

Prototyping can either be low fidelity prototyping and high-fidelity prototyping Rogers et al., (2023).

Low-Fidelity Prototyping

A low-fidelity prototype does not look very much like the final product, nor does it provide the same functionality such as paper and cardboard rather than electronic screens and metal, it may perform only a limited set of functions, or it may only represent the functions and not perform any of them.

Low-fidelity prototypes are useful because they tend to be simple, cheap, and quick to produce. This also means that they are simple, cheap, and quick to modify so that they support the exploration of alternative designs and ideas.

This is particularly important in the early stages of development, during conceptual design for example, because prototypes that are used for exploring ideas should be flexible and encourage exploration and modification. Low-fidelity prototypes are not meant to be kept and integrated into the final product. Low-fidelity prototyping has other uses, for example in education.

Storyboard

A storyboard consists of a series of sketches showing how a user might progress through a task using the product under development. It can be a series of screen sketches or a series of scenes showing how a user can perform a task using an interactive device.

When used in conjunction with a scenario, the storyboard provides more detail and offers stakeholders a chance to role-play with a prototype, interacting with it by stepping through the scenario.

A storyboard represents a sequence of actions or events that the user and the product go through to achieve a goal.

A storyboard can be generated from a scenario by breaking the scenario into a series of steps that focus on interaction and creating one scene in the storyboard for each step.

Sketching

Low-fidelity prototyping often relies on hand-drawn sketches.

Many people find it difficult to engage in sketching because they are inhibited by the quality of their drawing.

Index Cards

Card-based prototypes are commonly used to capture and explore elements of an interaction, such as dialog exchanges between the user and the product. The value of this kind of prototype lies in the fact that the interaction elements can be manipulated and moved around in order to simulate interaction with a user or to explore the user's end-to-end experience.

Prototyping with Index Cards Using index cards (small pieces of cardboard about 3 × 5 inches) is a successful and simple way to prototype an interaction, and it is used for developing a range of interactive products including websites and smartphone apps. Each card represents one element of the interaction, perhaps a screen or just an icon, menu, or dialog exchange. In user evaluations, the user can step through the cards, pretending to perform the task while interacting with the cards.

High-Fidelity Prototyping

A high-fidelity prototype looks more like the final product and usually provides more functionality than a low-fidelity prototype.

High-fidelity prototypes can be developed by modifying and integrating existing components—both hardware and software—which are widely available through various developer kits and open-source software, for example.

Selection of the kind of prototyping

No doubt that both high- and low-fidelity prototypes are extremely important and can provide useful feedback during evaluation and design iterations, however, due to the fac that high fidelity prototypes are more resource-intensive to develop, time-consuming to modify and a greater potential of being mistaken for the final product, we decided to go for low fidelity prototype because it is simple, cheap, and quick to produce. This also means that this kind of prototyping is quick to modify and also helps to support the exploration of alternative designs and ideas.

Quick revision is possible with low fidelity prototypes at a very low cost, and also, more time can be spent on improving the design before starting development.

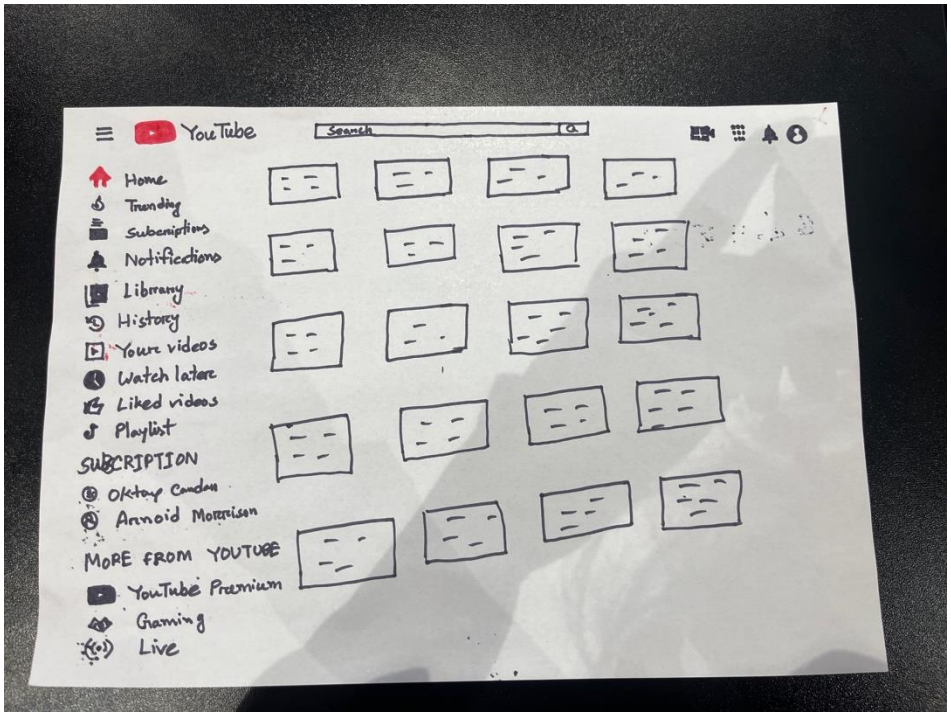

Figure 3: YouTube homepage prototype.

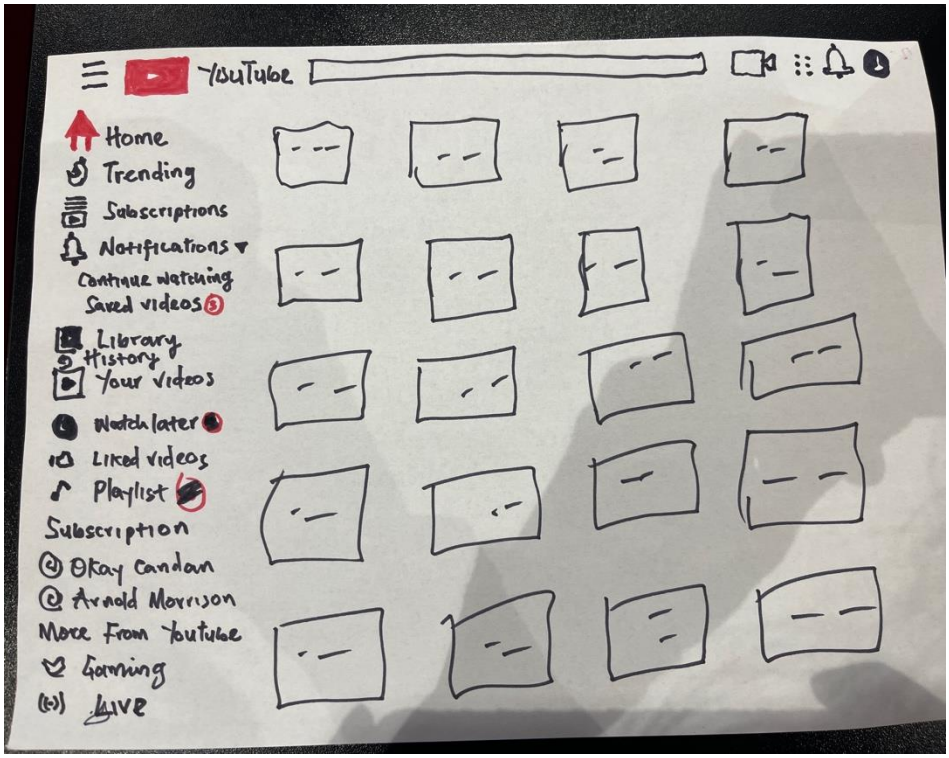

Figure 4: YouTube notification feature prototype.

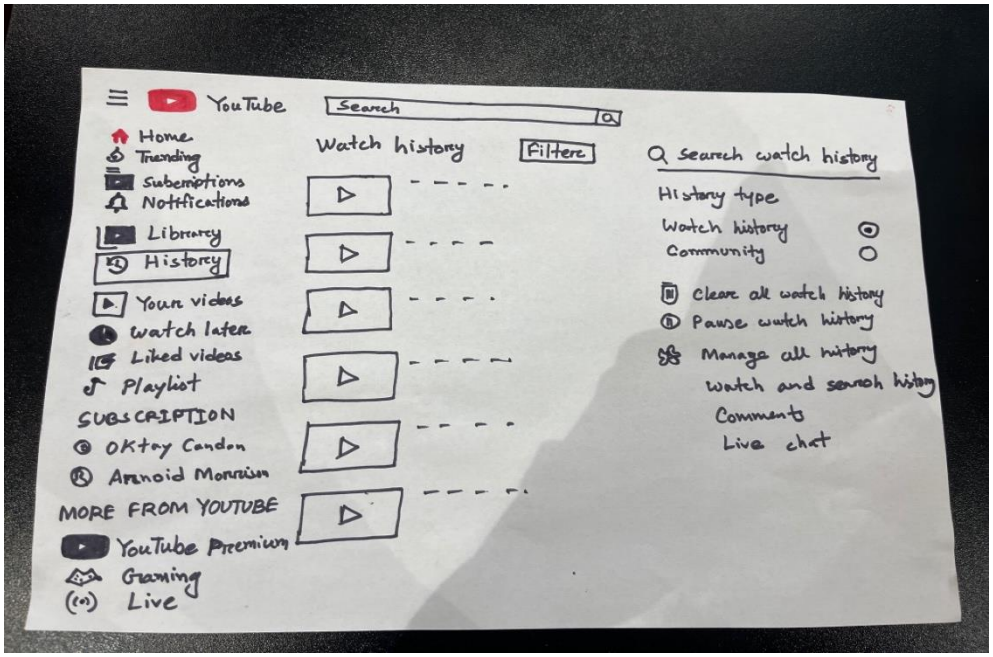

Figure 5: YouTube history list prototype.

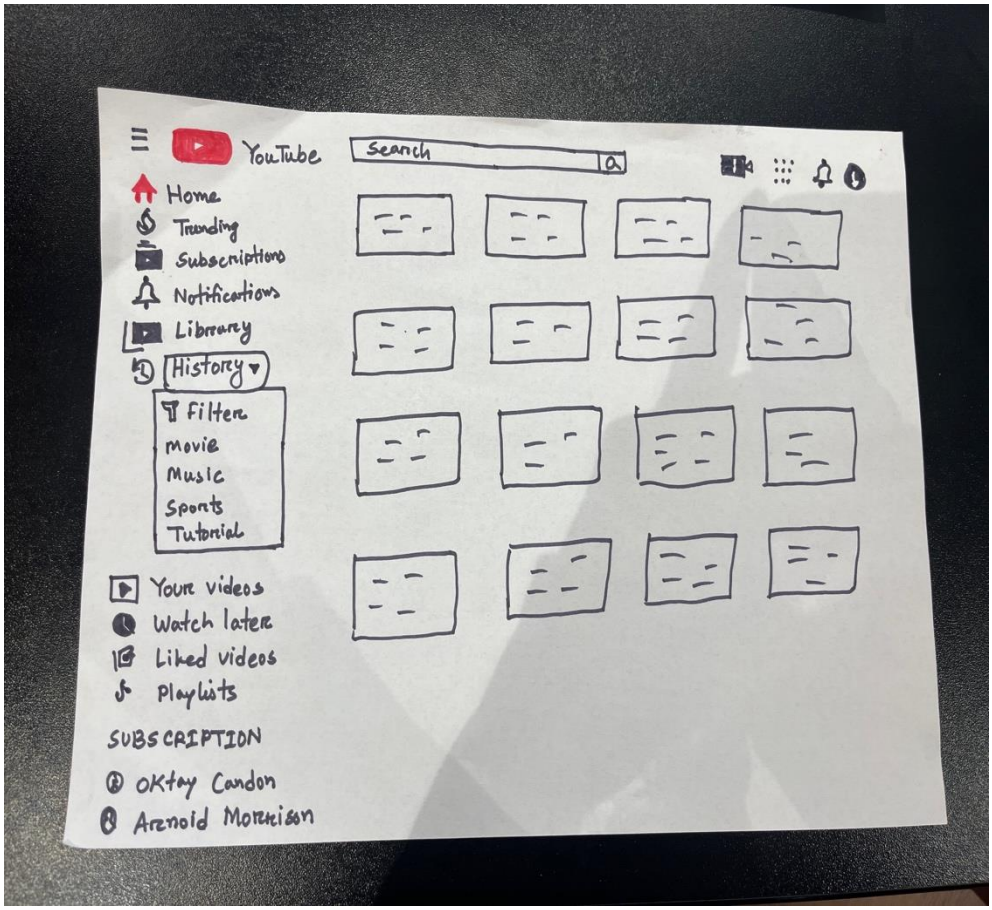

Figure 6: YouTube history list prototype.

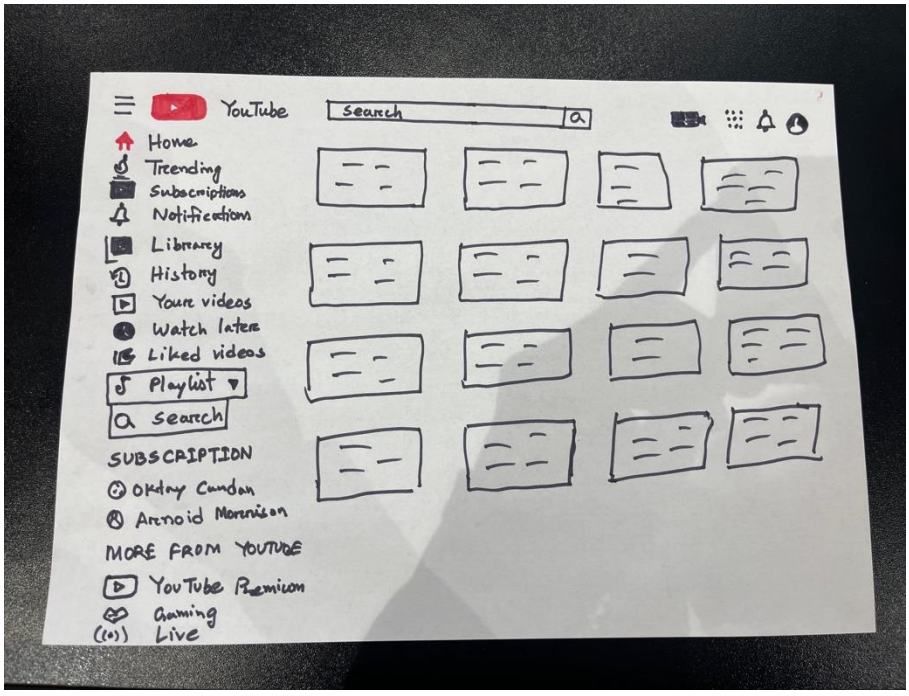

Figure 7: YouTube playlist feature prototype.

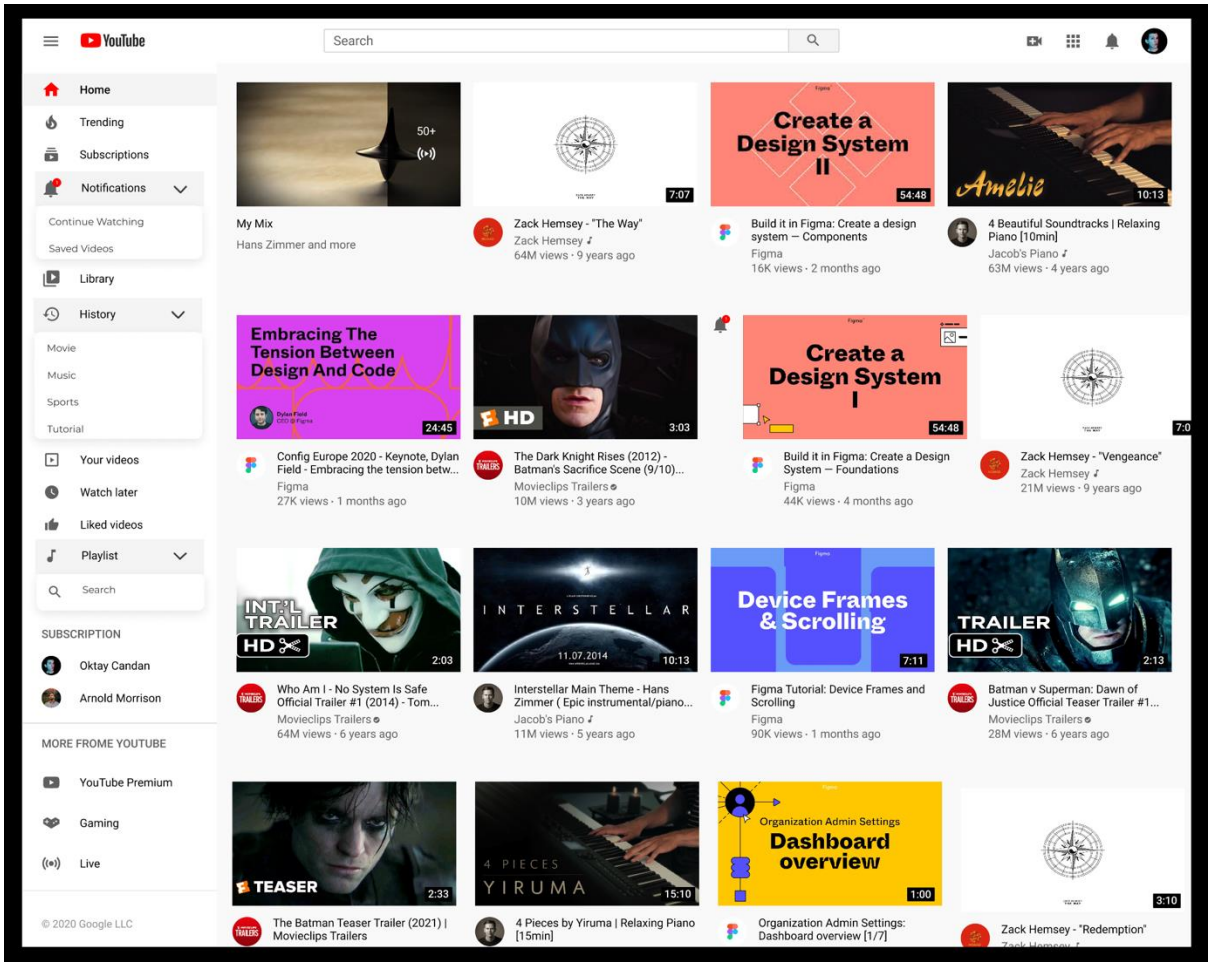

Figure 8: Low-fidelity YouTube homepage prototype on Figma.

5.6.3 Test

Testing is your chance to gather feedback, refine solutions, and continue to learn about your users. The test mode is an iterative mode in which you place low-resolution prototypes in the appropriate context of your user's life. Prototype as if you know you're right, but test as if you know you're wrong (Bootcamp Bootleg, 2010).

Pilot Testing

In an attempt to evaluate our first designed prototype which is a paper prototype, we carried out a pilot testing with one of our participants just to establish if we were able to capture their challenges regarding saving and re-finding YouTube videos and get valuable feedback.

Before the commencement of the test, we reintroduced ourselves to the participant, explained the concept of testing and its procedures, the aims or motivation of the testing session and how long we expected the testing session to last. We also explained in a plain term to the participant what had anticipated him to do. Further, we created an environment and encouraged the participant to be vocal and think aloud as he explored trying to make sense of the prototype.

Moreover, at the very beginning of the test session, one of us gave a detailed explanation to the participant about what a paper prototype is and how the test would be conducted stressing the features of the prototype we want tested and examined. The prototype we designed includes a notification feature for "continue watching" and "saved videos", a filtering functionality for the History list, and a search option within playlists.

The participant was observed at each phase of the test. The participant was asked to explain his expectations at the selection of the new added feature. This is to establish if the participant is actually grasping the purpose and the functionality of the added features of YouTube and what he anticipated to see on display based on the feature he is exploring and juxtapose it with our intention. Without foretelling, the participant was able to recognize the notification feature of the saved videos, related with it by voicing out what he thought it was and the function it performs, according to him *' i believe this is notification for saved videos because of the icon and labelling, and i can click here and see saved videos'* that which was exactly our intention for creating it. The participant was highly pleased with this new notification feature. However, the participant was confused and could not relate well with the continue watching function as we had envisaged. *'I know this continuous watching function, how does it work, he asked'* According to the participant, the function is not self-explanatory. Because of the confusion, we took time to explain to the participants the continuing watching feature and how it works. The participant was highly pleased and was okay with the feature after our explanation on how it works.

Overall, the participants expressed great satisfaction on the possibility of getting notifications on saved YouTube videos. He said the notification is really beneficial to him as it keeps him aware and updated on some saved videos he has not seen. The participant also liked the idea of 'continue watching' feature but said it would be great if it could be more explicit and self-explanatory or improve upon it. The last feature he commented on was the filtering option.

The participant was satisfied with the fact that he was able to search his history and playlist using the new filtering option such as movie, music, sport etc.

Test results

From the feedback we got from the piloting testing, we decided to work more on our paper prototyping by creating a more concrete design on Figma taking into consideration some of the limitations of the paper prototype. In order to test our new design, we conducted another round of tests on three participants. These participants were chosen from our previous total nine participants whom we interviewed. The reason behind choosing these participants is that including participants from different backgrounds, skill levels, and ages can help us gain insights into how the prototype performs across various user profiles.

We received positive feedback from all the participants when asked about their thoughts as they viewed a notification feature on YouTube that reminds them of their saved and unfinished videos. All participants agreed that the notification option for saved videos on the homepage was useful, and that it would make it easier for them to find the saved videos. Another participant, however, suggested having the option to turn off the notification if desired.

Furthermore, when participants were asked about their opinion on the filtering functionality in the History list, one of them seemed confused, as she did not get a clear understanding of how this functionality works in the first place. However, the remaining two participants appreciated the ability to filter out videos according to their categories. One of the participants said, "I really like the idea behind the filtering options in the history list and I think it's great how easy it is to navigate in the sidebar". Lastly, the inclusion of a search function within playlists was received as a thoughtful functionality among the participants. One of the participants stated, “Searching functionality seems convenient, and it can save me time and effort by letting me go straight to the video which I want to watch instead of having to scroll through my entire playlist.” In a nutshell, all the participants noted that the new features appeared to be simple, and that the UI was neat.

6. Discussion

This study is an effort to examine and uncover users' motivation behind their saving and re-finding of YouTube videos, saving strategies and possible challenge(s) in relation to personal information management.
We will now discuss our major findings summary of section.

6.1 Motivation for saving and re-finding YouTube videos.

From our findings, we were able to establish different motivations behind the saving and re-finding of YouTube videos by the participants which is mainly geared towards information seeking/education and entertainment purposes. This assertion is supported by Khan (2017) who in using multiple linear regressions was able to calculate and predict YouTube users' participatory acts based on motives for information seeking, giving information, self-status seeking, social interaction, and relaxing entertainment. He also later found out that information seeking motive proved to be a significant positive predictor for YouTube use.

Previous Uses & gratifications framework studies have also found information seeking (besides entertainment) as a common motive for media use (Katz et al., 1973; McQuail, 2000 as cited by Khan 2017). The information and entertainment motives were also buttressed by Khan (2017, p.8) who, based on the results of his study concluded that a typical YouTube user who has the information-seeking motive is likely to engage in participatory acts such as liking or disliking videos, commenting, saving, and re-finding them.

Connecting our finding to the self-determination theory of Deci & Ryan (2012), which stated that human motivation evolved, based on research, on intrinsic and extrinsic motivation, meaning human motivation and personality in social contexts are differentiated in terms of being autonomous and controlled, we were able to distinguished the form of motivation that propelled each participant group to save and re-find YouTube videos.

Some of our participants who are professionally inclined were motivated by intrinsic factors to save and re-find YouTube videos. Most of them agreed that they saved and refined videos on YouTube based on their professions because they want to be best at what they do and the pleasure they derive from doing what they know how to do best, which is in line with intrinsic motivation factor which stated that intrinsic motivation is when you engage in a behaviour or an activity for the sake of the pleasure and satisfaction derived from participation. This was supported by the statement of one of them who said, '*I save and refind videos on YouTube oftentime based on my profession because I love what I do, and I want to be the best at it'.*

Here, the participants perform or engage in saving and refinding YouTube videos, as an activity for its own sake, pleasure, and satisfaction- rather than from the desire for some external reward.

We found that the second spectrum of participants which were students are motivated by extrinsic factors. They are motivated to save and re-find YouTube videos to complete work tasks or school assignments that they are not necessarily interested in, however, they still engage in it in order to be rewarded with good grades and to pass or be promoted. This is in line with extrinsic motivation which states that individuals are motivated to perform a behaviour or engage in an activity because they want to earn a reward or avoid punishment.
This was confirmed by one of them who said, '*I mostly refind or save videos on school material to study or in preparation for an examination for good grades you know*'. This is a typical form of extrinsic motivation.

We also found out that motivation for saving and re-finding on YouTube for entertainment purposes is purely born out of an intrinsic form of motivation across the user groups. This was established by the majority of the participants in their statements: *'I also sometimes save or refind videos just for entertainment's sake - to laugh and make myself happy.* Another participant said, 'Having a nice time with myself also triggered me into saving or refinding videos on YouTube, especially videos that I have watched before or that someone recommended to me.

6.2 Saving and re-finding of YouTube videos

Personal information management behaviors in real-world contexts have been the subject of several studies. These researchers sought to understand the methods individuals use to save and retrieve information, the factors influencing their decision, and the issues these methods cause (Elsweiler et al. 2007). Studies show that in PIM, users require more efficient methods of saving and retrieving their data due to the significant growth in the amount of personal information that is now available in digital form (Deng & Feng, 2011). In PIM, the question of what personal information to store and how to keep it has a big impact on storage, organisation, and navigation.

Moreover, memory, context, and issues estimating the future worth of information all contribute to the complexity of the primary PIM activities of keeping and finding information (Lush, 2014). There are many diverse forgetting behaviors, as Elsweiler et al. (2007) revealed, and as a result, various techniques are required to support memory lapse (Elsweiler et al. 2007). Our findings indicated that a sizable portion of the participants admitted that they occasionally forgot that they added or saved some videos to their watch later or playlist.

In addition, forgetting behaviors were also associated with tracing unfinished videos among a few participants. Notifying users about certain videos was considered an effective strategy to help them remember to relocate those videos on YouTube since one of the participants showed interest in recessing unfinished videos with reminder functionality. Our prototype design of a notification feature for both saved videos and continued watching incomplete videos was preferred and regarded as a useful reminder by the participants.

According to several studies, people commonly return to previously watched internet content. For instance, a survey by Aula et al. (2005) of experienced web users revealed that while people frequently use search engines rather than history or bookmarking tools to re-find online information, they frequently struggle to recall the search terms they initially used to find the content in question (Morris et al. 2008). Elsweiler et al. (2007) claim that in order to successfully search in a query-based system, a user must be able to recall enough specifics about the data they are trying to find in order to formulate a question. According to our findings from the contextual inquiry, forgetting the precise search word appeared to be a widespread issue among the participants when it came to re-finding videos within the history list.

To recall precisely what information we have seen, where we may have stored an object, or how to find it again, we cannot rely only on our memory. As a result, in order to enable our access to and management of digital information, we are compelled to rely on tools that are specifically designed to search our personal information stores (Elsweiler et al. 2007). During the CI session conducted, one of the participants expressed great interest in the notion of including a filtering functionality in the history list, as it would considerably ease re-finding videos on YouTube. The ability to filter out specific videos based on their categories within the history list was well-received by most of the participants.

Furthermore, numerous factors have an impact on re-finding, according to studies in PIM. As stated by Capra (2005), determining the future value of information, or post-value recall, can aid in information re-finding. Studies highlight how crucial context is for re-finding. Users can more easily recognize content when it is placed in its proper context because they frequently remember the relative position of a sub-document within a larger document (Murthy et al., 2006). Finding information is frequently done via searching. However, one of the challenges our participants encountered while re-finding YouTube videos was the inability to search with keywords in their playlists. The goal of designing a search function in the playlists was to make it easier for users to find videos by minimizing the need for tedious scrolling. Our participants seemed quite satisfied with the search option, which enabled them to quickly retrieve videos.

7. Limitation & Future work

One of the major constraints of the research work is limited literatures of the user's motivation on YouTube in relation to personal information management. This knowledge gap has apparently made it somewhat difficult to have adequate literature review on the topic. A plethora of research has been carried out on users' motivation and engagement on YouTube, twitters, Facebook, and others, However, very few research works have been done on YouTube from the lens of personal information management. This huge knowledge gap posed a tremendous obstacle in this research work as we found ourselves struggling to gather literature that we could have built upon.

A significant set of limitations relate to the size of the research sample. Given that sample size may influence PIM, more diverse populations should be investigated in place of our two-target group's participant pool. For instance, knowledge professionals have greater collections than students, with extensive YouTube usages in daily life and arranging techniques. Further research can interview people from various job categories to explore the patterns in their saving and re-finding behaviors on YouTube. There is limited research and development in the composition of YouTube videos, especially in terms of Personal Information Management (PIM). Due to time constraints, several opportunities to improve and expand the scope of this work have been postponed indefinitely.

More detailed investigations of specific areas of interest and new method ideas will be part of future research. It is recommended that a possible notification or related feature should be added to the homepage of YouTube website to remind the users of saved videos that have not been opened or watched by the users would solve the constant inability of the users to remember saved videos thereby making re-finding of videos much easier.Prototype on Figma is just an interface version of the result of the paper prototype. Implementing a filtering functionality on Figma was a bit challenging. It was difficult to strike a balance between adding new functions and preserving a simple, user-friendly design. Our inability to design a filtering button for the history list on Figma that could have helped users to activate filtering dropdown lists posed a bit of confusion to the participants. The Filtering button needs to be made as simple to use and straightforward as possible to reduce user misunderstanding. It will be interesting to observe if the solution is beneficial or unpleasant to the users, if an interactive or high-fidelity prototype can be introduced to the users.

8. References

Alon, L., & Nachmias, R. (2020). Anxious and frustrated but still competent: Affective aspects of interactions with personal information management. *International Journal of Human-Computer Studies, 144,* 102503. 10.1016/j.ijhcs.2020.102503

Archibald, M. M., Ambagtsheer, R. C., Casey, M. G., & Lawless, M. (2019). Using zoom videoconferencing for qualitative data collection: perceptions and experiences of researchers and participants. *International Journal of Qualitative Methods, 18,* 1609406919874596.

Barreau, D. K. (1995). *Context as a factor in personal information management systems*. Wiley. 10.1002/(sici)1097-4571(199506)46:5<327::aid-asi4>3.0.co;2-c

Bass, J. (2013). A PIM perspective: Leveraging personal information management research in the archiving of personal digital records. *Archivaria*, , 49-76.

Bergman, O., Israeli, T., & Benn, Y. (2021). Why do some people search for their files much more than others? A preliminary study. *Aslib Journal of Information Management, 73*(3), 406-418. 10.1108/AJIM-08-2020-0250

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Brown, T., & Wyatt, J. (2010). Design thinking for social innovation. *Development Outreach, 12*(1), 29-43.

Bruce, H., Jones, W., & Dumais, S. (2004). Keeping and re-finding information on the web: What do people do and what do they need? *Proceedings of the ASIS Annual Meeting; Proc.Am.Soc.Info.Sci.Tech, 41*(1), 129-137. 10.1002/meet.1450410115

Bryman, A. (2012). Social Research Methods 4th Ed Oxford: Oxford University Press.

Bryman, A. (2016a). *Social research methods*. Oxford university press.

Bryman, A. (2016b). *Social research methods*. Oxford university press.

Buchenau, M., & Suri, J. F. (2000). Experience prototyping. Paper presented at the *Proceedings of the 3rd Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques,* 424-433.

Chasanidou, D., Gasparini, A. A., & Lee, E. (2015). Design thinking methods and tools for innovation. Paper presented at the *Design, User Experience, and Usability: Design Discourse: 4th International Conference, DUXU 2015, Held as Part of HCI International 2015, Los Angeles, CA, USA, August 2–7, 2015, Proceedings, Part I,* 12-23.

Cohn, M. (2004). *User stories applied: For agile software development*. Addison-Wesley Professional.

Cooper, A. (2004). The inmates are running the asylum: why high-tech products drive us crazy and how to restore the sanity, revised edn Indianapolis. *IN: Sams Publishing.[Google Scholar],*

Cooper, R., Junginger, S., & Lockwood, T. (2009). Design thinking and design management: A research and practice perspective. *Design Management Review, 20*(2), 46-55.

Creswell, J. W. (2003). A framework for design. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 2003*, 9-11.

Deci, E. L., & Ryan, R. M. (2012). Self-determination theory.

Deng, T., & Feng, L. (2011). A survey on information re-finding techniques. *International Journal of Web Information Systems, 7*(4), 313-332. 10.1108/17440081111187538

Denzin, N. K., & Lincoln, Y. S. (2008). Introduction: The discipline and practice of qualitative research.

Dubovi, I., & Tabak, I. (2021a). Interactions between emotional and cognitive engagement with science on YouTube. *Public Understanding of Science (Bristol, England), 30*(6), 759-776. 10.1177/0963662521990848

Elsweiler, D., Baillie, M., & Ruthven, I. (2008). Exploring memory in email refinding. *ACM Transactions on Information Systems, 26*(4), 1-36. 10.1145/1402256.1402260

Elsweiler, D., & Ruthven, I. (Jul 23, 2007). Towards task-based personal information management evaluations. Paper presented at the 23-30. 10.1145/1277741.1277748 http://dl.acm.org/citation.cfm?id=1277748

Floyd, I. R., Twidale, M. B., & Jones, M. C. (2008). Resolving incommensurable debates: a preliminary identification of persona kinds, attributes, and characteristics. *Artifact: Journal of Design Practice, 2*(1), 12-26.

Gillham, R. (2005). Diary Studies as a Tool for Efficient Cross-Cultural Design. Paper presented at the *Iwips*, 57-65.

Glaser, B. G., & Strauss, A. L. (1967). No title. *The Discovery of Grounded Theory: Strategies for Qualitative Research.,[E-Book] Aldine De Gruyter,*

Glen, R., Suciu, C., Baughn, C. C., & Anson, R. (2015). Teaching design thinking in business schools. *The International Journal of Management Education, 13*(2), 182-192.

Goodman, E., Moed, A., & Kuniavsky, M. (2012). Observing the User Experience. *Elsevier Gezondheidszorg,*

Goldman, S., Carroll, M., & Royalty, A. (2009). Destination, imagination & the fires within: Design thinking in a middle school classroom. Paper presented at the *Proceedings of the Seventh ACM Conference on Creativity and Cognition*, 371-372.

Gregory, J. (2003). Scandinavian approaches to participatory design. *International Journal of Engineering Education, 19*(1), 62-74.

Halepota, H. A. (2005). Motivational theories and their application in construction. *Cost Engineering, 47*(3), 14.

Helweg-Isenberg, E. J.Keeping Tabs: Using Browser Tabs as Self-reminders in Personal Information Management.

Hennink, M., Hutter, I., & Bailey, A. (2020). *Qualitative research methods*. Sage.

Holtzblatt, K., Beringer, J., & Baker, L. (2005). Rapid user centered design techniques: Challenges and solutions. Paper presented at the *CHI'05 Extended Abstracts on Human Factors in Computing Systems*, 2037-2038.

Interaction Design Foundation, Dam, R. F., & Siang, T. Y. (2021). No title. *What is Design Thinking and Why is it so Popular?,*

ISO, I. (1999). 13407: Human-centred design processes for interactive systems. *Geneva: ISO,*

Jansen, B. J., Jung, S., Salminen, J., Guan, K. W., & Nielsen, L. (2021). Strengths and weaknesses of persona creation methods: Guidelines and opportunities for digital innovations.

Jones, W. (2007). Personal Information Management. *Annual Review of Information Science and Technology, 41*(1), 453-504. 10.1002/aris.2007.1440410117

Jones, W. (2015). Building a better world with our information: the future of personal information management, Part 3. *Synthesis Lectures on Information Concepts, Retrieval, and Services, 7*(4), 1-203.

Jones, W., Bruce, H., Bates, M. J., Belkin, N., Bergman, O., & Marshall, C. (2005). Personal information management in the present and future perfect: Reports from a special NSF-sponsored workshop. *Proceedings of the American Society for Information Science and Technology, 42*(1)

Kanstrup, A. M., & Bertelsen, P. (2011). *User innovation management: A handbook*. Aalborg Universitetsforlag.

Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences, 8*(9), 255.

Karlgren, K., Ramberg, R., & Artman, H. (2016). Designing interaction: How do interaction design students address interaction? *International Journal of Technology and Design Education, 26*(3), 439-459. 10.1007/s10798-015-9314-3

Khan, M. L. (2017). Social media engagement: What motivates user participation and consumption on YouTube? *Computers in Human Behavior, 66*, 236-247.

Killam, L. (2013). *Research terminology simplified: Paradigms, axiology, ontology, epistemology and methodology*. Laura Killam.

Kolko, J. (2010). Abductive thinking and sensemaking: The drivers of design synthesis. *Design Issues, 26*(1), 15-28.

Kushniruk, A., & Nøhr, C. (2016). Participatory design, user involvement and health IT evaluation. *Stud Health Technol Inform, 222*, 139-151.

Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. sage.

Kvale, S., & Brinkmann, S. (2015). *Interviews*. Sage.

Lakshman, M., Sinha, L., Biswas, M., Charles, M., & Arora, N. K. (2000). Quantitative vs qualitative research methods. *The Indian Journal of Pediatrics, 67*, 369-377.

Lehmann, J., Lalmas, M., Yom-Tov, E., & Dupret, G. (2012). Models of user engagement. Paper presented at the *User Modeling, Adaptation, and Personalization: 20th International Conference, UMAP 2012, Montreal, Canada, July 16-20, 2012. Proceedings 20*, 164-175.

Liedtka, J. (2018). Why design thinking works. *Harvard Business Review, 96*(5), 72-79.

Liikkanen, L. A., & Salovaara, A. (2015). Music on YouTube: User engagement with traditional, user-appropriated and derivative videos. *Computers in Human Behavior, 50*, 108-124. 10.1016/j.chb.2015.01.067

Lush, A. (2014). Fundamental personal information management activities - Organisation, finding and keeping: a literature review. *The Australian Library Journal, 63*(1), 45-51. 10.1080/00049670.2013.875452

Markman, A. B., & Gentner, D. (2001). Thinking. *Annual Review of Psychology, 52*(1), 223-247.

Matthews, T., Judge, T., & Whittaker, S. (2012). How do designers and user experience professionals actually perceive and use personas? Paper presented at the *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1219-1228.

Menard, P., Bott, G. J., & Crossler, R. E. (2017). User Motivations in Protecting Information Security: Protection Motivation Theory Versus Self-Determination Theory. *Journal of Management Information Systems, 34*(4), 1203-1230. 10.1080/07421222.2017.1394083

Miaskiewicz, T., & Kozar, K. A. (2011). Personas and user-centered design: How can personas benefit product design processes? *Design Studies, 32*(5), 417-430.

Mishra, S. (2002). A design framework for online learning environments. *British Journal of Educational Technology, 33*(4), 493-496.

Morris, D., Ringel Morris, M., & Venolia, G. (2008). SearchBar: a search-centric web history for task resumption and information re-finding. Paper presented at the 1207-1216. 10.1145/1357054.1357242

Muller, M. J. (2002). The human-computer interaction handbook: fundamentals, evolving technologies and emerging applications, chapter Participatory Design: The Third Space in HCI.

Murthy, S., Murthy, U., & Fox, E. A. (2006). Using superimposed and context information to find and re-find sub-documents. Personal Information Management: Now That We're Talking, What Are We Learning?, 90.

Nacak, A., Bağlama, B., & Demir, B. (2020). Teacher candidate views on the use of youtube for educational purposes. *Online Journal of Communication and Media Technologies, 10(2), e202003,*

Nelson, W. A. (2014). The many facets of design and research in instructional design. *Design in Educational Technology: Design Thinking, Design Process, and the Design Studio,* , 125-141.

Nielsen, J. (1994). Enhancing the explanatory power of usability heuristics. Paper presented at the *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems,* 152-158.

Paracha, S., Hall, L., Clawson, K., Mitsche, N., & Jamil, F. (2019). Co-design with children: using participatory design for design thinking and social and emotional learning. *Open Education Studies, 1*(1), 267-280.

Plattner, H., Meinel, C., & Leifer, L. (2014). *Design thinking research: Building innovators*. Springer.

Plattner, H., Meinel, C., & Leifer, L. (2015). *Design thinking research: Making design thinking foundational*. Springer.

Ratnam, N. (2022). *Automation of Personal Information Management*. Aalborg Universitet.

Raven, M. E., & Flanders, A. (1996a). Using contextual inquiry to learn about your audiences. *ACM SIGDOC Asterisk Journal of Computer Documentation, 20*(1), 1-13.

Raven, M. E., & Flanders, A. (1996b). Using contextual inquiry to learn about your audiences. *ACM SIGDOC Asterisk Journal of Computer Documentation, 20*(1), 1-13.

Raven, M. E., & Flanders, A. (1996c). Using contextual inquiry to learn about your audiences. *ACM SIGDOC Asterisk Journal of Computer Documentation, 20*(1), 1-13.

Raven, M. E., & Flanders, A. (1996). Using contextual inquiry to learn about your audiences. *Asterisk (New York, N.Y.), 20*(1), 1-13. 10.1145/227614.227615

Ramberg, R., Artman Henrik, & Karlgren Klas. (2013). Designing learning opportunities in interaction design: Interactionaries as a means to study and teach student design processes. *Designs for Learning, 6(1–2),* , 30–56.

Rawnsley, M. M. (1998). Ontology, epistemology, and methodology: A clarification. *Nursing Science Quarterly, 11*(1), 2-4.

Rieder, B., Coromina, Ò, & Matamoros-Fernández, A. (2020). Mapping YouTube. *First Monday,* 10.5210/fm.v25i8.10667

Rogers, Y., Sharp, H., & Preece, J. (2023). *Interaction design: beyond human-computer interaction*. John Wiley & Sons.

Salminen, J., Jung, S., Kamel, A., Froneman, W., & Jansen, B. J. (2022). Who is in the sample? An analysis of real and surrogate users as participants in user study research in the information technology fields. *PeerJ Computer Science, 8*, e1136.

Salmons, J. (2009). *Online interviews in real time*. Sage.

Schelle, H., Ottmann, R., & Pfeiffer, A. (2008). GPM Deutsche Gesellschaft für Projektmanagement. *Nürnberg,*

Schuler, D., & Namioka, A. (1993). *Participatory design: Principles and practices*. CRC Press.

Seidel, V. P., & Fixson, S. K. (2013). Adopting design thinking in novice multidisciplinary teams: The application and limits of design methods and reflexive practices. *Journal of Product Innovation Management, 30*, 19-33.

Snickars, P., & Vonderau, P. (Eds.). (2009). The YouTube reader. *Retrieved from Http://Urn.Kb.Se/Resolve?Urn=urn:Nbn:Se:Umu:Diva-93619.*,

Steen, M., Kuijt-Evers, L., & Klok, J. (2007). Early user involvement in research and design projects–A review of methods and practices. Paper presented at the *23rd EGOS Colloquium*, , *5*(7) 1-21.

Thesing, T., Feldmann, C., & Burchardt, M. (2021). Agile versus waterfall project management: decision model for selecting the appropriate approach to a project. *Procedia Computer Science, 181*, 746-756.

Pu, H., & Jiang, X. (Feb 08, 2011). A comparison of how users search on web finding and re-finding tasks. Paper presented at the 446-451. 10.1145/1940761.1940822 http://dl.acm.org/citation.cfm?id=1940822

Viitanen, J. (2011). Contextual inquiry method for user-centred clinical IT system design. *User Centred Networked Health Care* (pp. 965-969). IOS Press.

Webb, N., & Renshaw, T. (2008). Eyetracking in HCI. *Research Methods for Human-Computer Interaction*, , 35-69.

Wysocki, R. K. (2011). *Effective project management: traditional, agile, extreme*. John Wiley & Sons.

9. Index

Shantanu Das

Age: **28**
Gender: **Male**
Occupation: **Masters student**

Strategies

- Saves videos to Watch later and playlists.
- Re-finds videos in the History lists.

Motivation

- keeps interesting and informative videos.
- Saves videos in order to re-access them.
- Saves videos to share with friends and family.

Goals

- Wants an easier way of re-finding videos on YouTube.
- Wants a quicker way of finding out specific videos within the History lists.
- Wants to filter out videos in the History lists.
- Wants to have more pre-defined playlists.

Frustrations

- Experiences challenges in re-finding videos.
- Cannot search for specific videos with keywords in the playlists.
- Gets trouble re-finding videos in the History lists.

Preferred YouTube videos

- Travel vlogs
- Tutorials
- Music videos
- News
- Documentaries

Appendix 1 : User Persona

Paul Ivan

Strategies

- Save videos to Playlists and liked videos.
- Re-find videos in the history lists.

Motivation

- Unique and interesting videos.
- Save music videos to enjoy them.
- Re-find videos in order to have more knowledge about it.

Age: **30**
Gender: **Male**
Occupation: **Software Engineer**

Goals

- Wants to have a feature in the homepage such as "continue watching".
- Add back the "watch later" as a separate thing not as pre-defined playlists.
- Making the UX consistent no matter which devices you are on.

Frustrations

- Experiences challenges while re-finding unfinished videos in the homepage.
- Save button acts differently on home page on different devices.
- Having trouble re-finding unfinished videos in the history lits.

Prefered YouTube videos

- Science videos
- Tutorials
- News
- Music videos
- Formula one car videos

Appendix 2: User Persona

Tope

Age: **32**
Gender: **Female**
Occupation: **Brand Manager**

Strategies

- Saves videos to playlists and Watch Later.
- Re-find videos in Watch Later and History lists.

Motivation

- Learning more Branding.
- Videos for stimulation and generating ideas on branding.
- Entertainment.

Goals

- Wants to have adequate knowledge of saved videos.

Frustrations

- Forgetting about having videos on the Playlists/ Watch Later list.
- Lack of having adequate knowledge of saved videos.

Preffered YouTube Videos

- Branding on videos
- Musical video
- Movies

Appendix 3: User Persona