



## Review

## Effective master's thesis supervision – A summative framework for research and practice

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## ABSTRACT

Each year, more students worldwide enter graduate school to complete their master's degree. A cornerstone of their education is the master's thesis. Respectively, master's thesis supervisors hold a key role in higher education teaching, yet no evidence-based overview currently exists of elements that make thesis supervision effective. Based on a systematic literature review, this study presents a summative framework of what is currently known about elements and their relationships that constitute effective master's thesis supervision, focusing on the interactions between individual students and supervisors. We develop an input-process-outcome framework based on 36 existing studies, identifying student and supervisor outcomes, characteristics of an effective student-supervisor relationship along with actions that students and supervisors can take to create and maintain it, along with student and supervisor characteristics that serve as critical inputs for an effective supervision process. We find that current research emphasizes the role of supervisor attitudes and actions in relation to the student-supervisor relationship, while future research is needed on student actions, supervisor learning over time, and contextual characteristics. Following our framework, we generate avenues for future research and summarize effective supervision practices in the dynamic and complex context of master's thesis supervision.

## 1. Introduction

The number of students pursuing a master's degree (or postgraduate/research degree<sup>1</sup>) is on the rise worldwide; for example, 20.000 additional students enter graduate school each year in the UK, an additional 370.000 students graduate with a master's in the US each year, and in China, the number of graduate students is around 1.400.000 (*Higher Education Statistics Agency, 2019; Statista.com, 2020a; Statista.com, 2020b*). In taught master's programmes, students complete a master's thesis (or dissertation) as a key element of their degree (i.e., *Anderson, Day, & McLaughlin, 2008; De Kleijn, Bronkhorst, Meijer, Pilot, & Brekelmans, 2016; Duke, 2013*), an

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<sup>1</sup> Terminology for master's thesis and thesis supervision varies substantially across national and institutional contexts (*De Kleijn, Meijer, et al., 2013*). To highlight this diversity, we have chosen to provide our key terminology along with common synonyms in brackets the first time we mention a concept.

independent research project ranging from six (De Kleijn et al., 2013, 2016; Neupane Bastola, 2022; Zhang & Hyland, 2021) to 18 months (Armstrong, 2004; Pilcher, 2011), and accounting for ten (Neupane Bastola, 2022) to 50 percent (Armstrong, 2004; De Kleijn et al., 2016). By completing a master’s thesis, students develop a range of skills and competences, including conceptual reasoning, research skills, information literacy, academic writing capabilities, as well as competences such as project management, feedback seeking/-receiving, and self-regulation (i.e., De Kleijn et al., 2016; Filippou, 2020; McMichael & McKee, 2008). These projects conclude with the assessment of a written thesis and often an oral defense (or viva), upon which a student is awarded their degree. The master’s thesis therefore provides a key learning experience for students that holds a prominent place in the graduate school curriculum.

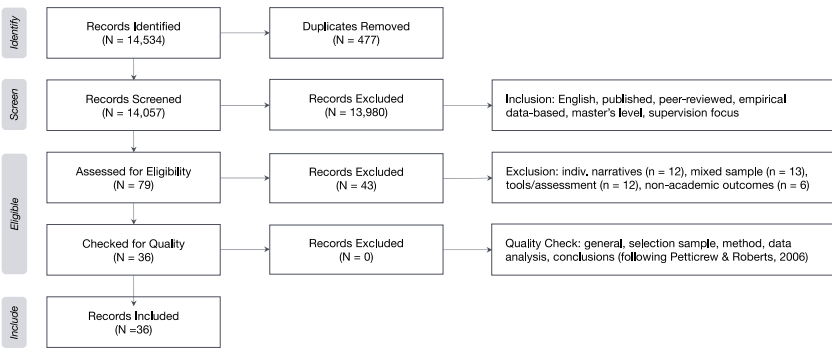
In working on their thesis, students are guided by a master’s thesis supervisor (or advisor) who is responsible for fostering the required skills and competences through one-on-one or small-group teaching over an extended period of time, making master’s thesis supervision a key teaching role for student development, as well as an increasingly prevalent role for academics (i.e., Filippou, 2020; Hu, van der Rijst, et al., 2016). Currently, faculty often receive little to no guidance on how to supervise effectively, so that new supervisors often have to rely on their own experiences as a student, or on the limited experience in their own network (De Kleijn, Meijer, Brekelmans, & Pilot, 2015; Filippou, Kallio, & Mikkilä-Erdmann, 2021; Hu, van der Rijst, et al., 2016; McMichael & McKee, 2008). This calls for insights that can support (beginning) thesis supervisors, acknowledging that thesis supervision is not a one-size-fits-all activity – the effectiveness of different approaches will vary widely based on students’ and supervisors’ needs, experiences, and preferences, making thesis supervision a complex and dynamic task (i.e., Aitken, Smith, Fawns, & Jones, 2022; De Kleijn et al., 2015; Harwood & Petric, 2020).

To address this need, this study presents a summative framework for effective master’s thesis supervision, built on a systematic synthesis of extant research findings. We base this framework on three key assumptions following past research on one-on-one supervision in different contexts. First, to understand what constitutes effective supervision, we assume that the aim of master’s thesis supervision is to develop students’ knowledge, skills, and attitudes regarding both the content of the thesis, as well as the processes and demands of conducting research (Anderson et al., 2008; Chang & Strauss, 2010; De Kleijn, Mainhard, Meijer, Pilot, & Brekelmans, 2012; Manathunga, 2007; Masek & Alias, 2020). Given the objective of this study to support (beginning) thesis supervisors, we focus on both student and supervisor outcomes, as we expect that supervisors’ learning across projects is likely to contribute to students’ outcomes (i.e., De Kleijn et al., 2015; Gezahegn & Gedamu, 2023; Teklesellassie, 2019). Consequently, in developing our framework, our first step is to synthesize current insights into outcomes of master’s thesis supervision at the student and at the supervisor level.

Second, in grasping the process that facilitates student and supervisor outcomes in the context of master’s thesis supervision, we assume that this process is characterised by inherent uncertainty, deriving from differences in students, supervisors, and their interactions, as well as different approaches, methods, and timelines across projects (i.e., De Kleijn et al., 2015; Grant, 2003; Grant, 2005). Following research on the provision and reception of feedback in higher education as well as research on PhD supervision, we understand the one-on-one supervision relationship as continually negotiated between both students and supervisors, with variances in power dynamics, roles and responsibilities, activities, and reactions over time and across student-supervisor pairings, making supervision a highly challenging yet potentially very impactful and rewarding teaching activity (i.e., Anderson, Day, & McLaughlin, 2006; Grant, 2003; Grant, 2005; Manathunga, 2007; Vehviläinen, 2009). Past studies on supervision at the undergraduate, master’s

**Table 1**  
Search Terms and Combinations (in title, abstract, and keywords).

| Boolean | Search Terms   |
|---------|--|
|         | "master* thes*" OR "graduat* thes*" OR "postgrad* thes*" OR "master* dissert*" OR "graduat* dissert*" OR "postgrad* dissert*" OR "master* research*" OR "graduat* research*" OR "postgrad* research*" OR "thes* supervis*" OR "thes* advis*" OR "thes* student*" OR "thes* candidat*" OR "dissert* supervis*" OR "dissert* advis*" OR "dissert* student*" OR "dissert* candidat*" OR "research* candidat*" OR "research* supervis*" OR "research* advis*" OR "research* student*" OR "research* candidat*" OR "master* supervis*" OR "master* advis*" OR "master* student*" OR "master* candidat*" OR "dissert* supervis*" OR "dissert* advis*" OR "dissert* student*" OR "dissert* candidat*" OR "research* supervis*" OR "research* advis*" OR "research* student*" OR "research* candidat*" |
| NOT     | PhD OR doctora* OR undergrad* OR bachelor*   |



**Fig. 1.** PRISMA flowchart.

**Table 2**

Overview of records included in the systematic literature review.

| Study Characteristics |   |           |          |        |             | Framework (Sub-)Themes                    |                     |                          |   |                                 |                                      |
|-----------------------|---|-----------|----------|--------|-------------|---|---------------------|--------------------------|---|---------------------------------|--------------------------------------|
| No.                   | Reference   | Domain(s) | Location | Method | Perspective | Inputs                                    | Stud. Actions       | Relationship             | Sup. Actions  | Outputs                         | Context                              |
| 1                     | <a href="#">Aitken et al. (2022)</a>                                      | mixed     | GBR      | Qual   | both        | Knowledge<br>Skills<br>Attitudes<br>Other | Tow. Supervisor     | Dynamics<br>Interactions | Adaptation<br>Expectations<br>Supportive<br>Nurturing                                     |                                 |                                      |
| 2                     | <a href="#">Anderson et al. (2006)</a>                                    | Education | GBR      | Qual   | supervisor  | Knowledge<br>Attitudes<br>Other           |                     | Dynamics                 | Adaptation<br>Expectations  | Reaction<br>Results             |                                      |
| 3                     | <a href="#">Anderson et al. (2008)</a>                                    | Education | GBR      | Qual   | student     | Attitudes<br>Other                        | Self-<br>Management | Dynamics<br>Interactions | Adaptation<br>Nurturing   | Results                         | Student                              |
| 4                     | <a href="#">Bakhou and Bouhania (2020)</a>                                | English   | DZA      | Qual   | both        | Knowledge<br>Skills                       |                     |                          |   | Results                         | Student<br>Supervisor<br>Institution |
| 5                     | <a href="#">Bayona-Oré (2021)</a>   | ICT       | PER      | Quant  | student     | Knowledge<br>Skills<br>Attitudes<br>Other |                     |                          |   |                                 |                                      |
| 6                     | <a href="#">Bayona-Oré and Bazan (2020)</a>                               | mixed     | PER      | Mixed  | student     | Knowledge<br>Other                        |                     |                          |   | Results                         | Student                              |
| 7                     | <a href="#">Chang and Strauss (2010)</a>                                  | mixed     | NZL      | Mixed  | student     | Knowledge<br>Other                        |                     | Interactions             | Adaptation<br>Expectations<br>Directive<br>Supportive<br>Nurturing<br>FB Focus            | Learning<br>Results             |                                      |
| 8                     | <a href="#">Cornelissen and van den Berg (2014)</a>                       | Education | NLD      | Qual   | both        | Knowledge<br>Skills<br>Attitudes<br>Other |                     |                          | Adaptation<br>Expectations<br>Directive<br>Supportive<br>Nurturing                        | Learning                        |                                      |
| 9                     | <a href="#">De Kleijn et al. (2012)</a>                                   | mixed     | NLD      | Quant  | student     |   |                     | Dynamics                 |   | Reaction<br>Results<br>Reaction |                                      |
| 10                    | <a href="#">De Kleijn, Mainhard, Meijer, Brekelmans, and Pilot (2013)</a> | mixed     | NLD      | Mixed  | student     |   |                     |                          | FB Format<br>FB Focus   |                                 |                                      |
| 11                    | <a href="#">De Kleijn, Meijer, et al. (2013)</a>                          | mixed     | NLD      | Qual   | both        |   |                     | Interactions             |   | Reaction                        |                                      |
| 12                    | <a href="#">De Kleijn et al. (2014)</a>                                   | mixed     | NLD      | Quant  | student     |   |                     | Dynamics                 | FB Format<br>FB Focus<br>Adaptation<br>Expectations<br>Nurturing<br>FB Format<br>BF Focus | Reaction                        |                                      |
| 13                    | <a href="#">De Kleijn et al. (2015)</a>                                   | mixed     | NLD      | Qual   | supervisor  | Knowledge<br>Attitudes                    |                     |                          |   | Reaction                        |                                      |
| 14                    | <a href="#">De Kleijn et al. (2016)</a>                                   | mixed     | NLD      | Qual   | both        | Other                                     |                     |                          | Adaptation<br>Supportive<br>Nurturing<br>FB Focus   | Results<br>Learning             | Institution                          |
| 15                    | <a href="#">Drennan and Clarke (2009)</a>                                 | nursing   | IRL      | Quant  | student     |   |                     |                          |   |                                 |                                      |
| 16                    | <a href="#">Dupont et al. (2015)</a>                                      | mixed     | BEL      | Quant  | student     | Attitudes                                 |                     |                          | Directive<br>Supportive<br>FB Format  | Reaction<br>Results             | Institution                          |

(continued on next page)

Table 2 (continued)

| Study Characteristics |   |             |          |        |             | Framework (Sub-)Themes           |                     |                          |  |                      |                           |
|-----------------------|---|-------------|----------|--------|-------------|----------------------------------|---------------------|--------------------------|--|----------------------|---------------------------|
| No.                   | Reference                                     | Domain(s)   | Location | Method | Perspective | Inputs                           | Stud. Actions       | Relationship             | Sup. Actions   | Outputs              | Context                   |
| 17                    | <a href="#">Dysthe et al. (2006)</a>          | Education   | NOR      | Mixed  | student     |                                  |                     |                          | Adaptation<br>Expectations<br>Supportive<br>FB Format<br>FB Focus            |                      |                           |
| 18                    | <a href="#">Ebadi and Pourahmadi (2019)</a>   | mixed       | IRN      | Qual   | both        | Knowledge<br>Other               |                     | Interactions             |  | Results              | Student<br>Institution    |
| 19                    | <a href="#">Filippou et al. (2017)</a>        | mixed       | Finland  | Qual   | student     | Other                            | Tow. Supervisor     | Dynamics<br>Interactions | Directive<br>Supportive<br>Nurturing   |                      |                           |
| 20                    | <a href="#">Filippou (2020)</a>               | mixed       | Finland  | Quant  | supervisor  |                                  |                     | Interactions             | Adaptation<br>Expectations<br>Nurturing                                      | Learning             |                           |
| 21                    | <a href="#">Filippou et al. (2021)</a>        | mixed       | Finland  | Qual   | supervisor  |                                  |                     |                          |  | Reaction             | Institution               |
| 22                    | <a href="#">Fossøy and Haara (2016)</a>       | mixed       | NOR      | Qual   | supervisor  |                                  |                     |                          |  | Reaction             |                           |
| 23                    | <a href="#">Gedamu (2018)</a>                 | mixed       | ETH      | Quant  | student     |                                  |                     |                          |  | Reaction             |                           |
| 24                    | <a href="#">Gezahegn and Gedamu (2023)</a>    |             | ETH      | Qual   | both        |                                  |                     |                          |  | Reaction             |                           |
| 25                    | <a href="#">Hajar et al. (2021)</a>           | mixed       | KAZ      | Qual   | student     | Attitudes                        | Self-<br>Management |                          | Adaptation<br>Expectations<br>Directive<br>Supportive<br>FB Format           | Learning             |                           |
| 26                    | <a href="#">Hu et al. (2016)</a>              | Linguistics | NLD, CHN | Qual   | supervisor  | Other                            |                     |                          |  |                      |                           |
| 27                    | <a href="#">Macfadyen et al. (2019)</a>       | Education   | GBR      | Qual   | supervisor  | Attitudes                        |                     |                          | Adaptation<br>FB Format  | Reaction<br>Learning |                           |
| 28                    | <a href="#">Macfadyen et al. (2020)</a>       | mixed       | GBR      | Qual   | supervisor  | Knowledge<br>Attitudes           |                     |                          | Adaptation<br>Expectations<br>Nurturing<br>FB Format                         | Results              |                           |
| 29                    | <a href="#">Neupane Bastola (2021)</a>        | mixed       | NPL      | Qual   | both        |                                  |                     |                          |  |                      |                           |
| 30                    | <a href="#">Neupane Bastola (2022)</a>        | Education   | NPL      | Mixed  | both        | Skills<br>Attitudes<br>Other     | Tow. Supervisor     |                          | FB Format  | Reaction<br>Learning | Supervisor<br>Institution |
| 31                    | <a href="#">Neupane Bastola and Hu (2023)</a> | mixed       | NPL      | Mixed  | supervisor  | Skills                           |                     |                          | FB Format<br>FB Focus  | Reaction             | Supervisor<br>Institution |
| 32                    | <a href="#">Pilcher (2011)</a>                | Math/CS     | GBR      | Qual   | supervisor  | Knowledge<br>Attitudes           |                     |                          | Adaptation<br>Directive<br>Supportive<br>FB Format<br>FB Format              | Behaviour<br>Results |                           |
| 33                    | <a href="#">Pitura (2022)</a>                 | English     | POL      | Qual   | student     | Other                            |                     |                          |  | Learning             | Student<br>Institution    |
| 34                    | <a href="#">Teklesellassie (2019)</a>         | Linguistics | ETH      | Mixed  | both        | Knowledge<br>Attitudes           |                     | Interactions             | Adaptation<br>Directive<br>Supportive<br>FB Format<br>Nurturing<br>FB Format | Reaction             |                           |
| 35                    | <a href="#">van Wyk et al. (2016)</a>         | Nursing     | ZAF      | Qual   | student     | Knowledge<br>Skills<br>Attitudes |                     | Dynamics<br>Interactions |  | Reaction             | Supervisor                |
| 36                    | <a href="#">Zhang and Hyland (2021)</a>       | Linguistics | HKG      | Qual   | both        | Other                            |                     | Dynamics                 |  | Reaction             |                           |
| N                     |   |             |          |        |             | 23                               | 5                   | 13                       | 23   | 29                   | 11                        |

and PhD level reflect this conceptualisation (i.e., Acker, Hill, & Black, 1994; Dysthe, 2002; Grant, 2003; Manathunga, 2007). For example, Acker et al. (1994) find that supervisors are likely to be trained to think of supervision in a technical rationality model view, where the production of a thesis is seen as a series of predictable steps that are managed and facilitated by the supervisor, with the student in a receiving and executing role. Contrarily, supervisors' practice is more likely to be represented by the negotiated order model, which accounts for uncertainty, uniqueness, and tensions based on students' and supervisors' existing experiences, values, and capabilities. Dysthe (2002), in turn, distilled three supervision models used by supervisors based on role and/or disciplinary expectations. The teaching model suggests a linear transmission of knowledge from supervisor to student; the apprenticeship model focuses on cooperation under the guidance of the supervisor; in the partnership model, the supervisor fosters the student's independence through dialogue and shared responsibility. All three models describe the student-supervisor relationship in terms of authority and agency on both sides, further highlighting the dynamic nature of supervision processes. In developing our summative framework on effective master's thesis supervision, we therefore focus on synthesising information on the negotiated and dynamic relationship between students and supervisors in relation to outcomes of the process as a second step.

Third, extant studies on graduate/PhD supervision state that the dynamics of the process of supervision is influenced by students' and supervisors' existing characteristics, such as their prior knowledge and skills (i.e., Masek & Alias, 2020), their values and expectations (i.e., Dysthe, 2002; Manathunga, 2007), and their goals for the supervision (i.e., Acker et al., 1994; Hassan, Ahmad, & Abiddin, 2009). Following this conceptualisation in other supervision contexts within higher education, we aim to capture student and supervisor characteristics, those elements that are in place as the supervision process begins, in relation to the dynamic and negotiated supervision process, and in turn, outcomes of the supervision process. To summarize, the aim of this study is to provide an overview of the current state of knowledge regarding the inputs, processes, and outcomes of effective master's thesis supervision in the context of taught master's programmes, focusing on the individual student and supervisor, as well as their interactions. We pursue this aim through the following three research questions:

1. What are outcomes of effective master's thesis supervision?
2. Which processes are characteristic of an effective master's thesis supervision that foster its outcomes?
3. Which inputs enable effective master's thesis supervision processes and outcomes?

By synthesising these outcomes, processes and inputs of effective master's thesis supervision in one summative framework, we contribute to current and future research on master's thesis supervision in the following ways. First, we capture research scattered across different educational contexts, methodologies, journals, and domains for a comprehensive overview (Filippou et al., 2021; Harwood & Petrić, 2020; Vos & Armstrong, 2019). Second, we identify gaps in the current literature, resulting in an agenda for future research and input for eventual theory-building. Third, our summative framework provides support for universities, guiding professional development activities for teachers, and evidence-based input for appraisal of thesis supervisors. The framework can also inform faculty developers in designing training materials and support for (beginning) supervisors, including resources, workshops, or coaching/intervision activities. Finally, the best practices aggregated across studies can provide input for thesis supervisors to reflect on their experiences and effectiveness, guiding their professional development individually and in their professional networks.

## 2. Methods

### 2.1. Database and literature search terms

In this review, we follow the steps laid out by Petticrew and Roberts (2006), starting with the formulation of our research questions and the selection of databases. To cast a wide net and capture results across domains, we chose one education-focused database, ERIC, as well as three broad databases: Web of Science, PsycARTICLES, and PsycINFO. Next, we developed our search terms by scanning recent studies on 'master's thesis supervision' from different geographical locations for synonyms, keywords used, as well as terminology from the reference lists, followed by a review of terminology used in the 50 most populous countries across continents (IndexMundi, 2021). We combine the terms master\*/graduate/postgraduate with thes\*/dissert\*/research\* and supervis\*/advis\*/student\*/candidat\*, resulting in the search terms outlined in Table 1. The search was carried out at the end of June 2023 without imposing restrictions on publication year.

### 2.2. Selection process and quality check

Before beginning the search process, we defined a series of inclusion criteria. First, we chose to focus on English-language publications to ensure equal accessibility to all studies included in this review, given the international relevance of master's thesis supervision, the dominance of the English language in research, and past findings that language restrictions have limited influences on review outcomes (i.e., Morrison et al., 2012). Second, to ensure consistent quality of the articles selected, we focused on published and peer-reviewed work, excluding working papers and dissertations, in addition to performing a quality check (see below for details). Third, we focused on studies using quantitative, qualitative, or mixed approaches, excluding conceptual papers. Fourth, in line with the scope of our research questions, we exclusively focused on papers that study master's students, excluding both undergraduate and doctoral education settings.

In the search process, we allowed search terms to be present in the title, abstract, and keywords, given the large number of initial hits obtained. We pre-selected full-text access, peer-reviewed articles, and English language in each database. This resulted in 14,534 hits

(ERIC, PsycARTICLES and PsycINFO = 1055 hits, Web of Science = 13,479 hits) including 477 duplicates. In the next step, the remaining 14,057 abstracts were scanned by two authors, and 13,980 records were excluded for not meeting one or more of the inclusion criteria.

In a next step, the remaining 79 records were read in full and we excluded a further 43 records for the following reasons: master's students were not the (sole) focus of the study (13 records excluded), the study did not focus on students and/or supervisors in the supervision process (like assessment criteria, tools, or trainings, 12 records excluded), studies with non-academic outcomes like students' religious or sexual identities (6 records excluded), and finally, we excluded records that report individual narratives and reflections of supervisors (12 records excluded). Consistency in record selection was facilitated using the online tool Rayyan (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016), first using blind mode to independently include and exclude studies, followed by iterative discussions on our criteria to resolve any conflicts in record selection.

In a final step, the remaining 36 studies were checked for quality following the procedure outlined by Petticrew and Roberts (2006). Following the scoring of each article by one author, a second author independently assessed 15% of the records ( $n = 5$  records, 11 record attributes assessed by each author per record; in line with Petticrew & Roberts, 2006). The intraclass correlation between both authors' ratings was found to be reliable at 0.87 (following Petticrew & Roberts, 2006), with 46 elements assessed identically by both authors, and neither author excluded a study based on quality. This leaves a final sample of 36 records included in this review (see Fig. 1 for the PRISMA flowchart and Table 2 for a detailed overview of studies, and Appendix A for record characteristics, including geographic location, year of publication, method, perspective, domain, and publication venue).

### 2.3. Initial data extraction and coding procedure

To address our research questions and build our summative framework, we relied on the codebook variety of thematic analysis, an approach that combines the use of a structured (existing) coding framework with themes developed early in the research process, allowing for the further development of themes throughout the analysis process (Braun & Clarke, 2021; Byrne, 2022). We opted for this specific approach to thematic analysis due to the concrete data from extant studies to be analysed, with a research question focused on summarising results, and with the aim in mind that findings should be accessible to and applicable by practitioners (in line with Braun & Clarke, 2021). We started with a generic input-process-outcome structure to synthesize all elements and relationships from our 36 studies. We next familiarised ourselves with all selected records, noting the reference, location(s) of data collection, journal name, domain studied, method(s) used, any other context characteristics, whether a record takes the perspective of students, supervisors, or both, and tentatively listing all concepts and relationships discussed per record within the broad categories of inputs, processes, and outcomes, along with relationships explored. These concepts and relationships were then further grouped in an iterative process into main themes and sub-themes. This iterative process was carried out by two authors through ongoing discussion and visualization of the resulting framework, interspersed with critical reflections by the remaining authors. We therefore address our research questions by mapping (sub-)themes and relationships studied to date by synthesising current insights in a systematic manner. The creation of the framework offers contributions for theory and practice on effective master's thesis supervision, highlighting opportunities for future research and supervision practice.

## 3. Results

Fig. 2 reports the summative framework we synthesized from the 36 records in our final sample, illustrating the results of the thematic analysis; Table 2 provides an overview which (sub-)theme is addressed by each record. Appendix A provides details on the characteristics of the included records, and Appendix B offers more detailed information on the relationships we have identified between themes in our framework. We describe each theme in turn, including sub-themes and relationships in the following sections.

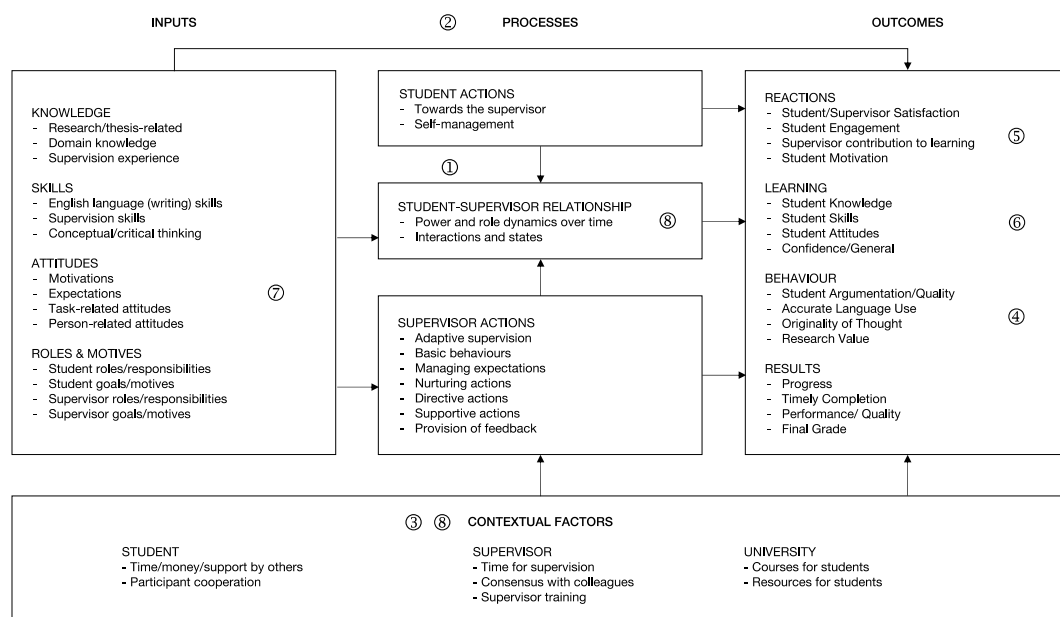
### 3.1. Research question 1 – outcomes of effective Master's thesis supervision

In a first step, we synthesize outcomes of master's thesis supervision outcomes ( $n = 29$ ). Using Kirkpatrick's (1996) evaluation model, we specify four themes: reactions, learning outcomes, behaviours, and results, with an effective learning experience ideally having an impact beyond short-term reactions.

#### 3.1.1. Student and supervisor reactions

Reactions refer to the degree to which an experience is perceived to be satisfying, engaging, motivating, etc. in the short term ( $n = 17$ , Kirkpatrick, 1996). Eight records focus on *satisfaction* with the thesis supervision (process), revealing a wide range among both students and supervisors, even though only two studies focus specifically on negative experiences and dissatisfaction (Hajar, Ait, & Mhamed, 2021; Teklesellassie, 2019). A further seven records explore students' cognitive, behavioural, and emotional *engagement* throughout the thesis process, capturing assessments by students and supervisors (see Table 2). Students reported to experience mostly negative emotions in response to feedback, and students and supervisors experienced large variations in cognitive and behavioural engagement between students and over time. These studies relate engagement to the thesis process as a whole (Anderson et al., 2008; Dupont, Galand, & Nils, 2015; Zhang & Hyland, 2021), or to the feedback exchanged in the thesis process (Neupane Bastola, 2022; Neupane Bastola & Hu, 2023). Finally, three records captured students' perceptions of their supervisor's *contribution to learning* (De Kleijn et al., 2012, 2014; De Kleijn, Mainhard, et al., 2013), and one record also explored students' *motivation* to continue engaging in research from a supervisor perspective (Neupane Bastola, 2022). Regarding reactions, we did not identify differences between student and supervisor perspectives.





**Fig. 2.** Summative Framework of Effective Master's Thesis Supervision

*Note:* Boxes represent themes and sub-themes identified through codebook-based thematic analysis of the 36 studies included in this review. Arrows represent relationships found in extant studies. Numbers in circles relate to avenues for future research detailed in Table 4.

### 3.1.2. Student learning outcomes

*Learning outcomes* refer to the knowledge, skills, and attitudes that result from a learning experience, along with perceptions of confidence and commitment ( $n = 8$ ; Kirkpatrick, 1996). We find four student-focused learning outcomes: knowledge skills, attitudes, and confidence/commitment. First, four studies have focused on *topic knowledge* (Neupane Bastola, 2022; Pitura, 2022), domain understanding (Cornelissen & van den Berg, 2014; Macfadyen et al., 2019; Pitura, 2022), and professional/academic English vocabulary (Pitura, 2022). Second, seven studies explored *skills*, specifically academic writing (Anderson et al., 2006; Drennan & Clarke, 2009; Neupane Bastola, 2022; Pitura, 2022), research (Bayona-Oré, 2021; Macfadyen et al., 2019, 2020; Neupane Bastola, 2022), analytical/conceptual (Anderson et al., 2006; Drennan & Clarke, 2009), problem-solving- and project management/planning skills (Drennan & Clarke, 2009). Third, five records cover a range of *student attitudes* in response to master's thesis supervision, including domain-specific values and beliefs (Pitura, 2022), a widened horizon and feeling agency (Anderson et al., 2006; Chang & Strauss, 2010; Hajar et al., 2021; Neupane Bastola, 2022), and gratitude for supervisor feedback (Chang & Strauss, 2010). This facet is also includes studies on negative attitudes, including embarrassment and feeling like a burden when receiving negative feedback (Chang & Strauss, 2010). Finally, five studies explore students' *confidence/commitment* as an outcome, including confidence in one's knowledge, skills, and academic voice (Anderson et al., 2006; Hajar et al., 2021; Neupane Bastola, 2022), in tackling unfamiliar problems (Drennan & Clarke, 2009), as well as low levels of confidence (Chang & Strauss, 2010) and imposter syndrome (Hajar et al., 2021). These outcomes include insights from both students and supervisors (see Table 2), and we did not detect differences between their perspectives regarding the content or relevance of student learning outcomes.

### 3.1.3. Student behaviours

*Behaviour* refers to the degree to which learning outcomes result in changes to how tasks are accomplished ( $n = 1$  from a supervisor perspective). This theme focuses on students' coherent argumentation after processing feedback and self-correcting spelling and grammar issues (Pilcher, 2011). Based on the limited insights on behaviours, we do not establish relationships with other framework elements in this paper.

### 3.1.4. Student results

Finally, *results* refer to the performance, progress, and achievements that result from a learning experience ( $n = 11$ , including student and supervisor perspectives, see Table 2). In the master's thesis supervision context, this includes measures of progress (Bakhou & Bouhania, 2020; Chang & Strauss, 2010; Ebadi & Pourahmadi, 2019; Filippou, 2020), timely completion (Anderson et al., 2008; Bayona-Oré & Bazan, 2020; Filippou, 2020), performance/quality (Anderson et al., 2006; Chang & Strauss, 2010; Ebadi & Pourahmadi, 2019; Macfadyen, English, & Coates, 2020; Pilcher, 2011) and final grade (De Kleijn et al., 2012; Dupont et al., 2015).

## 3.2. Research question 2 – effective Master's thesis supervision processes

The second research question focuses on the processes that relate to the outcomes of reactions, learning, and results. In synthesising

**Table 3**

Overview of effective student and supervisor actions for effective Master's thesis supervision.

| Sub-Theme                          | Effective Actions   |
|------------------------------------|---|
| <b>Panel A. Student Actions</b>    |   |
| Towards Supervisor                 | <p>Actions students can take during meetings and when submitting work to their supervisor</p> <ul style="list-style-type: none"> <li>- Take initiative in planning meetings and interactions</li> <li>- lead interactions in meetings by preparing and presenting an agenda</li> <li>- monitoring time during meetings as well as demands on the supervisor's time outside of meetings</li> <li>- make feedback needs explicit when submitting work to the supervisor</li> <li>- meaningfully process feedback provided by the supervisor by understanding comments provided, critically reflecting on lessons learned, and by consistently applying these lessons to current and future work across the thesis process</li> </ul>  |
| Self-Management                    | <p>Actions students can take while working on their thesis in between meetings/feedback moments</p> <ul style="list-style-type: none"> <li>- use time available for working on the thesis effectively and consistently by planning ahead, including buffers and regular writing moments</li> <li>- involving peers, family, and friends in offering inputs, emotional support, and feedback where appropriate</li> <li>- using cognitive, affective, and meta-cognitive strategies to regulate one's motivation, persistence, effectiveness of approach, and progress</li> </ul>  |
| <b>Panel B. Supervisor Actions</b> |   |
| Adaptive Supervision               | <p>Flexibly applying different actions based on students' needs:</p> <ul style="list-style-type: none"> <li>- adapt their actions to students' needs based on <ul style="list-style-type: none"> <li>o existing knowledge</li> <li>o skills</li> <li>o attitudes</li> <li>o student expectations</li> <li>o circumstances affecting their work</li> <li>o changes in needs over time</li> </ul> </li> <li>- engage students in active discussions about these themes to adapt their actions effectively</li> </ul>  |
| Managing Expectations              | <p>Actively negotiating conditions for a realistic, feasible, and successful thesis process:</p> <ul style="list-style-type: none"> <li>- initiate discussions on how to engage in the thesis process</li> <li>- establish that supervision is a dialogue where both parties hold distinct, but connected responsibilities</li> <li>- make expectations regarding responsibilities and initiate (re-)negotiation where needed</li> <li>- highlight students' ownership, accountability and agency</li> <li>- position oneself as a safety net or a passenger with the student in the driver's seat</li> <li>- communicate academic standards explicitly and early on, including notions of integrity, ethics, and institutional requirements</li> </ul>                     |
| Nurturing actions                  | <p>Creating a safe environment in which the student is seen as a person and where (personal) circumstances are accounted for:</p> <ul style="list-style-type: none"> <li>- make students feel welcome from the beginning</li> <li>- take time to get to know students personally</li> <li>- show interest in students' cultural backgrounds</li> <li>- communicate openly and kindly</li> <li>- role model professional, respectful interactions</li> <li>- encourage students through difficulties</li> <li>- focus students on achieving long-term goals</li> <li>- remain visible, accessible, and engaged throughout - sympathise with students and their circumstances</li> <li>- listen actively to students</li> <li>- seriously consider students' ideas</li> </ul> |
| Directive actions                  | <p>Providing students with instructions and direct guidance:</p> <ul style="list-style-type: none"> <li>- schedule/encourage the scheduling of regular meetings</li> <li>- role-modelling time management</li> <li>- request that students prepare an agenda and bring concrete products and questions to meetings</li> <li>- set feasible but binding deadlines for thesis milestones</li> <li>- give direct instructions for what students should do</li> <li>- use checklists, forms and other aids to help students plan and execute their work efficiently</li> </ul>  |
| Supportive Actions                 | <p>Actions that provide students with relevant resources, including information, help, and advice:</p> <ul style="list-style-type: none"> <li>- provide information, advice and help when the student indicates they need this type of support</li> <li>- dedicate sufficient resources to the supervision process</li> <li>- offer guidance on <ul style="list-style-type: none"> <li>o selecting and refining the thesis topics</li> <li>o formulating and adjusting research questions</li> <li>o searching for literature</li> <li>o choosing and executing a methodology</li> <li>o academic writing (conventions)</li> </ul> </li> </ul>  |
| Provision of Feedback              | <p>Supervisors provide feedback on student drafts in an iterative manner so the student can improve their work over time:</p> <ul style="list-style-type: none"> <li>- make expectations around feedback explicit, including <ul style="list-style-type: none"> <li>o format and timing</li> <li>o processing and follow-up of feedback</li> <li>o that it is an iterative process</li> </ul> </li> <li>- provide specific, timely, constructive and relevant feedback that does not overwhelm the student</li> <li>- include both praise and constructive comments to provide encouragement and appropriate challenge</li> <li>- provide feedback on <ul style="list-style-type: none"> <li>o language and grammar (for non-native speakers)</li> </ul> </li> </ul>        |

(continued on next page)



Table 3 (continued)

| Sub-Theme | Effective Actions   |
|-----------|---|
|           | <ul style="list-style-type: none"> <li>o structure and argumentation</li> <li>o thesis content accuracy/quality</li> <li>o students' approaches to working</li> <li>o student progress towards their goals</li> </ul> |

the available insights, we distinguish between three themes within the thesis process – the effective student-supervisor relationship, along with actions by students and supervisors.

### 3.2.1. The effective student-supervisor relationship

Thirteen records including student and supervisor perspectives offer information on what an effective student-supervisor relationship consists of (see Table 2). The first sub-theme covers the *dynamics of power and changing roles over time* for master's thesis supervision ( $n = 8$ ). Both students and supervisors state that their relationship should be a two-way street where student initiative interlocks with supervisor guidance (Aitken et al., 2022; Anderson et al., 2006, 2008; Filippou, 2020; van Wyk, Coetzee, Havenga, & Heyns, 2016; Zhang & Hyland, 2021), that is negotiated and subject to change (Aitken et al., 2022; Zhang & Hyland, 2021), so that at the start of the collaboration, supervisors are more directive, while students take more ownership of the process over time, learning to co-construct research with their supervisors in a balanced power dynamic (Aitken et al., 2022; De Kleijn et al., 2012, 2014; Zhang & Hyland, 2021). This negotiated relationship is then characterised by convergent expectations about each other's roles and a clear division of responsibilities (Aitken et al., 2022).

Additionally, nine studies detail the *interactions and states* that students and supervisors perceive to be effective in their interaction ( $n = 9$ ). Both parties state that their relationship needs to be trusting (Aitken et al., 2022; Filippou, 2020; van Wyk et al., 2016), with students adding that this means interactions need to be reliable, stable, and consistent (van Wyk et al., 2016), where they feel seen as a person, not just a student (Chang & Strauss, 2010), and where both parties know each other well (van Wyk et al., 2016). This trust is further fostered by honest and open communication on both sides (Aitken et al., 2022; Anderson et al., 2008; Filippou, 2020; Teklesellassie, 2019; van Wyk et al., 2016), including about cultural differences (Chang & Strauss, 2010), leading to emotionally gratifying interactions (van Wyk et al., 2016). Next, students and supervisors alike feel that effective interactions should be respectful and professional, welcoming, but neither too formal/hierarchical nor too friendly (Ebadi & Pourahmadi, 2019; Filippou, Kallo, & Mikkilä-Erdmann, 2017; Teklesellassie, 2019; van Wyk et al., 2016). Finally, De Kleijn and Meijer et al. (2013) add that it is important for both students and supervisors to pursue compatible goals, both personal and curricular, for their interactions to be effective.

Appendix B shows that an effective student-supervisor relationship is the second-most studied theme in our framework. It has been related directly to all three student outcomes in past research, finding positive links for both sub-themes of dynamics and interactions. We therefore conclude that an effective student-supervisor relationship fosters student outcomes and therefore plays a critical role in the master's thesis supervision process.

### 3.2.2. Student actions for an effective thesis process

Five studies list actions that students can undertake to create and maintain an effective student-supervisor relationship, which we grouped into two sub-themes. *In relation to the supervisor* ( $n = 3$ ) students and supervisors agree that students should lead interactions during meetings (Aitken et al., 2022; Filippou et al., 2017), they should account for their supervisors' limited time in their planning (Aitken et al., 2022), and they need to engage with the feedback they receive from their supervisor in a meaningful way (Neupane Bastola, 2022). A second set of studies from the student perspective lists actions for *student self-management* ( $n = 2$ ). These suggest that students should engage in careful planning and strategic use of the resources available (Anderson et al., 2008; Hajar et al., 2021), make use of meta-cognitive strategies to complete their work, and should engage in regular writing activities across the thesis trajectory (Hajar et al., 2021). Appendix B illustrates that, based on this small number of studies, these actions have been positively linked directly to student reactions and learning outcomes, as well as indirectly via an effective student-supervisor relationship. We further include a list of the effective student actions in Table 3 Panel A.

### 3.2.3. Supervisor actions for an effective thesis supervision process

Just like students, supervisors, too, can engage in a range of actions that foster and maintain an effective supervision process, ( $n = 23$ , with 78 individual actions listed). In synthesising these actions, we developed seven sub-themes: adaptive supervision, managing expectations, nurturing actions, directive actions, supportive actions, and the provision of feedback, which are partly based on categorisations used by Macfadyen et al. (2020), Pilcher (2011) and van Wyk et al. (2016). We have summarised the six sub-themes of supervisor actions in Table 3 Panel B, and we further describe each sub-theme below.

First, 14 records from both student and supervisor perspectives highlight that there is no one-size-fits-all approach to supervision, but rather that supervision is most effective when supervisors *adapt their actions* to the needs of a student across the thesis process (see Table 2). Supervisors should adapt their actions to their students' needs (see Table 3 Panel B) through direct discussions across the supervision process, and should avoid making assumptions (Chang & Strauss, 2010; De Kleijn et al., 2015; Filippou, 2020; Macfadyen et al., 2019, 2020). This requires that supervisors are actively engaged across the thesis process (Dysthe, Samara, & Westheim, 2006), and that they are aware of being role-models on how to think, reflect and critically evaluate not only the content, but also the thesis process itself (Cornelissen & van den Berg, 2014). Adapting one's actions is therefore an ongoing demand on supervisors across the thesis process.

Second, supervisors can undertake a series of actions to *manage expectations* with respect to two targets, the supervision process, as well as the academic standards underlying the thesis process ( $n = 9$ ). Regarding the thesis process, both students and supervisors agree that supervisors should initiate discussions about how the thesis process will be approached, positioning the student in an increasingly active and agentic role, with the supervisor as a safety net (Aitken et al., 2022; Anderson et al., 2006; Chang & Strauss, 2010; Cornelissen & van den Berg, 2014; Filippou, 2020). This balance needs to be made explicit and re-negotiated across the thesis process (see Table 2; Aitken et al., 2022; Anderson et al., 2006; De Kleijn et al., 2015; Dysthe et al., 2006; Hajar et al., 2021). Regarding academic standards, both students and supervisors highlighted that supervisors should make explicit what constitutes a high-quality thesis in terms of quality, integrity, ethics, and institutional requirements (Cornelissen & van den Berg, 2014; De Kleijn et al., 2015; Dysthe et al., 2006; Hajar et al., 2021; Macfadyen et al., 2020). We conclude that managing expectations is especially critical at the start of the supervision process, but the resulting agreements should be subject to adjustments where needed.

Third, ten records emphasise the need for supervisors to *nurture students* by creating a safe environment for open and honest communication between students and supervisors. Both students and supervisors agree that it is the supervisor's task to create such a safe space for students (Cornelissen & van den Berg, 2014; Filippou, 2020; Macfadyen et al., 2020; van Wyk et al., 2016) through the way supervisors communicate and react to student requests and challenges (see Table 3 Panel B for details; Aitken et al., 2022; Anderson et al., 2008; Chang & Strauss, 2010; Cornelissen & van den Berg, 2014; De Kleijn et al., 2015; Drennan & Clarke, 2009; Filippou et al., 2017; Hajar et al., 2021; Macfadyen et al., 2020; Pilcher, 2011; Teklesellassie, 2019; van Wyk et al., 2016). We conclude that nurturing actions are relevant at the very start of the supervision process, but also are applicable when students are facing difficulties to maintain open and honest communication (Anderson et al., 2008; Cornelissen & van den Berg, 2014; Filippou et al., 2017).

Fourth, a series of seven studies describe *directive actions* in which supervisors provide instructions and structure for students. This includes the scheduling of regular meetings (Filippou et al., 2017), role-modelling effective time management, requesting that students bring in concrete works and comments to meetings (Cornelissen & van den Berg, 2014), setting deadlines for thesis components (Teklesellassie, 2019), giving direct instructions for what students should do (Dupont et al., 2015; Pilcher, 2011), as well as using checklists and forms to aid students in planning their work (Filippou, 2020). These actions are most effectively used at the start of the thesis process to facilitate students' settling in (Aitken et al., 2022; Zhang & Hyland, 2021), and when students are faced with challenges they cannot yet overcome by themselves (De Kleijn et al., 2012, 2014). These actions are described by students as well as supervisors, and we did not detect any differences between perspectives (see Table 2).

Fifth, ten records suggest that supervisors need to engage in *supportive actions*, those that provide students with the necessary resources to complete their thesis. Students and supervisors agree that any support provided to students should be aimed at filling knowledge/skills gaps (Teklesellassie, 2019) and to facilitate the timely completion of the thesis (Aitken et al., 2022). Support can be general, overarching (Drennan & Clarke, 2009; Dupont et al., 2015; Dysthe et al., 2006; Filippou et al., 2017; Pilcher, 2011), as well as task-specific (Chang & Strauss, 2010; Cornelissen & van den Berg, 2014; Drennan & Clarke, 2009; Filippou et al., 2017; Hajar et al., 2021) and should be provided across the thesis process (Teklesellassie, 2019). These actions are not universal, but inextricably linked with adaptation of actions, so that support fosters rather than limits student agency and confidence (Cornelissen & van den Berg, 2014; De Kleijn et al., 2015; see Tables 2 and 2 Panel B).

Finally, a critical action identified by 16 studies is supervisors' *provision of feedback* to students, based on which we formed two sub-themes: the format in which feedback can effectively be delivered, and the different targets on which feedback can be focused. Starting with the feedback format, both students and supervisors agree that providing feedback is a key action required of supervisors (Neupane Bastola & Hu, 2021; Pitura, 2022; Teklesellassie, 2019; van Wyk et al., 2016) that is most effective when it follows clear expectations, is iterative, and provided effectively (see Table 3 Panel B for details; Dysthe et al., 2006; Neupane Bastola & Hu, 2023). This facilitates students' capacity for processing and applying the feedback received (Hajar et al., 2021; Neupane Bastola, 2022; Pilcher, 2011; Pitura, 2022; Teklesellassie, 2019; van Wyk et al., 2016). Providing feedback therefore is inherently adaptive and requires careful monitoring and diagnosing of students' needs over time (De Kleijn et al., 2014, 2015; De Kleijn, Mainhard, et al., 2013; Dupont et al., 2015; Hajar et al., 2021; Macfadyen et al., 2019; Teklesellassie, 2019; van Wyk et al., 2016).

Appendix B shows that supervisor actions are by far the most-studied theme within our framework, including several studies linking the different supervisor actions to the three student outcomes directly: reactions, learning, and results. These actions also relate positively to an effective student-relationship (see Appendix B for details). In our framework, we therefore position supervisor actions as an input to the student-supervisor relationship and as an input to student outcomes.

### 3.3. Research question 3 – inputs for effective Master's thesis supervision

Our third research question focuses on inputs that foster the thesis supervision process and outcomes. We grouped all input by using the KSAO framework (Kozlowski & Klein, 2000; Mathieu, Tannenbaum, Donsbach, & Alliger, 2014) that distinguishes individuals' knowledge (K), skills (S), attitudes (A), and other characteristics (O). We explore these sub-themes for both students and supervisors as a way to synthesize extant insights into a known framework in line with our codebook approach to thematic analysis, linking sub-themes in relationship to process and outcome themes identified before.

#### 3.3.1. Student and supervisor knowledge

A set of 13 records include information on the role of both student and supervisor knowledge as an input for the master's thesis supervision process. Both students and supervisors require *research- and thesis-related knowledge*, including student knowledge of writing conventions (Bakhou & Bouhania, 2020; Macfadyen et al., 2020), methodological knowledge (Bakhou & Bouhania, 2020; Ebadi & Pourahmadi, 2019; Macfadyen et al., 2020) and more general pre-requisite knowledge (Bayona-Oré & Bazan, 2020; De Kleijn

et al., 2015; Macfadyen et al., 2020). In addition, part-time students can also rely on their domain-specific professional knowledge (Aitken et al., 2022). For *supervisors*, prior studies highlight the relevance of their knowledge of academic standards and processes (Aitken et al., 2022; Anderson et al., 2006; Bayona-Oré & Bazan, 2020; van Wyk et al., 2016), and experience with research steps and methods (Anderson et al., 2006; Cornelissen & van den Berg, 2014; Teklesellassie, 2019). In addition, supervisors need to be competent in the domain, but they do not necessarily need to be experts (Aitken et al., 2022; Anderson et al., 2006; Cornelissen & van den Berg, 2014; Teklesellassie, 2019; van Wyk et al., 2016). Moreover, having *experience with supervising* master's theses was appreciated by both students and supervisors (Bayona-Oré, 2021; Chang & Strauss, 2010; Cornelissen & van den Berg, 2014). To conclude, students and supervisors agree on the different kinds of knowledge needed by both parties (see Table 2), and Appendix B shows that these types of knowledge relate to student reactions and results directly, as well as indirectly via supervisor actions and an effective student-supervisor relationship in roughly equal measure. We therefore position student and supervisor knowledge as a positive input in our summative framework.

### 3.3.2. Student and supervisor skills

A further seven records study the skills that enable students to successfully complete their master's thesis and the skills that enable supervisors to guide their students effectively. Both students and supervisors agree that (*English*) *writing skills* are critical for students to succeed (see Table 2; Bakhou & Bouhania, 2020; Chang & Strauss, 2010; Neupane Bastola, 2021; Neupane Bastola & Hu, 2023). They also agree that supervisors should possess relevant *supervision skills*, including social and leadership skills, fostering knowledge development effectively, and connecting to their students (see Table 2; Aitken et al., 2022; Bayona-Oré, 2021; Cornelissen & van den Berg, 2014). Finally, both students and supervisors should possess *critical and conceptual thinking skills* (see Table 2; Bakhou & Bouhania, 2020; van Wyk et al., 2016). Appendix B shows that these skills relate positively to an effective student-supervisor relationship, to supervisor actions, and to all three student outcomes, solidifying skills as a positive input in our summative framework.

### 3.3.3. Student and supervisor attitudes

A total of 14 studies include information on attitudes of both students ( $n = 9$ ) and supervisors ( $n = 7$ ) in relation to the thesis process and outcomes. First, four studies emphasized the relevance of *students' intrinsic motivation* for their thesis process, which can relate to the thesis topic as well as to the learning opportunities afforded by the thesis process (student and supervisor insights, see Table 2, Dupont et al., 2015; Ebadi & Pourahmadi, 2019; Macfadyen et al., 2020; Neupane Bastola, 2022). Next, *students' expectations* for the thesis process, and specifically the degree to which these expectations match with their supervisors', were identified as relevant inputs by three studies (Aitken et al., 2022; Anderson et al., 2008; Hajar et al., 2021). This includes expectations regarding the final grade, the distribution of responsibilities between students and supervisors, as well as students' openness to potential changes in the thesis process. A third sub-theme collates information on *task-related attitudes* by students and supervisors, which are addressed by seven records (see Table 2). Both students and supervisors highlight that students should be determined and persistent while working on their thesis (Anderson et al., 2008; De Kleijn et al., 2015), and students added that they need to be flexible to succeed (Anderson et al., 2008). Regarding supervisors' task-related attitudes, supervisors should be committed to the thesis process (van Wyk et al., 2016), energetic and passionate about supervision (Bayona-Oré, 2021; Cornelissen & van den Berg, 2014; Teklesellassie, 2019; van Wyk et al., 2016), as well as accepting of the inherent unpredictability of the thesis supervision process, so that they are driven to develop a personal understanding of supervision through reflection and discussion with other supervisors (Anderson et al., 2008; Macfadyen et al., 2019). Finally, six records focus on beneficial attitudes by *supervisors towards their students*. According to both supervisors and students (see Table 2), supervisors should first and foremost have a professional attitude towards their students, meaning they should be friendly, approaching students informally, with transparency and respect, being appropriately demanding and role modelling productive actions and procedures (Anderson et al., 2008; Cornelissen & van den Berg, 2014; Teklesellassie, 2019; van Wyk et al., 2016). In addition, supervisors should be committed to their students as a person, displaying genuine interest in them (Anderson et al., 2008; Cornelissen & van den Berg, 2014; van Wyk et al., 2016), being emotionally supportive of students (Anderson et al., 2008; Bayona-Oré, 2021), demonstrating persistence with their students (Bayona-Oré, 2021; van Wyk et al., 2016) and being willing to adapt to student needs across the thesis process (Anderson et al., 2008; Macfadyen et al., 2019). Following the information presented in Appendix B, we conclude that student and supervisor attitudes are the most-studied inputs, and that they relate positively to all three student outcomes, as well as to an effective student-supervisor relationship, and, to a lesser degree, to supervisor actions. At the same time, student attitudes have not been linked to student actions to date.

### 3.3.4. Student and supervisor roles and motives

In addition to student- and supervisor KSAO, fourteen studies discuss role expectations and motives for engaging in the thesis process for both students and supervisors. Both supervisors and students agree that *students* should take increasing responsibility and ownership for progressing as they advance in the thesis process (Anderson et al., 2006, 2008), are expected to take initiative and challenge themselves (Anderson et al., 2006, 2008), and to plan their time and make strategic use of resources surrounding the thesis process (Anderson et al., 2008), which are culturally sensitive demands (Anderson et al., 2006; Chang & Strauss, 2010; Filippou et al., 2017). Student goals were identified to include graduating and accessing specific job opportunities (Dupont et al., 2015; Macfadyen et al., 2020; Pitura, 2022), as well as contributing to academic knowledge development and helping others in their profession (Pitura, 2022). Regarding *supervisors*, students propose that thesis supervisors' roles and responsibilities include developing the students' academic potential (Aitken et al., 2022; Bayona-Oré, 2021), planning the thesis process (Bayona-Oré, 2021), providing supervision on choosing the topic and methodology and analyses (Bayona-Oré, 2021), and they should be available to the student (Chang & Strauss, 2010; Ebadi & Pourahmadi, 2019). Studies that involve both students and supervisors also mention that supervisors are involved in the

**Table 4**

Agenda for future research on effective Master's thesis supervision.

| Nr | Avenue  | Research Question  |
|----|---|--|
| ①  | Balance research on student and supervisor actions                      | <i>What are students' actions that impact effective thesis supervision, how do these interact with supervisor actions?</i><br>Purpose: comprehensive insight into both contributors to the student-supervisor relationship   |
| ②  | Combine student and supervisor perspectives in the same study           | <i>How do student and supervisor characteristics/actions interact in determining effective student-supervisor interactions and student outcomes?</i><br>Purpose: adaptive supervision relies on diagnosing and relying on student and supervisor characteristics and actions                                     |
| ③  | Understanding contextual support  | <i>How can the university, faculty, and programme leaders effectively support (beginning) master's thesis supervisors?</i><br>Purpose: establish conditions under which characteristics, actions, and interactions indeed result in desirable outcomes   |
| ④  | Add studies on Kirkpatrick's behavioural level                          | <i>Which behaviours do students demonstrate during their thesis trajectory and/or subsequent (research) work that is the result of (effective) thesis supervision?</i><br>Purpose: fully understanding learning and transfer of KSA from the supervision process to other relevant contexts                      |
| ⑤  | Study student and supervisor wellbeing in the context of supervision    | <i>Which framework themes foster or hamper students' and supervisors' mental health and wellbeing as they cope with the challenges of the master's thesis supervision process?</i><br>Purpose: leveraging the role of master's thesis supervision for student and supervisor for sustainable learning            |
| ⑥  | Understanding supervisor learning and development over time             | <i>How do supervision experiences of the student-supervisor interaction and students' outcomes feed into supervisors' goals, attitudes, and knowledge?</i><br>Purpose: establishing mechanisms to support supervisor professional development over time  |
| ⑦  | Linking student and supervisor attitudes and actions                    | <i>How do student and supervisor attitudes relate their actions, and how to these relationships interact dynamically over time?</i><br>Purpose: deepening our understanding of the dynamics of the student-supervisor relationship in relation to student- and supervisor inputs to identify intervention points |
| ⑧  | Effective use of group supervisions and technology-enhanced supervision | <i>How can master's thesis supervision effectively adapt to increasing student numbers and the advent of distance/hybrid education?</i><br>Purpose: establishing applicability and extension of current best practices given societal and technological developments   |

approval/grading of a thesis (Neupane Bastola, 2022), and that they should socialise students into academia/the domain (Anderson et al., 2008; Zhang & Hyland, 2021). Finally, four studies state supervisor motives and goals (Anderson et al., 2008; Cornelissen & van den Berg, 2014; Hu, van der Rijst, et al., 2016; Pitura, 2022), including shared knowledge development in terms of content and methods, students' (language) skill development, and connecting to the students as a person to build their confidence and employability. We therefore position both student and supervisor roles and motives as inputs to student outcomes, as well as to the thesis process, specifically the student-supervisor relationship and supervisor actions (see Appendix B).

### 3.4. Contextual characteristics

While analysing the records described above, a number of *contextual characteristics* emerged, those that are beyond the control of either students or supervisors, but that were found to affect master's thesis supervision ( $n = 11$ , including student and supervisor insights, see Table 2), which we grouped into three sub-themes: student-related characteristics, supervisor-related characteristics, and institution-related characteristics. Looking at *student-related characteristics*, five records identified financial support (Anderson et al., 2008; Bayona-Oré & Bazan, 2020; Macfadyen et al., 2020), hours off work for part-time studies (Anderson et al., 2008; Bayona-Oré & Bazan, 2020; Ebadi & Pourahmadi, 2019), support by significant others for childcare, advice, and emotional support (Anderson et al., 2008; Bakhou & Bouhania, 2020; Macfadyen et al., 2020), and cooperative respondents (Bakhou & Bouhania, 2020). Next, four records identified *supervisor-related characteristics* that enable effective master's thesis supervision: a manageable teaching load allowing for sufficient time for supervision (Bakhou & Bouhania, 2020; Chang & Strauss, 2010; Neupane Bastola & Hu, 2023; van Wyk et al., 2016), and consensus among supervisors within a programme on values, approaches, and assessment of master's theses (Fossøy & Haara, 2016). Third, at the level of the *institution*, eight records suggest that programmes should be intellectually stimulating/motivating/creating interest (Drennan & Clarke, 2009) and should include research courses (Bakhou & Bouhania, 2020; Dupont et al., 2015; Filippou, 2020; Hajar et al., 2021; see Table 2). Additionally, universities should provide essential resources for students like lab spaces, tech access, library resources, and financial support for research activities (Drennan & Clarke, 2009; Hajar et al., 2021; Neupane Bastola & Hu, 2023; Pitura, 2022), a social environment where supervisors and students can meet and connect outside the supervision setting (Filippou, 2020), and through providing trainings to develop staffs' key supervision skills (Fossøy & Haara, 2016). These contextual characteristics relate directly to all three student outcomes, as well as to supervisor actions, but not to any of the inputs, student actions, or the student-supervisor relationship (see Appendix B).

### 3.5. Nuances across student populations

While we did not find differences across the different methodologies and educational domains covered by the 36 studies in this review (which was empirically shown by, i.e., Filippou et al., 2017; Neupane Bastola, 2021; Neupane Bastola & Hu, 2023), we noticed that recommendations for effective thesis supervision differed by student populations. First, 12 studies focused on students preparing a master's thesis in a foreign language, mostly English, while being supervised by someone with a different cultural background. These studies highlight that the student-supervisor relationship may be more fragile than that of student-supervisor pairings with the same cultural background. For example, expectations and social norms (i.e., with respect to hierarchy, directness of communication,



expectations regarding critical thinking and building academic arguments) may differ implicitly, so that for an open and trusting relationship, differences need to be acknowledged and negotiated more explicitly (i.e., Chang & Strauss, 2010; Ebadi & Pourahmadi, 2019; Filippou et al., 2017). Second, part-time students who pursue a master's degree in their chosen profession should be enabled to build on their professional knowledge and experiences in their thesis, and supervisors may need to be more flexible in their support due to competing responsibilities and demands on their time (Aitken et al., 2022; Anderson et al., 2008; Bakhou & Bouhania, 2020; Dupont et al., 2015). Finally, even though only two records focused on online degrees (Aitken et al., 2022; Pitura, 2022), they suggest that for students writing their thesis remotely, accessibility of online resources is critical, and that in establishing a student-supervisor relationship, technologies that allow for more social cues should be used first, such as video calls over emails. Additionally, written communication should be even more explicit in these settings, where in-person communication cannot compensate for implicit differences.

#### 4. Discussion

As more and more students pursue a master's degree (Higher Education Statistics Agency, 2019; Statista.com, 2020a; Statista.com, 2020b), academics engage in master's thesis supervision more frequently and with larger student numbers. Often with little support and training, master's thesis supervisors set out to engage in the highly complex, dynamic, and uncertain process of facilitating their students' learning and performance (De Kleijn et al., 2015; Filippou et al., 2021; McMichael & McKee, 2008). To support master's thesis supervisors as well as faculties in meeting this challenge, we created a summative framework by systematically synthesising extant research on outcomes, processes, and inputs of effective master's thesis supervision. At the core of an effective master's thesis supervision process lies the dynamic, negotiated relationship between students and supervisors that is influenced by inputs on both sides, as well as by student and supervisor actions; the dynamics we synthesized around power, changes in role expectations and needs between students and over time aligns more closely with the negotiated order model rather than the technical rationality model posited by Acker et al. (1994), in which both students and supervisors need to adapt to each other and the process' demands over time. Similarly, this conceptualisation suggests that supervisors may effectively engage in different supervision models over time and across students, with teaching, apprenticeship, and partnership serving different, ideally complementary, purposes (Dysthe, 2002). This notion is also reflected in the work by De Kleijn et al. (2012, 2014), who find that students benefit from both controlling and affiliating interactions with their supervisor in different ways (based on the interpersonal teacher behaviour model by Wubbels, Créton, & Hooymayers, 1985). We therefore conclude that effective master's thesis supervision relies on a supervisor's ability to flexibly adapt their actions and their role in the student-supervisor relationship based on the students' existing knowledge, skills, attitudes, expectations, circumstances affecting their learning, and changing needs over time, which requires them to leverage their own KSA as well as their roles and motives to make a genuine connection with their students in a safe and supportive environment.

In the absence of past reviews of effective master's thesis supervision, we compared our summative framework with available literature reviews on a closely related teaching dynamic in higher education – research supervision at the PhD level (Gray & Crosta, 2019; Hassan et al., 2009; Masek & Alias, 2020; McCallin & Nayar, 2012). Overall, we identified overlap with respect to four framework elements: the student-supervisor relationship, student outcomes, and supervisor actions. First, similarly to our model, all four reviews place the interactions between PhD candidates and their supervisor at the centre of effective supervision practices, referring to trust, availability, and the provision and reception of feedback (Gray & Crosta, 2019; Hassan et al., 2009; Masek & Alias, 2020). Second, outcomes studied overlap with respect to time to completion and the knowledge and skills acquired in the process (Masek & Alias, 2020; McCallin & Nayar, 2012). Third, Masek and Alias (2020) distinguish between dynamic (the student-supervisor interaction, including supervisor actions) and static determinants (student and supervisor characteristics), in line with the conceptualisation of our model inputs. Additionally, Abiddin et al. (2009) specify a range of roles and responsibilities of the supervisor, which overlap considerably with our category of other inputs and supervisor actions. Finally, while research on PhD supervision places more emphasis on student inputs, their insights on the role of students' prior knowledge on methods and content as well as their research skills levels aligns with our sub-themes of student inputs level (Abiddin et al., 2009; Masek & Alias, 2020; McCallin & Nayar, 2012). These similarities offer general support both for our themes, as well as for the general focus of the summative framework.

At the same time, research on PhD supervision also focuses on emotional and mental health struggles of students (Masek & Alias, 2020), as well as on the relationship between faculty-level support and effective PhD supervision, including time and resources afforded to students and supervisors, the role of financial aid, procedures for assessment, and the role of coursework in the PhD curriculum (Abiddin et al., 2009; Gray & Crosta, 2019; Masek & Alias, 2020; McCallin & Nayar, 2012). These differences highlight shortcomings of the current literature on master's thesis supervision, which we further address in the avenues for future research. Finally, significant differences in existing insights on master's thesis versus PhD supervision regard the timeframe of the interaction between student and supervisor, and the role of enculturation/socialisation into academia, which are less relevant in the master's context compared to the PhD context. Based on our summative framework and these similarities and differences between our and reviews on PhD supervision, we formulate our avenues for future research, limitations, and contributions to practice.

##### 4.1. Avenues for future research

Reviewing our summative framework and comparing it to the more mature field of research on PhD supervision, we observed a series of gaps in current research on effective master's thesis supervision, that inform our suggestions for future research (see Table 4 research questions, and benefits of these avenues). We suggest eight major avenues: (1) additional insights into student characteristics and actions to match insights currently available on supervisors; (2) integrating research on student and supervisor perspectives in the same study to explore interactions and adaptive supervision further; (3) consistent focus on contextual characteristics to derive

necessary external support for both students and supervisors; (4) investigating student behaviours as an outcome of the supervision process to cover all Kirkpatrick levels, such as in the transition to the workplace, within- and outside of academia; (5) relating elements of our framework to student and supervisor mental health/wellbeing as a way to leverage a critical teaching interaction; (6) studying the feedback loop between outcomes of student supervision and subsequent adaptations in supervisors' characteristics and actions over time; (7) studying how and when student and supervisor attitudes translate into (in-)effective actions and relationships; and (8) exploring what effective thesis supervision looks like in group settings, due to rising student numbers, and through the use of technology, in the wake of COVID-19. These avenues can be addressed both qualitatively and quantitative, and are likely to benefit from a mixed-method approach for reliable, yet nuanced, insights into the inputs, conditions, processes, and outcomes of effective master's thesis supervision at different levels. These insights would also contribute to a more comprehensive and adaptive framework of effective master's thesis supervision over time.

#### 4.2. Limitations

Our results need to be interpreted in light of the following limitations. First, we excluded personal or dyadic narratives from our review. This limited the number of studies included, but provided model input based on empirical findings that are more likely to generalise. Integrating these narratives into our framework can add nuance to our findings in a subsequent step. Second, we focused on English-language studies as a way of building on accessible inputs to our framework across readers. Based on work by [Morrison et al. \(2012\)](#), we do not expect that our results are heavily biased based on this choice, but we acknowledge that nuances relating to national education systems can be added by including non-English language records. Third, we inductively developed the themes and sub-themes included in our framework, based on definition/conceptual overlap of themes and relationships studied to date. We ensured reliability of this categorization by working with two independent coders and using an iterative process with a third reviewer. Yet, thematic analysis retains its subjective nature ([Braun & Clarke, 2021](#)), which is why we compared our framework to reviews on PhD supervision for further validation. Fourth, we found that studies on master's thesis supervisor training frequently do not include outcome measures beyond satisfaction reactions of beginning supervisors to the training itself. Due to the lack of insights on the effects of supervisor training on themes in our framework, we were only able to derive limited insights from these studies. We suggest including follow-ups into such studies in which participants reflect on the changes in their KSAO, their actions, their relationships with students as well as student and supervisor outcomes. Finally, as a majority of the studies are qualitative in nature, we inferred links between concepts and categories from the language used in the results sections of these studies. With two coders, we worked to ensure that our interpretation of qualitative findings is as representative as possible for the studies included. At the same time, this implies that reliable information on framework relationships is still currently limited. With more quantitative evidence, a next step towards validation would be to perform exploratory/confirmatory factor analysis and/or subgroup meta-analyses to validate the current framework themes and their relationships.

#### 4.3. Implications for practice

In [Table 3](#), we collate student and supervisor actions that have been identified as effective for creating effective student-supervisor relationships and student/supervisor outcomes. These insights can serve as a resource for thesis supervisors, but also for faculty developers who seek to guide and professionally develop (new) thesis supervisors. Developing training and support for thesis supervisors closes a gap in faculty development ([De Kleijn et al., 2015](#); [Filippou et al., 2021](#); [Hu, van der Rijst, et al., 2016](#); [McMichael & McKee, 2008](#)). Simultaneously, these actions can help programme directors and administrators to communicate specific expectations to (beginning) supervisors, along with interventions designed to foster students' KSAO to prepare both parties for an effective master's thesis process. Finally, by identifying elements of effective student-supervisor relationships and its inherent complexities, our framework can provide the necessary language for supervisors and faculty developers to effectively reflect on and develop their supervision practices, transforming teaching practices and experiences into learning opportunities.

#### Author contribution

Therese Grohnert: conceptualisation, methodology, formal analysis, investigation, writing – original draft, writing – review & editing, visualization, supervision, project administration, funding acquisition.

Lena Gromotka: methodology, formal analysis, investigation, writing – original draft.

Inken Gast/Laurie Delnoij: validation, writing – review & editing, supervision.

Simon Beusaert: conceptualisation, validation, writing – review & editing, supervision.

#### Declaration of competing interest

None.

#### Data availability

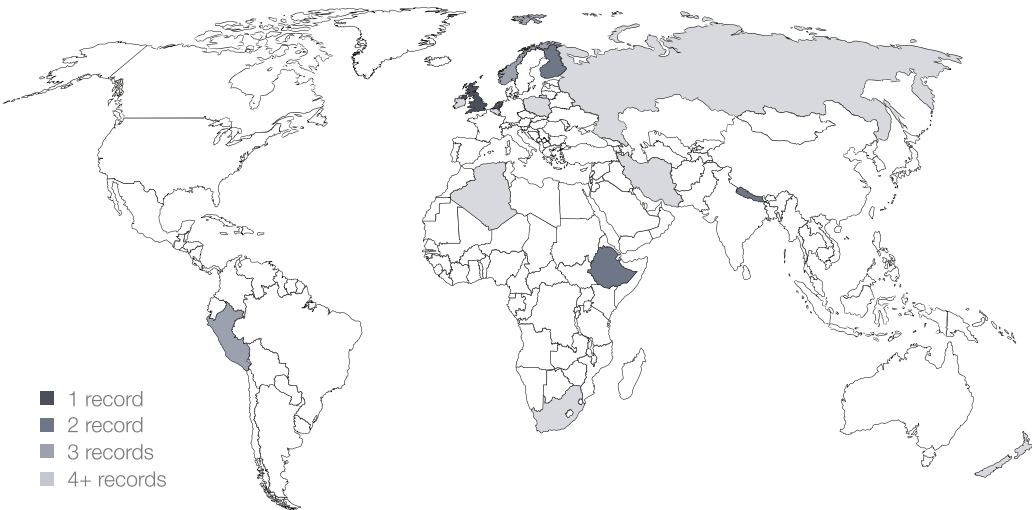
All studies reviewed in this study are listed and described in the paper proper.

Acknowledgments

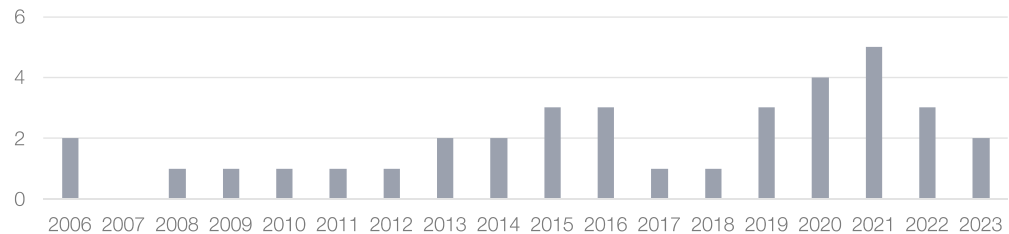
This work was partially funded by Maastricht University through the School of Business and Economics' Educational Institute. The funding source had no involvement in the conception, design, execution, interpretation or write-up of this study.

Appendix A. Sample Characteristics of Records Included (n = 36)

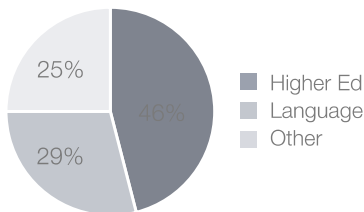
Panel A. Geographical distribution of studies included (multiple contexts possible)



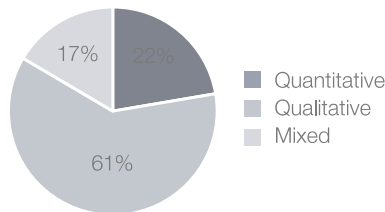
Panel B. Distribution of studies included by year of publication



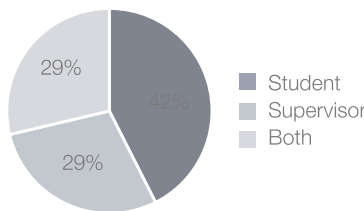
Panel C. Distribution by Journal Domain



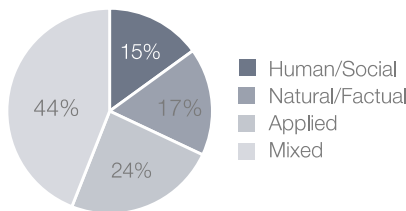
Panel D. Distribution by Method



Panel E. Distribution by Perspective



Panel F. Distribution by Academic Domain





## Appendix B. Overview of Relationships Identified between Summative Framework Themes (n = 36)

Please click here to access the online appendix <https://view.genial.ly/64efab994220ae0019430e42>.

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