

MESTRADO EM CIÊNCIA DA INFORMAÇÃO

THE IMPACT OF GENERATIVE ARTIFICIAL INTELLIGENCE TOOLS ON THE INFORMATION BEHAVIOUR OF ENGINEERING STUDENTS

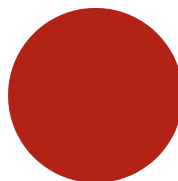
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Mestrado em Ciência da Informação

Supervisor: Prof. Teresa Joana da Silva Silveira

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Resumo

Esta investigação tem como ponto central a necessidade de identificar as mudanças que estão a surgir no comportamento informacional dos estudantes e nas suas competências com o surgimento da Inteligência Artificial Generativa, constatando se as suas competências informacionais saíram beneficiadas ou prejudicadas. O objetivo principal consiste em analisar o comportamento dos estudantes para uma possível integração da Inteligência Artificial nos recursos educacionais oferecidos pelas bibliotecas académicas. Para dar seguimento à investigação, foi adotada uma abordagem qualitativa baseada num estudo de caso, centrado nos estudantes de engenharia. Como tal, foram realizadas entrevistas semi-estruturadas para perceber a perspetiva dos estudantes face ao assunto e também para permitir uma interação mais produtiva com o entrevistado. A população escolhida foi constituída por vinte estudantes da Faculdade de Engenharia da Universidade do Porto inscritos no presente ano letivo, dez dos quais se encontram a frequentar o terceiro ano do primeiro ciclo de estudos e os restantes dez estudantes encontram-se inscritos no segundo ciclo de estudos. Os resultados revelam uma utilização generalizada das ferramentas de IA generativa no apoio às tarefas académicas, sobretudo nas fases iniciais do processo informacional, e dois perfis distintos de utilizadores: estudantes que demonstram uma atitude crítica e informada, frequentemente associada a conhecimento de fontes científicas de informação, e outros que utilizam estas ferramentas de forma mais passiva, por vezes sem uma verificação dos conteúdos. Além disto, os resultados indicam ainda que os estudantes não veem as bibliotecas académicas como instituições que possam vir a ser substituídas pela IA, acreditando numa relação de complementaridade. Os participantes sugerem uma maior integração entre os serviços das bibliotecas e as ferramentas de GenAI, nomeadamente através da promoção da literacia informacional, do acesso a recursos científicos e da orientação para uma utilização ética destas tecnologias. Conclui-se, portanto, que as ferramentas de GenAI e os recursos das bibliotecas académicas contribuem para a literacia informacional dos estudantes de engenharia, desde que se complementem e que exista orientação responsável por promover a atitude crítica e os princípios éticos.

Palavras-chave: Inteligência Artificial Generativa. Comportamento Informacional. Literacia da Informação. Estudantes de Engenharia. Bibliotecas Académicas.

Abstract

This research aims to identify the changes that are arising in students' information behaviour and skills with the emergence of Generative Artificial Intelligence, and to see whether their information skills have benefited or suffered. The main goal is to analyse student behaviour with a view to the possible integration of Artificial Intelligence into the educational resources offered by academic libraries. In order to carry out the research, a qualitative approach based on a case study will be adopted, centred on engineering students. As such, semi-structured interviews were conducted to understand the students' perspective on the subject and also to allow for more productive interaction with the interviewee. The chosen population consisted of twenty students from the Faculty of Engineering of the University of Porto enrolled in the current academic year, ten of whom are attending the third year of the first cycle of studies and the remaining ten students are enrolled in the second cycle of studies. The results reveal widespread use of generative AI tools to support academic tasks, especially in the early stages of the information process, and two distinct user profiles: students who demonstrate a critical and informed attitude, often associated with knowledge of scientific sources of information, and others who use these tools more passively, sometimes without verifying the content. In addition, the results also indicate that students do not see academic libraries as institutions that could be replaced by AI, believing instead in a complementary relationship. Participants suggest greater integration between library services and GenAI tools, namely through the promotion of information literacy, access to scientific resources, and guidance on the ethical use of these technologies. It is therefore concluded that GenAI tools and academic library resources contribute to the information literacy of engineering students, provided that they complement each other and that there is responsible guidance to promote critical thinking and ethical principles.

Keywords: Generative Artificial Intelligence. Information Behaviour. Information Literacy. Engineering Students. Academic Libraries.

UN Sustainable Development Goals

Contribution to the Sustainable Development Goals (SDGs)

The following table shows the relationship between the work developed in this dissertation and the United Nations Sustainable Development Goals (SDGs). Each relevant SDG is associated with a specific contribution of the study, as well as the indicators and metrics used to evaluate that contribution. This analysis highlights how the work promotes quality education, technological innovation, the reduction of inequalities, and reflection on ethical issues in the use of GenAI tools.

This dissertation contributes to the United Nations Sustainable Development Goals (SDGs), as detailed in the following table:

SDG	Contribution	Indicators and Metrics
4 - Quality Education	Enhances students' information literacy by examining the use of generative AI tools and proposing their integration into academic library services.	Identified levels of information literacy from interviews; students' perceptions regarding the educational impact of AI tools; willingness to integrate such tools within university libraries.
9 - Industry, Innovation and Infrastructure	Investigates the impact of emerging technologies (generative AI) in educational contexts, fostering innovation in students' information behaviour.	Reported frequency of AI tool usage; variety of tools employed; students' perceived usefulness and innovation potential of generative AI tools.
10 - Reduced Inequalities	Addresses potential disparities in access, usage, and competencies regarding generative AI tools across different groups of engineering students.	Comparative data between undergraduate and postgraduate students; identification of unequal levels of tool mastery or digital literacy.
16 - Peace, Justice and Strong Institutions	Discusses ethical concerns related to the use of generative AI tools, particularly in relation to plagiarism and responsible information use.	Students' views on academic ethics and plagiarism; inclusion of ethical aspects in interview responses; students' attitudes towards responsible AI usage.

Table 1: Analysis of relevant SDGs in relation to this dissertation project

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„Es ist nicht genug zu wissen, man muß auch anwenden; es ist nicht genug zu wollen, man muß auch tun“

"It is not enough to know, one must also apply; it is not enough to want, one must also do"

Johann Wolfgang von Goethe

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List of Acronyms

ACRL	Association of College and Research Libraries
AI	Artificial Intelligence
AL	Academic Libraries
FEUP	Faculty of Engineering of University of Porto
GenAI	Generative Artificial Intelligence
IFLA	International Federation of Library Associations and Institutions
ILHE	Information Literacy for Higher Education
IM	Information Management
IS	Information Science
LISS	Library & Information Science Source
LLM	Large Language Model
RQ	Research Question
SDG	Sustainable Development Goals
UPorto	University of Porto

Chapter 1

Introduction

1.1 Context and Motivation

“Information Science [...] cannot do without AI and must rely on it” (A. M. Silva, 2018, p. 4)¹. In recent years, the need for a relationship between IS and AI has been recognised, and Armando Malheiro da Silva’s phrase reflects this: what the field of Information Science can offer when it is allied with AI, especially considering the impact that AI can have on transforming various information processes.

With the evolution of these technologies, especially since the last decade, the use of GenAI tools has increased significantly, resulting in a profound impact on how organisations in the most diverse sectors can approach Information Management.

The paradigm is similar in the academic context. The emergence of these tools has led to their use not exclusively by students but by the entire academic community. This trend leads to the possibility of rethinking their implications for search habits, the quality of the information retrieved through these tools, and the information literacy skills of engineering students.

The use of GenAI tools, especially in this specific case - in the context of engineering - makes it extremely important to understand the main changes that occur in the face of this new reality. This includes the influence of information-seeking habits and the interaction between students and the available resources, so it will be equally important to investigate this behavioural component.

Linked to the above, it is also pertinent to comparatively analyse the relationship between the aforementioned tools and the accuracy, relevance and reliability of the information sources found by students understanding as well how prepared its impacts on students performances.

This research also aims to understand the impact that GenAI tools have on the information skills of engineering students, especially in critically evaluating information and their ability to identify and use different sources of information efficiently and effectively. In this way, it may be possible to recognise what gaps students have in the field of information literacy as a result of the

¹Translated by the author. Original in Portuguese: “A Ciência da Informação [...] não pode prescindir da IA e tem de se apoiar nela” (A. M. Silva, 2018).

emergence of these new tools, concluding whether or not this factor influences the development of the information skills necessary for students' academic success.

Based on these ideas, this dissertation was developed as part of the Master's in Information Science, which also arose from the essential need nowadays to understand the relationship and dependence between information or Information Science, as well as its associated aspects, and emerging technologies, namely GenAI tools.

1.2 Hypothesis and Research Questions

Related to scientific research, it is very common to have one or more hypotheses which, according to Lakatos et al., 2003, must be based on a problem, being its solution provisional, and related variables. In addition, Gil, 2002 explains that a hypothesis needs to have a logical sequence and, above all, it must be testable, that is, it must be subsequently verified and confronted, confirming or contradicting it being this process partly done by the questions guiding the research. Defining the research questions was essential to proceed to the following points and they are divided into three RQs. Thus, this research aims to answer, to a large extent, three interrelated questions:

RQ1: Do the GenAI tools and resources provided by the library contribute to the information literacy of engineering students?

RQ2: How can the use of AI tools influence the information behaviour of engineering students?

RQ3: Will the use of GenAI tools have an impact on the quality of the information retrieved through them?

It is important to realise that RQ1 serves as the main research question, as the path to its answer is dependent on and complementary to RQ2 and RQ3, so once the three questions have been answered, the concepts needed to advance the research are analysed leading this study to the construction of the hypothesis, contributing to scientific progress.

That said, the development of this dissertation has given rise to a hypothesis, predictive and testable, which relates the possible change in engineering students' behaviour to their skills:

"The change in information search behaviour can influence the information literacy skills of engineering students"

Based on the problem that the information behaviour of engineering students, when faced with GenAI tools, tends to encourage a readaptation of the educational resources provided by academic libraries, the hypothesis presented not only aims to relate two variables - information behaviour and information literacy skills - but also allows it to be tested using quantitative and/or qualitative methods and also enables its subsequent confirmation or non-confirmation in the light of the literature review carried out in conjunction with the results obtained in the research.

1.3 Research Objectives

Once the problem has been identified and the research hypothesis formulated, clear objectives have been defined to achieve the conclusion of the scientific work.

The general aim of the research is to make an assertive contribution to understanding the evolution of AI according to the information behaviour of engineering students, as well as to help identify improvements to be made to the educational resources offered by academic libraries.

To achieve this key objective, four sub-objectives have been detailed that underpin the methodology to be followed in this dissertation. Thus, the first sub-objective will require an analysis of the impact of GenAI on the information behaviour of engineering students. Next, students' research practices will be compared before the emergence of GenAI tools and after using these technologies. As a result, it will be necessary to analyse the impact that AI has on various aspects, such as the quality of the information retrieved and students' information literacy skills. Finally, a possible integration of AI into the educational resources of academic libraries will be outlined, to boost information literacy.

In this way, once the objectives listed have been achieved, it will be possible for academic libraries to optimise access to information, thus beginning a process of adapting and integrating AI.

Figure 1.1 shows a diagram that aims to summarise the whole process, from defining the problem to specifying the general and specific objectives of the research.

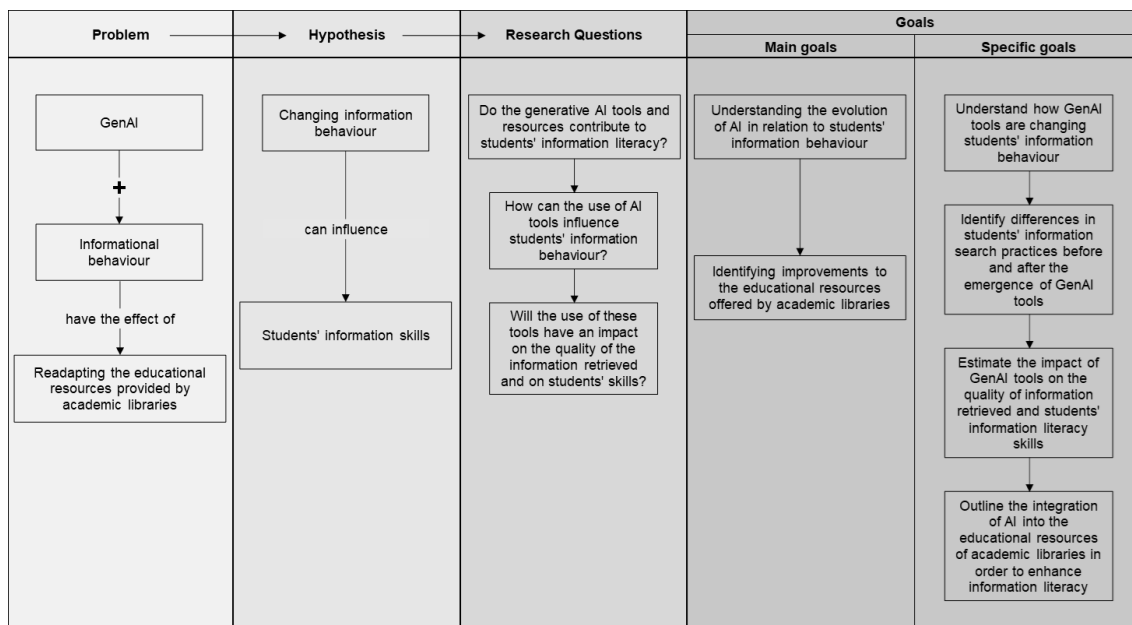


Figure 1.1: Outline of the Research

1.4 Dissertation Structure

For a more logical structure, this dissertation is divided into three main chapters, some of which are divided into sections and subsections.

The dissertation begins with this introductory chapter, which aims to frame the topic and explain the motivation, present the main problem that led to the formulation of the hypothesis, the guiding research questions and the set of objectives intended to be achieved at the end of the research.

The second chapter, dedicated to the literature review, confronts different perspectives based on the scientific literature analysed. Firstly, the research strategy used to arrive at these results is contextualised, and then the review begins. The first section starts with a brief notion of Information Behaviour and a temporal context for framing its characteristics. After it, various models of Information Behaviour were selected, explaining their main aspects, commonalities and differences so that, at the end of the section, it would be possible to relate this concept, based on the perspectives presented, to its contribution to individuals' information skills. In the next section, on Information Literacy, a temporal context is also provided, as well as an explanation of what the concept consists of. However, the particular focus is on the information skills that Information Literacy encompasses, with a link to the previous section. Finally, in the last section, although conceptual perspectives of AI are introduced, the focus will be on a presentation of the state-of-the-art of GenAI, evolution and, consequently its interdisciplinarity to understand the impact on students' behaviour and skills.

The third chapter explains the methodology adopted to carry out this study, also based on the literature, as well as the data collection and analysis techniques and the research sample.

Chapter 2

Literature Review

As a literature review is a critical discussion of all significant and publicly available literature that contributes to the understanding of a subject under study (Pickard, 2013), this section will present different perspectives from various authors toward the questions and the hypothesis raised.

In the first approach, fundamental concepts will be identified, analysed and mobilised for the pursuit of this research, namely the concepts of Information Behaviour, Information Literacy and Artificial Intelligence itself, as well as their origin and relationship with academic libraries and their users, in this case, university students. The aim of this literature review is therefore to address these concepts and then, together with the results obtained, answer the question that guides this research: 'How can the use of AI tools influence the information behaviour of engineering students?'.

To carry out the literature review, a search strategy was initially defined which consisted of combining terms. The terms to be included focused on the concepts to be explored, resulting in several compound terms. Thus, this strategy resulted in: "informational behaviour" for results returned on informational behaviour; "information literacy" for the concept of information literacy and "artificial intelligence" for the standard concept of AI. In addition, in some searches, it was also necessary to use the terms "university students" and "academic libraries" to associate them with the general terms mentioned above, as they are also the subject of this research.

Once the process of defining search terms had been completed, databases were selected, some of them focused on Information Science. Library & Information Science Source, Scopus and Web of Science were chosen. Preference was given to the results obtained in English, due to the greater number of results in this language, it was decided to standardise the information to be analysed, also making it easier to retrieve. Even so, documents in Portuguese were included, as they deal with concepts in the light of situations quite specific to the subject of this research, such as Information Literacy. The Open Repository of the University of Porto was also consulted to retrieve theses and dissertations published on the topics to be dealt with. However, due to the search mechanisms being different to those of the databases used, the search expressions indicated in the table below were not used, and a more direct search was made for theses or dissertations published in the area of IS and focusing on the intended topics.

Figure 2.1 details the combinations of terms and relates them to the databases used.

Search Queries	LISS	Scopus	Web of Science
<i>"informational behavio*"</i>	x		
<i>"informational behavio*" AND "academic libraries"</i>	x	x	
<i>"informational behavio*" AND "university students"</i>	x		x
<i>"informational behavio*" AND "university students" AND "academic libraries"</i>	x	x	x
<i>"information literacy"</i>	x		
<i>"information literacy" AND "academic libraries"</i>	x	x	
<i>"artificial intelligence"</i>	x	x	x
<i>"artificial intelligence" AND "academic libraries"</i>	x	x	x

Figure 2.1: Search queries and databases used

2.1 Information Behaviour

"Changes in information search behaviour can influence the information literacy skills of engineering students". The hypothesis underpinning this dissertation refers to the need to understand the information behaviour of engineering students, as well as an analysis of their trends and main changes in the academic context, given the rise in the use of GenAI tools. However, for a better understanding of the above, we will first explore the concept of Information Behaviour and, likewise, the different perspectives of those who study this area.

The concept of Information Behaviour has been the subject of study in various scientific areas, such as Information Science, Psychology and even Health (Xavier, 2021). Wilson, 1999 traces the origins of this concept back even earlier than the focus on the general term "Information Science", mentioning that the first studies on the area date back to 1948 when scientific papers on information behaviour were presented at the Royal Society Scientific Information Conference. Even so, there were already other studies on the use of documents and libraries which, in themselves, showed some concern and interest in understanding how information was researched and used.

In this context, Wilson, 1999 argues that information behaviour consists of the totality of human actions with respect to information sources and channels, including active and passive information search, as well as information use. In other words, it not only includes the active

search for information, such as direct interactions with information sources or systems, but also includes all other passive forms of receiving information, with no intention of interacting with the information received.

Dervin, 1998, through the 'Sense-making theory', a model explained in the following subsection, defines information behaviour as a process of constructing meaning, driven by a gap in the user's understanding. Thus, through this model, the search for information aims to respond to this gap and construct meaning based on the information found.

From a different perspective, Krakowska, 2020 states that emotional and affective factors play an important role in information behaviour. Through a qualitative study, the author found that much of the research into information behaviour focuses on cognitive aspects and that emotions are the secondary result of information exploration. For this reason, the author recommends studying the impact of emotional and affective factors related to information behaviour, using methods that assess individual and group differences in people with developed information skills.

Araújo et al., 2017 believes that information behaviour tends to depend on context and subjectivity, arguing that the social context, the social groups to which the individual belongs and the roles they take on in their daily lives shape their interaction with information. In this case, he advocates an analysis that considers the influence of cultural, symbolic, cognitive and affective factors, as well as conscious and unconscious psychodynamic factors, to understand the information phenomenon.

In this way, models from different authors who have delved deeper into the processes and strategies involved in this area, will be presented and compared (Kundu, 2017).

2.1.1 Models of Information Behaviour

Wilson, 1981 begins by proposing one of the first models of information behaviour that is more complex than the others, as it involves the (non) satisfaction of the user's information needs. This model emphasises the entire process by which an individual interacts, when there is an information need, with various sources and systems to satisfy that need. Thus, the individual or information user searches for information in information resources or services, which can result in success or failure. The author also considers that one of the central ideas of this model lies in the fact that the information obtained can be shared with other people instead of being used exclusively by the person who retrieved it. Figure 2.2 shows a schematic of the model proposed by Wilson, 1981.

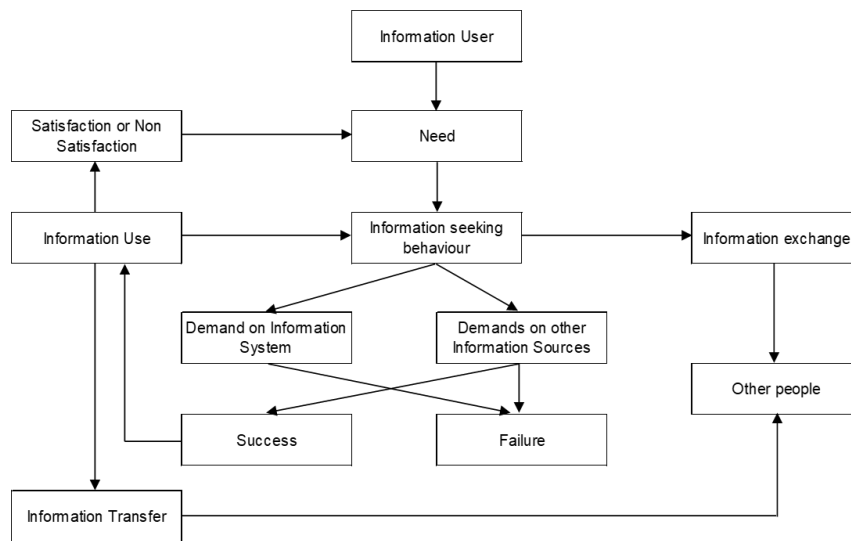


Figure 2.2: Wilson's 1981 information behaviour model (adapted) (Kundu, 2017)

Wilson, 1996 designed another model of Information Behaviour, a revision of his 1981 model based on its central ideas. One of the main differences between this revision and the 1981 model is the inclusion of variables that include psychological, demographic, interpersonal, environmental and resource characteristics. In addition, this model indicates four types of information-seeking behaviour, as illustrated in Figure 2.3, being passive attention, passive search, active search and continuous search.

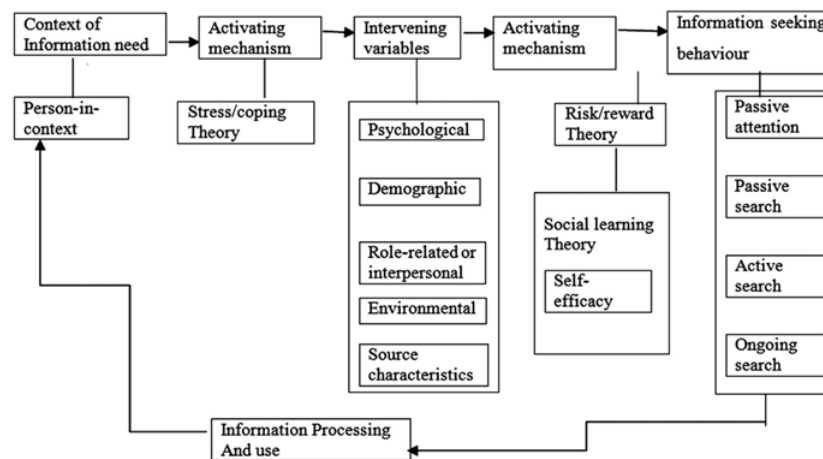


Figure 2.3: Wilson's 1996 information behaviour model (Kundu, 2017)

In this sense, and taking into account the contents and concepts that come from the two models of information behaviour, Wilson, 2000 also deepens his concept of information behaviour, already presented above, by distinguishing it into four aspects:

1. Information Behaviour, in which the totality of human behaviour related to the use of information sources and channels also encompasses passive and active search;

2. Information-seeking behaviour, which consists of the action of looking for information motivated by the need to achieve a specific goal;
3. Information-seeking behaviour, seen as the micro level of behaviour, in which the individual interacts directly with information systems, using specific strategies and tools;
4. Information use behaviour, which involves the set of physical and mental actions involved in integrating new information into the individual's previously acquired knowledge.

From another perspective, Dervin, 1998 model of information behaviour, known as “Sense-making theory”, is a model focused on the information needs that individuals experience in the context of their personal situations. Thus, the main points that make the model work are the situation, which represents the starting point of the process; the gap, which indicates the difference between the situation in the context and the desired situation; bridge, which simulates the strategies used by the individual to achieve their goal and, finally, the outcome, that is what results from this whole process. Figure 2.4 shows a redesigned schematic of Dervin's original model (1983).



Figure 2.4: Dervin's 1983 information behaviour model (re-drawn) (Kundu, 2017)

Ellis, 1989 proposes a behavioural model - the Behavioural Model of Information Seeking Strategies - which describes information-seeking strategies with a focus on the actions and stages that individuals use to meet their information needs. As Figure 2.5 illustrates, this model consists of six main stages, from the initial search for information (starting), through exploring information resources and sources (browsing), searching for bibliographical references in a document to find other basic documents (chaining), keeping up to date with the latest developments in the topic to be dealt with (monitoring) to differentiation, that is, the stage where the user selects, from the information retrieved, the one they think is relevant to their research. Finally, extraction takes place, which usually ends the process, where the individual obtains the desired information. According to Kundu, 2017, verification and finalisation are two additional steps that add confirmation and assurance to the process that all the relevant information has been obtained.

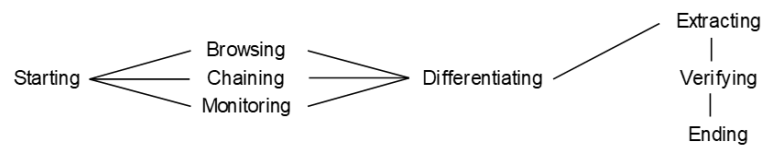


Figure 2.5: Ellis's 1989 behavioural model of information seeking strategies (adapted) (Kundu, 2017)

Kuhlthau, 1999 presents a model from 1991 that describes information behaviour through six stages - initiation, selection, exploration, formulation, collection and presentation. As explained in Figure 2.6, initiation is the first stage of the process, where the individual becomes aware of the information need. Next, in selection, the user chooses a topic to continue their search. In exploration, they sometimes come across inconsistent information that can generate uncertainty in the individual and it is in formulation that they form clearer perspectives on their study, demystifying these uncertainties. Subsequently, the recovered and relevant information is collected so that the results can be presented in the last phase. One of the valuable aspects of Kuhlthau's 1991 model is that it takes into account the cognitive and emotional aspects contained in each stage already defended by other authors.

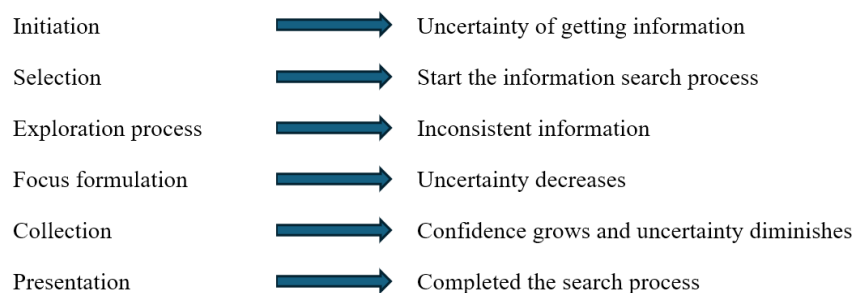


Figure 2.6: Kuhlthau's six stages Information Search Process (adapted) (Kundu, 2017)

Having compared the models and ideas put forward by the different authors who have studied this area, the summary table below (2.1) summarises the most important characteristics of each perspective, as well as the main points where they come together and where they differ.

Author	Main characteristics	Proximity points	Distancing points
Wilson, 1981	Focus on the process of interacting with sources and systems to satisfy information needs.	It is based above all on the interaction between the individual and the sources of information and on the use of structured processes for searching for and using information.	Model more focused on satisfying needs.
Wilson, 1996	Revision of the 1981 model with the inclusion of psychological, demographic, interpersonal and environmental variables and defines passive, active and continuous behaviour.	It comes closer to the 1981 model by incorporating contextual and social variables.	It does not explicitly address emotional aspects during the stages of the information process.
Dervin, 1998	Sense-making model focused on the need for information caused by gaps; it considers the situation, the gap, the strategies (bridge) and the result (outcome).	It recognises the role of subjectivity and personal context and values the resolution of gaps as a central aspect of information behaviour.	Structure more focused on the gap and situational resolution.
Ellis, 1989	It describes behavioural strategies in six stages: initiate, navigate, chain, monitor, differentiate, extract..	It focuses on the practical steps and concrete actions taken by the user; Like Wilson, 1981 model, it describes the user's interaction with information sources.	It differs from the other models in that it focuses more on describing research actions.
Kuhlthau, 1999	Six-stage model: initiation, selection, exploration, formulation, collection and presentation; integrates cognitive and emotional aspects at each stage.	It comes close to Dervin, 1998 model in its inclusion of subjectivity; it also details emotional aspects (for example, uncertainties) and how they can have an impact on the stages.	It distances itself from other models that don't detail or focus on emotional states.
Krakowska, 2020	It explores the importance of emotional and affective factors and addresses the assessment of individual and group differences in information behaviour.	It complements Dervin, 1998 and Kuhlthau, 1999 in exploring the impact of emotions on information behaviour.	This perspective is close to that of other authors such as Kuhlthau, 1999, who consider emotional and cognitive factors to be extremely important.
Araújo et al., 2017	He argues that information behaviour depends on the individual's social and cultural context and daily roles, and also includes the awareness of unconscious choices.	It is in line with Dervin, 1998 and Krakowska, 2020 in highlighting the subjectivity and influence of the socio-cultural context.	It focuses more on the impact of cultural and symbolic factors.

Table 2.1: Overview of Information Behaviour models

2.1.2 The importance of the information needs

Wilson, 1981 also argues in favour of the importance of the information need as part of Information Behaviour. From the author's perspective, the information need is seen as a complex and subjective phenomenon that arises after the basic needs of users, such as cognitive or affective needs, and can therefore be influenced by factors internal or external to the individual. In addition to the information need being a criteria in the evaluation process in the event of a successful or unsuccessful search, according to Xavier, 2021 it is this that defines the search objectives and guides the individual in the selection of documents, information, which search strategies to adopt and the criteria for evaluating the quality of the information retrieved. Since all these stages are intrinsically linked to the concept of Information Behaviour, the information need acts as a stimulus for the individual, in the sense that it can adapt the strategies and methodologies to be followed, as well as their behaviour as an individual on a path of searching for and collecting information. Despite focusing his studies on understanding the Information Behaviour of museum visitors, Xavier, 2021 stresses that libraries have a role to play in understanding the specific information needs of their users - from students to professors and even researchers - and in understanding their research objectives, based on their prior learning, which will certainly be in different areas. Knowing that academic libraries are spaces for access to information and for promoting and encouraging research, Information Behaviour, the area dedicated to studying how individuals search for, use and manage information, is extremely important for academic libraries, especially in terms of the resources they offer and whether they are adequate, taking into account the information literacy and skills of their users, to meet their information needs.

2.2 Information Literacy

According to Lopes et al., 2012, the term "information literate" first appeared in 1974, used by Zurkowsky¹, who defined the info literate individual as "one who can use information tools and resources in their work to solve problems". Since then, this concept has been the subject of different approaches by those who study it, whether at an academic, professional or research level. However, before analysing the cross-cutting approaches and the main points that guide this concept, it is important to clarify what information literacy consists of.

According to the ACRL - Association of College and Research Libraries - Information Literacy is the ability of an individual to recognise the information need, as well as the ability to locate, evaluate and use it effectively to achieve a specific goal. This definition, according to Moustapha, 2023 who also defends it, emphasises that information literacy is not just about identifying the information need, but also about understanding it and evaluating it. Even so, Lopes et al., 2012 believe that there are various conceptions of this concept, with the most simplified and operational, which see it as a set of skills centred on the individual, and others that are more complex with a

¹Paul Zurkowsky was an American librarian and President of the Information Industry Association (A. M. Silva, 2008).

holistic approach, framing the concept in a more interdisciplinary and theoretical perspective, influenced by other aspects of the professional or academic life of individuals.

For Information Science, in addition to the ACRL definition, this concept is more focused on “skills and selective synthesising capacity in the search for and use of information” (A. M. Silva, 2008, p. 18). In this sense, this skill, which is of great importance to the field of Information Science, should be focused on understanding how individuals gain information skills independently, that is, without depending on librarians, archivists or documentalists.

In the academic context, information literacy is all the more important. Lopes et al., 2015 state that the need for university students to be equipped with these skills is crucial to their success, arguing that they will be prepared to deal with problems that have arisen as a result of technological developments in recent decades, such as the exponential growth in the volume of information on the Internet. The authors also point out that the fact that they are “equipped with knowledge and skills that enable them to perform well in their academic activities and throughout their professional lives”² (Lopes et al., 2015, p. 1) will be a key factor, in addition to student success, for them to use information efficiently and ethically and for them to know how to search, select and evaluate the information available. In this way, they believe that students will acquire skills that will enable them, among other things, to access, evaluate, select and use high-quality sources of scientific and technical information, assess the reliability and relevance of information, especially information available on the Internet, and also avoid errors or gaps in the citation and referencing of sources, taking into account aspects of the ethical use of information.

2.2.1 Information Literacy in the context of Engineering

In the context of engineering, along with the perspectives presented above, Information Literacy - or infoliteracy - is recognised in a similar way, that is as a fundamental element for the success of students, both academically and, in the future, professionally. Lopes et al., 2012 use the Faculty of Engineering of the University of Porto as an example and explain that infoliteracy is seen as “a set of knowledge and skills in the field of information”³ (Lopes et al., 2012, p. 2) that will enable engineering students to be equipped with the skills inherent in this dynamic process. Therefore, these skills include the ability to

1. recognise an information need, identifying it when it exists and knowing how to act on this identification;
2. locate information, identifying where it is or searching for information effectively;
3. evaluate information, that is, understand whether its origin is reliable and whether it presents acceptable levels of quality;
4. use information appropriately for the intended purposes;

²Translated by the author. Original in Portuguese: “munidos de saberes e competências que os capacitem para um bom desempenho nas suas atividades académicas e ao longo da sua vida profissional”.

³Translated by the author. Original in Portuguese: “um conjunto de conhecimentos e competências no domínio da informação”.

5. communicate information ethically and effectively.

Also in this context, and unlike other more theoretical and methodological perspectives, a process-based approach is used to implement infoliteracy, to present this concept as “a catalysing element and an active component of the transformational process of student learning”⁴ (Lopes et al., 2012, p. 2). In this sense, the Figure 2.7 highlights the main process, the “Information Literacy process at FEUP”, which is influenced by and gives rise to the associated details. Lopes et al., 2012 recognise that all these projects have had a positive impact, showing that students adhere to and perform well in the activities offered by the library.

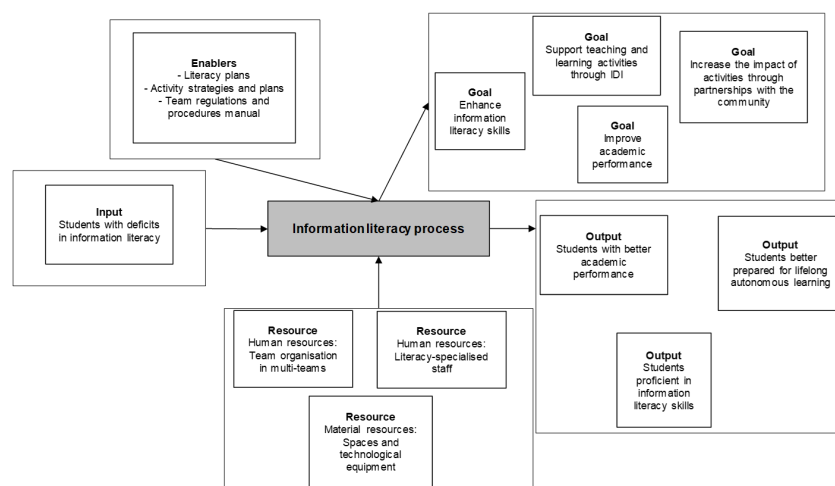


Figure 2.7: Information Literacy process at FEUP (adapted) (Lopes et al., 2012)

It should also be noted that academic libraries play a key role in affirming Information Literacy, as it is a win-win process where both the library and university students benefit. Lopes et al., 2015 point out that by promoting information literacy, academic libraries can develop a strong bond with students in this teaching-learning process. In addition, promoting infoliteracy entails the need for partnerships with teachers and researchers, thus involving the academic community. Students also benefit and by acquiring information literacy skills, they tend to perform better throughout their academic career, especially scientific writing and citation and referencing practices. Thus, Lopes et al., 2015 conclude that through infoliteracy and the evaluation of its impact, it was possible to realise the effective value of the library’s services and activities, especially for the better performance of students in carrying out their academic work.

2.2.2 Information Skills

As mentioned above, Information Literacy aims to encourage students to be citizens who are consumers of information and, above all, producers of information, paying attention to ethical aspects and responsibility. As such, it contributes to the development of information skills through a set

⁴Translated by the author. Original in Portuguese: “um elemento catalisador e uma componente ativa do processo transformacional da aprendizagem dos estudantes”.

of skills such as the “reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning” (ACRL, 2015, p. 3). However, once the concept of information literacy has been explored, it is, therefore, important to understand what information skills consist of, which has also been mentioned.

Information skills consist of an individual’s ability to locate, evaluate, use and produce information effectively. In addition, being endowed with these skills also means being able to determine the nature and extent of the information needed, such as scientific or academic information; access the information needed effectively and efficiently; evaluate information and information sources critically, use information effectively to achieve specific and intended goals, an example being the use of keywords or Boolean operators to combine terms; and understanding the economic, legal and social issues surrounding the use of information, including accessing and using information in an ethically and legally manner, such as the principles of referencing, making it possible to avoid plagiarism in the use of information (ACRL, 2015).

The development of information skills is related to some fundamental concepts in the area, most of which are present in the Framework for Information Literacy for Higher Education, which proposes six frames identified as crucial for information literacy:

1. Authority: it is important to realise that authority is constructed and contextual, that is, it is built by communities and is based on the context in which it is inserted, implying an assessment of the credibility of information sources;
2. Recognising that information is created through a process that affects its format and sharing, thus implying an understanding of the quality and context of information;
3. The value of information: understanding that information has value in various dimensions, including the educational dimension, as a consumer good, a means of influence and even for understanding the world;
4. Viewing research as an iterative process, contemplating the search for new knowledge and the formulation of complex questions to analyse information and draw conclusions;
5. Academic studies as a conversation: in academic studies, continuous dialogue between the producers of information is important;
6. The search for information is a flexible and non-linear process that requires the evaluation of various sources and the ability to adjust the search strategy.

As a result, all the ideas conveyed in this Framework mean that citizens who possess these skills will be encouraged to participate actively in an information society, being able to make their own decisions using quality information and then being able to communicate that information effectively. In this way, the path taken so far will lead to the production of new, high-quality knowledge, contributing new interpretations and perspectives.

This Framework also introduces the concept of “metaliteracy” which, according to this perspective, is an extension of Information Literacy, as it introduces participation in digital environments and adaptation to new technologies. However, although the latest technologies are the main focus of the concept, metaliteracy still requires the individual to reflect by promoting critical thinking in the face of information. This requires the involvement of behavioural, affective and cognitive aspects, giving rise to another concept inherent to metaliteracy - metacognition. This concept, metacognition, refers to the perception of one’s own understanding of the individual’s thought processes, in other words, “thinking about thinking” to achieve reflection on how information is processed. For these reasons, metacognition is fundamental to better understanding the concept of metaliteracy, as critical self-reflection is advisable and even necessary for producing and sharing information. It is also important to stress that the behavioural, affective, cognitive and metacognitive involvement mentioned above establishes one of the links between the areas of Information Literacy and Information Behaviour, since the latter, as Krakowska, 2020 has already mentioned and defended, needs to focus on cognitive aspects and emotional factors, which make an extremely important contribution to the perception of what Information Behaviour is.

2.3 Artificial Intelligence

“AI is a science with a history covering some 30 years” (Laurière, 1990, p. 2)

In the 1990s, AI, as an area of Computer Science, already had a history that went back three decades. AI is a field whose journey began in the second half of the 20th century. With the term being coined in 1956, considered to be the birth of AI, it is important to emphasise that related projects were already being developed before this time, which were close to what was later defined as AI. In the same year, John McCarthy coined the term "Artificial Intelligence" at a conference held at Dartmouth College in the United States (R. J. d. Silva, 2021).

In the first few decades, with the beginning of the affirmation of AI, there was a need for various authors to position themselves in terms of their visions, as well as how to understand this concept, which Laurière considers to be a “science”, also taking into account the theoretical bases that already existed. From this perspective, Lunin, 1984 sees AI as a simulation of human intelligence. Supported by studies carried out by Marvin Minsky, he shows that the core of AI lies in machines carrying out tasks that are usually performed by humans and require human intelligence, emphasising that AI tends to be based on the cognitive capacities of human beings. However, he also explains the concept from the point of view of Edward Feigenbaum, who believes that AI seeks to understand “the nature of intelligence as an information processing” (Lunin, 1984, p. 2), whether this is manifested by humans or machines. Two definitions in which, according to Lunin, 1984, its foundations are focused on the way information is "recognised, acquired, organised [...] and retrieved” (Lunin, 1984, p. 2), especially that of Edward Feigenbaum, who reflects AI as an area that investigates issues inseparable from “intelligence”. Both perspectives refer to the ability

to infer relationships between apparently unrelated ideas and to generate new knowledge (Lunin, 1984).

"AI is the capability a system has to correct and interpret external data, learn from such data, and use it to achieve specific goals and responsibilities through supple adaptation" (Okunlaya et al., 2022, p. 3)

Along the same lines as Marvin Minsky, Zhang et al., 2015 define AI as a field which, in addition to covering a wide range of technology, aims to reproduce the activities of human intelligence, introducing a more technological vision, along with Okunlaya et al., 2022 who emphasise the importance of "external data" and its interpretation.

Russel et al., 2013 analyse eight different definitions of AI and propose dividing them into two categories in terms of how they think - thinking like a human being and thinking rationally - and into two other categories in terms of behaviour - acting like a human being and acting rationally. In short, the authors believe that there is a difference between AI approaches that "measure success in terms of fidelity to human performance" (acting like a human being) and approaches that "measure success by comparing it to an ideal of intelligence" (acting rationally), since when these are human-centred they involve hypotheses and also experimental confirmation. However, when they are rationalist, they involve a "combination of mathematics and engineering" (Russel et al., 2013, p. 25).

2.3.1 Artificial Intelligence and its interdisciplinary nature

AI has a vast and rich history, but above all it has been built on its interdisciplinary nature. Therefore, before identifying the path and driving forces behind the area, it is important first to emphasise that AI represents the influence of multiple disciplines, reinforcing the vision of a composite area and not an "isolated science". In this sense, Cercone et al., 1984 state that this interdisciplinary field depends on other areas for its perfect development, relating above all to Linguistics, Philosophy, Psychology, Electrical Engineering, and Computer Science, as illustrated in Figure 2.8. The figure also shows the sub-areas that are necessary for AI and that fall under each of the disciplines mentioned.

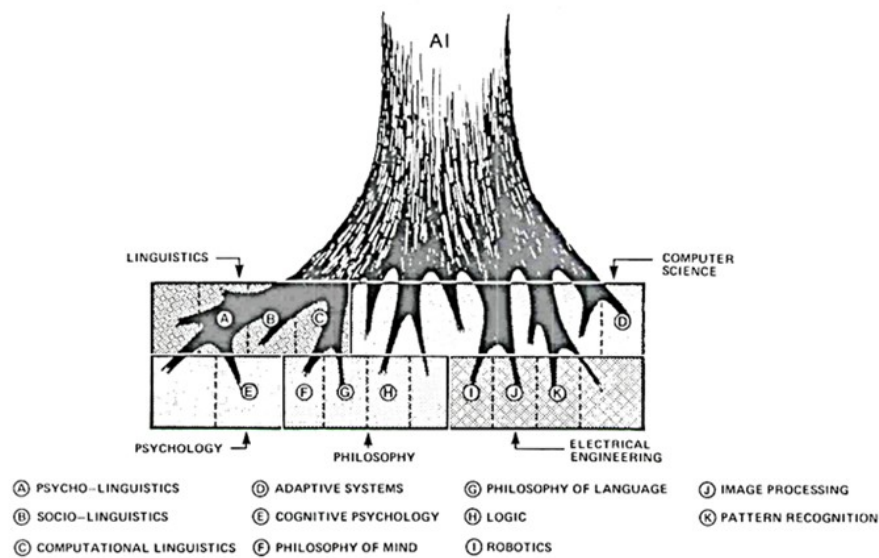


Figure 2.8: The interdisciplinarity of AI (Cercone et al., 1984)

Understanding the specificities of human language is one of the main aspects in which Linguistics can cross paths with AI. This understanding goes beyond simply decoding words, since, according to Cercone et al., 1984, it involves three levels of interpretation: analysing grammatical structure (syntax), interpreting meaning (semantics) and considering context (pragmatics). Computational Linguistics is responsible for applying linguistic methods to solve computational problems. For example, machine translation systems, discussed in the next section, use linguistic models to bring their results closer to reality. Linguistics is therefore a fundamental basis for AI programmes and systems to be able to understand natural language and solve problems taking into account their context.

In the sense that AI tries to reproduce the mental capacities and way of thinking of human beings, Philosophy and its sub-disciplines, such as Philosophy of Mind, represent support for the area, involving evaluating ethical aspects and the distinction between mind and machine. Knowledge-based systems also refer to the inclusion of Epistemology - the study of knowledge - as it is necessary to understand the origin and nature of knowledge (acquired and represented), that is, the solid justification of represented beliefs (represented knowledge) through acquired knowledge. Cercone et al., 1984 also consider Logic to be one of the pillars of AI since AI systems must be able to support reasoning, inference and deduction. If an AI system is to reproduce human thought, then it is essential that these systems are equipped with rationality and logical models aimed at improving the systems, such as First Order Logic, Propositional Logic and even Boolean Logic.

Like Philosophy, Psychology, in particular Cognitive Psychology, is also concerned with thought processes, contributing to the construction of computational models of cognition for AI. Cognitive Psychology's focus on modelling mental processes is related to the idea of 'thinking like a human' introduced by Russel et al., 2013, in other words, once again trying to reproduce human thought in AI. However, there is another aspect of equal importance, which is to understand how humans

understand and produce natural language, thus resorting to psycholinguistics. In this way, by combining the similarities between cognitive psychology and psycholinguistics, it becomes possible to develop AI systems that allow us to interact with humans in a complex but natural and effective way, as far as possible.

However, AI needs technological foundations to implement its systems. Electrical Engineering is made up of areas such as Robotics that contribute greatly to the development of AI and is even considered to be the bridge between this branch of engineering and AI by Cercone et al., 1984. Computer Science, on the other hand, is responsible for a large part of the development of AI, providing the entire base of algorithms and software essential for its operation. Together with Electrical Engineering, these disciplines complement each other, resulting in significant advances in the introduction of machine learning, for example Russel et al., 2013. However, the focus is also predominantly on the aspects of language and knowledge. This is because, in terms of language, these disciplines create specific programming languages so that what is idealised in natural language can be understood by the machine. In terms of knowledge, they are responsible for representing it in a very structured way and, at the same time, for the machine recognising the knowledge correctly.

Cercone et al., 1984 emphasise the importance of each of the sub-areas listed above through the AI pie, with each slice representing a sub-area making up the total pie (Figure 2.9).



Figure 2.9: AI pie (Cercone et al., 1984)

2.3.2 Generative Artificial Intelligence

GenAI is a type of artificial intelligence that uses deep learning models, which are trained to produce new data and are capable of recognising and imitating data initially created by humans,

making it possible to generate results when necessary (Deschenes et al., 2024). These models are trained with large volumes of data so that they can cover an extensive volume of information and as a result, new content is classified and generated. Creating content begins with mapping the information in the input data, then transforming the information to the nearest desired level, and finally returning a new result (Gozalo-Brizuela et al., 2023). Thus, using GenAI models, it is possible to produce content in text, audio, image and video formats.

From the perspective of Gozalo-Brizuela et al., 2023, the most suitable models used for transforming content are those shown in Table 2.2. It should be noted that these tools can be used to carry out other text transformation operations, and the table only shows what the authors believe to be the most suitable.

Original format	Intended model	Recommended Model
Text	Image	DALL-E
Text	3D	Dreamfusion
Text	Video	Phenaki
Text	Audio	AudioLM
Text	Text	GPT (ChatGPT tool)
Image	Text	Flamingo

Table 2.2: Recommended models for content transformation

Notwithstanding the suggestions of the aforementioned authors, since this research aims to promote an improvement in the services offered by academic libraries, the models and tools considered most pertinent will be analysed with this objective in mind. The choice of the GenAI tools listed below, given their nature, constitutes a range of potentialities for improving the current paradigm of information access and sharing.

The ChatGPT tool, which has become extremely important and which, according to Lund et al., 2023, has seen a sharp increase in users since the beginning of this decade, consists of a language model developed by OpenAI, an AI company, which is trained to answer questions - whether simple or complex - to satisfy the needs of its users, generating meaningful human language (Wolfram, 2023). In more detail, this Large Language Model was built based on GPT technology, which is a neural network developed particularly to deal with human language. The processing of human language or natural language is mostly used by LLMs because it makes it possible to understand and interpret the needs of users, as well as to make these users understand the content that is provided by the tool, in this case, the answer, resulting in a robust communication interaction between the GPT technology, through the ChatGPT tool, and the person requesting the information. That said, the benefits are manifold, but according to Vogus, 2023, there is a time limit. The data and information that the current version of the technology gathers do not go back further than 2021, so any content returned before that date will be provided based on knowledge acquired by ChatGPT itself or using research tools available online. Furthermore, Lund et al., 2023 draw attention to another problem. Because this model is based on a "statistical approach that learns patterns from a large set of text data", the information retrieved is not exempt from

reaching the user without bias, and there may be situations in which the data is not completely correct or does not represent reality.

There are also other GenAI tools that can be very useful and relevant to the context of this research. For example, the DALL-E tool, also developed by the OpenAI company, is a model that allows images to be created from text. This means that the user starts the process by entering the desired text into this tool and an image is returned which is generated based on the textual descriptions provided, already making it possible to create high-quality images with plenty of detail that can respond to complex requests from users (Gozalo-Brizuela et al., 2023). A tool with some similarities to ChatGPT is Claude, although it is not as popular. It is a model described by Vogus, 2023 as an “alternative to ChatGPT”. It is often compared to it in terms of information retrieval and quality, as well as the results returned. Finally, the Gemini tool is based on an AI model developed by Google and allows users to use functionalities such as transforming texts into other texts, for example, more summarised ones, and transforming texts into images, which are generated using natural language input by the user. To develop dialogues, Gemini uses the LaMDA model, which is specifically trained to hold conversations when requests are sent to it, and to create images from texts it uses the Imagen model, which can encode and synthesise the text entered into an image (Lang et al., 2024).

However, as a result of using GenAI tools, problems will naturally arise, mainly related to copyright and intellectual property rights, as well as some ethical implications.

About ethical implications, and the academic context being the main focus of this research, plagiarism is one of the issues that most concern institutions at this level. The use of GenAI and its ability to create content almost instantaneously and with easy access can lead students to commit this offence. However, this combined with a lack of transparency will raise questions about the authenticity of the academic work (Fruehauf et al., 2024). The author also explains that, in certain cases, there is a certain difficulty in understanding whether certain content or academic work has been generated by AI, so these institutions should pay special attention to providing students with information skills that enable them to be aware of how to recognise and cite GenAI when used (Newcastle-University, 2023). Furthermore, Adetayo, 2023 mentions an extremely important aspect when using these tools. Data privacy and security may be compromised when personal data is collected from users, and there is a risk of sensitive data being shared or used, especially in security checks of conversations by the tools themselves. As such, Adetayo, 2023 argues that academic libraries, in addition to the transparency they must demonstrate about data collection and use, must also draw up a security measures plan that safeguards user data when using GenAI tools.

Regarding the problems that may arise concerning copyright and intellectual property, the situation is different from the previous problem. It has already been mentioned that these GenAI models use large amounts of data to be trained. However, the data used for training often involves material and content protected by copyright, so this data is used and then transformed without the owner’s authorisation (Fruehauf et al., 2024). This situation gives rise to many divergent opinions such as who owns the copyright to this content. Since it has already been manipulated

by GenAI, Fruehauf et al., 2024 point out that some argue that the copyright may belong to the model developer or even the user. Even so, in these cases, it is not always possible to resort to the legislation in force, as in several countries it is not yet prepared to defend copyright in situations where it is necessary to do so. Lang et al., 2024 points out that, in the case of the United States of America, AI-created content from training data may not be protected by copyright, due to the “human authorship requirement”. For these reasons, Mannheimer et al., 2024 advocate the establishment of new regulations and policies aimed at defending the copyright of the content used by GenAI and that this legislation be specific and clear to withstand not only copyright problems but other ethical problems.

With the advance of GenAI, greatly boosted by the emergence of the aforementioned tools, the way in which individuals keep in touch with technology and information has undergone severe changes, such as those described, and so the need arises to readapt traditional habits to the new paradigm.

2.3.3 Information Behaviour and Infoliteracy with the advance of GenAI

Literature revision does not leave any doubts about the impact of GenAI on today’s society, as well as its ethical implications, it is extremely important, within the scope of the objectives proposed for this Dissertation, to understand how Information Behaviour and Information Literacy have been adapting or evolving in the face of this advance in technology.

About aspects related to the area of Information Behaviour, Dott et al., 2024 show that the use of GenAI tools has increased and, therefore, given their easy and quick access, this factor can represent significant changes in the behaviour of its users, which can lead to passive information consumption behaviour. This represents a risk that users will consume the information retrieved without any concern for checking the quality of the information or the sources from which the information comes, and that they will not be active individuals in reading the sources. This could also lead to a behaviour of dependence on AI-generated content whenever there is a need to obtain information, and the individual could lose information skills, such as critical evaluation of information or critical thinking. According to the Framework for Information Literacy for Higher Education, this will lead to changes not only in the individual’s behaviour as a result of the direct consequences of using GenAI tools, but also in the whole surrounding process, such as choosing appropriate search strategies and, consequently, retrieving reliable and accurate information.

In Information Literacy, the relationship with GenAI is more focused on information skills and use (locating, evaluating, using and producing information effectively). For this reason, Dott et al., 2024 consider it essential to evaluate information critically when it is generated by AI. In addition to the ILHE Framework, it is also stated that critically evaluating information sources includes identifying or searching for their authority and checking for credibility, accuracy, veracity and bias. To expand on the previous point regarding ethical implications, users should be aware of the challenges involved in using AI, always endeavouring to be transparent (UNESCO, 2022). Academic libraries should also strengthen their role in this regard, through strategies or training that enable students to be informed about these implications and their consequences (IFLA-FAIFE,

2020). In addition, the ILHE Framework does not totally discredit GenAI tools and confirms that they can be very useful for defining, for example, search strategies, but with user supervision.

In short, individual users of AI must understand what these tools are capable of producing, the concept of “AI Literacy” being introduced by Dott et al., 2024, be aware of the implications of using GenAI tools, both ethical and in terms of copyright and, above all, be able to justify the choice of certain selected sources when necessary (Newcastle-University, 2023).

Once again, academic libraries play an extremely important role, as they cannot only promote Information Literacy but also AI literacy, in addition to strategies or training, they must provide guidance and resources adapted to this development of GenAI so that students realise that this is a significant advance and that it can bring numerous benefits to their academic career, as well as disadvantages (IFLA-FAIFE, 2020). In this way, imparting this essential knowledge to students will enable them to have a more appropriate education in the current context, as well as being able to develop a critical assessment of the information presented to them and critical thinking that makes it possible to understand the consequences of using information generated by AI.

2.4 Considerations

It can be concluded that the three areas dealt with - Information Behaviour, Information Literacy and Artificial Intelligence - despite having different strands, have a solid relationship with each other and several aspects in common.

Explaining what the Information Behaviour of individuals consists of proved to be important, as it provides the support to understand how they retrieve, evaluate and use information, how they react and act in the face of the information presented to them and to understand that there are different types of behaviour that in certain situations can be influenced by factors external to the individual or by cognitive, affective or emotional factors.

In turn, Information Literacy, according to the literature revision, is an area intrinsically related to information skills. If an individual has received training in this area, in addition to information skills, they will also be able to identify their information needs, access information sources, evaluate them, check their quality and the quality of the information they contain and, finally, be able to apply it while respecting all ethical principles. Even so, the individual must not only have skills in these areas but also be equipped with the ability to analyse and think critically about the information they come into contact with.

It was also found that AI, being an interdisciplinary area, has links with various disciplines such as Logic, Philosophy, Cognitive Psychology and Linguistics, but plays an increasingly important role in both Information Behaviour and Information Literacy. Users who make use of GenAI tools must, in addition to what has been mentioned above, also be literate in AI, so that they use these tools consciously, ethically and critically, since the information retrieved through them is not always reliable and truthful, and can lead to erroneous knowledge being shared. It is above all at this point that the three areas explored in this research intersect and their importance

is understood, concerning academic libraries, which play a central role in training their students in these three areas.

Academic libraries, as spaces for accessing information and sharing knowledge, should promote information literacy through dynamic training or available resources to encourage effective information behaviour. With the emergence of GenAI tools, these spaces can integrate these tools into their daily lives to improve and facilitate access to information, but never forgetting the implications that this integration can have, such as consequences, ethical implications and less correct behaviour on the part of those who use them. Libraries should be aware of these aspects and be able to pass them on to their users, thus building a more informed and capable society for today's adversities.

In order to further reinforce this link between the main concepts, Figure 2.10 aims to show, in practical terms, the temporal dimension of the relationship between them.

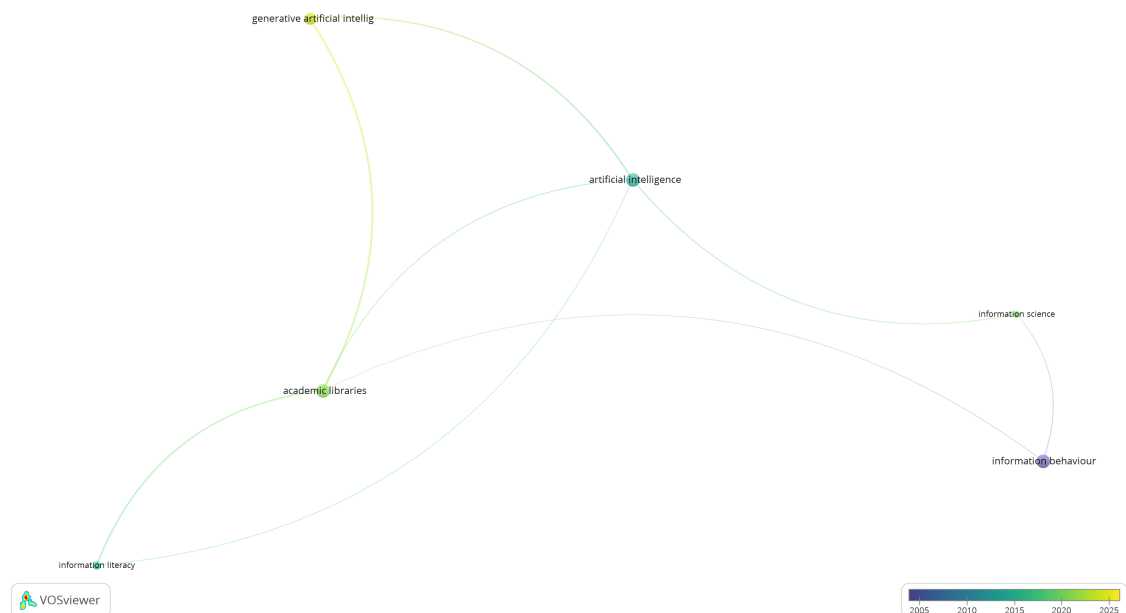


Figure 2.10: Relationship between the main research concepts (2005-2025) - VosViewer

In this diagram, all the concepts have an associated colour that indicates a temporal dimension, and it can be seen from the lines that connect them and the colour legend whether one concept is actually related to another, and also when this connection was made, taking into account the literature reviewed.

Thus, by analysing this figure and together with the conclusions reached throughout Chapter 2, it can be concluded that:

1. "Artificial Intelligence" is a concept that is at the centre of the map because it has direct relations with a large part of the universe of concepts on this map. In addition, the first

interactions are with 'Information Literacy', from 2015 onwards, which, also in this area, was a great help for AI to be present in academic libraries, years later, in 2020;

2. "Generative Artificial Intelligence" turns out to be the most recent concept on this map, so the oldest relationship it establishes is with "Artificial Intelligence", as it is one of its aspects, that is, it derives from it. However, it can be seen that it has been establishing relationships with the other areas for a very short time, many of which are not direct, and which began after 2023, coinciding with the literature and the advances that have been made.
3. The remaining concepts have a greater number of direct relationships, mainly with each other. "Information Behaviour" and "Information Literacy" are the two concepts that mark the beginning of the relationships on this map, in 2005 and 2015 respectively, which, in the case of "Information Behaviour" through IS, and in the case of "Information Literacy" directly, converged at the same time towards AI;
4. Academic Libraries have a primary GenAI base, which relates to the "AI Literacy" concept adopted by Dott et al., 2024.

With some of the relationships in the map, it can also be concluded that there is some potential to strengthen Information Literacy in academic libraries through AI, as already identified in the previous section, where it was mentioned that GenAI tools could simplify everyday processes in these institutions. However, in the Discussion Chapter, it will be clearer to understand this conclusion.

Finally, the term "Information Science" was included in the map, as it is a concept common to all the others and since it is the main area motivating this research.

Chapter 3

Empirical Context

3.1 Institutional framework

The Faculty of Engineering of the University of Porto is an organic unit belonging to UPorto, founded in 1926 and characterised by being one of the largest and most prestigious units. With over 9.000 students¹ enrolled in Bachelor's, Master's and Doctorate programmes, FEUP seeks to cover all fundamental areas of engineering, as well as other emerging areas such as AI, Data Science and Industrial Sustainability. This diversity in training is supported by strong links to the business world, industry and scientific research centres, which ensures that training is geared towards the real and current challenges facing society.

FEUP's mission, as defined institutionally, is to establish itself as an institution for the creation, transmission and dissemination of culture, science and technology in the field of engineering, covering its scientific, technical, ethical and cultural aspects. This mission is manifested both in the training of technically professionals and in the promotion of fundamental values for the responsible practice of engineering in contemporary society.

FEUP has been playing a key role in engineering at national and international level, standing out for the quality of its technological infrastructure and its constant commitment to innovative teaching methodologies. In the context of this research, FEUP has thus become a space where students are familiar with digital and current platforms, integrating them into their daily lives for study, research and problem solving. In recent years, UPorto has been investing heavily in digital infrastructure and related academic services², thereby promoting a learning environment that naturally encourages the use of more and more digital tools. As an integral part of UPorto, FEUP is therefore well placed to adopt new digital tools, which encourages its students to become increasingly digitally literate and to opt for resources geared towards efficiency and speed in the management and execution of their various academic tasks. These are some of the main characteristics that make FEUP students particularly relevant for the study of the academic use of GenAI

¹Information available at: https://sigarra.up.pt/feup/pt/web_gessi_docs.download_file?p_name=F-945964080/FEUP_em_Numeros_2023_PT.pdf

²Information available at: https://www.up.pt/portal/documents/23/Plano_Estrategico_U.Porto_2020.pdf

tools. For this reason, it is essential to understand the relationship that may exist between the FEUP community and GenAI tools.

3.2 The FEUP Library

The FEUP Library aims to play a role focused on supporting teaching, learning and research activities, acting as a mediator between students and scientific knowledge.

The services available at the FEUP Library go beyond consulting books on its premises or borrowing books. It also offers digital access and various internationally recognised scientific databases, such as Scopus, Web of Science, IEEE Xplore, ScienceDirect, among others. It also groups these databases by area to facilitate user access, as shown in Figure 3.1. All these resources are accessible via FEUP's VPN connection, allowing users to access them both inside and outside the Faculty.



Figure 3.1: Demonstration of the FEUP library website homepage FEUP Library, 2024

In addition to providing access to scientific content, the Library promotes training courses every academic year, mainly in the areas of information literacy, citation, referencing and bibliographic management, thus contributing to the development of cross-cutting skills that are fundamental in the academic context. These initiatives, in addition to promoting information skills, also contribute to the development of critical thinking and ethical awareness among students, skills that have become increasingly important with the rise of AI-generated content.

Infoliteracy Training - June - 2025

Time Zone: UK, Ireland, Lisbon Time ([change](#)) ICal

Monday	Tuesday	Wednesday	Thursday	Friday
May 26	May 27	May 28	May 29	May 30
	Webinar - Predator Magazines Video Conferencing System (Zoom) 14:30		Zotero Library - Training Room (C601) 14:30	
Jun 2	Jun 3	Jun 4	Jun 5	Jun 6
Bibliographic databases: Scopus and Web of Science Library - Training Room (C601) 14:30		Avoid Plagiarism Library - Training Room (C601) 10:00		
Jun 9	Jun 10	Jun 11	Jun 12	Jun 13

Figure 3.2: Example of a schedule of sessions scheduled at the FEUP library FEUP Library, 2024

Students therefore have access to training sessions supported by library staff, where they can also clarify any doubts they may have regarding research and the ethical use of information. This role reinforces the library's role not only as a provider of resources, but also as an active partner in promoting good practices among students.

The library facilities also include study areas, workspaces with computers and access to scientific publications, which, together with the other resources, reinforce its technological role. It is clear that the FEUP Library is attentive to developments in information technology, maintaining its commitment to supporting students in acquiring critical and responsible research practices.

3.3 The technological context associated with GenAI tools

FEUP, as a scientific and technological higher education institution, as mentioned in the previous point, offers an academic environment that is highly conducive to digital tools, which contributes to the training of students familiar with current technological tools.

With the emergence of GenAI tools, namely Large Language Models such as ChatGPT, Gemini, Copilot and Claude, the academic landscape at the digital level has undergone significant changes, as these tools have introduced new possibilities in the way students research, structure and produce information, offering support in the formulation of ideas, writing texts, clarifying more complex concepts, and programming.

In this sense, and as partly stated by Dott et al., 2024, the emergence of GenAI in higher education represents a milestone in the way knowledge is accessed, which implies the strengthening of information literacy and ethical skills. Its use by students is often expected to be informal, but it

tends to become increasingly systematic as tools become more accessible, intuitive, and integrated into academic workflows.

It is important to note that, although the use of GenAI brings with it new insights into learning support, it also raises important challenges in terms of verifying the quality of information, academic integrity and the need for pedagogical guidance. It is in this context that Dott et al., 2024 emphasise that student training should include not only technical skills, but also critical and reflective skills regarding the use of AI.

That said, it is well known that students are increasingly adopting GenAI tools for their daily use in academic tasks. It is therefore on the basis of this fact and the other reasons outlined above that there is a clear need for a study to investigate how FEUP students, in a technological environment, behave when using these tools, how they use the information generated and whether they are aware of its ethical use.

Chapter 4

Methodology

This research aims to identify changes in the information behaviour of students and to understand whether, with the emergence of GenAI, their information skills have been improved or diminished. To do this, it is necessary to follow a methodology that suits the context and needs of the research. According to Pickard, 2013, the path to follow should be related according to a hierarchy, which also helps to follow all the steps correctly and logically, as shown in Figure 4.1.

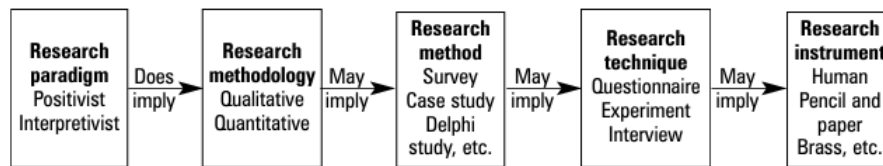


Figure 4.1: The hierarchy of research (Pickard, 2013)

However, as the figure shows, let us start by defining the research paradigm that will serve as the basis for choosing the research methodology.

4.1 Research Paradigm

Traditionally, a paradigm is characterised by the set of “beliefs, values, techniques [...] shared by members of a given scientific community” (Kuhn, 1970). However, when verifying which paradigm to adopt, the three paradigms discussed by Pickard, 2013 - positivism, post-positivism and interpretivism - were considered.

From the perspective of Guba et al., 1985, positivism defends a view based on realism, in which reality exists independently of our knowledge. As a very objectivist paradigm, it focuses on quantitative data and explains events based on general laws.

The post-positivist movement, on the other hand, adopts a vision of critical realism and doesn’t view objectivism as absolutely as the positivist current, understanding that our knowledge is influenced by our perspective. Thus, research based on this current accepts the involvement of both quantitative and qualitative data.

Interpretivism, on the other hand, takes a view of relativism, in which importance is given to context and meaning. Based on qualitative methods, it focuses more on interviews and participant observation, believing that each reality is unique and has a specific context.

Thus, the context of this research, which involves engineering students and their behaviour and skills, falls within the interpretivist paradigm, by its nature and given the approach, methods and techniques described below.

4.2 Research Methodology and Research Method

Initially, in the 1960s, a qualitative approach was recognised as being somewhat dependent on the more rigorous quantitative methods. However, through the contributions of various authors in this field, the qualitative approach began to be seen as a methodological approach in its own right, which generates theories based on research data (Charmaz, 2006).

The quantitative approach uses scientific methods that involve a different treatment and analysis of data to those used by the qualitative approach, testing hypotheses, more focused on samples with many individuals and, consequently, a large volume of data is analysed. A qualitative approach stands out for its focus on understanding the context and social experiences of the individuals who make up the sample and, for the most part, other types of research methods are used, such as observation, interviews and analysis (Charmaz, 2006). The above shows that the qualitative approach is aligned with the paradigm chosen for this research.

As far as the research method is concerned, a case study is used, focusing on engineering students. A case study is of great importance in research based on a qualitative approach so that, by focusing on a smaller sample, it is possible to explore the subject in greater depth and obtain richer perspectives (Charmaz, 2006).

Thus, for this research, a qualitative approach is adopted based on a case study - engineering students.

4.3 Research Technique

Following on from what was said in point 4.2, the choice of technique for subsequent data collection focused on a technique that supported the qualitative approach and the case study method - the interview.

Although interviews can result in more fruitful content in conjunction with case studies when compared to other techniques, there are some considerations regarding this technique. When using interviews, the interviewer should ask questions that lead the participant to share their perspective and reflect on the topic being addressed, however, if necessary during the interview, more specific questions can be asked, taking into account the answers previously obtained by the participant (Charmaz, 2006).

In this way, the interview is semi-structured, based on the assumption that there is greater flexibility in bringing up the topics that are really necessary for discussion between the researcher and

the participant and that it is also possible to adapt the type of questions based on the participant's answers. That said, and not forgetting the paradigm adopted, individual interviews were carried out in order to be able to investigate the students' position in more depth and also to note down any other details that are considered relevant about the interviewee's behaviour.

These interviews were supported by a script (Appendix D) made up of nine questions which, as well as focusing on the area of student behaviour and competences, also focus on the following dimensions of information inherent to the areas highlighted:

- | | |
|---------------------------|---|
| 1. Information needs | 4. Information Quality |
| 2. Sources of Information | 5. Authority and Reliability of Information |
| 3. Information Search | 6. Information Ethics |

Given that each student's profile is different and the specific nature of the questions in this guide, it is important to emphasise that it may change before it is applied, as well as being adjusted to the profile of the student in question, both for a better understanding of the questions and for more targeted responses to the proposed objectives.

Even though the interviews were one of the main sources of information for the research considering the aims of the study, the transcripts are not included in the appendices of this dissertation. This decision was made voluntarily, and since the interviews were used mainly for the thematic analysis that follows in the subsequent points and not for direct quotation, the focus was on interpreting the data in its context rather than on presenting the exact text. Nevertheless, this approach ensures the contextual integrity of all participants' responses, as well as any other type of contribution, and preserves the confidentiality of each student.

4.4 Sample

The objectives that were intended to be answered at the end of the research helped, in a way, to choose the sample to be studied. Since the main objectives are to analyse the information behaviour and skills of engineering students, it was concluded that it would not be feasible to include students from all years or academic degrees and to focus only on those in a sample that would be convenient to continue the research.

Pickard, 2013 introduces the concept of "purposive sampling", which consists of selecting participants based on criteria that are relevant to the aim of the research and focusing on samples made up of specific groups of individuals who fall within the area or subject to be addressed.

Thus, students in degree programmes attending their third year at FEUP have a course unit in their syllabus in which they must develop a project that will culminate in the writing of a final report. From the outset, these students have the necessary skills to carry out this work, however, in the second cycle of studies, these skills will be deepened, since to complete this cycle they will have to write a Dissertation, which requires an increased degree of demand. A sample that brings

together participants from these two cycles of studies, especially with the specificities described above, would be an asset to understanding these students' information skills and how they reflect on them, in addition to the fact that these students, by having notions on this subject, will have their perspective formed on their information behaviour, since these are two related areas.

Thus, the selected population consists of twenty FEUP students enrolled in the current academic year, ten of whom are attending the third year of the first cycle of studies, along with the remaining ten students in the second cycle of studies. Table 4.1 details the profile of these students, as well as the reason why they were selected to make up the sample.

Sample Profile	Cycle of Studies	Number of Expected Participants	Reason
Third year students	Bachelor	10	Third year students will need to develop a project that requires writing and research skills. Most of these students have had little contact with research work. In some cases this could be one of their first steps.
All students	Master	10	Students who will have their skills tested through a scientific research and the writing of a dissertation.

Table 4.1: Profile and justification of the selected sample

By analysing this sample, it will be possible, for the reasons mentioned above, to compare two different segments of students, given that the stage of development of their competences is also different, and to see in what aspects their behaviour differs, making it possible to achieve the desired objectives both in terms of behaviour and the competences that each group of students possesses.

4.5 Ethical Considerations

When the interviews are carried out with the participants, it was explained to them individually that their participation in this study is completely voluntary, respecting all guarantees of confidentiality and anonymity, since the aim of the interviews is only be to use the information provided by the students for academic purposes.

It was also be emphasised that all contacts to continue this study was made in an academic context and that, despite this, the identity of the participant will never be revealed.

In addition to these observations that was made before starting the interview, all the warnings are duly explained in the Free and Informed Consent (Appendix A).

4.6 Project Plan

To manage time efficiently concerning the tasks required to carry out this dissertation, a plan was drawn up (Appendix C), which brings together the main stages of this process to ensure that they are completed in full and deadlines are not exceeded.

The plan is divided into ten stages and four groups, each with its associated milestones. The first group concerns introductory points and the literature review carried out; the second group reflects points related to methodology and data collection; the third group includes analysing the results and conclusions drawn and, finally, the last group only highlights the final aspects for when the research work is completed, such as formatting issues or preparing the presentation of the results.

It is important to note that, as time progressed and the work advanced, this plan was reviewed regularly and underwent minor adjustments so that the development of the tasks was adapted to the needs of the researcher.

Chapter 5

Collected Data and Analysis

This chapter will present the process of collecting and analysing the data obtained as part of this study, in the context that this research followed a qualitative approach, with the main data collection tool being semi-structured interviews.

Firstly, the process of conducting the interviews will be described, including some details about their nature and the profile of the participants involved. Next, the main themes that guided the development of the interview script will be presented, structured in such a way as to explore, in depth, the practices of research, evaluation and use of information in an academic context, before and after contact with GenAI tools.

Finally, the results of the analysis will be presented, organised by interview question, so as to allow a sequential and in-depth reading of the students' perceptions and experiences regarding the use of these tools in their academic career. This will be followed by a conceptual map based on the analysis of the data collected, which summarises the main categories and the relationships between the trends identified.

5.1 Interviews

The semi-structured interviews carried out were the main data collection tool for this research, with the main aim of gaining an insight into the practices and experiences of engineering students regarding the use of GenAI tools in the academic context. A total of twenty students from the Faculty of Engineering at the University of Porto took part, as planned and mentioned in section 4.4, ten of whom were studying Bachelor courses and the remaining ten Master's courses at the Faculty, thus ensuring a diversity of perspectives between different levels of education.

The selection of participants was guided by the criteria already defined in this research, as explained in section 4.4, namely their experience with GenAI tools in an academic context, but above all taking into account the background inherent to the specificities of each area/course, as well as the different stages each student faces as a result of the cycle of studies they are attending. However, the final constitution of the interviewee group was also the result of the availability and interest shown by the participants, since their participation was entirely voluntary.

The interviews took place between February 5 and May 12, 2025, in person and online, depending on the interviewees' preference and availability. Each session lasted an average of thirty minutes and was then analysed in full in order to present the results in the following sections.

Below are Figures 5.1 and 5.2, for Master's and Bachelor's students respectively, which show the distribution by type of course in which the participants in this study were enrolled.

Participant	Course
P1	Master in Materials Engineering
P2	Master in Information Science
P3	Master in Information Science
P4	Master in Industrial Engineering and Management
P5	Master in Information Science
P6	Master in Information Science
P7	Master in Information Science
P8	Master in Information Science
P9	Master in Information Science
P10	Master in Information Science

Table 5.1: Distribution by type of course for Master's degree students

Participant	Course
P11	Bachelor in Information Science
P12	Bachelor in Information Science
P13	Bachelor in Electrical and Computer Engineering
P14	Bachelor in Informatics and Computing Engineering
P15	Bachelor in Informatics and Computing Engineering
P16	Bachelor in Informatics and Computing Engineering
P17	Bachelor in Informatics and Computing Engineering
P18	Bachelor in Informatics and Computing Engineering
P19	Bachelor in Informatics and Computing Engineering
P20	Bachelor in Information Science

Table 5.2: Distribution by type of course for Bachelor's degree students

5.1.1 Objectives and themes of the questions

The questions that make up the interview were designed in such a way as to understand the main objective guiding the research, that is how GenAI tools influence the information behaviour of engineering students. The questions were designed based on four objectives:

1. to investigate how these tools are changing students' information habits and practices;
2. to identify concrete differences in the research process before and after contact with GenAI;
3. evaluate the impact of these tools on the way students access, interpret and use information, including aspects such as the quality of the information retrieved and information literacy skills;
4. reflect upon the potential role of GenAI as a complementary resource to academic libraries, with a view to strengthening the information literacy skills of higher education students.

Based on these objectives, the script was structured into nine questions, each orientated to address specific topics that meet the specified objectives, as shown below:

Q1 - Have you had contact with GenAI tools in an academic context? If so, for what purpose and how often do you use these tools?

Theme/Objective - To identify whether students have used GenAI tools in an academic context, how often and for what purpose(s);

Q2 - How did you search for information before using GenAI?

Theme/Objective - To explore the resources used and search habits before the emergence of these tools;

Q3 - Do you think these tools have changed the way you search for information?

Theme/Objective - To understand whether there have been changes in search strategies and approaches that have been introduced only since the use of these tools;

Q4 - How do you now structure your search with GenAI? Do you consider this process more or less efficient/demanding?

Theme/Objective - To evaluate the search strategies that students use in GenAI tools, in comparison with previous methods, and to understand whether students consider this process to be more or less efficient and more or less demanding (whether it requires more or less effort on the part of the student in order to be well understood by the algorithm).

Q5 - Is the information obtained through GenAI tools of higher or lower quality? What is this due to?

Theme/Objective - To investigate the students' perception of the reliability, depth and relevance of the information obtained, in relation to the instruction provided;

Q6 - How do you identify and evaluate the origin of the information obtained?

Theme/Objective - To understand whether it is usual to carry out a critical evaluation of the information obtained and to understand the criteria used by the student to validate and interpret the origin and credibility of the information;

Q7 - Do you consider the information obtained through GenAI to be useful for your academic tasks?

Theme/Objective - To confirm the usefulness and suitability of the information generated for carrying out specific academic tasks.

Q8 - Once integrated into academic libraries, should GenAI tools adopt a role of (1) replacing the resources provided by ALs, (2) complementing them or (3) not agreeing with this integration?

Theme/Objective - To analyse the position of students with regard to the possible integration of GenAI tools in ALs in the future and, if this is confirmed, to understand whether they consider that GenAI should complement or replace the traditional resources provided by academic libraries.

Q9 - What impact could GenAI have on academic integrity?

Theme/Objective - To reflect upon the risks and challenges that the use of GenAI could represent to academic integrity, particularly with regard to ethical implications such as plagiarism.

The questions were constructed in an open-ended way, allowing participants to freely express their opinions and, moreover, their experience. The structure of the script was designed to ensure consistency in data collection and, at the same time, to offer flexibility to deepen into other emerging aspects related to the topics covered that arose during the interviews, given the participants' responses.

5.2 Results of the interviews

This phase will present the main results obtained from the qualitative analysis of the interviews conducted with FEUP engineering students. This analysis was guided by a case study approach, based on the themes previously defined in the interview script. For greater clarity and logical sequence, the results will be presented grouped by question, which will make it possible to emphasise the participants' perceptions and experiences in relation to each subject. In each subsection (5.2.1 and following), the most frequent answers will be presented, grouped by category.

5.2.1 Contact with GenAI tools in an academic context: objectives and frequency of use

This first question sought to understand whether each student had already had contact with any GenAI tool in an academic context, as well as to identify the main objectives of their use and the frequency with which these tools are integrated into their academic routine.

At the time the question was asked, all the interviewees confirmed that they had already used GenAI tools in their academic career, though with different objectives and degrees of frequency. Analysing the answers allowed us to identify four usage trends, shown in Table 5.3, which occur repeatedly among the participants:

Participants	Findings
P2-P7, P9-P11	Support for structuring work and writing texts (e.g., introductions, conclusions, organisation of ideas)
P1, P4, P7-P9, P20	Researching and gathering information, including aggregation and systematisation
P11, P12, P14-P19	Deepening theoretical concepts and obtaining complementary explanations
P13-P15, P17, P18	Solving technical problems, especially in the area of programming, including correcting errors and/or suggesting code

Table 5.3: Main purposes of students for using AI

The table shows that Master's students (P1-P10) showed a strong tendency to use GenAI for support in structuring and writing academic work, as well as for organising initial ideas, drawing up summaries and drawing conclusions. There was also significant use for searching large volumes of information and confirming results. With regard to frequency, this characteristic varied between weekly and daily use, and was often conditioned by the existence of academic work.

Among undergraduate students (P11-P20), there was a greater incidence of using GenAI to deepen more technical concepts. Since some of the interviewees in this group are studying for a degree in Computer Engineering, given the nature of this course, there were some students who used these tools to help solve more specific problems, such as problems in the area of programming and correcting errors in code. Some interviewees emphasised the role of AI as a useful tool for understanding content that is considered more complex, from the perspective of complementing traditional learning methods.

In terms of frequency, the majority of interviewees indicated that they use these tools whenever there is academic work to be done, with the frequency described as "fairly regular", "frequent" or even "daily" in several cases. Use is therefore strongly associated with the existence of tasks that require more information.

It was thus revealed that the adoption of GenAI is already fully integrated into the academic routines of the students interviewed, although the objectives may vary according to the level of teaching and the type of tasks to be carried out.

5.2.2 Information behaviour before the use of GenAI tools

This question was put to the students to find out what their information search habits and practices were before the introduction of GenAI tools into their daily lives. The interviewer provided

examples of some potential sources used, search strategies or filtering techniques, with the aim of establishing a point of comparison with more recent habits.

Analysing the answers revealed a predominant pattern of using Google and other traditional search engines, often mentioned as the first resource for research. Alongside these, some students also said they used scientific repositories and databases, as well as the bibliography recommended in the course units.

That said, four main trends were identified.

Firstly, the use of traditional search engines (Google, Bing) with simple searches based on basic keywords or phrases is the trend that brings together the majority of students. These searches are characterised by a preference for direct searches with a low degree of complexity, without the use of more advanced techniques such as Boolean operators. However, it is important to emphasise that some students were aware that their strategies were not very structured at the time.

The combination of Google/Google Scholar and scientific databases such as Scopus, Web of Science (WoS), LISS or RCAAP is a technique used by several students who choose to use them as a gateway to scientific articles. In this case, it has been mentioned that in many situations Boolean operators, filters and other more advanced search techniques are also used. Even so, even among these, the central tendency continues to be towards Google as the first stage of more informal searches.

A small group of students said that they prioritised the sources provided within the framework of the course units, including the bibliography indicated by the lecturers and specific academic discussion forums. In these cases, Google was also used in parallel, but seen as a complementary tool.

Finally, the last trend found concerns the application of advanced search techniques, such as Boolean operators, inverted commas, searches originally in English or division by areas/themes.

Table 5.4 below shows the four trends highlighted above, together with the identification of the interviewees who fall within these trends.

Participants	Trend	Description
P1 P3-P5 P7 P8 P10-P16 P18 P19	Simple search engines (Google, Bing)	Informal search, with phrases or single words
P2 P6-P9 P20	Scientific databases (e.g. Scopus, WoS) and Google Scholar	Structured, scientific research
P11-P13 P17 P18	Formal bibliography and course materials	Use of books, forums, specific bibliographies
P1-P3 P6 P9 P11 P20	Search techniques (Boolean operators, inverted commas, English)	Application of advanced research methods

Table 5.4: Main trends in pre-IA research

It is important to note that several students, still in response to this question, began to recognise an evolution in their search practices with the arrival of GenAI, admitting that previously this process required more cognitive effort, since filtering, understanding and organising information depended exclusively on the user. However, this is an aspect that will be addressed when analysing the following questions.

In addition to the trends described, Figure 5.1 shows a bar chart summarising the distribution of the main types of behaviour identified among the students interviewed.

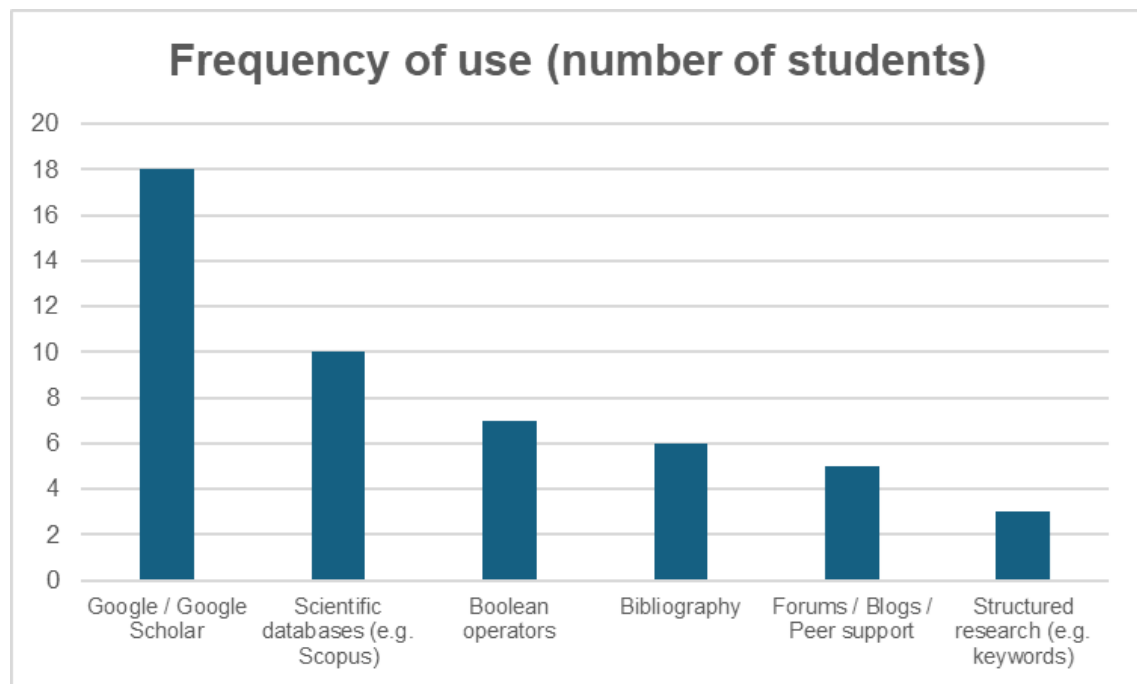


Figure 5.1: Distribution of types of behaviour by students

5.2.3 Main changes with the introduction of GenAI tools

Analysing the answers to the third question asked to the interviewees made it possible to identify trends in the information search processes of engineering students, driven by the introduction of GenAI tools. All the interviewees, without exception, recognised that these tools have changed, in some cases more markedly, the way they search for and access information.

As such, these changes have been organised into four main trends, as shown below.

1. Speed and efficiency in searching for information

Nine of the students interviewed said that the main change was the increase in speed and efficiency in searching for information, which has optimised the time dedicated to academic tasks and reduced the effort needed to locate relevant content.

2. Simplification of concepts

Another frequently mentioned change concerns the simplification of concepts considered to be more complex. GenAI tools are seen as a crucial aid to students' understanding, especially by converting content that contains more technical language into texts with very clear and accessible language.

3. Support in formulating initial ideas and synthesising information

As already mentioned by the students in the first question, several of the responses referred to the use of GenAI tools to structure initial ideas or to synthesise content based on ideas provided by the students themselves. This use arises above all in the preliminary stages of work, as a way of structuring thinking.

4. Direct access and information gathering

Some interviewees emphasised that GenAI tools contribute to more direct access to information and make it easier to gather relevant information according to their needs, reducing the number of steps in the research process.

Table 5.5 shows the four trends highlighted above, together with the identification of the interviewees who fall within these trends.

Participants	Trend	Description
P3 P11 P14-P20	Speed and efficiency in searching for information	Reduction in the time and effort needed to access relevant information.
P1 P3 P7-P9 P11 P12 P14-P17	Simplification of concepts	Clarity in language, accessible explanations, and easier understanding of complex content.
P2 P4-P6	Support in formulating ideas and summarising	Support in constructing reasoning, structuring ideas and summarising content.
P5 P6 P8-P10 P12 P13 P18 P20	Direct access to and gathering of information	Easier to find and gather relevant information for academic work.

Table 5.5: Main changes with the introduction of GenAI tools

It is important to emphasise that these categories are not mutually exclusive. Most students mentioned benefits that cut across more than one of these dimensions, demonstrating the cross-cutting nature of GenAI's influence on research processes.

5.2.4 Structuring research with GenAI tools

When the interviewees were asked the fourth question, it was hoped that they would focus on structuring their research, while at the same time assessing the efficiency and demands of using these tools. Analysing the answers, it was possible to identify three main dimensions associated with how the students interviewed understand the influence of AI on the formulation and structuring of their research: structuring the research, efficiency and cognitive demand. These dimensions reveal some relevant aspects in the way AI is beginning to transform research habits in the academic context.

With regard to structuring research, the responses show two profiles in terms of how the interviewees structure their instructions when using GenAI tools.

Some students choose to provide structured instructions, with context and an explanatory introduction, which shows care in formulating their questions, starting them with explanations or text in a conversational/dialogue format. The complexity of this structuring is intended to ensure that the tool understands exactly what is intended.

On the other hand, there is a group of students who give these tools simple, straightforward and basic instructions, who say that they tend to formulate questions that are quite targeted to what they want and sometimes with little context, so there is a generalised confidence that even basic instructions will result in appropriate answers.

As for the efficiency of the answers, the majority of participants consider GenAI tools to be efficient, above all because of the level of detail and focus they show in the answers, and several interviewees highlighted the speed with which the information is presented as a central factor in this efficiency. Despite the majority opinion, five students pointed out that compared to other sources, such as traditional search engines, these tools don't always present the same level of efficiency, either in terms of the accuracy of the information or the nature of the answers.

Finally, with regard to the cognitive demands on the user of these tools, perceptions are fairly divided into two groups. On the one hand, a number of students believe that greater demands are needed and argue that the effective use of these tools requires a greater ability to formulate questions, that is it requires the student to be clearer, more organised and more aware of what is really required, implying careful structuring of the question and the research itself so that the answer is really appropriate and relevant. On the other hand, a significant amount of the sample say that it doesn't take much effort to get relevant answers, even when asking simple questions, and this perception is generally associated with the idea that AI has a good ability to understand vague or generic instructions.

Table 5.6 summarises the total trends observed in the interviewees' responses regarding the way they structure their research using AI, their perception of the efficiency of these tools and the degree of cognitive demand associated with their use. In turn, Figures 5.2 and 5.3 analyse the students' perspective on the efficiency and demand, respectively, of these tools.

Participants	Trend
P1 P3 P7 P8 P11 P12	Structured instructions (with context)
P4-P6 P9 P10 P13-P20	Simple/direct instructions
P1-P13 P19 P20	AI seen as efficient
P14-P18	AI seen as less efficient
P1-P3 P6 P9 P12 P20	Requires more of the student
P4 P5 P7 P8 P10 P11 P13-P19	Does not require much of the student

Table 5.6: Main purposes of students for using AI

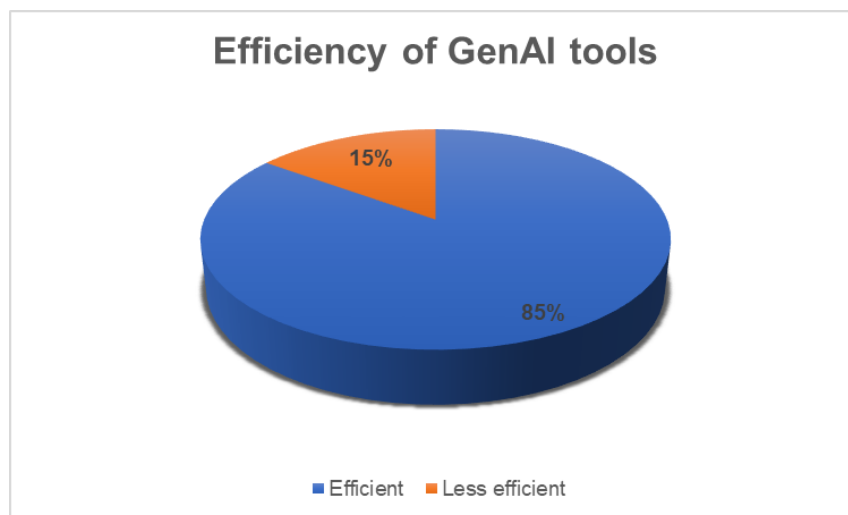


Figure 5.2: Efficiency of GenAI tools

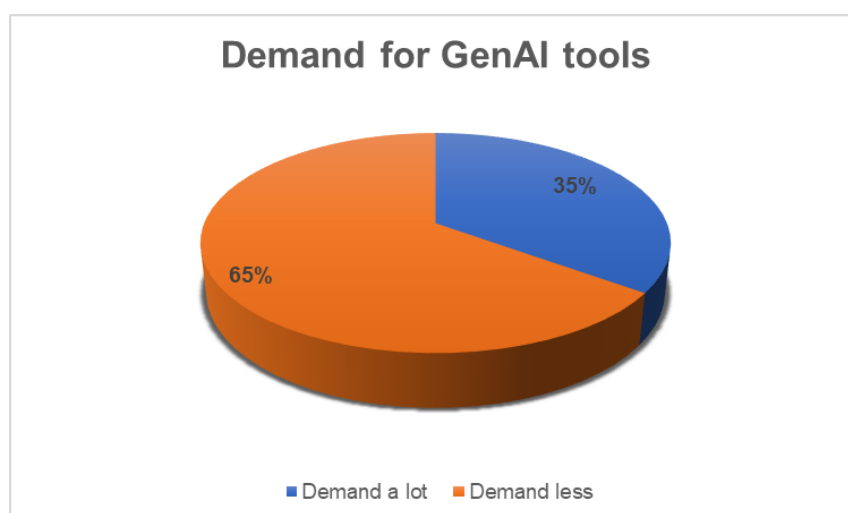


Figure 5.3: Demand for GenAI tools

5.2.5 Quality of the information retrieved from the GenAI tools

In a context of constant contact with information, its quality is one of the essential points for the development of critical thinking and the construction of knowledge with rigour and accuracy. Allied to this, with the growing use of GenAI tools in the academic context, it is extremely important to understand the extent to which the information provided by these technologies is credible, accurate and appropriate to the objectives of those who use it. This is why the fifth question was drawn up and the analysis of the answers reveals a generally positive perception, but where various criteria arise regarding the quality of the information retrieved by GenAI tools.

It can therefore be concluded at this level that the quality of the information provided by these tools is generally seen to be of a good standard, although some care should be taken. The majority of participants consider that, in general, this information is especially effective when it comes to questions of a more factual and objective nature. In the latter case, students describe the results as clear, organised and with a good or at least satisfactory degree of accuracy. There are also students who say that this quality has improved over time, denoting a certain evolution and refinement on the part of these tools.

Despite this positive assessment, certain precautions should not be overlooked, and these were listed in the responses. Several interviewees pointed out the need to carry out a critical assessment of the content, emphasising that the sources presented are not always reliable or sometimes don't even exist. This concern is especially enhanced when it comes to more subjective issues, such as research papers or topics that require greater depth. In these cases, some participants consider that the quality of the information provided may only be satisfactory or even unsatisfactory, which emphasises the importance of verification and the user's ability to analyse.

Thus, although the majority of interviewees recognise the value of GenAI tools in providing quality information, this recognition may be conditioned by awareness of their limits and the need for critical validation on their part, especially in more subjective academic contexts.

Figure 5.4 presents a graph showing the distribution of the interviewees, in the universe of twenty students, regarding their perception of the quality of the information generated by these tools.



Figure 5.4: Students' perception of the quality of information generated by GenAI

5.2.6 Critical evaluation of information

In the current context of easily accessible content generated extremely quickly, the ability to verify the veracity or accuracy of sources is becoming extremely necessary. The critical evaluation of the information provided by GenAI tools thus emerged in the answers to this question as an important point in their responsible use in the academic context. An analysis of the answers obtained reveals that the majority of students recognise that it is very necessary to carry out a critical evaluation, and that they adopt different strategies with a view to guaranteeing the reliability of the information.

Most of the interviewees said that they carry out a critical evaluation of the answers provided by the GenAI tools. In many cases, this evaluation is carried out by requesting sources directly from the tool itself, followed by a manual check by the students, who then explore the sources and, when they are considered unreliable, resort to a second level of verification, which they call "double-checking", often carried out on traditional search engines such as Google.

However, there is a group of students who have also shown that they adopt a critical attitude, thus in a different way. In these cases, preference is given to comparisons with databases, other sites that they consider to be reliable, confirmation with the course bibliography or even other AI tools that deal with data provided by the users themselves.

One interviewee said that almost never carries out a critical evaluation, recognizing, however, that these tools can fail, explaining that, from this perspective, despite growing awareness, there is sometimes a certain amount of trust in the information received.

It should also be noted that the question was not put to students P14 and P15, given the characteristics of their profile combined with their patterns of use of GenAI tools, which they themselves

mentioned in response to the previous questions, where it was stated that use exclusively involves programming tasks and creating code or correcting it when necessary.

Table 5.7 below shows in more detail the strategy used by each student to carry out the critical evaluation, in the applicable cases.

Participants	Strategy used	Notes
P1	Requests sources from the tool and checks on Google	
P2	Comparison with databases	
P3	Uses other AI tools based on self-provided content	
P4	Requests sources from the tool and checks on Google	
P5	Requests sources from the tool and checks on Google	Does not use AI for scientific research
P6	Comparison with databases	
P7	Requests sources from the tool	
P8	Requests sources from the tool and checks on Google	Does not use AI for scientific research
P9	Uses other AI tools based on self-supplied content	
P10	Requests sources from the tool	
P11	Not in the habit of carrying out a critical evaluation	Recognises flaws, but is not in the habit of checking
P12	Checks on search engines (e.g. Google)	
P13	Requests sources from the tool and checks on Google	
P14		The question was not asked due to usage patterns
P15		The question was not asked due to usage patterns
P16	Checks search engines (e.g. Google)	
P17	Consults UC bibliography and search engines	
P18	Requests sources from the tool	
P19	Checks search engines	
P20	Requests sources from the tool	

Table 5.7: Main changes with the introduction of GenAI tools

Figure 5.5 shows a pie chart highlighting the different types of critical evaluation strategies used by students, in a sample of eighteen students, given that this question was not asked to two students due to their usage patterns, grouped into three groups: searching for sources and double-checking on search engines, which accounts for more than half of the total (78%); a comparison with scientific databases and/or bibliography of the course units, with 17%; and, finally, those who do not make a critical evaluation, with only 5%, since only one student revealed that they did not take this care.

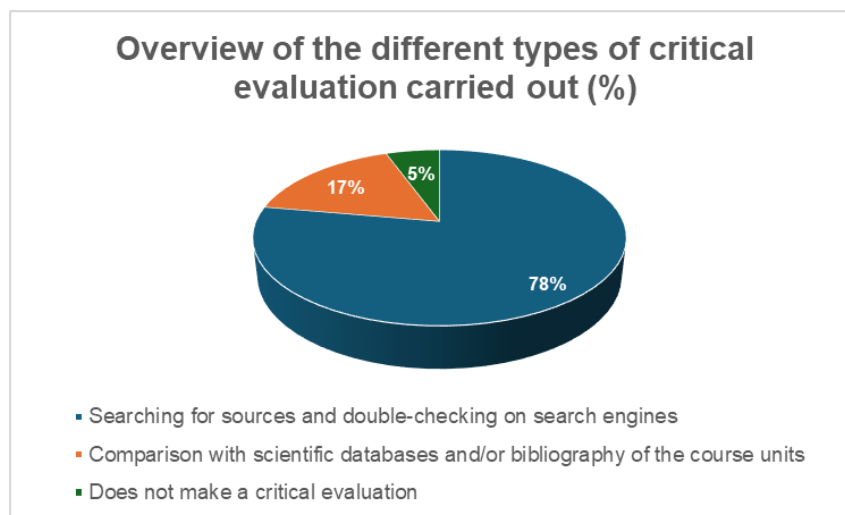


Figure 5.5: Comparison between the different types of critical evaluation carried out by students

5.2.7 Usefulness of GenAI tools in the academic context

This question was introduced in the interview with the aim of summarising all the other previous answers. When the students were asked this question, they were simply expected to infer whether these tools were actually useful for any and all tasks they had carried out in the course of their academic career, so no further explanations were requested, as these had already been provided in response to the previous questions.

That said, based on the answers to the seventh question, it is possible to state that there is unanimity regarding the usefulness of the information obtained by GenAI tools for the academic tasks of the students interviewed. All the students, without exception, answered that they consider these tools to have always been very useful when it comes to information from GenAI.

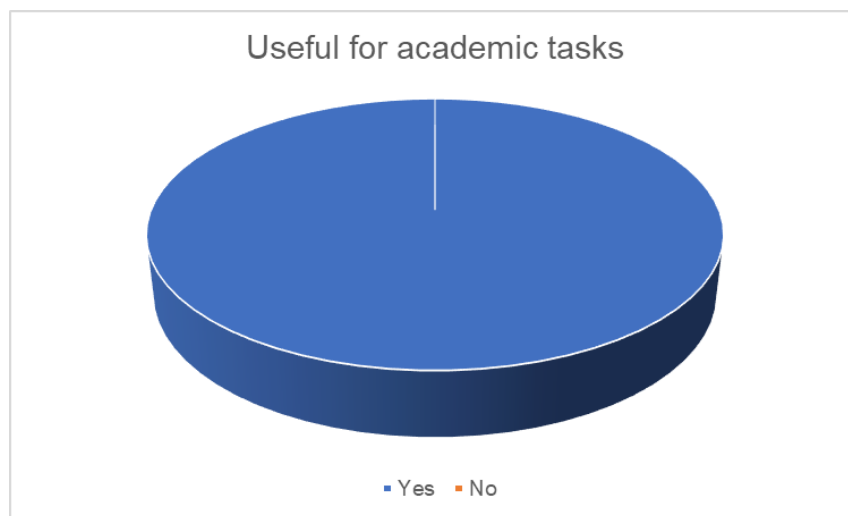


Figure 5.6: Usefulness of GenAI tools in the academic context

5.2.8 Integration of AI in academic libraries

By analysing the answers to the eighth question, it was possible to conclude various students' perceptions of the role that GenAI tools should play in the context of the resources provided by academic libraries. It was hypothesised

- a) the possibility of a total replacement of existing resources in academic libraries;
- b) the integration of AI but through a complementary relationship with these resources;
- c) the possibility of not integrating AI into these spaces.

As a result, a large proportion of those interviewed favoured a complementary relationship between GenAI tools and traditional library resources. The students recognise the usefulness and potential of AI tools, but stress that they are not infallible, nor are they currently sufficiently developed to completely replace existing resources.

It was also pointed out that the integration of AI could be a support at different stages of the study process or in research work, provided that it is accompanied by conscious use, critical evaluation and that traditional resources remain accessible.

On the other hand, two students, P11 and P12, did not agree with the integration of AI in the current context, considering that the resources already available are sufficient and pointing out the need to improve the accessibility and usability of the existing library website. Allied to this fact, they also argued that, as mentioned by other participants, GenAI tools are not yet sufficiently developed to justify their incorporation, although both do not completely rule out this possibility in the future.

In short, analysing the responses on this subject reveals an optimistic position towards the complementary integration of GenAI, as shown in Figure 5.7, into the universe of academic libraries, as long as it is done consciously and in conjunction with existing resources.

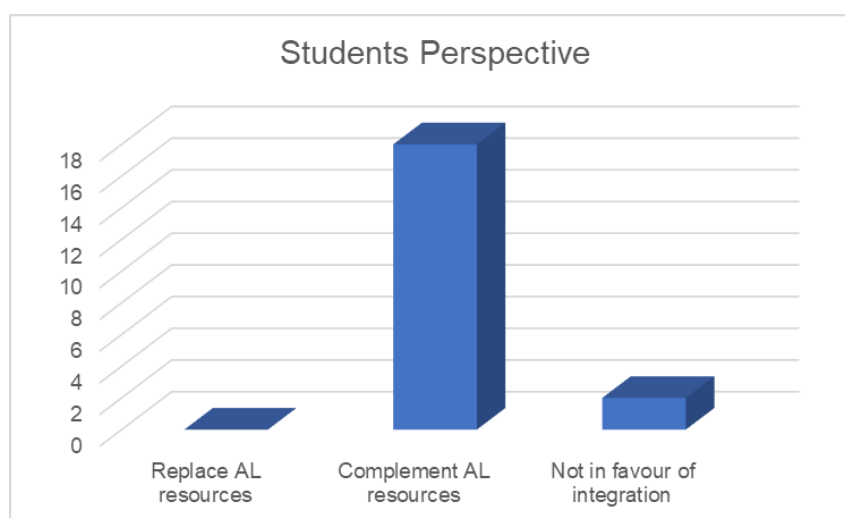


Figure 5.7: Students' perspective on the integration of AI in academic libraries

5.2.9 Impact of GenAI on academic integrity

Based on the responses to the last question asked to students, it was possible to observe a division between students who believe there will be a negative impact, or at least that it will cause problems, and students who believe that there will be no negative impact caused by the integration of GenAI tools in academic libraries, as long as they keep in mind an ethical awareness/vision and good practices in the use of information.

Thus, a group of students, which constitutes the majority, recognises that there may be negative impacts associated with the use of GenAI tools, mainly related to the lack of information on referencing and the poor reliability of these tools. Therefore, they consider that the lack of clear rules on how students can correctly cite AI-generated content, combined with the ease of access and copying of varied information, can be an obstacle and constitute a threat to the increased risk of unintentional plagiarism and unethical use of the generated information. Some of the students also mentioned that some of these situations could be avoided through plagiarism detection mechanisms, already used in an academic context, or even the integration of GenAI tools together with reliable academic databases, such as Scopus or Web of Science.

In contrast, a high number (seven students) of the total number of respondents consider that the integration of AI in academic libraries does not have a marked negative impact, as long as a critical attitude and ethical awareness are maintained and promoted by the academic community. Some students also mentioned that the main justification for this position lies in the fact that the main problem is not the tool being used, but the user and their ethical and academic foundations. In addition, it was further emphasised that, in the view of this group of students, the academic community has been demonstrating greater knowledge regarding the correct use of these technologies.

Thus, it is pointed out that the main trend is to recognise that GenAI tools pose some challenges in terms of ethical aspects, which can be mitigated through training, awareness and specific rules

appropriate to the case in question.

Figure 5.8 graphically shows the distribution of students between the two groups mentioned.

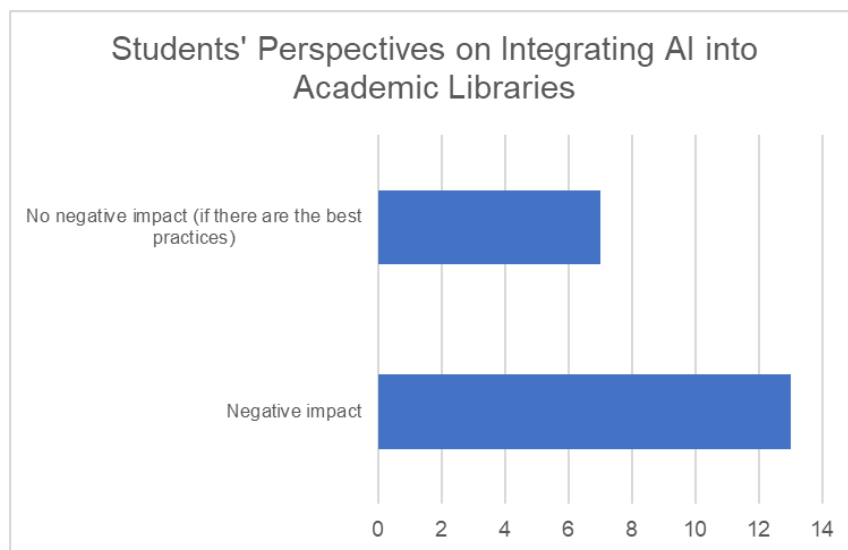


Figure 5.8: Students perspectives on integrating AI into ALs

5.3 Summary

In order to summarise the main results of the analysis, a conceptual map is presented below that summarises the main themes and trends identified throughout the study.

The map (Figure 5.9) is organised into six main points:

1. Information Quality: viewed as satisfactory/good, but combined with the need for continuous critical evaluation, especially due to the difference in reliability between objective and subjective subjects.
2. Critical evaluation of information: most students reported having carried out some form of critical evaluation when using GenAI tools. The most common practices include checking the sources provided by the tool and verifying the information using traditional search engines such as Google or academic databases. This behaviour is especially important due to the known limitations of GenAI in terms of accuracy and referencing.
3. Efficiency and demand for GenAI tools: GenAI is understood to be efficient and intuitive to use, but it requires some care in terms of information validation.
4. Usefulness of GenAI tools: GenAI tools are considered useful in supporting academic tasks, particularly in organising ideas, preparing summaries and writing papers.
5. GenAI's role in relation to AL resources: the view is that GenAI should act as a complement to existing resources, as it is not yet sufficiently developed to be a full replacement.

6. GenAI's impact on Academic Integrity: although there are risks, mainly related to the lack of referencing of information, the importance of raising awareness and training students is reinforced, as well as the adoption of plagiarism detection mechanisms.

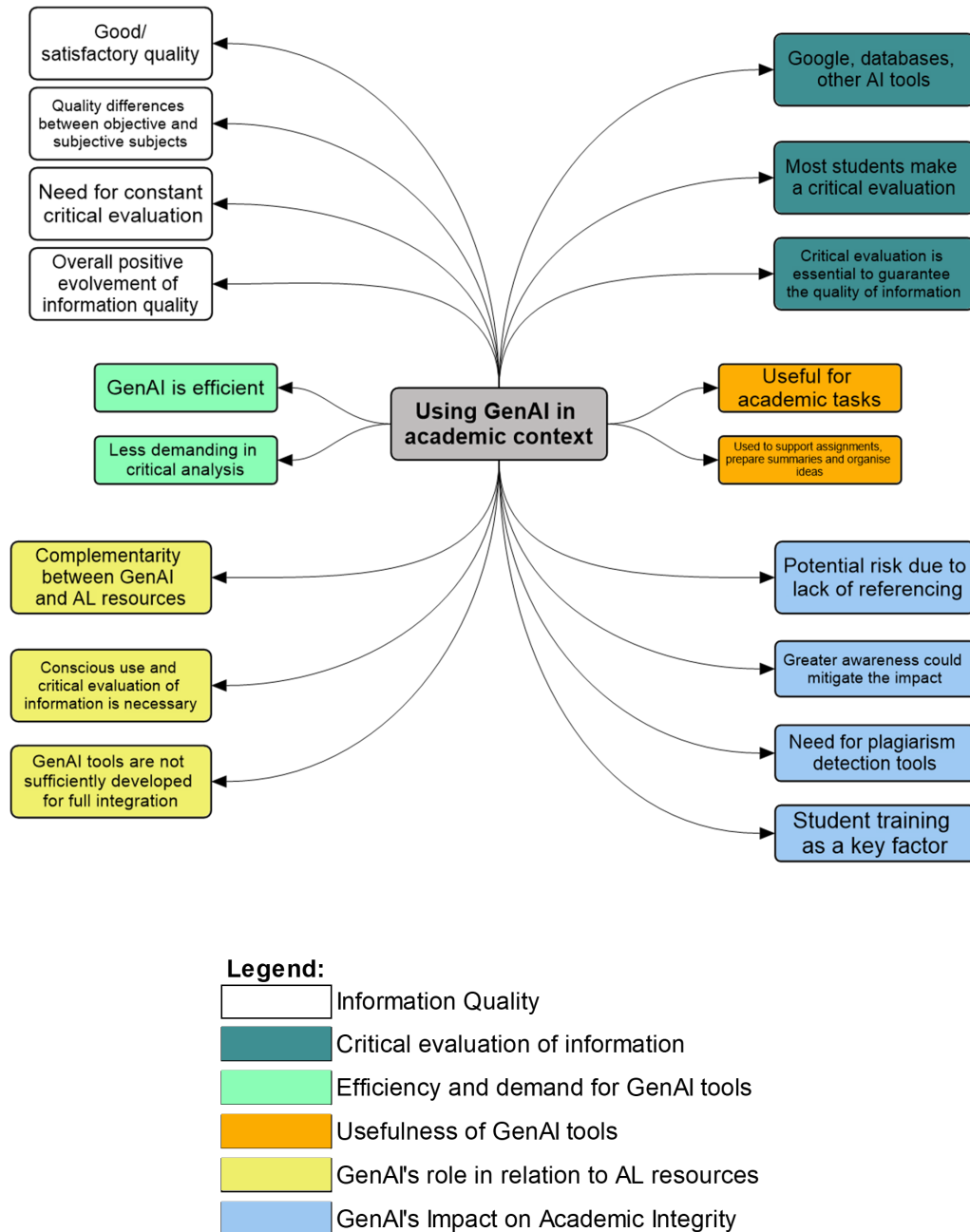


Figure 5.9: Summary of data analysis

Chapter 6

Discussion

This chapter will present a critical discussion that crosses the findings of the literature review with the results obtained in the empirical study, seeking to validate or refute the initial hypotheses of this research. Taking into account the guiding question of this research, "Do GenAI tools and resources contribute to students' information literacy?", the main objective will be, in addition to answering this question, to relate the data obtained in the research to the literature analysed, as well as to revive some of the concepts contained therein. Thus, it was decided to structure the Discussion around four main areas:

1. The information behaviour of the students interviewed versus information behaviour from the perspective of the literature;
2. The information literacy skills of the students interviewed and their critical attitude versus information literacy from the perspective of the literature;
3. The role of Academic Libraries in this context and the integration of AI;
4. Aspects related to Academic Integrity.

At the end of the chapter, a SWOT analysis will also be presented, which analyses the positive and negative points or threats of integrating GenAI into academic libraries, based on the results obtained in the previous chapter, as well as some ideas that will be introduced in this discussion of results.

This structure allows evaluating the validity of the hypothesis and understanding the effects of GenAI integration on students' practices and attitudes.

In addition to the above, this structure proved to be more appropriate and logically sequenced in relation to the objectives proposed in Chapter 1, from the most general to the most specific.

6.1 Information Behaviour

Wilson, 1999 defined information behaviour as the attitudes and strategies that enable the identification of needs, the search for information, and the use of information. It is in the context of this

definition that the data analysis confirmed that, in terms of information behaviour, the students interviewed have undergone changes, especially when compared to the pre-AI era.

Before the emergence of GenAI tools, analysis of the interview results shows that the informational behaviour of FEUP students was, until then, predominantly focused on the use of traditional search engines, such as Google, for initial and informal searches, with frequent use of simple words or phrases. However, differences were found when comparing Master's and Bachelor's students. Master's students, particularly those studying Information Science and given their study plan, tend to have greater contact with scientific databases (Scopus, WoS, LISS, RCAAP) when conducting their research and to use more structured search strategies, including Boolean operators, to access scientific articles. Bachelor's students, with the exception of Information Science students, have simpler search habits, with less use of Boolean operators, or lack of knowledge of them, and specialised resources, such as the aforementioned databases.

With the introduction of GenAI tools, all students interviewed began to use them in their academic careers, with diverse objectives of use that are often influenced by the areas they study, resulting in widespread adoption and representing a significant transformation in their information behaviour. These changes suggest a reformulation of the initial stage of information exploration, where traditional search engine research is being complemented or, in some cases, replaced by direct interaction with GenAI tools. The speed and efficiency in acquiring relevant information through these tools were highlighted by a significant amount of the sample as the main change driven by GenAI, so this search for a faster approach with very accessible language reflects an adaptation of their behaviour to better optimise time in academic tasks.

Regarding the structuring of research with GenAI, responses are divided between students who develop more structured and contextualised instructions, seeking a more accurate understanding by the tool, and students who choose to outline simple and direct instructions and trust in the AI's ability to provide adequate responses even without contextual explanation. It appears that this duality in input formulation behaviour may be related to the perception of efficiency and cognitive demand associated with the tool, as although most students consider these tools to be efficient, some recognise that, compared to other sources, accuracy may vary. In turn, perceptions of cognitive demand also diverge: for some students, the effective use of these tools requires greater clarity and structure of thought to formulate precise questions, while others feel that the effort is less due to the tool's good comprehension capacity, so this difference in understanding of the tool's demands may directly influence the type of search behaviour adopted (the choice of structured or simple instructions).

In short, the results obtained in the interviews confirm that the informational behaviour of the students interviewed was altered by the introduction of GenAI, reflecting a change in the initial stages of research and a search for greater efficiency and speed, subsequently developing, in most cases, behaviours for the evaluation and critical validation of information. However, GenAI has not only redesigned the initial stages of student research, but has also simplified the entire cognitive process associated with it, since by facilitating research and thought structuring, these tools may be reducing students' cognitive development. Therefore, this means that the very technology that

was created with the aim of supporting the learning process may, in some cases, promote less in-depth informational behaviour. This behavioural transformation, regardless of its final outcome, in itself reveals a new paradigm, taking into account research behaviour before the emergence of GenAI tools.

6.2 Students' information literacy skills and critical attitude

Dott et al., 2024 pointed out throughout the literature that easy and quick access to information through GenAI can lead to passive consumption behaviour, where users may neglect to verify the quality of information or sources, and this risk may result in the loss of essential information skills, such as critical evaluation and critical thinking.

Nevertheless, the results obtained in the interviews revealed that the students interviewed generally perceive the quality of the information provided by GenAI as good, especially when it comes to more factual and objective questions, considering the results to be clear, organised and somewhat accurate. Another factor that made a positive difference and was mentioned by some students was the noticeable improvement in the quality of information generated by these tools over time. However, this positive perception is accompanied by an explicit recognition of the need for increased attention on the part of those who use them and constant critical evaluation, especially when it comes to research work, where more subjective areas are involved, because if this care is not taken, the quality of the information will tend to be unsatisfactory or barely satisfactory. Thus, these results are the result of students' reflection and awareness of the limitations of GenAI, thus aligning with the need to assess the credibility, accuracy and reliability of sources, a pillar of information literacy, as noted by Moustapha, 2023.

As for the effective critical evaluation of information obtained by GenAI tools by students, the overwhelming majority of students claim to critically evaluate GenAI responses, making this one of the most significant and positive behavioural adaptations in the context of information literacy skills. About 95% of students reported performing this critical evaluation, which reveals a set of more conscious habits with regard to information validation. In addition to requesting sources directly from the tool, students tend to frequently resort to other complementary ways to perform this validation and even comparisons between different AI platforms. In this sense, the existence of these strategies shows not only a higher level of skills and critical attitude on the part of students, but also a concrete response to the risks of poor quality information or sources, previously identified in the literature, since this behaviour tends to contradict the initial idea of Dott et al., 2024, which encompasses the risk of passive consumption of information, demonstrating that the introduction of GenAI to students reinforces the importance of verifying information in practice and leads them to structure strategies for assessing the reliability and credibility of information sources. Thus, although one of the students interviewed admits that he does not always have the habit of carrying out a critical evaluation, the general trend points to a more conscious and critical behaviour at this level, a crucial factor in the context of students' information literacy skills.

It is important to note once again that, in the context of information literacy, the academic background of the participants may reveal changes in their behaviour and critical attitude. Given that there are students with previous contact in situations where information literacy is worked on, namely students who are developing research work or are in the field of Information Science, they reveal specific behavioural patterns when using Boolean operators, resorting to multiple sources and showing greater sensitivity to verifying the information obtained. However, this situation underscores the idea of Lopes et al., 2015 that information literacy skills are developed largely through training and practical work, often supported by academic libraries. This reinforces the central role of information literacy, not only as a set of technical skills, but also as an ethical framework. Core training in evaluation, referencing, and the ethical use of information should therefore remain a priority in students' academic careers.

6.3 The role of academic libraries and the integration of AI

With the advancement of new technologies, such as GenAI, there is a need to readjust traditional information habits, and academic libraries, as spaces for the transmission of knowledge, must reinforce their role in this context. Dott et al., 2024 advocate not only information literacy but also "AI literacy". It is therefore in this context that academic libraries must provide the necessary guidance and resources adapted to the favourable development of GenAI, helping students to understand the benefits that this technology can bring and highlighting the disadvantages that these tools can entail in their academic career. Furthermore, by imparting this knowledge, academic libraries can also enable students to receive training that is more appropriate to the current context and to develop critical thinking about information generated by AI.

In this sense, the results obtained in this research are, for the most part, in line with the ideas mentioned by various authors in the literature, since in both cases there is a need for academic libraries to adapt to this new era marked by GenAI. Despite this favourable opinion, students prefer the integration of GenAI into academic libraries to be complementary, without replacing existing resources, which reflects their awareness of some negative points or limitations of these tools.

This concern on the part of students, combined with the conscious use and critical evaluation of GenAI mentioned by them, requires academic libraries to promote the aforementioned "AI literacy", as well as the ability of their users to make good critical assessments and be equipped with critical thinking skills that allow them to have the most accurate perception of the information generated by AI. In turn, the idea of continuing to use traditional library resources shows that, although GenAI tools are extremely useful for countless tasks, they should not replace the need to check and validate the information obtained. Since students consider libraries to be a place of learning and support, these institutions must maintain their position as providers of quality knowledge, with GenAI serving only as a complement. This complementary relationship, proposed by the students, refers mainly to the coexistence of traditional resources, such as physical resources, scientific databases, and all the support and training offered, together with GenAI tools, in an

auxiliary role in the initial phase of research and structuring of ideas. The literature (Dott et al., 2024) further reinforces this view by proposing that academic libraries promote "AI literacy" as an extension of traditional information literacy, with a view to training critical users with a high degree of autonomy when using AI-based tools. It is also argued that academic libraries should adapt their services to include training and guidance strategies on the ethical use of GenAI, so this complementary relationship is something to be achieved (IFLA-FAIFE, 2020), with one of the potential benefits being to reinforce, through this measure, the library's mission as a space responsible for promoting the training of students in both information literacy and AI literacy. In this way, academic libraries and their managers gain an increased role as mediators capable of guiding their users in interpreting information and subsequently verifying content generated by AI. So, the coexistence of traditional resources and new technologies should be seen as an opportunity to enrich students' skills and not as a replacement for their fundamental habits or practices.

Thus, and taking into account the above, the integration of GenAI into academic libraries is seen as a way to strengthen and benefit the information literacy of their users, especially students, as it tends to take on a role of driving a new paradigm, in which informed and critical use of GenAI tools is promoted.

6.4 Academic integrity

The literature analysed, particularly that relating to GenAI, shows that ethical and academic integrity issues are a concern that has increased significantly with the use of these tools.

Since GenAI models are trained with large volumes of information, they often include copyrighted material, so their use and subsequent transformation of this data without the author's permission raises questions about the copyright ownership of content generated by GenAI. Also, due to the ease and speed of access and content creation through GenAI, there is an increased risk of plagiarism in the academic context. In general, the lack of transparency about the origin of the information generated raises questions about the authenticity of academic work, and it is still very difficult to determine whether a particular piece of work was constructed or generated by these tools.

In this sense, and also taking into account the results obtained, it is clear that the main concern relates to plagiarism and references. This problem, highlighted by authors such as Fruehauf et al., 2024, was mentioned by most of the students interviewed, who recognise potential negative impacts, mainly related to the lack of information on how to reference content generated by GenAI. They also emphasise that ease of access and copying is seen as a factor that can increase the risk of plagiarism, sometimes even unintentional, and unethical use of information. Thus, students recognise that these negative impacts on academic integrity are due, in part, to the poor or insufficient reliability of GenAI tools. However, as mentioned in previous points, the fact that most students critically evaluate responses by checking sources or comparing them with other resources suggests that critical evaluation strategies, as introduced by Dott et al., 2024, are already being adopted.

Nevertheless, there is one extremely important aspect to highlight, which concerns the responsibility for the (un)ethical use of information. Dott et al., 2024, when introducing the term ‘AI literacy’ and the need for conscious and ethical use of GenAI tools, refer in part to the increased responsibility of users to be equipped with the skills and knowledge that enable them to effectively have the necessary knowledge for such efficient and ethical use. This idea is in line with the perspective of the students interviewed, who show a sense of individual responsibility, since they argue that the main problem lies with the user and not with the tool, and that if they are equipped with a critical attitude and ethical awareness, this situation would mitigate any negative impact that may exist. This perspective is in line with the literature, as it values ethical training and the development of information skills, arguing that the impact of GenAI on academic integrity will depend, above all, on the literacy and responsibility of its users. It should also be added that some students consider that, over time, the academic community has been demonstrating greater knowledge regarding the correct use of these technologies, so the process of developing these skills may already be underway, although still at an early stage.

Finally, in an attempt to minimise or even solve the risks listed, while Mannheimer et al., 2024 advocate the establishment of new policies and regulations to establish the copyright of content used and generated by GenAI, students suggest that specific mechanisms for detecting plagiarism, some of which are already known and used in an academic context, be implemented in conjunction with GenAI tools, or that GenAI tools be integrated with scientific databases. These solutions, presented from the perspective of students as library users, reveal a high degree of ethical awareness and concern for the credibility of their academic work. Thus, these suggestions provided by students should be taken into account in order to complement the strategies proposed in the literature, such as the establishment of rules, reinforcing the clarity and transparency of libraries and even academic institutions.

6.5 Main findings

The discussion in the previous sections has enabled the preparation of a summary of the main findings of this research, as presented in Table 6.1, as well as their relationship with the literature analysed.

THEMATIC AXIS	MAIN FINDINGS	RELATIONSHIP WITH THE LITERATURE
Information Behaviour	• GenAI changes the way students initiate research • The perception of GenAI's efficiency and demands varies among students, influencing the type of interaction and the depth of research • Simplification of the entire associated cognitive process.	• It confirms Wilson, 1999 perspective on the adaptability of information behaviour to context and available tools • The influence and importance of the educational context is confirmed (Araújo et al., 2017) • The impact of academic background on students' information behaviour is added (Xavier, 2021)
Information Literacy	• AI contributes to literacy when used critically and reinforces the importance of evaluating sources • The research reveals students with a more critical attitude than expected in the literature • Training influences the relationship with AI and the quality of information decisions	• It confirms Moustapha, 2023 perspective on the potential of IL in supporting understanding, but warns of the risks of its misuse • It contradicts some ideas introduced by Dott et al., 2024, especially the warning about the risk of passive consumption of information • Confirms the idea of Lopes et al., 2015 that information literacy is developed through training and practice
Academic libraries	• Students value the role of libraries as a complement to GenAI and suggest their integration into library services, provided that certain precautions are taken • Reinforcing the role of ALs as mediators in the analysis and verification of information generated by AI.	• Confirms the idea of Lopes et al., 2015 regarding the role of libraries in the critical mediation of information • Ideas aligned with the perspective of Dott et al., 2024 on the need for "AI literacy"
Academic integrity	• Critical area sensitive to the misuse of AI • Students point to user behaviour as a key factor in mitigating risks • They also suggest measures such as integration with scientific databases or plagiarism detection mechanisms	• The ideas of Fruehauf et al., 2024 and Dott et al., 2024 regarding plagiarism and critical evaluation are confirmed

Table 6.1: Summary of the main findings of the research

6.6 SWOT analysis

Before concluding this chapter, it is now important to summarise the main results together with the main findings of the research, but from a strategic perspective. Through a SWOT analysis, presented in Tables 6.2 and 6.3, it is possible to describe the strengths, weaknesses, opportunities, and threats associated with the integration of GenAI in the context of academic libraries, so that the potential impact of the results discussed is clear and to facilitate the planning and implementation of any future measures.

STRENGTHS	WEAKNESSES
• High efficiency and effectiveness in accessing information	• Lack of transparency in sources
• Support in the structuring of ideas	• Potential decline in cognitive development
• Ease of use and accessibility	• Variability in the quality of generated content
• Potential complementarity with existing resources	

Table 6.2: SWOT analysis – Strengths and Weaknesses of GenAI integration in academic libraries

OPPORTUNITIES	THREATS
• Further reinforcement of information literacy	• Risk of plagiarism and misuse
• Expansion of library training offers, such as AI literacy programmes	• Replacement of reliable bibliographic sources
• Greater student engagement with library services	• Passive consumption of information
• Integration with scientific databases	

Table 6.3: SWOT analysis – Opportunities and Threats of GenAI integration in academic libraries

Although traditionally a SWOT analysis has a structure that looks at four aspects (strengths, weaknesses, opportunities, and threats), it was decided to also include a third table that aims to explain the analysis beyond the students' perspective. While tables 6.2 and 6.3 capture the main points perceived, most of them from the users' perspective, table 6.4 highlights the dimensions at an institutional level¹. This information is extremely important for a deeper understanding of the context in which GenAI integration occurs and enables academic libraries to anticipate challenges that may affect implementation.

¹ Although most of the information was obtained from the literature reviewed, few conclusions were drawn based on the responses provided by students in the interviews conducted.

ADDITIONAL WEAKNESSES	ADDITIONAL THREATS	ADDITIONAL OPPORTUNITIES
• Limited staff training in AI tools and ethical implications (IFLA-FAIFE, 2020)	• Lack of clear institutional policies on AI use (Fruehauf et al., 2024)	• Potential for partnerships with AI development teams (IFLA-FAIFE, 2020) (Newcastle-University, 2023)
	• Risk of decreased trust in library services if GenAI is misused (Lund et al., 2023)	
	• Potential misalignment between AI capabilities and user expectations (Fruehauf et al., 2024)	

Table 6.4: SWOT analysis – Institutional and strategic considerations related to GenAI integration in academic libraries

This analysis, by enabling an understanding of the main critical points and opportunities associated with GenAI integration, can also serve as a decision-making support tool for libraries in higher education institutions.

Chapter 7

Conclusions

Throughout all chapters, this dissertation sought to understand the effects and implications of using GenAI tools on the information behaviour of engineering students, focusing on how they search for, evaluate and use information in an academic context. At a time marked by digital transformation and the strong increase in the presence of new technologies, such as AI, in higher education, it proved extremely important to investigate how this new technology-related paradigm could interfere with cognitive aspects, training and issues related to information ethics, all of which are traditionally promoted by institutions such as academic libraries.

The importance of this research lies not only in the significance of the subject, but also in its conceptual and thematic nature, because although there is already recent literature that points to some of the potentialities and concerns associated with GenAI in the academic context, it is very important to continue to understand and study the daily practices of students and their relationship with the central concepts of information literacy.

It was in this sense that this research required a qualitative approach, using interviews, so that the collection and analysis of data would allow for an in-depth understanding of the main strategies, perceptions and concerns of students associated with the use of GenAI tools in their academic tasks, as well as an identification of trends associated with different student profiles.

Based on the research question ‘Do GenAI tools and resources contribute to the information literacy of engineering students?’, this study, as previously mentioned, sought to investigate the results of using GenAI on information behaviour and skills associated with research, evaluation, and the ethical use of information. In this regard, this analysis revealed that GenAI is being widely used as an initial resource to support the structuring of ideas, clarification of various concepts and organisation of tasks. Its ease of use and accessible language, combined with its ability to synthesise information, have made it an effective alternative to the traditional research methods used previously. It was also possible to observe the coexistence of two distinct profiles of students - those who adopt a critical stance and use GenAI as a complementary tool to their research process and those who show a greater dependence on AI, with a consequent tendency to check information sources less, thus answering the first three objectives in Figure 1.1. Furthermore, the cognitive implications of using GenAI should not be overlooked. This study revealed that

simplifying information retrieval and task structuring can, in some cases, lead to reduced cognitive effort and a decline in critical thinking skills, especially among students who use these tools less reflectively.

In addition to the above, each student's perception of the integration of AI in academic libraries was also analysed, with the majority of respondents demonstrating a view that recognises that GenAI tools can and should be integrated into the daily life of these spaces, but never in an attempt to replace existing resources. On the other hand, students consider that, even in this context, libraries should take on a role in training their users, as well as mediators in the analysis and verification of information obtained through GenAI tools, helping them to understand the benefits and, above all, the disadvantages of using GenAI, to develop skills to critically evaluate information and not to neglect the principles of academic integrity.

On this last subject, the research highlighted relevant concerns, mainly in the field of ethics, as the risk of plagiarism (unintentional or otherwise), the difficulty of referencing information obtained by GenAI, and the absence of reliable sources in the responses generated were frequently mentioned. Nevertheless, the majority considered that the impact of AI on academic integrity tends to depend more on the behaviour adopted by the user and their critical awareness than on the tool itself, thus reinforcing, once again, the importance of training in information literacy skills, thus answering the last objective in Figure 1.1. These findings were further synthesised through a SWOT analysis, which highlighted strategic opportunities and threats associated with integrating GenAI into academic library services. In addition to summarising the findings from a user perspective, the SWOT analysis also incorporated institutional and operational considerations. The strategic elements, including staff training needs, internal policy development and interdepartmental collaboration, highlight the broader role that academic libraries and universities must play in guiding the ethical and effective integration of GenAI and understanding of how institutions can better prepare for ethical and effective adoption.

The results confirm the relevance of the initial research question - whether GenAI tools and academic library resources contribute to the information literacy of engineering students. The findings support the conclusion that they can indeed contribute to students' information literacy, but only when used in a complementary and critically informed manner, supported by ethical and pedagogical oversight. In this context, institutional involvement plays a key role in ensuring the responsible and educationally beneficial use of these technologies.

In short, the results obtained confirm that the hypothesis established was broadly validated. It was found that the use of GenAI altered students' search behaviour, leading, in most cases, to more conscious practices. This transformation is associated with a parallel development of information literacy skills, validating the proposed relationship between behaviour and competence. However, although on a smaller scale, profiles with greater dependence on technology and less attention to information verification were also identified, which highlights the nature of this impact. Thus, it can be concluded that the relationship between information behaviour and literacy is effectively mediated by factors such as basic training, critical attitude and the role of academic institutions, in particular academic libraries, as training centres.

Given the extremely dynamic nature of the technological universe and the diversity of student profiles, these results tend to open up new lines of research, particularly in terms of exploring the extent to which different contexts, levels of literacy and academic profiles can model this relationship between the three general concepts discussed (GenAI, information behaviour and information literacy), such as comparative studies between institutions with the aim of providing contributions to confirm and, above all, expand knowledge in this area. However, this aspect will be addressed in more detail in section 7.2.

7.1 Limitations of this study

Although the results obtained in this research provide relevant contributions to the understanding of the subject, it is important to recognize that the study has its limitations which, although they do not invalidate the conclusions drawn, may condition their generalization.

Firstly, one of the limitations relates to the composition of the group of participants, more specifically due to the fact that some of the students interviewed had an academic background in Information Science. Although this condition provided richer perspectives on information and revealed more advanced research practices, such as the regular use of Boolean operators or the use of scientific databases, it may also have influenced the results in terms of information literacy skills, limiting representativeness in relation to the general population of engineering students. For this reason, this particularity should be taken into account when reading the data and interpreting it.

Secondly, it was impossible to include students from FEUP's different engineering courses. Although the study sought to achieve some diversity by including students from different cycles (Bachelor's and Master's), and also for the reasons specified in Table 4.1, the distribution by specific areas was conditioned by the availability of students and the voluntary nature of participation. This limitation may reduce the comparability between courses, but it was still possible to identify differences in various areas, such as between Information Science students and Computer Engineering students, with the latter exhibiting very specific practices that differed from those of other students. Nevertheless, the results should be interpreted as representative of a group of FEUP students enrolled in the courses mentioned in Figures 5.1 and 5.2.

Thirdly, the size of the sample, consisting of twenty students, stands out as a limitation. Although this number is considerable for a qualitative approach and has allowed us to achieve relevant results for the topic, the diversity of responses could have been extended with a larger sample, with the possibility of minimising the second limitation regarding the diversity of courses. However, the number of interviews depended on factors such as the time defined in the dissertation schedule, the difficulty of direct access to students, and the unavailability of some potential participants.

Finally, the exclusive focus on the context of a single higher education institution, FEUP, can also be considered a limitation. Although FEUP is a large institution, the specificities of engineering must be taken into account when interpreting the results obtained. The generalisation

of the results to other contexts outside FEUP or outside the context of engineering should be done with some caution and in accordance with the specificities of each institution or area.

7.2 Perspectives for development / Future work

This section aims to identify some recommendations for future work that aims to continue the research carried out so far or reproduce it in different contexts.

Firstly, one of the recommendations is to continue the research by expanding and diversifying the sample, that is, including more participants in the study from different areas. In this way, it would be possible to conclude whether the results obtained are in line with existing results and whether they reflect major changes which, if so, should be compared with the results of this study and the appropriate conclusions drawn.

Next, it is also recommended that this study be re-evaluated in some aspects that are influenced by the advance of time, since this study focuses on technologies that are constantly changing and evolving, so understanding how students adapt to these technologies over time and which practices remain unchanged are critical factors that may require further research.

As far as academic libraries are concerned, the results of this research clearly point to the need for further reflection on the integration of GenAI into their services. It is therefore suggested that concrete cases of integration between GenAI tools and the bibliographic resources already made available by the libraries be explored, or even interfaces that combine the information generated by AI with scientific databases. This integration would, above all, increase the quality of the information provided and confidence on the part of library users.

Furthermore, allied to this last issue, it would be extremely important to integrate the GenAI tools already implemented in the library with systems for detecting plagiarism or academic integrity. This measure has been mentioned by some students and advocated by some authors in the literature, so as AI becomes more advanced and integrated into students' daily lives, it becomes crucial to understand how institutions can combine its use with tools to verify the originality of the content generated.

Finally, future research could explore the cognitive dimension of GenAI use in academic contexts, particularly in regard to how students' critical thinking and autonomy evolve when these tools are incorporated into their daily routines, and how different profiles behave, given that, especially for academic libraries, this would be valuable for the implementation of additional educational strategies or even for the definition of institutional policies.

In short, the relationship between GenAI, Information Behavior, Information Literacy and, of course, academic libraries is constantly growing and changing. The results obtained so far are valid and reflect a starting point for future research to ensure that these technologies effectively contribute to the ethics and quality of education in higher education.

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Appendix A

Free and Informed Consent



CONSENTIMENTO INFORMADO, LIVRE E ESCLARECIDO PARA PARTICIPAÇÃO EM INVESTIGAÇÃO de acordo com a Declaração de Helsínquia ¹ e a Convenção de Oviedo ²

Por favor, leia com atenção a seguinte informação. Se achar que algo está incorreto ou não está claro, não hesite em solicitar mais informações. Se concorda com a proposta que lhe foi feita, queira assinar este documento.

Título do estudo: O impacto das ferramentas de Inteligência Artificial generativa no Comportamento Informacional de estudantes de engenharia

Enquadramento: A presente participação enquadra-se no âmbito da Dissertação de Mestrado do estudante Cláudio Roberto Vera Cruz Simões, intitulado "O impacto das ferramentas de Inteligência Artificial generativa no Comportamento Informacional de estudantes de engenharia". O Mestrado surge no contexto do curso Mestrado em Ciência da Informação, da Universidade do Porto, sob orientação da Professora Doutora Teresa Joana da Silva Silveira.

Explicação do estudo: Este estudo pretende avaliar o impacto das ferramentas de inteligência artificial generativa no comportamento informacional e competências dos estudantes de engenharia, com o objetivo de compreender como são influenciados os hábitos de pesquisa, a qualidade da informação e as competências de literacia informacional dos estudantes. Para tal, serão agendadas reuniões e entrevistas, presenciais ou remotas, com os estudantes da Faculdade de Engenharia da Universidade do Porto que demonstrem interesse em participar no estudo e que se entendam relevantes para a realização do mesmo. As reuniões terão por base um guião elaborado especificamente para a entrevista em causa, no sentido de perceber qual a relação entre a utilização das ferramentas de inteligência artificial generativa, por parte dos estudantes, e as suas competências informacionais, bem como a qualidade da informação que recuperam, para ser possível, através das suas respostas, retirar as devidas conclusões para este estudo.

O estudo não possui um limite de tempo mínimo ou máximo para a sua realização. No entanto, estima-se que o mesmo não se estenderá para além dos trinta minutos. As reuniões poderão ser gravadas, sempre com a informação e consentimento prévio dos participantes. As gravações servirão apenas para o processo de recolha de dados para o estudo a realizar. Caso pretendam, os estudantes poderão ter acesso às gravações efetuadas e terão ainda acesso aos resultados da presente investigação, atingidos com a sua colaboração. Estas gravações de áudio serão destruídas num prazo máximo de cinco anos. Em nenhum momento do processo de Mestrado, ou para lá deste, será desvendada a identificação do participante, nem a gravação da sua tarefa no estudo. Os dados provenientes do estudo serão devidamente anonimizados e, posteriormente, utilizados para publicação de eventuais artigos científicos e apresentação e publicação da Dissertação de Mestrado. Caso este estudo seja utilizado para outros fins, após a sua conclusão, as condições supra descritas manter-se-ão.

Condições e financiamento: O estudo não é financiado por qualquer instituição e a sua participação. A participação neste estudo é totalmente voluntária e não envolve qualquer tipo de compensação financeira ou benefício material. Desta forma, não existem quaisquer custos ou perdas associadas à sua participação. A sua decisão de participar ou não participar no estudo não terá impacto negativo na sua relação com os investigadores ou com qualquer entidade envolvida.

Confidencialidade e anonimato: O presente estudo garante a confidencialidade e o uso exclusivo dos dados recolhidos, bem como o anonimato (não registo de dados de identificação), nunca tornando pública a identificação dos participantes. Está assegurado que os contactos provenientes do estudo serão realizados em ambiente de contexto académico.

Eu, Cláudio Roberto Vera Cruz Simões, estudante do Mestrado em Ciência da Informação, da Universidade do Porto, com o endereço eletrónico "up202004583@up.pt", agradeço a (nome do participante), pela disponibilidade e prontidão para a participação neste estudo.

Assinatura: _____

Declaro ter lido e compreendido este documento, bem como as informações que me foram fornecidas pela pessoa que acima assina. Foi-me garantida a possibilidade de, em qualquer altura, recusar participar neste estudo sem qualquer tipo de consequências. Desta forma, aceito participar neste estudo e permito a utilização dos dados que de forma voluntária forneço, confiando em que apenas serão utilizadas para esta investigação e nas garantias de confidencialidade e anonimato que me são dadas pelo investigador.

Nome: _____

Assinatura: _____

Data: ____ / ____ / ____

ESTE DOCUMENTO É COMPOSTO POR 1 PÁGINA E É FEITO EM DUPLICADO:
UMA VIA PARA O/A INVESTIGADOR/A, OUTRA PARA A PESSOA QUE CONSENTE.

¹ <http://www.icsi.med.up.pt/pdf/helsinki2013.pdf>

² <http://www.prjpdf1.ufpa.br/2001/01/0002/000/001/00016.pdf>

Appendix B

E-mail message inviting participation in interviews

PORTUGUESE VERSION

Caros colegas!

Chamo-me Cláudio Simões, sou estudante do Mestrado em Ciência da Informação, e estou a realizar uma Dissertação sobre o impacto das ferramentas de inteligência artificial generativa no comportamento informacional e competências dos estudantes de engenharia.

Preciso da tua ajuda! Se és estudante de engenharia e estás a frequentar o **3º Ano** de um curso de **Licenciatura** ou um curso de **Mestrado**, o teu contributo é essencial! Participa numa breve entrevista para partilhar a tua experiência com o uso da IA e refletir sobre o tema.

Porquê?

- Contribuirás para um estudo inovador.
- Poderás refletir sobre o impacto da IA no teu percurso.
- Receberás o feedback desta investigação!

É rápido e simples: envia um email para mim - up202004583@up.pt - com a tua disponibilidade!

Garantimos a total confidencialidade e uso exclusivo dos dados para fins académicos.

ENGLISH VERSION

Dear colleagues!

My name is Cláudio Simões, I am a Master's student in Information Science, and I am writing a dissertation on the impact of generative artificial intelligence tools on the information behaviour and skills of engineering students.

I need your help! If you are an engineering student and are in your **third year** of a **Bachelor's degree** or **Master's degree** programme, your contribution is essential! Take part in a short interview to share your experience with the use of AI and reflect on the topic.

Why?

- You will contribute to an innovative study.
- You will be able to reflect on the impact of AI on your career path.
- You will receive feedback from this research!

It's quick and simple: send me an email - up202004583@up.pt - with your availability!

We guarantee total confidentiality and exclusive use of the data for academic purposes.

Appendix C

Project Plan

O IMPACTO DAS FERRAMENTAS DE INTELIGÊNCIA ARTIFICIAL GENERATIVA NO COMPORTAMENTO INFORMACIONAL DE ESTUDANTES DE ENGENHARIA																																												
INSTITUIÇÃO		Faculdade de Engenharia da Universidade do Porto																																										
RESPONSÁVEL PELAS TAREFAS		Cáudio Simões																																										
ORIENTADOR/A		Prof. Teresa Silveira																																										
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	SEMANA 1 (30 set - 4 out)				SEMANA 2 (7 - 11 out)				SEMANA 3 (14 - 18 out)				SEMANA 4 (21 - 25 out)				SEMANA 5 (4 - 8 nov)				SEMANA 6 (11 - 15 nov)				SEMANA 7 (18 - 22 nov)				SEMANA 8 (25 - 29 nov)				SEMANA 9 (2 - 6 dez)				SEMANA 10 (9 - 13 dez)					
			S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q						
1	Introdução																																											
1.1	Pontos introdutórios	10	100%																																									
2	Revisão da Literatura																																											
2.1	Revisão Narrativa	30	100%																																									
2.2	Estado da arte	10	100%																																									
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	SEMANA 11 (16 - 20 dez)				SEMANA 12 (6 - 10 jan)				SEMANA 13 (13 - 17 jan)				SEMANA 14 (20 - 24 jan)				SEMANA 15 (27 - 31 jan)				SEMANA 16 (3 - 7 fev)				SEMANA 17 (10 - 14 fev)				SEMANA 18 (17 - 21 fev)				SEMANA 19 (24 - 28 fev)				SEMANA 20 (5 - 7 mar)					
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q		
2	Revisão da Literatura																																											
2.2	Estado da arte	5	100%																																									
3	Amostra																																											
3.1	Elaboração do guião	10	100%																																									
3.2	Contactos para entrevistas	10	100%																																									
4	Entrevistas																																											
4.1	Realização de entrevistas	23	100%																																									
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	SEMANA 21 (10 - 14 mar)				SEMANA 22 (17 - 21 mar)				SEMANA 23 (24 - 28 mar)				SEMANA 24 (31 mar - 4 abr)				SEMANA 25 (7 - 11 abr)				SEMANA 26 (22 - 24 abr)				SEMANA 27 (28-30 abr/2 mai)				SEMANA 28 (5 - 9 mai)				SEMANA 29 (12 - 16 mai)									
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q		
5	Resultados																																											
5.1	Análise das entrevistas	5	100%																																									
5.2	Discussão	23	100%																																									
6	Conclusões																																											
6.1	Conclusões finais	4	100%																																									
7	Redação																																											
7.1	Redação/Escrita da Dissertação	10	100%																																									
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	SEMANA 30 (19 - 23 mai)				SEMANA 31 (26 - 30 mai)				SEMANA 32 (2 - 6 jun)				SEMANA 33 (9 / 11 - 13 jun)				SEMANA 34 (16 - 18 / 20 jun)				SEMANA 35 (23 - 27 jun)																					
TAREFAS	DURAÇÃO (DIAS)	PCT DE REALIZAÇÃO DE TAREFA	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q	S	T	Q	Q		
7	Redação																																											
7.1	Redação/Escrita da Dissertação	10	100%																																									
8	Referências																																											
8.1	Referências / Texto	5	100%																																									
9	Apresentação																																											
9.1	Preparação da apresentação	12	100%																																									

Appendix D

Interview Script

GUIÃO PARA ENTREVISTA

Título	The Impact of Generative Artificial Intelligence Tools on the Information Behaviour of Engineering Students
Orientador/a	Prof. Teresa Silveira

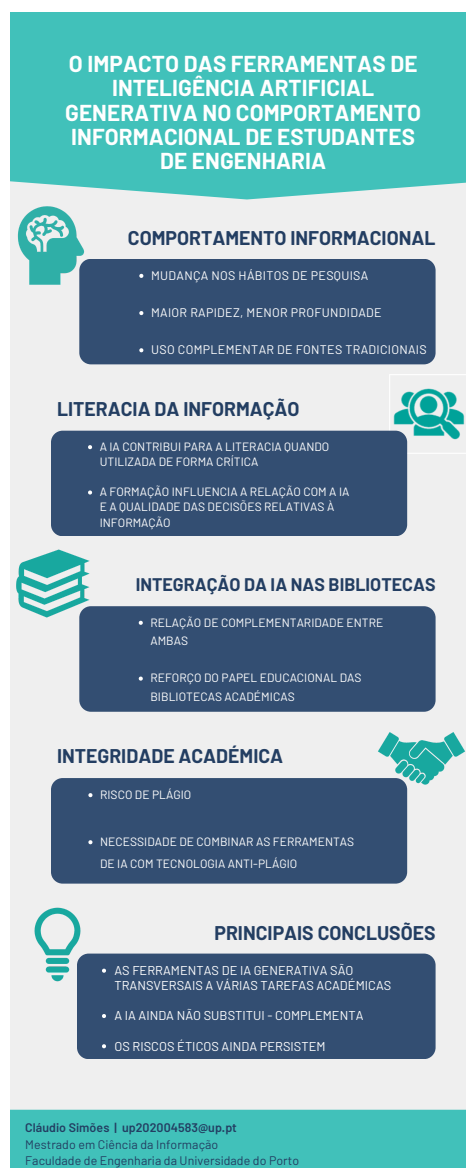
Pergunta	Questão	Objetivo	Tempo estimado (min)	Observações
Breve apresentação do tema e objetivo do estudo + Consentimento informado			2 min	
1	Já teve contacto com ferramentas GenAI em contexto académico? Se sim, com que objetivo e frequência utiliza estas ferramentas?	Questão para entendimento do background	3 min	Background do estudante <i>Necessidade de Informação</i>
2	Como pesquisava a informação anteriormente ao uso da GenAI?	Perceber se o comportamento sofreu alterações com a IA e os hábitos de pesquisa pré-IA	10 min	Objetivo a) RST <i>Fontes de Informação</i>
3	Considera que estas ferramentas alteraram a forma como pesquisa a informação?			Objetivo a) RST <i>Fontes de Informação</i>
4	A pesquisa certamente mudou. Como a estrutura com a GenAI? Considera mais ou menos eficiente/exigente?			Objetivo b) RST <i>Pesquisa de Informação</i>
5	A informação obtida através de GenAI, revela maior ou menor qualidade? A que se deve?	Perceber os níveis de qualidade da informação fornecida pela IA	5 min	Objetivo c) RST <i>Qualidade da Informação</i>
6	Como identifica e avalia a origem da informação obtida?	Compreender a perspetiva do estudante quanto a uma análise crítica da informação e a sua fiabilidade		Objetivo c) RST <i>Autoridade e Fiabilidade da Informação</i>
7	Considera que a informação obtida através de GenAI tem utilidade para as suas tarefas académicas?	Analisar se a informação fornecida pela IA é útil da perspetiva do participante enquanto estudante	5 min	Objetivos a) c) RST
8	As ferramentas de GenAI devem adotar um papel de (1) substituir os recursos fornecidos pelas BA ou (2) complementá-los?	Perceber a perspetiva do estudante face à integração da IA nas bibliotecas académicas		Objetivo d) RST
9	Qual o impacto que a GenAI pode vir a ter na integridade académica? P.ex.: no plágio?	Entender a visão do estudante face a questões éticas do uso da IA	5 min	Objetivo c) RST <i>Ética da Informação</i>
Total			30 min	

- a) investigar como as ferramentas de IA generativa estão a alterar o comportamento informacional de estudantes de engenharia;
- b) identificar diferenças nas práticas de pesquisa de informação dos estudantes de engenharia com a introdução das ferramentas de IA generativa;
- c) avaliar o impacto destas ferramentas na forma como os estudantes processam e usam a informação, bem como a qualidade da informação recuperada e as competências de literacia da informação dos estudantes de engenharia;
- d) esboçar a integração da IA nos recursos educacionais das bibliotecas académicas, de forma a potenciar a literacia informacional.

Appendix E

Infographic

PORTUGUESE VERSION



ENGLISH VERSION

