

# Information Seeking in Translation: Bibliometric Analysis and Scoping Review

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## ABSTRACT

The rapid integration of artificial intelligence (AI) is altering information seeking in translation (IST), yet this research field remains in its nascent stages. This study provides the first comprehensive mapping of information seeking in translation research to delineate its intellectual structure and identify future priorities. A dual methodology was employed, combining a quantitative bibliometric analysis of 379 publications using CiteSpace with a qualitative scoping review of 71 selected articles. The bibliometric analysis identifies the knowledge structure, key disciplines, major topics and emerging trends in information seeking in translation research. The scoping review

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synthesizes findings on translators' information needs, resources consulted, behavioral strategies and cognitive processes, as well as the conceptualization, assessment, and development of information literacy (IL). Findings indicate that AI-driven workflows demand a redefinition of information literacy models and more integrated, adaptive pedagogical approaches. The study provides valuable perspectives for future research and translator education in the context of human-technology collaboration.

**Keywords:** Information Seeking; Translation Process; Information Literacy; Bibliometric Analysis; Scoping Review

### **Búsqueda de información en traducción: análisis bibliométrico y revisión exploratoria**

*Yunjie Xu, Liqun Wu, Victoria Lai Cheng Lei y Defeng Li*

#### **RESUMEN**

La rápida integración de la inteligencia artificial está incidiendo en la búsqueda de información en traducción, aun cuando este campo de investigación todavía se encuentra en sus etapas incipientes. Este estudio ofrece el primer mapeo exhaustivo de la investigación sobre la búsqueda de información en traducción, para delinear su estructura intelectual e identificar las prioridades futuras. Se emplea una metodología dual que combina un análisis bibliométrico cuantitativo de 379 publicaciones mediante CiteSpace con una revisión exploratoria cualitativa de 71 artículos seleccionados. El análisis bibliométrico identifica la estructura del conocimiento, las disciplinas clave, los temas principales y las tendencias emergentes en la investigación sobre la búsqueda de información en traducción. La revisión exploratoria sintetiza los hallazgos sobre las necesidades de información de los traductores, los recursos consultados, las estrategias conductuales y los procesos cognitivos, así como la conceptualización, la evaluación y el desarrollo de la alfabetización informacional. Los hallazgos indican que los flujos de trabajo impulsados por la inteligencia artificial exigen una redefinición de los modelos de alfabetización informacional y de enfoques pedagógicos más integrados y adaptativos. El estudio aporta perspectivas valiosas para la investigación

futura y la formación de traductores en el contexto de la colaboración humano-tecnología.

**Palabras clave:** Búsqueda de información; Proceso de traducción; Alfabetización informacional; Análisis bibliométrico; Revisión exploratoria

## INTRODUCTION

The rapid integration of AI-powered tools into translation workflows is reshaping the profession, creating both opportunities and challenges. While machine translation (MT) and other technologies offer increased efficiency, they also introduce new complexities in how translators interact with information. Within the broader field of information behavior (Bates 2010; Wilson 2000), information seeking refers to the goal-oriented process of searching for information to fulfill a particular need (Wilson 1999, 263). In translation, this process, also termed “translation-oriented research” (Gough 2019; 2024) or “consultation” (Cui and Zheng 2021; Zheng 2014), has been examined across web searching (Enríquez Raído 2014a; Shih 2019), digital resource use (Hvelplund 2019; Whyatt, Witczak, and Tomczak 2021), and the adoption of translation tools (Teixeira and O’Brien 2017).

Despite the lack of an established definition in translation studies, information seeking is widely treated as a core competence in many translation models (e.g., Göpferich 2009, 20; PACTE Group 2003; 2017; Pinto and Sales 2008a, 421). These models recognize the importance of information seeking, although they may use different terms related to instrumental or research skills. This emphasis is strongly supported by cognitive theories that frame translation not as a purely internal, mental process, but as a form of situated cognition. Expertise in this context is demonstrated through the dynamic interaction between the translator, their tools, and their environment (Risku 2010, 103). Therefore, studying information seeking in translation (IST) is crucial. Information seeking is also linked to increased translation efficiency and quality (Lu, Xiangling, and Shuya 2022, 7; Whyatt, Witczak, and Tomczak 2021, 166). Effective search strategies can save research time and ensure accurate solutions to translation problems. Furthermore, understanding information seeking patterns can inform the design of translation technologies and resources (Gough 2024; White, Matteson, and Abels 2008, 577), as it provides developers with valuable insight into translators’ workflows and challenges, thereby enabling the creation of more intuitive tools tailored to their specific needs.

Having already evolved from printed materials to electronic resources (Lu, Xiangling, and Shuya 2022, 2), the process of information seeking in translation is now entering a new phase with the rise of artificial intelligence. In particular, large language models (LLMs) are fundamentally reshaping traditional workflows. This rapid and ongoing transition compels us to investigate how has this journey unfolded, and what are the implications for the translation profession today. A comprehensive review is thus essential. Additionally, despite its profound shifts, research into information seeking is still in its nascent stages and has yet to gain significant prominence within translation studies.

This article seeks to map the current research landscape and identify priorities for future inquiry. It employs a dual methodology, combining a quantitative bibliometric analysis using CiteSpace with a qualitative scoping review. The bibliometric analysis is designed to explore the following questions:

1. What are the primary categories, top-cited journals, and overall knowledge landscape within information seeking in translation? Additionally, how has this research field evolved over time?
2. What are the dominant themes and emerging trends in information seeking in translation research?

Informed by the findings of the bibliometric analysis, the scoping review will focus on the topics of the translation process and information literacy (IL), addressing two more research questions:

3. What are the key characteristics of information seeking in translation exhibited by translators, and what empirical methodologies are used to investigate these behaviors?
4. How is the concept of information literacy for translators defined, modeled, and assessed in current literature? What are the essential competencies and training needs identified for translators in the rapidly evolving technological landscape?

By looking into these questions, this review endeavors to present a comprehensive overview of current information seeking in translation research and offer guidance for its future development, emphasizing areas that could benefit from exploration and innovation. The dual methodological framework allows for a nuanced analysis, integrating both quantitative data and qualitative insights, ultimately contributing to the enhancement of translation studies.

## METHODS

This study integrates a bibliometric analysis with a scoping review, drawing on the multi-method review process proposed by Marzi et al. (2025). This approach,

which combines quantitative and qualitative methods, is increasingly used to provide a comprehensive overview of complex research domains. It has precedents in diverse fields such as food science (Xavier-Santos et al. 2022), healthcare (Su et al. 2025), and language education (Wen and Zeng 2025; Xu 2024). In this review, the bibliometric analysis first provides a macroscopic map of the intellectual structure and research trends, quantitatively identifying key themes and influential works. The findings from this data-driven analysis then guide the scoping review, which delves deeper to qualitatively synthesize the evidence on specific topics, ensuring a rigorous and holistic examination of the research landscape.

### ***Bibliometric Analysis***

The emerging field of ‘mapping knowledge domains’ has gained prominence as a method for exploring scientific frontiers (Shiffrin and Börner 2004). CiteSpace, developed by Chaomei Chen at Drexel University (Chen 2006), has become a widely used tool for bibliometric analysis; its visualization capabilities are particularly crucial for untangling the complex structure of an interdisciplinary field like the one under study. In this research, CiteSpace 6.4.R1 (64-bit) Advanced, the latest version, was employed to perform bibliometric and visual analyses on a dataset of 379 publications.

The analyses performed included co-citation analysis, thematic clustering, and burst detection. Co-citation analysis identified influential works that formed the intellectual base of the research field by examining cited references. Thematic clustering revealed major themes in the field. Burst detection pinpointed emerging trends and shifts in research interest. The modularity (Q) and silhouette (S) values are used to assess the quality of the clustering results; in this study, all the clustering networks generated have Q values higher than 0.3 and S values greater than 0.5, indicating a significant clustering structure and reasonable clustering results (Li and Chen 2022, 105).

Literature was retrieved online through the Web of Science Core Collection and exported as plain text files with complete records and cited references. The time span of the dataset was from the inception of the database in 1988 to June 2025. This review follows the preferred reporting items for systematic reviews and meta-analyses flowchart (PRISMA) (Tricco et al. 2018). The specific search query used was TS=((translat\* OR post-edit\* OR postedit\*) AND (information\* OR web search\* OR consultation\* OR translation-oriented research OR external resource\* OR digital resource OR online resource\*)). The two pillars, joined by the Boolean operator AND, target the intersection of translation activities (including post-editing) and information seeking-related concepts respectively. Truncation (e.g., “translat\*”, “information\*”) was used to capture morphological

variants and broaden retrieval to encompass related terms such as information literacy, information need, and external information use. A university librarian reviewed the search strategy to ensure comprehensiveness and precision.

Initially, 79 119 publications were collected. These records were then screened for eligibility, and publications were excluded based on the following criteria:

1. Articles irrelevant to the research topic, such as those that solely conduct linguistic analysis without considering information seeking in translation;
2. Duplicate records;
3. Retracted articles and non-article publications, including editorials, book reviews, and meeting abstracts. After that, 379 records were retained for the bibliometric analysis (*figure 1*).

### ***Scoping Review***

To systematically analyze the key concepts and empirical evidence related to information seeking in translation, a scoping review was conducted. This is an appropriate method because the objective of a scoping review is to examine the extent, range, and nature of research activity and to identify gaps in the existing literature, rather than to answer a narrow, predefined question (Munn et al. 2018, 1-2). As a complement to bibliometric analysis, it can also address the inherent limitations of data-driven approaches by synthesizing previous research in a qualitative manner. This review follows the methodological framework established by Arksey and O'Malley (2005, 22-29).

Informed by the bibliometric analysis, this phase addresses two more research questions concerning the characteristics of information seeking in translation and the conceptualization of information literacy for translators. The selection of studies for this phase involved a focused screening of the 379 articles retained for the bibliometric analysis. The selection process was conducted in two stages: an initial screening of titles and abstracts, followed by a full-text review of potentially relevant articles. The selection process resulted in the final inclusion of 71 records (*figure 1*).

A data charting form was developed to systematically extract key information from each included study. This included data on empirical methodologies, translators' information needs, behavioral patterns, cognitive effort, definitions and models of information literacy, and identified training needs. The synthesis of the charted data was conducted to provide a narrative overview of the existing research. The complete data charting form is available from the corresponding author upon reasonable request.

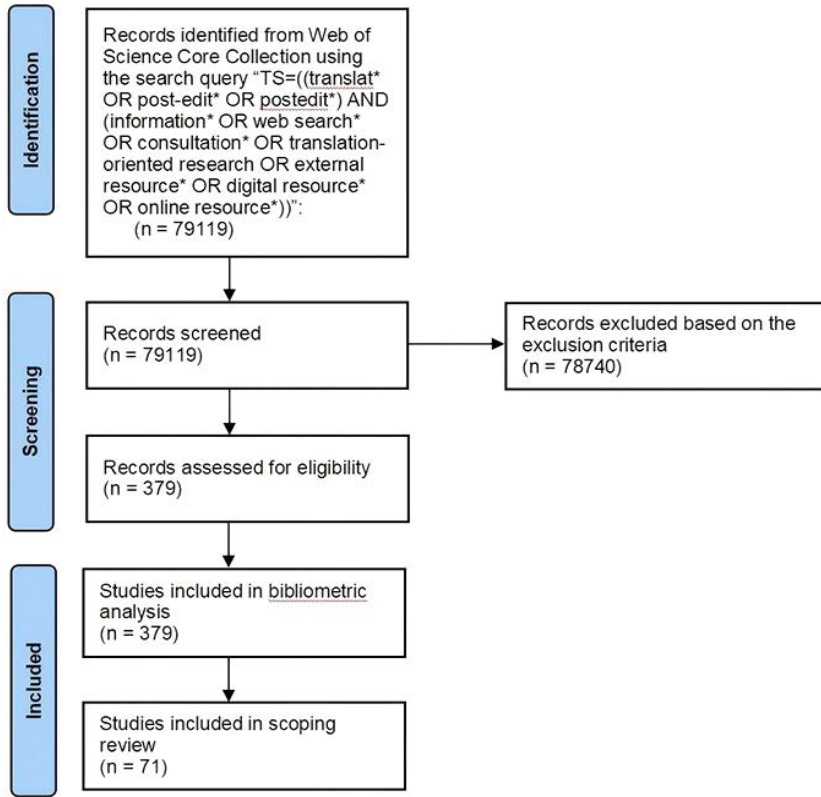


Figure 1. PRISMA flowchart

Source: elaboration by Yunjie Xu, Liqun Wu, and Victoria Lai Cheng Lei, 2025

## THE INTELLECTUAL STRUCTURE AND EVOLUTION OF INFORMATION SEEKING IN TRANSLATION RESEARCH

This section presents the findings from the bibliometric analysis conducted with CiteSpace. By analyzing citation patterns, co-citation networks, and keywords, this section maps the field's intellectual structure and historical evolution. The following subsections will first identify the core disciplines and most influential journals that shape the research domain. Subsequently, visualizations of the intellectual landscape and its timeline will reveal the interconnections and development of key research areas, influential works, and emerging trends.

## Major Research Disciplines and Top Cited Journals

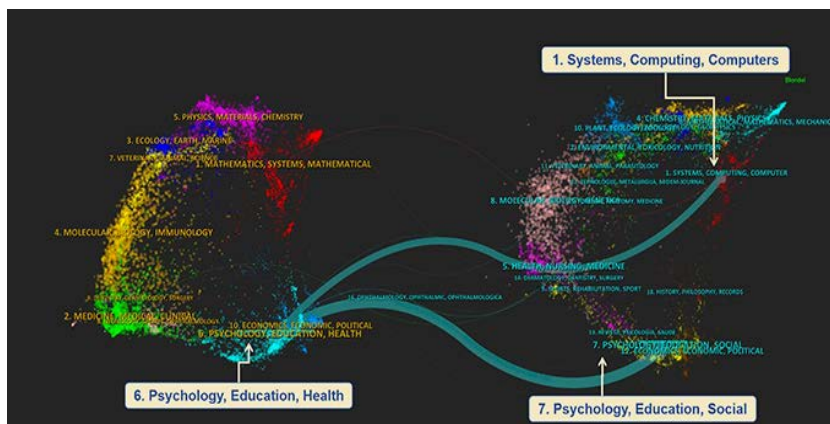


Figure 2. Dual-map overlay  
Source: screenshot from CiteSpace 6.4.R1, 2025

The dual-map overlay (*figure 2*) visualizes the flow of knowledge by mapping citation relationships, with citing journals on the left and cited journals on the right (Chen and Leydesdorff 2014, 337; Li and Chen 2022, 249).

The map reveals two key patterns in the field of research. First, a dominant citation trajectory flows from the Psychology, Education, Health cluster to the Psychology, Education, Social cluster. This strong, focused arc signifies that the field is firmly rooted in the social sciences, featuring a robust internal dialogue where new research primarily cites its own disciplinary literature. Second, a clear, albeit weaker, citation path from the Systems, Computing, Computers cluster to the core psychology and education category indicates a significant interdisciplinary connection. This suggests the research is complemented and enriched by computational fields.

| Count | Centrality | Year | Cited Journals                                                  |
|-------|------------|------|-----------------------------------------------------------------|
| 97    | 0.18       | 1993 | <i>Meta: Translators' Journal</i>                               |
| 68    | 0.1        | 2010 | <i>Perspectives: Studies in Translation Theory and Practice</i> |
| 61    | 0.17       | 2010 | <i>The Interpreter and Translator Trainer</i>                   |
| 61    | 0.07       | 2013 | <i>The Journal of Specialised Translation</i>                   |
| 41    | 0.15       | 2012 | <i>Machine Translation</i>                                      |
| 39    | 0.06       | 2011 | <i>Across Languages and Cultures</i>                            |
| 30    | 0.02       | 2015 | <i>Translation &amp; Interpreting</i>                           |

|    |      |      |                                                  |
|----|------|------|--------------------------------------------------|
| 29 | 0.02 | 2010 | Revista Tradumàtica. Tecnologies de la Traducció |
| 28 | 0.06 | 2008 | Journal of Documentation                         |
| 27 | 0.03 | 2016 | Translation Spaces                               |

Table 1. Top cited journals  
Source: elaboration by Yunjie Xu and Liqun Wu based on data from CiteSpace 6.4.R1, 2025

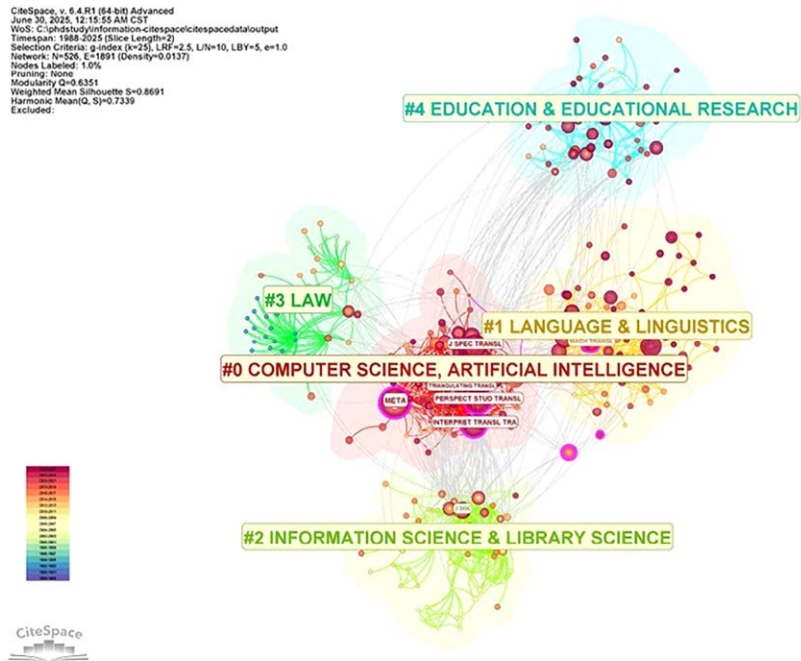


Figure 3. Subject categories  
Source: screenshot from CiteSpace 6.4.R1, 2025

While the dual-map effectively pinpoints these major disciplines within the whole scientific world, a complementary analysis of the most cited journals offers a meso-micro perspective (Li and Chen 2022, 171, 175). This approach helps to detail the internal structure of the field and identify its most influential journals (table 1) and subject categories (figure 3).

The analysis of subject categories reveals the deeply interdisciplinary nature of research on information seeking in translation. The field is anchored by a central hub of interconnected disciplines, encompassing Computer Science, Linguistics, and Information Science. The presence of distinct categories like Law and Education further illustrates the broad scope of this research area. Despite this broad interdisciplinary foundation, the most-cited journals reveal a significant concentration

within the field of translation studies itself. The most influential journal is *Meta: Translators' Journal*, a foundational and long-standing journal in translation studies whose citations date back to 1993, establishing its role as a cornerstone of the field. The majority of the most cited journals are indeed from translation studies, indicating the discipline's central role. However, the inclusion of the *Journal of Documentation*, an information science journal with early citations from 2008, highlights the cross-pollination of ideas. Furthermore, the presence of technology-focused journals like *Machine Translation* and *Revista Tradumàtica. Tecnologies de la Traducció* underscores the critical role of technology in the field, reinforcing its multifaceted essence.

## Landscape and Timeline View

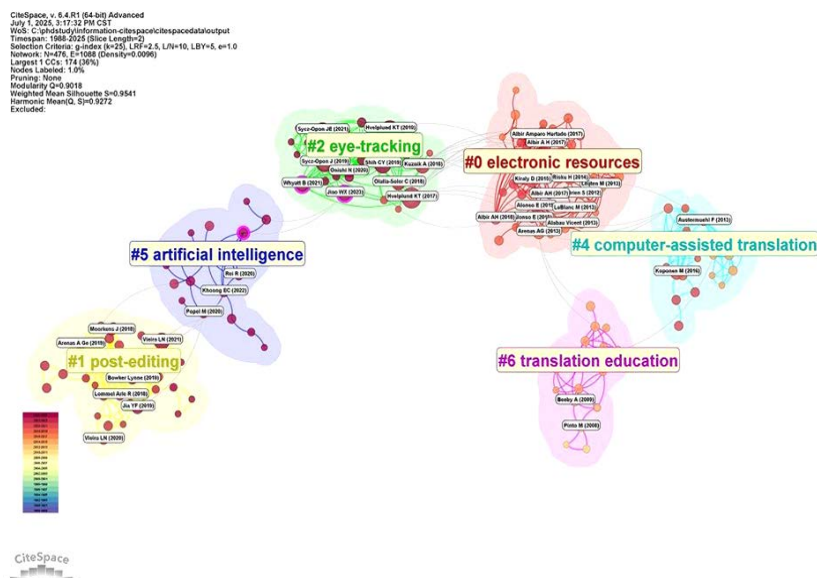


Figure 4. Cluster view  
 Source: screenshot from CiteSpace 6.4.R1, 2025

Cited references represent the knowledge base of a research field (Chen 2006, 361). Co-citation clusters visualize the intellectual landscape as well as the inter-relationships among the clusters (Chen, Ibekwe-Sanjuan, and Hou 2010, 1389). Cluster view (figure 4) and timeline view (figure 5) are presented to show the overview and evolution of research areas in the field of information seeking in translation. Table 2 provides a summary of the clusters, including size, S value, and mean publication year.

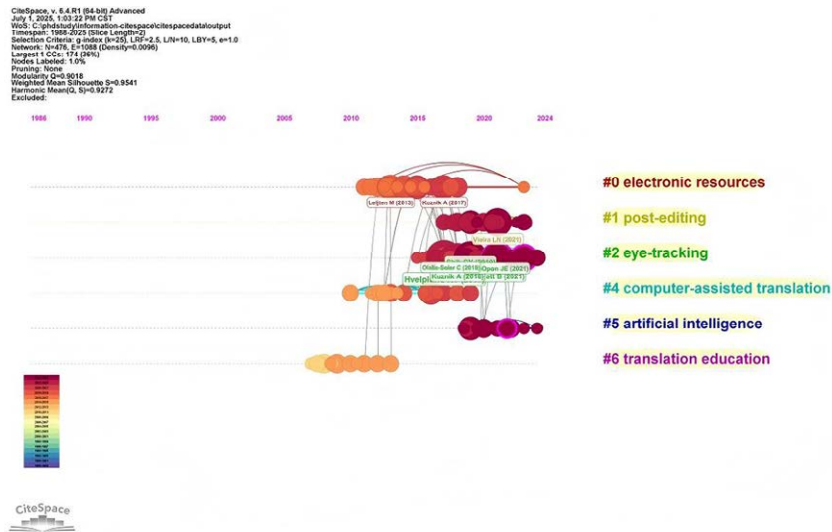


Figure 5 Timeline view  
Source: screenshot from CiteSpace 6.4.R1, 2025

| Cluster ID                       | Size | Silhouette | Mean Year (From-To) |
|----------------------------------|------|------------|---------------------|
| #0 electronic resources          | 53   | 0.902      | 2014 (2011-2023)    |
| #1 post-editing                  | 33   | 0.983      | 2019 (2017-2023)    |
| #2 eye-tracking                  | 30   | 0.97       | 2020 (2015-2024)    |
| #4 computer-assisted translation | 18   | 0.996      | 2014 (2010-2019)    |
| #5 artificial intelligence       | 18   | 0.941      | 2020 (2019-2024)    |
| #6 translation education         | 16   | 0.989      | 2010 (2007-2013)    |

Table 2. Summary of the clusters  
Source: elaboration by Yunjie Xu and Liqun Wu  
based on data from CiteSpace 6.4.R1, 2025

The landscape view reveals a highly interconnected research domain. The cluster Electronic Resources stands out as the largest with 53 member references, while Eye-Tracking is the third largest with 30 members. Both emerge as highly central themes, exhibiting extensive connections to other clusters and the highest number of links. Uniquely among the identified clusters, which primarily represent research topics, Eye-Tracking constitutes a core research methodology. Its centrality underscores that the study of cognitive processes through eye-tracking forms the methodological foundation for understanding information-seeking behavior in translation. This methodological core is intricately linked to pivotal research topics, including Post-editing, Computer-Assisted Translation, Artificial Intelligence, and

Translation Education. Notably, the strong connections between the clusters Artificial Intelligence, Post-editing, and Eye-Tracking indicate how this methodology is being leveraged to investigate the growing integration of artificial intelligence technologies and cognitive effort in translation.

The timeline view further illustrates the evolution of these research clusters. While the timespan of the research foundation extends across nearly four decades, the primary development of the intellectual base stems from studies conducted after 2005. Early research, notably Translation Education, was prominent in the initial phases, with a focused activity period between 2007 and 2013, showing a subsequent decline in intensity.

Two research areas, Electronic Resources and Computer-Assisted Translation, have demonstrated a sustained presence, indicating their foundational influence. Eye-Tracking has been a particularly vibrant focus since 2015, with an active time-frame extending to 2024. This cluster's high S value and size confirm its status as a coherent and significant research area, encompassing some of the most highly cited literature within the information seeking in translation domain.

More recently, Post-editing and Artificial Intelligence have emerged as critical new frontiers. Post-editing has quickly grown to become the second-largest cluster with a mean year of 2019. Concurrently, Artificial Intelligence has seen a rapid increase in research activity, evidenced by its recent mean year of 2020 and a compact but active timespan from 2019 to 2024, signaling its transformative potential for the field of information seeking in translation.

### ***Intellectual Turning Points: Influential Works***

Intellectual turning points in a co-citation network are publications marking major contributions or transitions in a knowledge domain, identifiable as landmark nodes (frequently cited references) or pivotal nodes (references with high centrality) (Chen 2004, 5305-5309), as the landmarks with bigger size (Chen 2004, 5306) and pivots with dark-colored (usually purple) rings (Chen 2006, 365) in the landscape view. *Table 3* and *table 4* showcase the two types of cited references.

| Frequency | Centrality | Title                                                                           | Reference Label                     |
|-----------|------------|---------------------------------------------------------------------------------|-------------------------------------|
| 7         | 0.11       | "Information Behaviour in Bidirectional Translators: Focus on Online Resources" | Whyatt, Witczak, and Tomczak (2021) |
| 4         | 0.11       | "Is ChatGPT a Good Translator? Yes with GPT-4 as the Engine"                    | Jiao et al. (2023)                  |
| 2         | 0.11       | "No Language Left Behind: Scaling Human-Centered Machine Translation"           | NLLB Team (2022)                    |

|    |      |                                                            |                  |
|----|------|------------------------------------------------------------|------------------|
| 10 | 0.10 | "Translators' Use of Digital Resources During Translation" | Hvelplund (2017) |
|----|------|------------------------------------------------------------|------------------|

*Table 3. References with high centrality*  
Source: elaboration by Yunjie Xu and Liqun Wu  
based on data from CiteSpace 6.4.R1, 2025

| Frequency | Title                                                                                                                                      | Reference Label                       |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| 10        | "Translators' Use of Digital Resources During Translation"                                                                                 | Hvelplund (2017)                      |
| 8         | "A Quest for Web Search Optimisation: An Evidence-Based Approach to Trainee Translators' Behaviour"                                        | Shih (2019)                           |
| 8         | "Digital Resources in the Translation Process – Attention, Cognitive Effort and Processing Flow"                                           | Hvelplund (2019)                      |
| 8         | "Information-Seeking Behaviour of Translation Students at the University of Silesia During Legal Translation – An Empirical Investigation" | Sycz-Opoń (2019)                      |
| 7         | "Information Behaviour in Bidirectional Translators: Focus on Online Resources"                                                            | Whyatt, Witczak, and Tomczak (2021)   |
| 7         | "Results of PACTE Group's Experimental Research on Translation Competence Acquisition. The Acquisition of the Instrumental Sub-Competence" | Kuznik and Olalla-Soler (2018)        |
| 6         | "Understanding the Societal Impacts of Machine Translation: A Critical Review of the Literature on Medical and Legal Use Cases"            | Vieira, O'Hagan and O'Sullivan (2021) |
| 6         | "Trainee Translators' Research Styles: A Taxonomy Based on an Observation Study at the University of Silesia, Poland"                      | Sycz-Opoń (2021)                      |
| 5         | "Keystroke Logging in Writing Research: Using Inputlog to Analyze and Visualize Writing Processes"                                         | Leijten and Van Waes (2013)           |
| 5         | "Use of Instrumental Resources"                                                                                                            | Kuznik (2017)                         |
| 5         | "Using Electronic Information Resources to Solve Cultural Translation Problems: Differences Between Students and Professional Translators" | Olalla-Soler (2018)                   |

*Table 4. Most frequently cited references*  
Source: elaboration by Yunjie Xu and Liqun Wu  
based on data from CiteSpace 6.4.R1, 2025

A cornerstone of this research area is the work of Hvelplund (2017), which stands out as the most frequently cited publication and also possesses high centrality. This study was pivotal in empirically demonstrating that digital resource consultation constitutes a significant portion of professional translators' time and cognitive load, using eye-tracking to measure fixation duration and pupil size. This research was built upon earlier methodological advancements, such as the keystroke logging tools detailed by Leijten and Van Waes (2013), and

was complemented by Hvelplund's (2019) subsequent, highly-cited paper that further unpacked the cognitive aspects of resource use by analyzing processing flow. Together, these works established a robust empirical methodology for investigating the cognitive underpinnings of information seeking.

Following these foundational studies, a significant body of highly cited research emerged between 2018 and 2021, focusing on the information-seeking behavior of trainee translators. The PACTE group's research, presented by Kuznik and Olalla-Soler (2018), systematically investigated the acquisition of instrumental sub-competence, comparing students with professionals. This was echoed in studies by Shih (2019) on web search optimization and a series of investigations by Sycz-Opoń (2019, 2021) which examined the specific behaviors of students in legal translation and developed a taxonomy of their research styles. These studies collectively highlight a concerted effort to understand the development of information competence.

More recently, influential publications are characterized by high centrality, indicating their role as critical bridges connecting established research with new technological frontiers. Whyatt, Witczak, and Tomczak (2021), a frequently cited article with high centrality, advanced the field by studying professional bi-directional translators, proposing the Information Behaviour in Bidirectional Translation model to explain how directionality affects the use of online resources. Vieira, O'Hagan, and O'Sullivan (2021) extended the inquiry into medical and legal settings, exploring the societal implications of machine translation use. The newest pivotal nodes further point to the influence of artificial intelligence. The work by the NLLB Team (2022) on scaling machine translation for over 200 languages and the analysis by Jiao et al. (2023) on the capabilities of ChatGPT as a translator represent emerging, critical areas of inquiry. Though their citation counts are still accumulating, their high centrality suggests they are pivotal in shaping the future discourse, linking traditional information-seeking behavior research to the new realities of generative artificial intelligence and large-scale machine translation systems.

### *Key Themes and Emerging Trends*

| ClusterID | Count | S Value | Year (Mean) | LSI                    | LLR                    |
|-----------|-------|---------|-------------|------------------------|------------------------|
| 0         | 94    | 0.697   | 2015        | translation process    | information literacy   |
| 1         | 48    | 0.812   | 2013        | translation competence | information technology |

|    |    |       |      |                              |                                     |
|----|----|-------|------|------------------------------|-------------------------------------|
| 2  | 42 | 0.923 | 2017 | artificial intelligence      | artificial intelligence             |
| 4  | 34 | 0.927 | 2011 | neural machine translation   | neural machine translation          |
| 5  | 33 | 0.945 | 2009 | machine translation          | machine translation                 |
| 6  | 30 | 0.917 | 2014 | medical translation          | medical translation                 |
| 7  | 27 | 0.83  | 2015 | collaborative translation    | collaborative translation           |
| 10 | 20 | 0.96  | 2002 | terminology management tools | computer-assisted translation tools |
| 12 | 19 | 0.934 | 2006 | translation competence       | bilingual corpora                   |
| 13 | 18 | 0.969 | 2017 | information competence       | information technologies            |

Table 5. Keyword cluster  
Source: elaboration by Yunjie Xu and Liqun Wu  
based on data from CiteSpace 6.4.R1, 2025

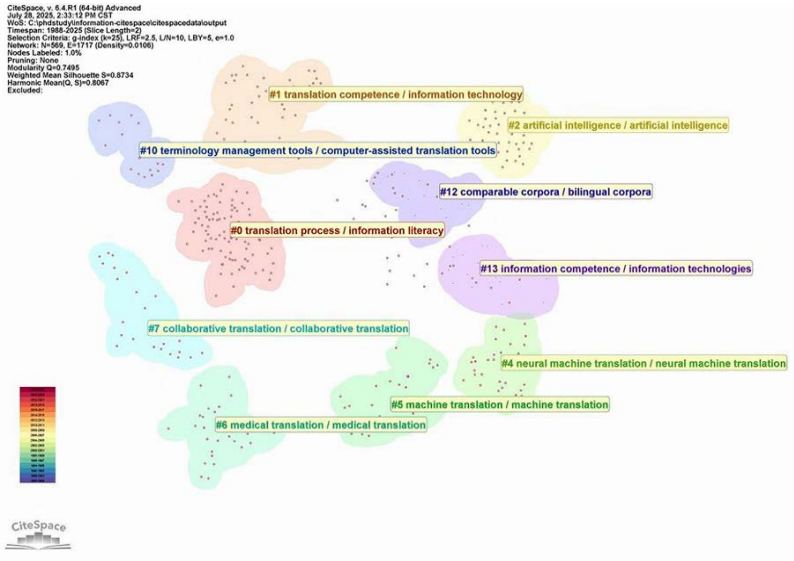


Figure 6. Keyword cluster view  
Source: screenshot from CiteSpace 6.4.R1, 2025

The key research themes, identified through keyword cluster analysis (table 5 and figure 6), point to three main pillars of inquiry. The largest and most central research cluster focuses on the “translation process” and “information literacy,” highlighting the fundamental importance of how translators work and acquire information. This central theme is complemented by a strong focus on technology, with significant clusters dedicated to “machine translation” and “computer-assisted translation”. A third prominent group of themes pertains to translator capabilities and context, with clusters forming around “translation competence”, “collaborative translation”, and specialized domains such as “medical translation”. Collectively, these clusters map out the foundational knowledge structure of the research area.

An examination of keyword bursts (*figure 7*) over time illustrates the dynamic evolution of research frontiers. The foundational period, approximately from 2008 to 2017, was characterized by strong interest in “translation technologies”, “translation tools”, and “translation memory”. This was followed by a shift towards more holistic and process-oriented topics, with “translation process” (2014-2021) and “translation studies” (2016-2021) emerging as prominent research trends. Currently, the field is dominated by trends at the intersection of intelligent systems and specialized practice. The most powerful burst is “artificial intelligence” (2020-2025), alongside the closely related “neural machine translation” (2022-2025). Concurrently, “legal translation” (2020-2025) has surfaced as a significant and sustained trend, indicating a growing focus on high-stakes, specialized domains in the age of artificial intelligence.



Figure 7. Keyword bursts  
Source: elaboration by Yunjie Xu and Liqun Wu  
based on data from CiteSpace 6.4.R1, 2025

## THE PROCESS AND LITERACY OF INFORMATION SEEKING IN TRANSLATION

The bibliometric analysis in the earlier section provides a clear empirical basis for defining the scope of this qualitative synthesis. The keyword cluster analysis identified “translation process” and “information literacy” as the largest and most central cluster, establishing these two facets as the field’s core intellectual concerns. This centrality is corroborated by converging evidence: the co-citation clusters of “electronic resources” and “eye-tracking” form the empirical backbone for studying the translation process, while dedicated clusters on “translation competence” and “information competence” confirm information literacy as a standalone research concern. Additionally, the powerful keyword burst for “artificial intelligence” signals a technological transformation whose implications cut across both facets. These findings thus point consistently to translation process and information literacy as the two thematic pillars warranting in-depth synthesis. From an initial pool of 379 articles, a final dataset of 71 records was selected and classified into two subsets: 46 articles on the information-seeking process in translation and 31 on IL. Notably, reflecting their dual focus, six articles were included in both subsets.

### *Overview of Research on Translators’ Information-Seeking Process*

This section reviews studies on information-seeking behaviors of translators. It highlights their primary information needs, the types of external information they consult, the strategies they use, their behavioral patterns, the cognitive effort involved in the process, and various factors that influence these behaviors. Additionally, it analyzes the methodologies used in these studies and compares the differences between novice and professional translators.

### *Methodological Approaches to Investigating Information-Seeking*

Diverse and increasingly sophisticated methodologies are employed. Foundational and earlier approaches include qualitative methods like focus groups to gather initial insights into professional practices (White, Matteson, and Abels 2008) and surveys to capture self-reported resource use and preferences across different experience levels (Massey and Ehrensberger-Dow 2011, 195). Case studies, often multiple-case design, allow for in-depth, contextualized analysis of individual or group behaviors (Enríquez Raído 2014b, 90; Sales, Pinto, and Fernández-Ramos 2016).

To capture the dynamic nature of the translation process, researchers heavily adopt process-tracing methods. These include traditional techniques like

think-aloud protocols (TAPs), which provide verbal insights into a translator's decision-making (Sycz-Opoń 2019, 155; Zheng 2014), and a suite of technological tools. Screen recording is widely used to capture all on-screen activities, including web searches and navigation between applications (Cai and Tian 2025; Hvelplund 2019, 515; Lei 2013, 1166). Keystroke logging records temporal data, pauses, and revisions, offering metrics for productivity and cognitive effort (Daems et al. 2016, 115; Robert et al. 2017, 299). Eye-tracking provides direct measures of cognitive processes, such as fixation duration and count, by tracking visual attention on external resources (Cui and Zheng 2022, 4; Hvelplund 2019, 515; Whyatt, Witczak, and Tomczak 2021, 159). The prominence of eye-tracking as a methodology is strongly confirmed by the bibliometric analysis, where it emerged as a distinct co-citation cluster (cluster #2) with 30 members and a high silhouette value (0.97).

Many contemporary studies adopt a mixed-method or triangulated approach, combining several of these tools to create a richer, more robust dataset. For instance, studies frequently combine eye-tracking, screen recording, and retrospective interviews to correlate observable behaviors with cognitive load and self-reported strategies (Cui and Zheng 2021, 746-747; Teixeira and O'Brien 2017, 85-86), providing a holistic understanding of their interaction with information.

### *Information Needs and Resources Consulted*

Translators primarily seek information to address uncertainties and fill knowledge gaps that arise during the translation process (Whyatt, Witczak, and Tomczak 2021, 155). These information needs are diverse and can be broadly divided into linguistic and extralinguistic categories. Linguistic needs involve understanding and conveying meaning, specifically concerning terminology, collocations, polysemy, and stylistic expression (Lei 2013, 1165; Massey and Ehrensberger-Dow 2011, 196; Sycz-Opoń 2019, 157). On the other hand, extralinguistic needs, also known as thematic needs, pertain to acquiring domain-specific knowledge for understanding the subject matter of the source text (Cui and Zheng 2022, 1; Massey and Ehrensberger-Dow 2011, 196). Furthermore, the nature of these information needs can vary according to the cognitive stage of the process, which may involve comprehending the source text, transferring meaning, or producing the target text (Cui and Zheng 2021, 749).

To meet these diverse needs, translators consult an extensive array of external resources, with electronic resources being the most prominent. This finding is consistent with the bibliometric analysis, where "electronic resources" emerged as the largest co-citation cluster (cluster #0, 53 members), with an active timespan from 2011 to 2023, confirming the sustained centrality of this topic over

the past decade. Search engines like Google are frequently used across all levels of experience (Giampieri 2020; Lei 2013, 1165; Robert et al. 2017, 303). Dictionaries, whether bilingual, monolingual, or specialized, remain a fundamental resource with a strong preference for electronic versions, due to their speed and convenience (Sycz-Opoń 2019, 160-161; White, Matteson, and Abels 2008, 587). Parallel texts and corpora have become increasingly vital for finding contextualized equivalents and ensuring stylistic appropriateness, especially in specialized fields such as legal translation (Liu et al. 2024, 1748; López-González 2024, 1, 6). Recently, generative artificial intelligence has emerged as a tool used for broader queries beyond simple terminology, including style guidance and text polishing (Cai and Tian 2025, 19009). Human consultation, such as reaching out to domain experts or colleagues, remains a crucial, highly valued source, particularly for complex legal or technical texts (Moreno 2020, 158; White, Matteson, and Abels 2008, 576, 582).

### *Behavioral Strategies, Patterns, and Cognitive Effort*

Translators employ various strategies and exhibit distinct behavioral patterns. In terms of research style, studies have classified student translators into “Traditionalists,” “Digital natives,” “Minimalists,” “True detectives,” “Habitual doubters,” and “Procrastinators” (Sycz-Opoń 2021, 140), while professional translators are labeled as “Explorer,” “Prolific,” “Economical,” “Methodical,” and “Understated” (Gough 2024, 402), highlighting significant individual variation. A common tendency, especially among novices, is an over-reliance on a few familiar tools like bilingual dictionaries, which are used both as first and last resorts (Sycz-Opoń 2019, 167). Successful search episodes often involve a deeper dive into search engine results and a willingness to explore beyond the top hits, whereas unsuccessful searches are marked by quick abandonment and repetitive, superficial queries (Shih 2019, 919).

Studies of cognitive processes reveal that information consultation is a cognitively demanding activity. Visual attention and cognitive effort, gauged by fixation duration, are significantly higher during resource consultation compared to merely reading the source text (Hvelplund 2019, 518; Whyatt, Witczak, and Tomczak 2021, 162). Extralinguistic consultation requires extended time and scanning but tends to impose a lower cognitive load per attention unit compared to linguistic consultation (Cui and Zheng 2022, 13). Frequent task-switching between translation tools and external resources, a common behavior, can increase cognitive friction and load (Teixeira and O’Brien 2017, 97).

### *Novice versus Professional Information-Seeking Behaviors*

A consistent finding across the literature is the marked difference in information-seeking behavior between students or novices and experienced professionals. Professionals tend to use a much wider and more diverse range of resources, including parallel texts and consulting with human experts, whereas students often limit themselves to using online dictionaries and search engines (Künzli 2001, 513, 515; Massey and Ehrensberger-Dow 2011, 198). Professionals exhibit more controlled, efficient, and planned search processes (Enríquez Raído 2014b, 96, 108). They rely more on their internalized knowledge and demonstrate a greater tolerance for ambiguity (Zheng 2014, 122, 127).

In contrast, students and novices often display inefficient, repetitive, and unplanned search behaviors (Olalla-Soler 2018, 1313). They tend to perform more search queries and spend more time searching, but this increased effort does not consistently lead to higher-quality translations (Kuznik and Olalla-Soler 2018, 48). Students also struggle with critically evaluating online sources, often using unreliable information or failing to distinguish between source types (Lei 2013, 1166; Sales, Pinto, and Fernández-Ramos 2016, 195), and prioritizing ease of access over the quality and authority of a source (Cid-Leal and Perpinyà-Morera 2015). These findings collectively indicate that access to information does not guarantee the competence to use it effectively (Olalla-Soler 2018, 1313).

### *Key Factors Influencing Information-Seeking Behaviors*

Several factors influence how translators seek information. The translator's level of experience is a primary determinant, as previously mentioned. The translation direction is also crucial, although its influence is not straightforward, with research revealing contradictory findings depending on the translators' expertise and text type. Whyatt, Witczak, and Tomczak (2021, 165) found professionals search more when translating into their non-native language (L2) so as to compensate for the "L2 cognitive disadvantage". In contrast, Qassem and Al Thowaini (2023, 12) reported that trainees dealing with cultural texts searched more when translating from L2 to native language, driven by the difficulty of comprehending the culturally-laden L2 source text. The type and domain of the text also matter, with specialized fields and textual characteristics directly influencing the complexity and strategy of information seeking and prompting the use of domain-specific resources (Fernández-Silva and Folch Cañete 2020; White, Matteson, and Abels 2008, 584).

The advent of technology, including machine translation and computer-assisted technology (CAT) tools, has transformed research patterns. When post-editing

MT-generated text, translators typically spend less time consulting external resources compared to translating from scratch, as their main focus shifts from drafting to verification, correction (Daems et al. 2016, 119), orientation, and revision (Quinci 2024, 299). The very tools used, such as machine translation, can alter research patterns, sometimes leading to more time spent in revision and orientation phases (Quinci 2024, 299). Finally, individual factors such as cognitive style, personality, and self-confidence significantly shape a translator's research style and effectiveness (Gough 2024, 409; Liu et al. 2024, 1762; Sycz-Opoń 2021, 144).

### ***Information Literacy***

Initially, translators' information literacy (IL) was known as "documentary competence," a foundational skill for using information resources within a translator's overall macro-competence (Delgado Pugés and Barceló Martínez 2011, 117; Pinto 2009, 293). With the rise of digital resources, this evolved into the broader concept of information literacy or information competence, which covers the complete process of identifying, locating, evaluating, and effectively using information (Cid-Leal and Perpinyà-Morera 2015; Pinto and Sales 2008a, 415). The subsequent boom in information and communication technologies (ICT) shifted the focus to digital competence, emphasizing the practical ability to safely and efficiently use translation programs and other digital tools within the modern translation workflow (Gavrilenko 2020, 550, 552; Ivanova 2016, 130).

### ***Conceptual Models***

To effectively teach and assess information literacy skills in translation, several conceptual models have been proposed. The most prominent is the InfoliTrans model, a holistic and transversal framework designed for integrated translator training (Pinto and Sales 2008a, 414). This model identifies four interconnected facets: cognitive skills to manage data and knowledge, digital-informational skills for using information and communication technologies, communicative skills for utilizing human and material resources, and procedural and strategic skills for research, planning, and problem-solving (Pinto 2009, 293). This framework underscores that information literacy is not just a single ability but a multi-dimensional competence that is integral to the entire translation process (Sales and Pinto 2011, 248). Other models, while perhaps less detailed, similarly break down competence into sub-competencies. For instance, Amelina and Tarasenko (2018, 46-47) propose a model with seven components, including information retrieval, technological, and analytical aspects, aligning with international standards. Most recently, the concept of information literacy has expanded further to

metaliteracy, which incorporates the previous skills but adds a higher-level focus on reflective discovery, ethical information use, and collaboration (Sales 2024, 753-754). These frameworks collectively emphasize that information literacy is a procedural competence that activates and supports other sub-competencies essential for the overarching macrocompetence of translation. However, it is worth noting that none of these models were developed in response to the AI-driven paradigm shift. As the bibliometric data show, the “artificial intelligence” cluster emerged only from 2019 onward, while pivotal works on LLM-based translation (Jiao et al. 2023; NLLB Team 2022) are among the newest high-centrality nodes. This temporal disjunction suggests that the existing information literacy models, though still valuable as foundations, may not adequately address the new competencies required for prompt engineering, artificial intelligence output verification, and the ethical use of generative tools.

### *Assessment Methods*

The assessment of information literacy has moved from theoretical discussion to empirical measurement, employing a variety of tools and methods. A key instrument developed from the project is the InfoliTrans Test, an online tool designed to diagnose the learning levels of translation trainees across the macro areas of information search, assessment, treatment, and communication (Pinto 2009, 297; Pinto et al. 2014). Studies using this test have revealed that while students may excel in communication and assessment, they often show weaknesses in information search and treatment, highlighting these specific areas for pedagogical intervention (Pinto et al. 2014).

Beyond standardized tests, researchers use a range of qualitative and quantitative methods. Surveys and questionnaires are widely used to gauge the perceptions, habits, and self-efficacy of students and professionals. The IL-HUMASS survey, for example, was used to explore students’ motivation and self-efficacy, finding that both tend to increase with academic advancement but that a significant gap exists in skills related to information processing (Pinto and Sales 2010, 623, 628). Other surveys have investigated the information-seeking habits of students, revealing a heavy reliance on general search engines like Google and an underutilization of university libraries and specialized databases (Cid-Leal and Perpinyà-Morera 2015).

### *Training Needs*

The competence gap documented in the part titled Overview of Research on Translators’ Information-Seeking Process underscores the critical need to bolster information literacy training. Beyond the behavioral differences between novices and

professionals, survey data reveal a discrepancy between perception and proficiency: both students and professionals attribute high importance to information skills yet report lower success in acquiring them (Pinto and Sales 2008b, 55; Sales and Pinto 2011, 251). Accordingly, a primary training need is developing critical evaluation skills to navigate the “noise” of the internet and verify the reliability of sources (Delgado Pugés and Barceló Martínez 2011, 123; Sales and Pinto 2011, 252).

Technological proficiency is another major area of need. This includes not only general software but also specialized tools like computer-assisted technology software, terminology management systems (e.g., SDL MultiTerm), and translation memory databases (Amelina and Tarasenko 2016, 54; Ivanova 2016, 132; Kovačević 2019, 2). Training must be systematic and staged, moving from basic tools like spreadsheets for terminology to advanced systems for term extraction and project management (Amelina and Tarasenko 2017, 108-109, 112; Amelina and Tarasenko 2018, 49). Furthermore, as machine translation becomes integrated into workflows, trainees require skills in post-editing and an understanding of how machine translation impacts information behavior (Ivanova 2016, 131; Quinci 2024, 295).

However, information literacy development in university curricula remains largely unsystematic, with students often entering and leaving programs with underdeveloped information strategies (Evsikova et al. 2022, 11; Nesterova 2014, 72, 80). Professionals and trainers therefore call for pedagogical approaches that move beyond isolated courses towards integrated, task-based learning that simulates professional practice (Massey and Ehrensberger-Dow 2011, 208; Nesterova 2013, 37; Pinto and Sales 2008b, 67).

### *Influencing Factors*

The development of a translator’s information literacy is influenced by a confluence of technological, individual, and pedagogical factors. Technologically, the shift to a digital-first environment is the primary driver, making proficiency with online resources and specialized software non-negotiable (Gavrilenko 2020, 548; Ivanova 2016, 130-131). Individually, a translator’s training plays a crucial role. A clear progression is observable as students advance academically, moving from simple, word-level searches to more sophisticated, contextual strategies (Chaia 2022, 143; Fernández-Silva and Folch Cañete 2020).

Finally, pedagogical context is paramount. Previous studies consistently point to a lack of systematic information literacy instruction as a major barrier (Evsikova et al. 2022, 10; Nesterova 2014, 75). Effective training requires a structured, integrated approach that fosters critical thinking and procedural knowledge (Amelina and Tarasenko 2018, 49; Massey and Ehrensberger-Dow 2011, 208). Collaborative learning environments, facilitated by digital platforms, have

also been shown to enhance engagement and strengthen information literacy skills by encouraging peer-to-peer learning and collective problem-solving (Jeanmaire and Kim 2024, 328).

## DISCUSSION

By integrating a quantitative bibliometric analysis with a qualitative scoping review, this study maps the intellectual contours of information seeking in translation, revealing a burgeoning, multidisciplinary field currently defined by a critical paradigm shift. As documented in the third and fourth sections of this study, the pre-AI era consolidated around a stable ecosystem of electronic resources and computer-assisted technology tools, with cognitive load and the competence gap between novice and professional translators constituting the primary research concerns. Framed through situated cognition theory (Risku 2010, 103), these patterns confirm that translation expertise is distributed across the translator, tools, and environment. The observed cyclical behaviors of query refinement, iterative searching, and source evaluation (Gough 2024, 402-406; Shih 2019, 916-917) further align with Wilson's (1999, 266) information-seeking model. Pedagogical frameworks like InfoliTrans (Pinto and Sales 2008a, 423) were developed to address the demands of this digital yet largely static information environment.

However, our analysis reveals a recent and abrupt rupture in this established paradigm, driven by the advent of generative artificial intelligence. This technological disruption is captured vividly in the bibliometric data by the powerful keyword burst for "artificial intelligence" (2020-2025) and the emergence of pivotal works on large language models (Jiao et al. 2023; NLLB Team 2022). The implications of this shift are particularly significant for the evaluation dimension of information literacy, the capacity for fact-checking and source verification central to translators' information competence (Pinto 2009, 293; Pinto and Sales 2008a, 421). In the pre-AI paradigm, evaluation was fundamentally a process of source appraisal: translators assessed the authority and provenance of identifiable resources such as specialized dictionaries or parallel texts. Generative artificial intelligence reconfigures this dynamic. Unlike traditional resources, large language models generate plausible outputs that may contain factual inaccuracies or fabricated terminological equivalents, a phenomenon known as "hallucination" (Guerreiro, Voita, and Martins 2023, 1060; Ji et al. 2023, 3-4). Since such outputs can appear linguistically fluent while being factually unfounded (Floridi and Chiriatti 2020, 684-689), the evaluative task shifts from source appraisal to output verification: translators must now cross-reference artificial intelligence

suggestions against authoritative external sources (Cai and Tian 2025, 19009; López-González 2024, 6), a process that initial research suggests is more time-consuming and complex than traditional searching (Cai and Tian 2025, 19013-19014). This shift gives new urgency to a critical vulnerability identified in our scoping review. For trainees who already exhibit weaknesses in evaluating conventional sources (Olalla-Soler 2018, 1313; Sales, Pinto, and Fernández-Ramos 2016, 195) and who tend to uncritically rely on convenient tools (Sycz-Opoń 2019, 167), the risk of passively accepting unverified AI-generated content is particularly acute. This paradigm shift has profound implications for both professional practice and pedagogy, demanding an evolution in how we define and teach information competence. The established models of information literacy, while still valuable, are no longer sufficient. The focus of translator training must pivot from teaching ‘how to search’ to teaching ‘how to verify, prompt, and ethically integrate.’ In this new context, the concept of *metaliteracy*, which emphasizes reflective and ethical engagement with information ecosystems (Sales 2024, 753-754), becomes paramount. The persistent finding that information literacy development is often unsystematic (Evsikova et al. 2022, 10; Nesterova 2014, 75) is thus transformed from a mere inefficiency into a critical professional liability, one that threatens to widen the competence gap between novices and experts.

To address this new reality, a forward-looking and interdisciplinary research agenda is essential. Future research must urgently move beyond preliminary comparisons to investigate how translators’ cognitive and behavioral processes adapt to AI-enhanced workflows. For instance, studies should examine whether interaction with artificial intelligence reduces the cognitive load of traditional searching or if prompt engineering introduces new cognitive burdens. To capture these complex dynamics, research should employ innovative methodologies; while process-tracking methods like eye-tracking and keystroke logging remain crucial, they could be augmented with neuroimaging and biometric measures. Alongside this technological focus, research must delve deeper into the human and ethical dimensions, exploring affective factors like motivation, expanding to diverse cultural contexts, and developing guidelines for the responsible use of artificial intelligence.

Ultimately, these research efforts must inform the next generation of translator training. Longitudinal studies are needed to observe how information competence develops from novice to expert in the artificial intelligence era. The findings from such research should be used to develop and empirically test new curricula that integrate advanced, AI-integrated information literacy. This includes exploring the effectiveness of pedagogical approaches like collaborative projects and personalized instruction. By fostering this virtuous cycle of research and pedagogy, the field can equip translators with the critical resilience and adaptability required to navigate continuous technological change.

While this study offers a holistic perspective, its limitations must be acknowledged. The breadth of the review, by design, prioritizes a wide-angle map of the field over a deep, exhaustive analysis of any single theme. It represents a snapshot of a field in rapid motion; the intellectual landscape mapped today will undoubtedly evolve quickly. This underscores both the timeliness of this review and the urgent need for the research directions it has identified. The future of IST research, therefore, lies not just in observing this evolution but in actively shaping the frameworks for a future defined by human-technology collaboration.

## CONCLUSION

This study provides the first comprehensive mapping of information seeking in translation, integrating bibliometric analysis with a scoping review. The findings reveal a multidisciplinary yet cohesive research landscape anchored in translation studies and increasingly shaped by technological advances, most notably the paradigm shift driven by artificial intelligence and large language models. A persistent competence gap between novices and professionals confirms that information literacy is a developed skill rather than an inherent trait, underscoring the critical role of systematic training in digital resource consultation and cognitive strategies. Crucially, AI-driven workflows are fundamentally transforming information seeking in translation by shifting the core evaluative challenge from source appraisal to output verification. This transformation demands an urgent redefinition of existing information literacy models and pedagogical approaches, reorienting training from 'how to search' toward 'how to verify, prompt, and ethically integrate.' Current frameworks, though foundational, do not adequately address competencies such as prompt engineering and artificial intelligence hallucination detection. Future research should investigate the cognitive and ethical dimensions of AI-augmented translation processes, develop empirically validated curricula for advanced information literacy, and adopt cross-cultural and longitudinal designs to cultivate resilient, adaptive translator competence in an era of continuous technological change.

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