

Is critical thinking a future skill for business success: science mapping and literature review

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Abstract

Purpose – This article aims to review critical thinking (CT) as a future skill in business.

Design/methodology/approach – The study employed two research methods: science mapping analysis based on bibliometric keyword co-occurrence data and systematic literature review following PRISMA guidelines. The application of two distinctive research methods meant that we could obtain a broad picture thematic overview as well as a detailed, fine-grained insight into the content of CT business research.

Findings – Research in CT in business studies is dominated by themes related to education, university and learning that far outweigh CT business application, which focuses on three research axes. These are specific business functions (e.g. accounting, marketing, human resources and identifying business opportunities), certain skills used in business (e.g. decision-making and creativity) and other business-related topics (including ethics, stakeholder relations and individual employee performance).

Practical implications – The article identifies new research gaps related to the link between CT and business performance, a firm's ability to innovate and company characteristics. Moreover, the article highlights that CT positively influences business decision-making under the influence of cognitive biases and heuristics.

Originality/value – The article provides the first literature review on CT in business research. It uses a novel method of science mapping analysis to show unbiased algorithmic-based insight into the structure of the research, followed by a systematic literature review.

Keywords Critical thinking, Science mapping, Systematic literature review, Future skill

Paper type Research paper

1. Introduction

The social and economic shifts in the contemporary world put strong pressure on labor markets, including progress in AI applications (Vrontis *et al.*, 2021), migration (Mak, Roberts, & Zimmerman, 2021), climate change (Berrang-Ford *et al.*, 2021) and rising life expectancy (Schneider & Langen, 2021) identified as crucial drivers of the change (Balliester & Elsheikhi, 2018; Malik & Janowska, 2018). It is predicted that 65% of children entering education today will work in jobs that do not yet exist (WEF, 2016). In times of constant change, replenishing knowledge and skills is essential to remain competitive (OECD, 2017b). Therefore, the crucial problem is to recognize competencies that will be required by business and will provide employees with a competitive advantage in the future (Visvizi, Lytras, & Daniela, 2018). A review of analyses regarding key future competencies shows the growing importance attached to the competence of critical thinking (CT) (Palacios-Huerta, 2013; EC, 2016; Bakhshi, Downing, Osborne, & Schneider, 2017; Janowska & Skrzek-Lubasińska, 2019; Visvizi, Jussila, Lytras, & Ijäs, 2020).

JEL Classification — D9, J24, L21, M21

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CT is recognized not only as an important feature of future individual abilities but also as the key skill that will support business development and economic growth in the coming years future (Visvizi, Troisi, Grimaldi, & Loia, 2021). Scientists and business practitioners observe that the importance of this skill is growing (WEF, 2020), which creates a rationale for a more in-depth study connecting CT with business application in academic research. Considering the research value and its application potential, we require new insights and perspectives to distinguish and benefit from leading research streams, identify research gaps and adequately map areas of future research. This article addresses these needs by mapping key areas of research that deal with CT in business studies and identifying topics and issues that remain under-discussed. Therefore, this article addresses two crucial research questions:

RQ1. What are the principal themes researched in CT-related studies in business literature?

RQ2. What is the insight gained from the key articles about the application of CT in business?

The article consists of five sections. After the Introduction above, we will discuss the importance of CT as a fundamental future skill in business and its key dimensions so as to demonstrate the rationale for the presented study. Next, we will elaborate on the two research methods applied in the study, along with research limitations. The following section presents the study findings, and the article closes with a discussion and conclusions.

2. Critical thinking as a future skill

According to the European Council, the key skills that will create resilience against changes in the labor market and will be particularly valuable are CT, creativity, communication and collaboration (EC, 2016). These skills are also recognized by other researchers, and they are dubbed the 4Cs (Lamri, 2018). A World Economic Forum Report (WEF, 2020) lists CT among the top 10 skills of 2025, including such skills as active learning, creativity, leadership, social influence and technology use. The OECD (2017a) places CT in the group of key cognitive skills. In a European Commission Report, Gonzalez Vazquez *et al.* (2019) call CT a meta-cognitive skill.

CT skills are often combined with problem-solving (Edmond, 2017) as a bundled set of skills that highlights the practical and applicational edge of CT (Heckman, 2008; Cunningham & Villaseñor, 2016; Sousa & Wilks, 2018). However, in the OECD Employment Outlook 2020, the two skills are separated, and CT alongside complex problem-solving is recognized as a transversal skill (OECD, 2020). In an attempt to define this distinction further, Lamri (2018) states that CT enables solving problems using available knowledge, known facts and available data and logic.

The definition of CT remains the subject of discussion among researchers. There have been numerous attempts to conceptualize CT skills, which has led to a variety of definitions that highlight various aspects of competence, including the following definitions:

- (1) the ability to develop and the ability for lifelong learning (OECD, 2017b);
- (2) the ability to think strategically and apply rules to new situations to solve problems (OECD, 2017b);
- (3) the skill of CT enabling individuals to proactively and effectively deal with non-routine challenges (OECD, 2015);

- (4) the ability to undertake analysis and synthesis (to go through large amounts of available information, evaluate it and make judgments; [OECD, 2017b](#));
- (5) the ability to use logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems as well as assess one's own performance, others' performance, or the performance of organizations to make improvements or take corrective action ([WEF, 2020](#));
- (6) the ability to identify and select information due to access to almost unlimited information resources ([Lamri, 2018](#));
- (7) the ability to analyze and evaluate arguments according to their soundness and credibility, respond to arguments and reach conclusions through deduction based on certain information ([Tiruneh, Verburgh, & Elen, 2014](#)).

As the line between the concepts of skills and abilities remains debated, and opinions vary in their views on CT attributes, we adopted the following operational definition of CT for the purpose of our study: *CT in business means the skills to identify and select information, undertake their analysis and synthesis, and utilize them to solve business problems by proactively and effectively dealing with non-routine challenges to achieve strategic goals*. Thus, when analyzing CT in business, we adopted a skill-based definition instead of a general one to provide a more focused analysis.

Most agree that CT is of vital and amplifying importance for business success, and its features are “hard to measure, but essential to the success of individuals and firms” ([OECD, 2017a](#), p. 9). This calls for a review of the current state of the art so as to build an indispensable foundation for future research. Moreover, due to the complexity of the matter, we believe it is advisable to apply both novel and more conventional research methods to achieve more sophisticated insight.

3. Materials and methods

This article employed two methods to address the research questions. To answer the first research question, we used a science mapping analysis based on bibliometric keyword co-occurrence data. Moreover, a systematic literature review with the support of PRISMA guidelines was applied to address the second research question.

3.1 Science mapping analysis

Science mapping is a graphic representation of knowledge areas ([Small, 1990](#)). It uses automated algorithmic systems to analyze keywords to provide unbiased insight into the research subject based on the frequency at which two keywords appear together ([Su & Lee, 2010](#)). We utilized the SciMAT software to gain insight into the interaction between article keywords in the analyzed pool to generate a list of key themes ([Santana & Cobo, 2020](#)). Each theme was characterized by two dimensions: centrality and density ([Callon, Courtial, & Laville, 1991](#)). *Centrality* represents the extent of an interaction between the theme in question and all other themes. Therefore, centrality provides an insight into the strength of the thematic network's external ties (ties with other themes). Consequently, centrality is considered to be the degree of the theme's importance in the research area. *Density* explores the internal strength of the theme, namely the strength of links between the number of co-occurring keywords that are part of the theme (ties inside the theme). Density is considered a degree of theme development. The higher the density, the more concentrated the research on the theme ([Santana & Cobo, 2020](#)). SciMAT allocates themes based on their centrality and density into a strategic diagram. The strategic diagram is divided into quadrants

representing four types of themes: motor, basic, specialized and emerging themes (Gutiérrez-Salcedo, Martínez, Moral-Muñoz, Herrera-Viedma, & Cobo, 2018). The strategic diagram template is presented in Figure 1.

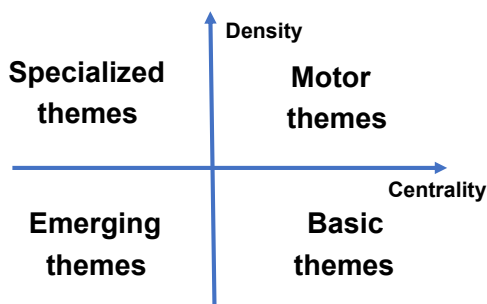
Motor themes have a high level of centrality and density, so they are considered well-developed and important for the research area. Thus, motor themes are viewed as a major contribution to the research area. *Basic themes* are characterized by high centrality and low density. Therefore, they are considered important but not key contributions to the research area. *Specialized themes* represent themes with low centrality and high density, so they are internally well-developed but not strongly linked to other themes. Hence, they make a limited but focused contribution to the research area. *Emerging themes* have a low degree of centrality and density, which illustrates their relatively insignificant internal and external development. Each theme is represented on the diagram by a sphere. The sphere size can refer to various bibliometric indicators, while in our study it indicated the number of articles with the keyword used as a label of the sphere. The label of the sphere is the keyword with the highest occurrence frequency in a network of articles in the theme (Santana & Cobo, 2020).

Science mapping analysis is a new kind of bibliometric analysis, but it has already been applied in the field of business and economic research. The same method – including SciMAT software and the use of strategic diagram analysis – was applied to research into a significant array of topics, including gig-economy (Malik, Visvizi, & Skrzek-Lubasińska, 2021), the future of work (Santana & Cobo, 2020), big data (López-Robles, Rodríguez-Salvador, Gamboa-Rosales, Ramirez-Rosales, & Cobo, 2019) and creativity in business economics (Castillo-Vergara, Alvarez-Marin, & Placencio-Hidalgo, 2018).

In this research, bibliometric data was obtained through the Web of Science (WoS) database, while the sample used in this study was limited to published articles. The sample for our study comprised 1074 WoS-indexed articles published between 1992 and 06.2021. These texts covered a total of 3419 unique keywords, and these keywords – together with their co-occurrence – were subjected to the algorithmic analysis with the SciMAT software. Then, we searched in the articles selected for the analysis for keywords “critical thinking” in all fields. The query scope was limited to articles in the field of business study.

3.2 Systematic literature review

To answer the research questions, we analyzed the existing scientific research and conducted a systematic literature review. To ensure the robustness of the review results and safeguard the consistency of the process, we followed the latest guidelines (Page *et al.*, 2021) for Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA; Moher *et al.*, 2015). Therefore, we developed a review protocol describing the article selection criteria,



Source(s): Own elaboration based on Gutiérrez-Salcedo *et al.* (2018)

Figure 1.
Strategic diagram
template

search strategy, data extraction and data analysis procedures. The key part of the data analysis procedure followed a three-step process, which comprised identification, screening for eligibility and inclusion of other texts.

In the initial phase, article selection criteria were established. To ensure a broad scope of the search and cover diversified insight from various sources for this systematic review – including research articles, public intuition papers and commercial reports – our search strategy used the Google Scholars database as the primary source of information. We noticed that not all texts included in this database undergo the same rigorous scientific verification procedure as in WoS. However, the texts in our research were validated and analyzed by the authors in a course of further PRISMA steps to ensure the high quality of data input. Moreover, regarding a more focused scope of systematic literature review compared to science mapping analysis, more conservative criteria were adopted in the next steps of the review process.

In the search strategy and extraction phases, the initial step of the review was performed on July 13, 2021, when articles with the phrase “critical thinking” and the word “business” in the title of the article were selected from the Google Scholar database. To fine-tune the results to the use of CT in business, we applied the exclusion criterium. In this step, the texts related to CT in business education were removed from the scope of our search by excluding texts with the following words in the title: “school,” “course,” “student,” “teaching,” “learning,” “curriculum,” and “education.” We did not use any additional inclusion criterium for our search. We found that 256 articles meet the original criteria and directed them to the data analysis phase for identification. By applying the exclusion criterium related to CT in business education, 212 articles were removed from the scope of our search while six texts were inaccessible. Consequently, a total of 38 articles remained in our database with potentially important insight into the application of CT in business.

However, the screening of the texts for eligibility further limited the number of articles to 15, because 23 texts provided no valuable insight into CT in business, usually because the term “critical thinking” was used in these texts in a different context, mostly to show that the authors thoroughly scrutinize their research subject. In the group of 23 excluded texts, 16 texts were excluded due to insufficient focus (e.g. CT used in colloquial meaning or in a context unrelated to the research field) and seven texts were excluded on the grounds of limited scientific rigor (e.g. lack of peer review process).

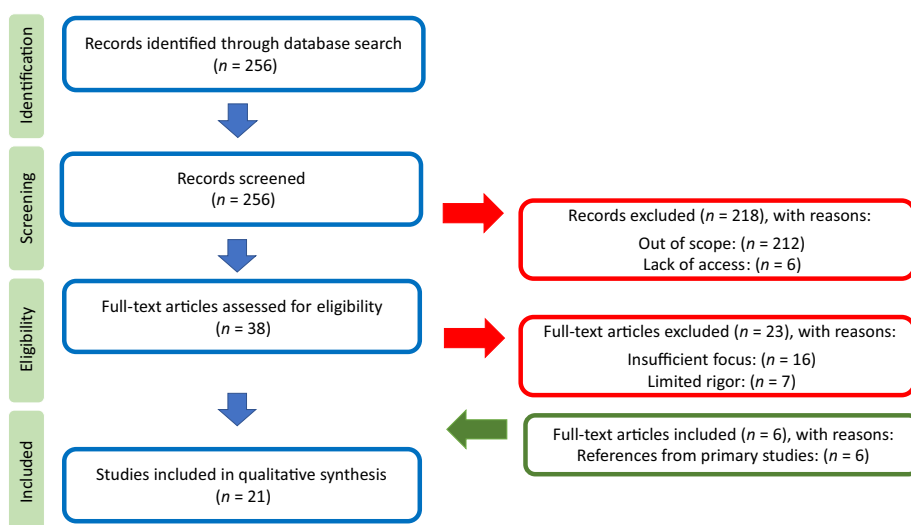
Six texts were included in the research based on references from primary studies. As a result, the insight from 21 texts is presented in the next section of this article. The selection process is summarized in [Figure 2](#).

3.3 Limitations

This study used multiple research methods to address research limitations. However, this study was not devoid of embedded limitations related to applied research methods and other limitations related to the scope of the study. Three limitations are highlighted and discussed in this part of the text.

First, science mapping as a method of analysis assumes that the content of the texts is adequately represented by the keywords provided by the articles’ authors. In this view, the outcome quality relies on input data quality. Input quality cannot be monitored during research that employs this method. Nevertheless, to address this limitation, other research methods can be deployed, and in the case of this research, science mapping analysis was followed by a systematic literature review.

Second, the findings of science mapping and systematic review depend on the choice of language of the scrutinized texts and the selection of databases. Despite the dominance of the English language in scientific literature, the exclusion of non-English articles adversely still affected the quality of this study.



Source(s): Own elaboration

Figure 2.
PRISMA diagram and
the selection process
with the number of
documents

Third, the use of specific databases and queries raises questions of inclusion, exclusion and bias. This study used the WoS database for science mapping and Google Scholar for the systematic literature review. Science mapping requires a list of keywords as article attributes. As Google Scholar does not have the keyword function, it cannot be used for this purpose. On the other hand, we preferred Google Scholar as it has a broader scope than WoS, which maximized the scope of the systematic literature review. However, the use of other databases such as Scopus would have further enhanced the study quality.

4. Findings

Application of the two distinctive research methods to analyze CT in business provided a detailed assessment of the research subject and allowed for capturing both overviews of the research landscape through science mapping and the more fine-grained insight through systematic literature review.

4.1 Science mapping

The science mapping analysis of the bibliometric data with the support of SciMAT software – based on keyword co-occurrence – allowed us to generate the following strategic diagram for CT studies presented in Figure 3.

Eleven themes were identified and mapped in CT research. The size of the theme sphere was proportional to the document number covered by the theme, while their allocation in the diagram was a derivative of theme centrality (importance in the research) and density (degree of development in the research). CT science mapping analysis using a strategic diagram allowed us to identify three motor themes (university, skills and creativity), three basic themes (education, experimental learning and perspective), three specialized themes (personality, assessment and impact) and two emerging themes (ethics and perceptions).

The results indicated that the research on CT in business literature was dominated by themes related to education and learning, mostly tertiary. This vein was represented by one motor theme with the highest density and centrality, namely “university,” and two basic

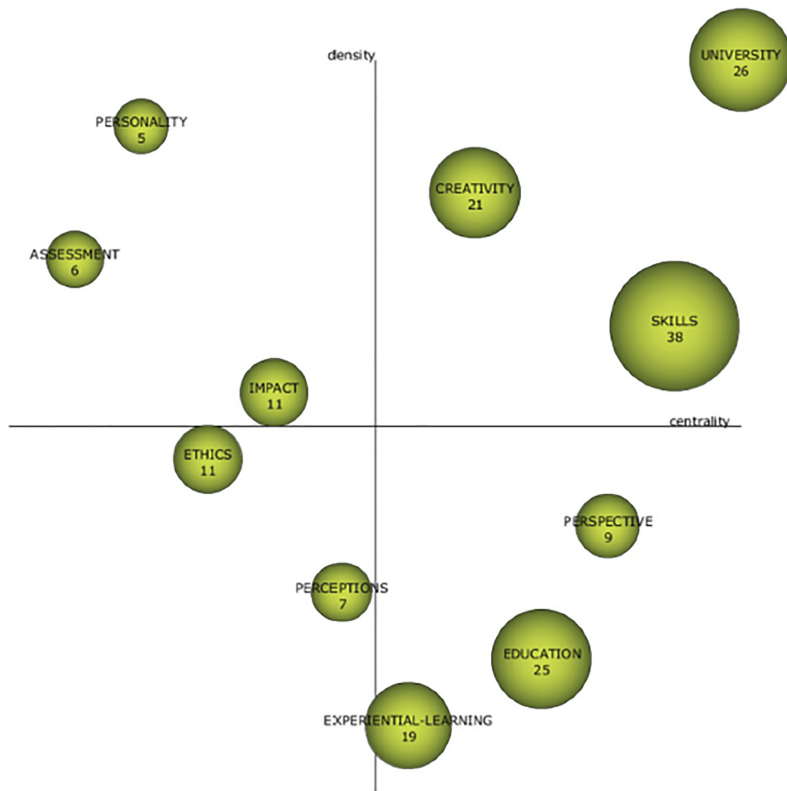


Figure 3.
The systematic review
process and the
number of papers
reviewed

Source(s): Own elaboration

themes: “education” and “experimental learning.” The second important perspective used in CT research in business studies was related to CT as a skill, along with its connection with other skills and attributes of personality. This stream of literature was identified based on two motor themes – “skills” and “creativity” – and one specialized theme: “personality.” The application of CT to business practice was represented by a limited number of themes, and this line of research could be traced in “impact” as a specialized theme and “ethics” as an emerging theme. Moreover, the science mapping results showed that researchers attempted to analyze and assess CT from various perspectives indicated by the themes such as “perspective,” “assessment,” and “perceptions.”

The review of science mapping results provided a bigger picture of the studies related to CT in business literature and demonstrated an elaborate overview of the state of the art in CT research, revealing that researchers approached CT from a number of perspectives. Moreover, the review suggested that there was no research into the application of CT to business practice. This became especially apparent compared to more mature research perspectives related to education and learning, along with CT as a skill. On the one hand, the science mapping results showed a promising but broad area for further research related to the application of CT in business and business practice. On the other hand, the results called for a more fine-grained analysis of the body of research that would be directly related to CT in business, thus allowing for an overview of the current state of the art and identification of more focused research areas.

4.2 Systematic literature review

The application of a systematic literature review allowed us to prepare a detailed and focused analysis of CT in business. The application of PRISMA resulted in a decrease in the initial number of articles to only 38 texts once education-related texts were excluded. Following the application of further exclusion and inclusion criteria, 23 texts were excluded due to insufficient focus and lack of scientific rigor and six new texts were added based on references from primary studies. Thus, the final number of texts analyzed in this systematic analysis was 21 as shown in [Annex 1](#).

The research on teaching CT far outweighs research on CT in business practice. This has already been observed by [Dwyer, Boswell, and Elliott \(2015, p. 260\)](#) who state that “there is a dearth of research on individuals” CT development and performance after university, “. . . and especially, in the working world.” This gap is puzzling, as CT is associated with crucial business applications, e.g. the ability to assess the situation in conditions of uncertainty ([Halpern, 2003](#); [Butler et al., 2012](#)). In this case, research on combining business activity with CT skills should be particularly important.

The studies in our sample showed that the scientific literature generally scrutinizes CT in business in three areas:

- (1) application to business functions;
- (2) part of a skillset used in business;
- (3) other business-related topics.

Business areas in which CT was researched at the business function level include accounting, marketing, human resources and business opportunity identification. Scholars showed that the application of CT in accounting allows for the appropriate construction of accounting systems, which increases profits thanks to appropriate information ([Ikbal, Paminto, Darma, Ulfah, & Ilmi, 2020](#)). Others revealed that the application of CT skills to marketing – especially advertising and promotion – increase their effectiveness by enabling businesses to reach intended target groups more efficiently ([Kraus, Harms, & Fink, 2010](#)). CT skills improve the quality of business opportunity identification through active information search ([Sugito, Kamaludin, Pramaditya, & Putri, 2020](#)), as these can be used as a framework for evaluating new product concepts and developing unique product designs ([Eggers, Lovelace, & Kraft, 2017](#)).

Moreover, some mention the application of CT might be beneficial for business, but these elements were not analyzed, including covers risk management ([Chartrand, Ishaikawa, & Flander, 2009](#)), organizational planning ([Chartrand et al., 2009](#)) and strategic planning ([McKee, 2020](#)). Consequently, these texts do not provide insight into the application of CT in business, yet such areas should be considered as a research gap for future research.

Furthermore, studies showed that CT refers to several other skills used in business practice, such as creativity, problem-solving, information selection and evaluation and decision-making. The studies linking CT to creativity in business revealed its positive influence on a variety of business performance indicators. In this vein, CT emerged as beneficial to creativity – measured as the number of product designs – and business performance, namely the ability to effectively manage firm resources ([Eggers et al., 2017](#)). Others discovered that CT combined with creativity increases a firm’s financial performance ([McMullan and Kenworthy, 2014a, b](#)). Studies related to problem-solving ([Kahneman & Frederick, 2002](#)) found that those different business problems require different proportions of qualitative (via intuition) versus quantitative analysis (i.e. models based on quantifiable factors, objectives and constraints), as CT involves objective quantitative analysis. The literature focused on the application of CT to the selection and evaluation of information in

business practice recognizes that CT is essential to the selection of a huge amount of information to evaluate and connect the information as necessary for business (McKee, 2020). Moreover, Wertz *et al.* (2013a, b) found that CT helps to identify what information is needed, accurately document information and evaluate its reliability.

The application of CT to decision-making in business is an important research area with a significant number of scientific texts. The primary objective of this research is to evaluate the extent to which CT helps in making better business decisions (Williams, 2002; Dobbs & Hamilton, 2007; Ayad, 2010; Deane & Borg, 2011; Dwyer *et al.*, 2011, 2014). According to Dwyer *et al.* (2015, p. 261), CT “enables individuals to act independently; analyze and evaluate data in order to draw conclusions; and thus, make the inferences, judgments and decisions necessary to take action.” Chartrand *et al.* (2009) argue that CT helps to make adequate decisions, because it requires focusing on the most relevant information, asking the right questions and separating reliable facts from false assumptions.

The effectiveness of developing CT skills is a crucial research area addressed, among others, by Anderson and Reid (2013), who showed that a long-term approach to CT skills development resulted in the successful acquisition of CT knowledge, skills and strategies. The developed CT skills were subsequently applied by the respondents in their professional lives and other areas as well. This skill transfer to real-life work-related situations was validated by respondents’ qualitative descriptions about their use of CT. Therefore, our study creates an important foundation for future research into the effectiveness of CT skills.

The use of CT in business decision-making is frequently studied in the specific area of judgment under the influence of cognitive biases and heuristics. In this light, CT is researched as a potential remedy to avoid biases and heuristics. With the use of Kahneman’s System 2 (slow thinking), CT may improve the quality of reasoning and decision-making (Kahneman, 2011, pp. 20–26). Critical thinkers as experts tend to use rational thinking rather than intuition to avoid making elementary errors (Williams, 2002; Dwyer *et al.*, 2015; qtd. after Tversky & Kahneman, 1974; Kahneman & Frederick, 2002). In turn, Ayad (2010, p. 562) notices the usefulness of CT in avoiding business mistakes: “critical thinking could guard the judgment from biases, bad data, wrong interpretation, and fallacies in reasoning. Furthermore, CT has the capacity to explore the context of situations, and provides a broad platform for understanding patterns, consequences, and risks.”

The third important area in business research that engenders studies on CT encompasses other subjects, unrelated to business functions and skills, including business ethics, stakeholder dialog and individual employee performance.

Several studies address the connection between ethical behavior in business and CT skills (Mahin, 1998; Seele, 2018; Boda, 2019). Seele (2018) suggests that we should make CT the common denominator of all business ethics activities. Seele’s study combines CT with corporate social responsibility, sustainability and corporate citizenship, recognizing CT in the application of business ethics and observing that CT “helps to challenge different notions and contest business activities as not serving the best sort of life and offers mental models, moral imagination, and system thinking” (Seele, 2018, p. 564).

A crucial study by Rear (2008), about the role of CT in facilitating dialog between businesses and government, shows that non-conformity resulting from CT can destabilize an organization, whether it is a company or a state. On the one hand, CT supports innovation and creativity, but on the other hand, it becomes a challenge to the stability of traditional social and economic structures.

Although direct relationship between CT and business performance remains to be researched in detail, some studies indicate that CT is positively correlated with business achievement. Dwyer *et al.* (2015) indicated that managers, supervisors, or business owners who hold more senior positions in a company scored significantly higher on business-related CT than company employees. By applying the CT definition used by Facione (1990, p. 11) –

which proposes that CT is a structured approach to problem-solving that includes collecting, segregating and analyzing information and evaluating results – Birkan and Yaşar (2021) compared the disposition of managers and white-collar employees to CT. The results of their studies revealed a moderate level of CT skills in both groups and showed that there were no statistically significant differences in this skill set between these two groups. The study is a rare example of a structured approach to analyzing CT and its link to business achievements, along with the application of mixed research methods – both qualitative and quantitative – that increases the reliability of the findings. Based on their study findings the authors propose a greater focus on the rollout of CT training in workplaces (Birkan & Yaşar, 2021).

5. Discussion and conclusions

Currently, the world faces profound social and economic changes that exert intense pressures on businesses and generates a growing need to apply new skills by both individuals and firms in order to adapt to future challenges. One of these new skills is CT. Therefore, this article sought to enliven the debate on CT in business by identifying and mapping existing research on CT in business studies and by reviewing the key insight from papers that directly tackle the issue of CT business applications encapsulated in the two research questions formulated in the introduction. Having done so, we have striven to provide a thorough examination of the research areas and underexplored synergies that have emerged in CT studies.

Our review has suggested that CT is broadly perceived as a concept that will gain importance and offers a variety of still underexplored research opportunities. This idea is shared by both researchers and business practitioners, which means that there is a greater need for more in-depth research into CT.

Our elaboration of the two research questions has led to four main conclusions. First, our article has shown what is missing in the research and what should be an important research topic. We expected to conduct a review of many practical studies showing the importance of CT in various sectors of the economy. Moreover, we expected a large number of studies on the importance of CT at various stages of company development and in different business units such as strategic planning, marketing, or finance. Meanwhile, this type of research was found to be extremely rare. Moreover, we did not find any studies that showed a correlation between business success (measured, e.g. by higher survival rate or financial performance) and CT skills. Therefore, the business applications of CT, its practical implementation and its outcome have been identified as under-researched. Our systematic literature review has confirmed the limited scope of the studies that directly refer to CT in business practice, demonstrated by the restricted number of articles in the scope of the review. Moreover, our study has also shown that there is no research consensus on the definition of CT in business and the operationalization of this concept.

Second, we have demonstrated that while research on CT proliferates in business studies, there are substantial imbalances in the body of literature, with most of the research dedicated to university education and the development of CT skills by other learning forms. This is evidenced by the study of articles on CT in relation to the Covid-19 pandemic. In an additional review performed by us following the outcome of this research, we studied CT in connection with Covid-19. The results showed that there were 54 articles with the words “critical thinking” and “Covid” in their titles. However, none of them concerned business, economics, or company research. This is astonishing at a time when substantial parts of the global economy are in lockdown, and many companies face the specter of bankruptcy. On the other hand, many articles from the sample focused on CT in education, especially on blended learning. This further indicates the imbalance in CT studies that we have identified in the course of our bibliometric analysis and literature review.

Third, the results of our study reveal that, relatively speaking, the most researched area in CT business application is its use as part of a skillset employed in business. The results of our research into this stream of literature generally indicate that CT skills reinforce business decisions and prevent cognitive biases and heuristics. However, the extent to which this contributes to better business decision-making requires further validation through empirical research. In this research stream, CT is often considered as a bundle of various skills, which frequently includes relatively distant and vaguely related concepts such as creativity. This result suggests that more research efforts are required to properly define and operationalize CT skills and chart a more evident boundary between CT and other skills.

Fourth, the results of our systematic literature review have revealed that the research in CT in business revolves around three research axes: (1) specific business functions, (2) part of a skillset used in business and (3) other business-related topics. While these axes seem to cover a significant range of topics, this also suggests that the current state of the art could be viewed as inconsistent as we have revealed apparent research gaps. The underexplored areas of research are such promising areas as the following:

- (1) attempts to explore the link between CT and business performance;
- (2) possible dependence between the application of CT and firms' ability to innovate;
- (3) application of CT to assess investment decisions;
- (4) strategic decision-making such as entering new markets or mergers and acquisitions;
- (5) assessment of decisions made by artificial intelligence (algorithms);
- (6) implementation of CT in risk assessment;
- (7) linking of soft skills (including learnability) with CT in business;
- (8) the potential relationship between the application of CT and company characteristics such as company size, internationalization and ownership.

The results of our systematic review demonstrate opportunities for future studies, which are based on investigating the application of CT to other business functions than those identified in our research, namely accounting, marketing, human resources and business opportunity identification. Moreover, the current literature seems to offer only rudimentary insight into the application of CT in each of the business functions discussed above in [Section 4.2](#). This opens research avenues for more in-depth studies with a particular focus on empirical research, as empirical research has proved to be especially scarce in the literature.

Our research resulted in several recommendations that may improve the quality of future studies about CT in business:

- (1) we need a broad discussion to develop a definition of CT in business, as the participation of researchers from various disciplines could especially strongly improve the consensus on how to operationalize CT in business;
- (2) the research gaps could be reduced by undertaking extensive research by teams of many scientific fields, including multidisciplinary research, which would investigate the relationship of CT with various aspects of business management;
- (3) the research gaps could be narrowed down by various types of research, but two research types are particularly relevant: panel studies – e.g. a panel study of newly established companies and experimental research – conducted by psychologists inside firms and in controlled environments of laboratory experiments. These types of research would progress our understanding of the link between CT skills in

business and the economic performance of companies. However, these studies should be preceded by a broad discussion on the definition of the concept of “critical thinking in business” and the operationalization of this concept.

To conclude, based on the advice of researchers and business practitioners, we agree that CT is one of the crucial skills of the future. Research on the use of this skill in business should definitely gain higher priority in management and economic studies. Our research is a voice in this discussion. We have synthesized the most prominent areas of study so far and have suggested the way forward for CT application in business. Without proving the usefulness of this skill in economic practice, teaching CT to many students of economics may turn out to be directly ineffective.

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Annex 1

Text	Research type	Type of text
Anderson and Reid (2013)	Empirical (quantitative)	Article
Ayad (2010)	Conceptual	Article
Birkan and Yaşar (2021)	Empirical (quantitative)	Article
Boda (2019)	Conceptual	Article
Chartrand <i>et al.</i> (2009)	Conceptual	Article
Deane and Borg (2011)	Review	Book
Dobbs and Hamilton (2007)	Review	Article
Dwyer <i>et al.</i> (2011)	Empirical (experimental)	Article
Dwyer <i>et al.</i> (2014)	Conceptual	Article
Dwyer <i>et al.</i> (2015)	Empirical (quantitative)	Article
Eggers <i>et al.</i> (2017)	Empirical (experimental)	Article
Ikbal <i>et al.</i> (2020)	Conceptual	Article
Kraus <i>et al.</i> (2010)	Conceptual	Article
Mahin (1998)	Conceptual	Article
McKee (2020)	Conceptual	Article
McMullan & Kenworthy (2014a, b)	Conceptual	Article
Rear (2008)	Conceptual	Article
Seele (2018)	Conceptual	Article
Sugito <i>et al.</i> (2020)	Empirical (quantitative)	Article
Wertz <i>et al.</i> (201a, b)	Empirical (quantitative)	Article
Williams (2002)	Review	Book
Source(s): Own elaboration		

Table A1.
Texts included in the
systematic literature
review

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