Competitive intelligence: A unified view and modular definition

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ABSTRACT

The study aimed to identify the core defining dimensions and descriptors of Competitive Intelligence (CI) to provide a unified view and approach. The authors used a mixed-methods approach to derive meta-inferences from the sequential integration of quantitative and qualitative methods. Five defining core dimensions and one hundred descriptors, twenty for each dimension, were identified. The integrated dimensions provide a consistent definition and understanding of CI. More precise definitions result from cascading down the meaning of the dimensions into the descriptors, from complex to simple concepts. Grouping the descriptors allows for more concise explanations without loss of precision. A unified definition establishes the body of knowledge of the discipline and advances business and science. It also supports the establishment of the CI profession and professional identity and serves as a guide for the effective establishment of the CI function. The development of CI theory has a significant impact on CI culture and may enable the society to address one of the greatest current challenges, information overload. CI education can only thrive if a clear definition and understanding is possible.

1. Introduction

"The beginning of wisdom is the definition of terms" (Socrates, 470–399 BC). A definition conveys the meaning of a word or term accurately and directly so that the addressees can understand it; this is an essential part of argumentation and communication (Sterkenburg, 2003; Stoyko, 2009). "Competitive Intelligence" (CI) has been defined in hundreds of ways; however, existing CI definitions exhibit considerable polysemy and synonymy (Lopez-Robles et al., 2020). Polysemy implies that CI as a term is associated with two or more related meanings (Vicente and Falkum, 2017), while synonymy implies that it has the same meaning as other terms. Lopez-Robles et al. (2019) provided scientific evidence for these phenomena, highlighting as the most prominent examples of polysemy and synonymy vis-à-vis CI (Fuld, 1985; Munoz, 2017), business intelligence (Gilad and Gilad, 1985; McGonagle and Vella, 2012; Koseoglu et al., 2016; Lopez-Robles et al., 2019), market intelligence (Kohli et al., 1993; Cipher, 2020), marketing intelligence (Fleisher, 2008; McGonagle, 2016), economic intelligence (Juillet, 2006; Franco et al., 2011; Dou et al., 2018, 2019), and even environmental scanning (Oraee et al., 2020). Soilen (2015) and Hoppe (2015) also questioned and investigated whether CI is a scientific field, as "academics and professionals within these fields have been unable to agree on what dimensions, topics, or content are addressed by their own

field of interest." The lack of agreement on a common definition, understanding, dimensions, themes, or content as well as the considerable polysemy and synonymy in existing definitions, hinders the development of the CI discipline. Thus, theory development and testing of CI in academia, teaching and learning in education, and practice in business are hindered.

In today's volatile, uncertain, complex, and ambiguous business environment (Bennett and Lemoine, 2014), organizations compete at the ecosystem level (Iansiti and Euchner, 2018). Successful organizations must access, process, and respond to the sheer volume, velocity, and variety of big data (Laney, 2001). Big data are increasingly riddled with fake news and misinformation (Lazer et al., 2018), leading to higher levels of information overload (Edmunds and Morris, 2000; Eppler and Mengis, 2004; Saxena and Lamest, 2018). Moreover, there is a significant gap between the data considered critical to decision making and the amount of data CEOs receive across all major categories. Most importantly, this gap has not narrowed over the past decade (PwC, 2019). Decision makers thus face more intensive challenges in terms of the quality of their decisions and strategies. Thus, improving firm performance has become harder, as evidenced by the increasing turnover of CEOs (McGinn and Ignatius, 2016; CBInsights, 2019; Challenger Gray, 2020) and the declining lifespan of organizations (Foster and Kaplan, 2011). The goal of CI is to ensure organizational survival by improving

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and sustaining firm performance through efficient decision making (De Almeida et al., 2016; Lopez-Robles et al., 2019, 2020).

The inter- and multi-disciplinary nature of CI, coupled with the lack of a unified understanding and consensual definition, is underpinned by a highly dispersed body of knowledge (Soilen, 2015; Lopez-Robles et al., 2020). The central phase of scientific research is the systematic classification of different items in a domain or field. This classification is crucial for the construction of new knowledge, especially in the early stages of a research process (Eppler and Stoyko, 2009) and it is impossible without a clear definition of CI. Soilen (2020) attests this fact by demonstrating that relabeling or "science-by-buzzwords," that is, using many different terms to name an existing concept, does not advance science. The reason why CI is not able to establish itself as a science is owing to the lack of a unified definition that could delineate the body of knowledge. Furthermore, CI research is biased towards the art of intelligence or intelligence as practice (Hoppe, 2015). The result is failure to answer research questions that would help us better understand what CI is and does, and more importantly, what impact CI has on science, education, society, and policy for the benefit of people and organizations (Wickert et al., 2020). Pursuing this latter avenue of research would lay the groundwork for establishing CI science.

The lack of a unified approach as a field of knowledge may explain the insufficient number of courses and curricular units in higher and executive education (Miller, 1994; Fleisher, 2004; Parker et al., 2008; Blenkhorn and Fleisher, 2013). Another explanation is that CI has been primarily driven by consultants rather than academics (Soilen, 2015). Consequently, only few students have exposure to CI, resulting in lower awareness and practice. The barriers outlined hinder CI adoption in organizations, academic research, and CI education. Thus, the full impact potential of CI is under-researched and under-utilized in both business and academia. Therefore, exploring and defining what CI is and what it means is crucial for leaders, policy makers, researchers, students, and educators.

Scientists and leaders have been defining CI for over a century. In fact, intelligence has been mentioned since the founding of nation-states and empires, such as in the Arthashastra, written by Kautilya in the 3rd century BC (Kautilya, 1915; Soilen, 2012; Shamsastry, 2016; Soilen, 2016). Scholarly references go back to business intelligence (Greene, 1905), marketing intelligence (Alderson, 1937), and CI (Alden and Campbell, 1959). The most recent definition known to the authors was given by Cavallo et al. (2020). CI has been defined as a process (Lutz and Bodendorf, 2020), a product (Lopez-Robles et al., 2020), function (Garcia-Alsina et al., 2016; Maungwa and Fourie, 2018), profession (Gilad and Herring, 2001; Lopez-Robles et al., 2019), system (Cavallo et al., 2020), tool (Du Toit, 2013), program (Hedin et al., 2011; Purpura, 2019), as a theory (Calof et al., 2015), practice (Rothberg and Erickson, 2017), skill (Markovich et al., 2019), body of knowledge (Trim, 2001), body of knowing, body of practicing, body of acting (Brody, 2008; Wang and Borges, 2013), discipline (Brody, 2008; Marcial and Suaiden, 2016; Barnea, 2020), an art (Rouach and Santi, 2001; Wright and Calof, 2006; Gilad, 2020), and a science (Marcial and Suaiden, 2016). Therefore, it is imperative to understand, define, and delineate this phenomenon and its dimensions, more than the different labels, in a unified approach that can be grasped by majority of the stakeholders (Soilen, 2015). Attempts to define CI in extension are proving to be almost impossible, as with any other multidisciplinary science. CI integrates many complex concepts that bring together several different ideas, or in other words, are themselves the integration of several other simple concepts (Stoyko, 2009). This conceptual cascade makes the development of a thorough definition too long, complicated to understand and communicate, and consequently irrelevant to scholarship and practice. Moreover, the usual strategy in creating definitions is to go back to the earliest uses of the word; however, according to Landau, "it is most useful to examine current meanings" (Brody, 2008). In their bibliometric review of the last 30 years intelligence models Lopez-Robles et al. (2019) call for new research to provide "a deeper examination of the field with a conceptual

analysis of definitions, along with an identification of common elements shared among such definitions." The authors also advocate "examining their points of interaction, complementarity, maturity, and their application to contemporary organizations, along with a definition of an integral model of intelligence." Although researchers and practitioners have defined CI comprehensively, there is still no consensus on what CI and its constituent concepts are. Therefore, it is crucial to explore and advance a unified view of CI that is in line with the current zeitgeist and clarify its meaning for both organizations and academia.

This study examines the most extensive corpus of definitions of CI and related concepts to date and propose a thorough, concise, clear, consensual, and contemporary definition. The integration of complex concepts to shorten the definition of CI without losing accuracy and simple concepts to detail their specifics without losing overall context and meaning, involves a modular approach. The identification of the core definition dimensions and their descriptors will ultimately enable a unified view and definition regardless of the level of granularity sought. A broad but precise definition should enable an easy understanding of CI. A specific definition that is highly granular and precise should allow a thorough understanding of intrinsic and specific properties of CI. A set of intermediate definitions should also reflect the interdisciplinary nature of CI and define the associated embedded concepts. Thus, the research objective is to propose a unified view and definition of CI by identifying and integrating its main defining dimensions and descriptors.

The main objective is to provide an integrative definition that can serve as a consensual reference and a cornerstone for future CI theorizing, education, and practice, building on previous attempts such as by Bulger (2016). The authors expect to contribute significantly to resolving existing terminological misunderstandings within or between CI and related terms (e.g., business intelligence, competitor intelligence) and CI and related fields of knowledge (e.g., competitive strategy, strategic planning, market research).

It is expected that the results will broadly extend the CI theory. Existing contributions are limited to exploring mutually exclusive partial explanations for CI. By applying abductive theoretical reasoning, the authors expect to provide a unified view through an integrative approach that considers the multidimensionality of the CI concept. The study aims to go beyond these dimensions and identify the explanatory descriptors to provide a holistic view and understanding of the concept. Consequently, a broader framework offers new research topics and new ways to expand the theory. Defining the scope of CI and reducing or explaining its distinction from other fields of knowledge will advance interdisciplinary theory development and testing while attracting new researchers to develop their investigations in the field of CI.

Given the multidisciplinary nature of CI, the results are expected to contribute to and extend theories from related disciplines (e.g., national intelligence, strategic management, organizational sociology). Moreover, contributions are also expected to theories such as the knowledge-based view of the firm (Conner, 1991; Grant, 1996), competitive strategy (Porter, 2008), absorptive capacity (Cohen and Levinthal, 1990), dynamic capabilities (Teece, 2007), knowledge management (Nonaka, 2007), and organizational learning (Argyris, 1977; Weick, 1979). The contributions arise from contextualizing the integration and application of related disciplines in the scientific development, practice, and teaching of CI while clarifying their role in related theories and vice versa.
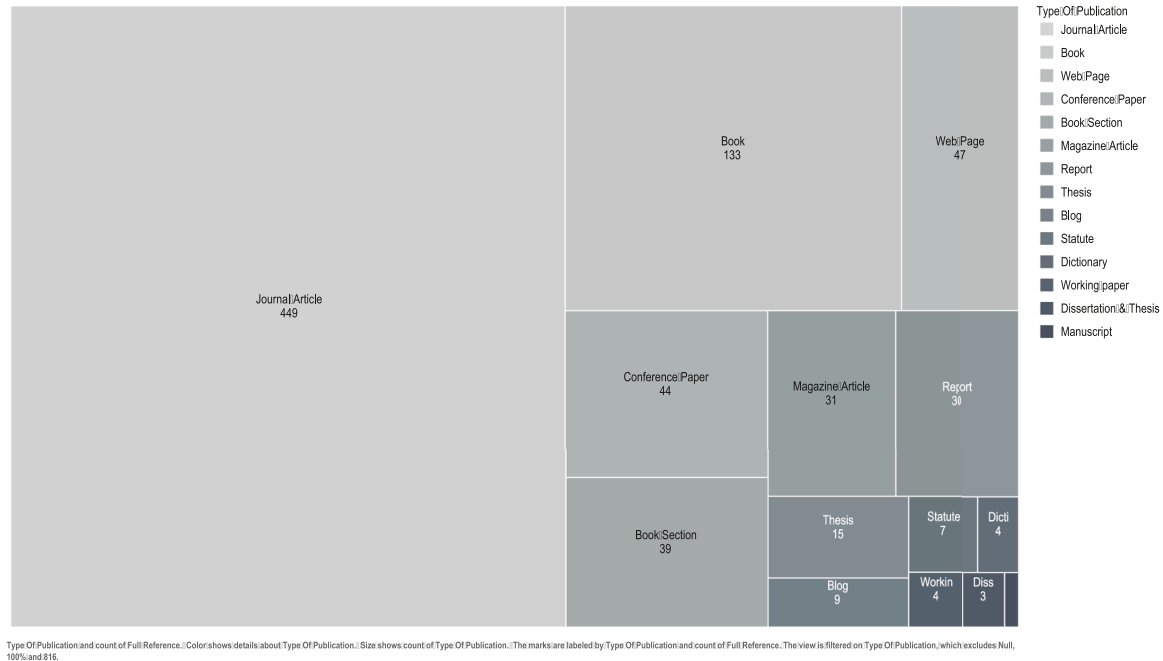
The study extends the research methods (e.g., sequential mixed-methods) and purposes (e.g., complementary, completeness, development, and confirmation) previously used; methods and techniques (e.g., Computer-Aided Text Analysis, Topic Modelling, and Analysis of Competing Hypotheses); sources (e.g., journal articles, industry reports, company and thought leader websites, dissertations); scope breadth and depth (i.e., knowledge areas, e.g., marketing intelligence); terms (e.g., knowledge management); perspectives (i.e., definition of dimensions and descriptors); and size of dataset (i.e., 412 publications and 816

Table 1

Publications, publication corpus, and definition corpus split by source. **Data set overview.**

	SCIP BIBLIOGRAPHY … - 2007	SCOPUS SEARCH 2007 - 2020	WEB	DICTIONARY	OTHER BACKWARD REFERENCES	TOTAL
PUBLICATIONS	993	272	21	4	222	1290
PUBLICATION CORPUS	114	51	21	4	222	412
DEFINITION CORPUS	212	127	56	4	417	816

Fig. 1. Definition corpus split by type of publication. **Definition corpus publication type detail.**

definitions). Previous research on the meaning of CI (Wheaton and Beerbower, 2006; Brody, 2008; Breakspear, 2013; Pellissier and Nenzhelele, 2013a; Bartes, 2014) is predominantly qualitative, with only one previous reference using quantitative methods (Brody, 2008). The inherent subjectivity of qualitative methods may explain the existing high levels of polysemy and synonymy. The authors made meticulous efforts to increase the volume of publications and definitions corpora to get the most benefit from quantitative methods. This mixed-methods approach enables the derivation of meta-inferences that would otherwise be impossible (Venkatesh et al., 2016) and brings more objectivity and robustness. Thus, the results serve as a reliable cornerstone for the induction of a unified view and definition and contribute significantly to the field and science. The methodology aims to make empirical contributions to research and the scientific method.

As Wheaton and Beerbower (2006) state regarding the absence of a definition of intelligence: "The intelligence community literally doesn't know what it's doing." This fact is reiterated by several authors to date as the lack of a common understanding and thus "unstable boundaries" of the field (Haddadi et al., 2011; Pellissier and Nenzhelele, 2013a; Du Toit, 2015). A unified CI definition will undoubtedly provide a much-needed baseline reference for organizations and practitioners. Consequently, the CI profession will delineate its body of knowledge and guide the development and application of a unique set of tools (Gilad and Herring, 2001). The CI professional (CIP) is established by addressing the six attributes that characterize a profession's identity: 1) artifact, 2) definition, 3) body of principles, 4) body of practices, 5) professional responsibility (ethical and legal), and 6) durability (Zinn and Goldsby, 2014). These criteria are crucial to the successful

establishment and operation of the CI function by determining its policies and structure. Defining CI and its role are paramount to gaining further attention and traction alongside business and education. Understanding CI enables organizations and their leaders to explore and harness the potential of CI to form organizational decisions and strategies. It informs CIP about what to do, how to improve performance, and where to focus time and effort to improve the overall yield and effectiveness. Finally, defining CI enables educators to develop specific curricula for the classroom and raise awareness in the business community, creating a virtuous cycle for the development of CI practices. As described above, the results are relevant to science, as well as education and business, while contributing to the five forms of scientific impact: scientific, practical, societal, political, and educational (Wickert et al., 2020).

The next section begins with a description of the materials and dataset, followed by a detailed explanation of how the mixed-methods approach was used, given its originality and apparent complexity. Later, the results derived from the application of each method and their overall integration are presented, in parallel with their discussion and implications for the field of CI. The paper concludes with the main conclusions and future research opportunities.

2. Material & methods

2.1. Materials & data Set

The data set for this study is based on several types of literature. It was collected after a thorough analysis and review of academic

literature including journal articles, books, book sections, dictionary and encyclopedia entries, dissertations and theses, and conference proceedings. In addition, there were trade journal articles, reports and industry surveys, statutes, websites, manuscripts, and working papers reflecting first-hand professional experiences of CI thought leaders and the respective organizations. We reviewed 1290 publications, resulting in a publication corpus of 412 selected publications. These publications included definitions of CI or related terms in any form (lexical, extensional, intentional, sentential, controlled, and stipulative (Geeraerts, 2003)), or referred to any of the elements of the CI model (Pellissier and Nenzhelele, 2013b; Araujo et al., 2017; Oraee et al., 2020). The definition corpus consists of 816 unique definitions of concepts in the domain of CI and is, to our best knowledge, the most comprehensive dataset of its kind. Table 1 shows the composition of the two corpora in detail.

Fig. 1 shows the detailed breakdown of definition corpus by publication type. The variety of publication types attests to the effort to ensure representation of both academic and professional sources and cover both theoretical and empirical perspectives.

2.2. Methodology

Pragmatism (Venkatesh et al., 2016) is the research paradigm (Kuhn, 1962; Creswell, 2010; Lincoln and Guba, 2013; Mertens, 2014) that centers on the concepts and methods of the study. Ontologically, reality is assumed to be continuously interpreted. CI is defined according to the multiple interpretations that result from its usefulness in new situations, in different contexts, and over time. This approach highlights the importance of subjective meanings, emphasizing the fact that understandings and perceptions serve to filter actual reality as well as the importance of objective facts. These understandings and perceptions can be transformed into numerical variables through quantitative methods such as Analysis of Competing Hypotheses (ACH) and Natural Language Processing (NLP). Epistemologically, this study starts from the premise that knowledge is constructed and based on the experienced reality of the world. Within this premise, different knowledge results from the different perspectives through which the engagement with truth occurs (Biesta, 2010). Axiologically, the perspective should be unbiased to achieve a balanced view that can serve as the broadest possible basis for future developments. Abductive reasoning is used as theoretical reasoning (Bechara and Van de Ven, 2007) to combine data and theory (Feilzer, 2010, p. 10). Observations are transformed into views and then evaluated through actions (Morgan, 2007) and different approaches to theory and data allow conclusions developed from qualitative and quantitative research to be triangulated (Morgan, 2007; Feilzer, 2010).

The methodology is based on a sequential, partially mixed-methods approach (Venkatesh et al., 2016, 2013). Qualitative data collection using document analysis was employed to identify the publications that contained the definitions of CI and related terms. The initial selection focused on the Strategic and Competitive Intelligence Professionals (SCIP) bibliography (Dishman et al., 2003; Fleisher et al., 2003; Knip et al., 2003; Fleisher et al., 2007). Qualitative content analysis of initial publication corpus enabled the identification of CI descriptors that supported the development of a working controlled vocabulary (Prior, 2010). The most relevant descriptors served as keywords in the search string used in the Scopus database to identify and locate post-2007 publications. The resulting final publication corpus was subject to a second iteration of document analysis to extract the relevant definitions. The final definition corpus was derived by adding these definitions to those used by the authors in their research and professional activities over the past decade. Qualitative analysis was performed on the final definition corpus using content analysis to refine and transform the working controlled vocabulary into a CI ontology. The primary purpose of this vocabulary of terms and associated definitions or rules (Uschold et al., 1998; Prior, 2010) is to serve as a basis for defining CI conceptual components while representing a common understanding of the field. In

parallel, a quantitative analysis of the same corpus was used to identify the main defining dimensions of CI and the corresponding descriptors using NLP and topic extraction. The interpretation of the results facilitated by the CI ontology formed the basis for the hypotheses used in the ACH. This method, both a qualitative and quantitative scientific methodology, was used to 1) validate the hypotheses for the defining dimensions of CI and the corresponding descriptors and 2) find the evidence and arguments that confirm or refute the hypotheses. A mix of these methods increases the confidence and robustness of the results and compensates for both the subjectivity of the previous qualitative approaches and the potential lack of explanatory power of the quantitative approaches due to the multidisciplinary complexity of the topic.

The final step is the qualitative analysis and integration of the results (the validated defining dimensions and the corresponding descriptors) by inductively developing a unified definition for CI. In this step, the key meta-inferences, "the theoretical propositions, narratives, or a study derived from an integration of findings from quantitative and qualitative strands of mixed methods research" (Venkatesh et al., 2013, p. 29), were derived.

2.2.1. SCIP bibliography as CI's foundational body of knowledge

In a departure from the "standing on the shoulders of giants" approach (Oraee et al., 2020), the SCIP bibliography, which is considered an early reference for the CI body of knowledge, is used. It comprises 993 references compiled by Knip, Fleisher, and Dishman (Knip et al., 2003; Fleisher et al., 2003; Dishman et al., 2003) for the writings until 2003 and by Fleisher, Wright, and Tindale (Fleisher et al., 2007) for the period between 2003 and 2007.

2.2.2. Thesaurus, controlled vocabulary, and ontology for future classification and interpretation

This literature review supported the development of a list of terms—authorized descriptors—that were used to create a controlled vocabulary of semantically and generically related terms that cover the specific knowledge domain of CI. The resulting thesaurus enabled the identification of hierarchical (broader, narrower), synonymous, and other related terms and the development of a scope notation. Most importantly, it provided clarification for the meaning of terms, guidance on their use, an aid to future indexing, and served as a basis for the future classification of definition corpus and the development of an ontology. The famous glossary of Vernon Prior entitled "The Language of Competitive Intelligence," published in a four-part series at Competitive Intelligence Review and subsequent updates, served as the cornerstone of this effort (Prior, 1998a, 1998b, 1998c, 1999, 2010).

2.2.3. Search strategy & keywords: identifying relevant publications with CI definitions from 2007

Controlled vocabulary was used to carefully select keywords and guide the search for additional publications, including CI definitions from 2007. Elsevier's Scopus, the world's largest abstract and citation database for peer-reviewed literature with over 75 million records containing 24,600 titles from more than 5,000 international publishers (Elsevier, 2020), was chosen to identify such relevant publications. The search string composed of keywords encompassing the different nomenclatures of intelligence, its components, practices and related knowledge domains, and associated terms from the thesaurus, filtered by the presence of the term definition (or derivatives) within three words.

2.2.4. Definition corpus development

The starting point of the search was a set of 1,290 publications, obtained by adding the 993 references from the SCIP bibliography with the 272 Scopus results. Using the previously developed thesaurus, a thorough analysis to identify publications with definitions of CI or related terms resulted in a corpus of 165 publications. The authors supplemented the corpus in two ways. First, by tracing 222 back references
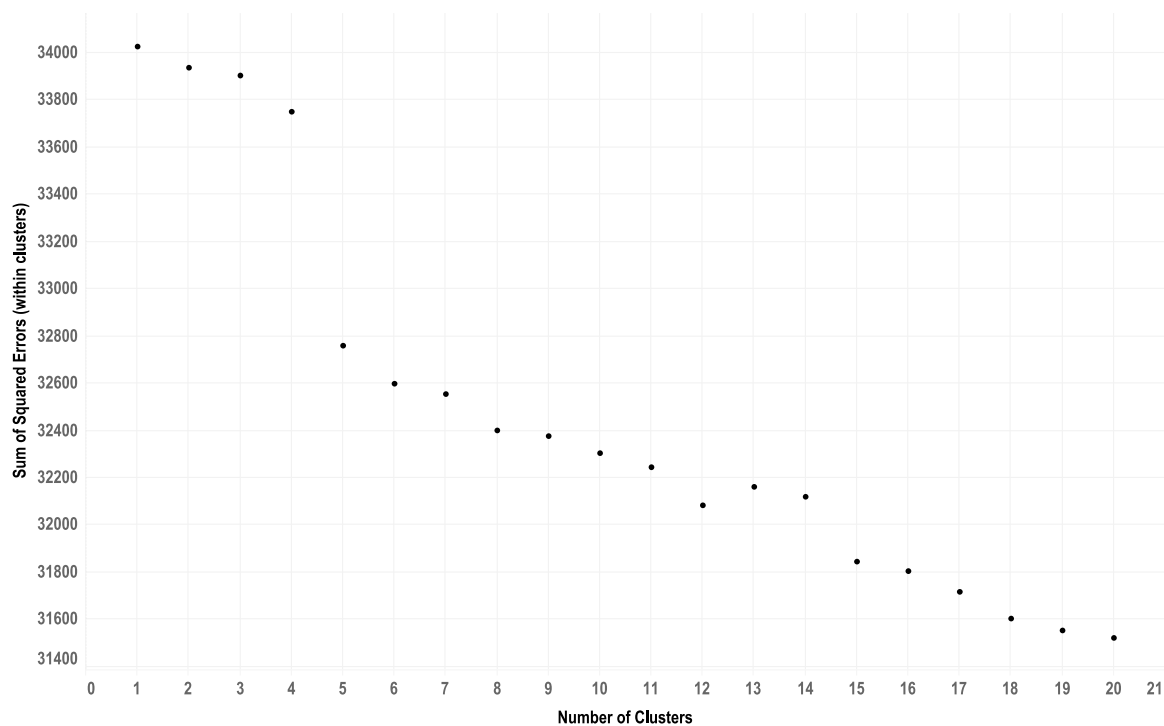
Elbow method scatter plot

Fig. 2. Scatter plot of the Elbow Method—five clusters as the optimal number of core defining dimensions. Elbow method scatter plot.

used in the definitions. Second, by adding the authors' definitions from their CI research and practice over a decade, including the most recent 21 web references from industry thought leaders and four dictionary entries. The final publications corpus included a total of 412 references. The selected definitions were then extracted and compiled in MS Excel to form the final definition corpus with 816 entries (see Table 1 for a detailed overview).

2.2.5. Topic modeling: identifying CI defining dimensions and descriptors

Quantitively Computer-Aided Text Analysis (CATA) using a Bayesian unsupervised statistical machine learning technique known as topic modeling, allows us to infer which topics best characterize the word distribution within definition corpus. The process begins by identifying topics as vectors of words, weighted by their importance in a given topic. This form of probabilistic modeling can be applied to the observed data to estimate the structure of the underlying hidden data generating process (Blei et al., 2003; Blei, 2012; Gentzkow et al., 2019). Topic generation and word weights are independent of meaning, order, and date of definitions. Each topic is treated as a "bag of words" with the only criterion being the presence of the words in the definition. The model identifies the hypothetical thematic structure that generated these definitions. The underlying premise is that topic models are a deliberate mixture of topics, and each topic has an associated probability distribution over words. Topic modeling specifies the probabilistic technique for generating a particular document by choosing a distribution over topics. Then, for each word in that document, a random topic corresponding to that distribution is determined and a word is selected from that topic. The direction of this generative process can be inverted and used to derive the set of topics that produced a collection of documents (Steyvers et al., 2007), the necessary intermediate goal to ensure the completeness and relevance of the new unified definition.

The simplest and commonly used topic model is called the Latent Dirichlet Allocation (LDA) model (Blei et al., 2003) and can be viewed as a type of Principal Component Analysis. LDA is a generative

unsupervised probabilistic model that discovers the top K topics in a text dataset and describes them using the most relevant N words. The observed data present in the definition corpus is a set of N unique words called tokens. The output of the topic model are two matrices: 1) K topic vectors, whose elements are the weights of the N tokens, representing the probability that the token belongs to each definition, conditional on the topic contributing to that same definition; and 2) distribution of topics over definitions, where each element of the matrix represents the probability that each tokened topic contributes to that specific definition.

To conduct the Topic Extraction, the authors chose KNIME, "a modular environment that allows easy visual assembly and interactive execution of a data pipeline" (Berthold et al., 2008). The critical steps in NLP included reading the compiled definition corpus from an MS Excel file, document generation, its preprocessing, and finally the topic extraction. Particularly, in the preprocessing phase, part-of-speech tagging, lemmatization, document cleaning (deletion of punctuation marks, number filtering, filtering of three-character words, removal of stop words, and conversion to lower case), filtering of rare terms (words that occur less than twice), and filtering only for nouns, verbs, and adjectives were performed. Lemmatization was preferred over stemming (Manning et al., 2008) to allow for better distinction between words and their meanings, which is crucial for developing a more accurate definition for CI, given the complexity and similarity of the terms analyzed.

Since the topic extraction uses an implementation of the LDA model, the user must specify the number of extracted topics beforehand. The KNIME topic extractor node used in this process integrates the "MALLET: A Machine Learning for Language Toolkit" topic modeling library (McCallum, 2002) and it required the configuration of several settings. The first computes the optimal number of K topics to extract—the number of core defining dimensions—using the "Elbow Method" (Tibshirani et al., 2001). The chosen method performs k-means clustering on the input data for a range of values of the number of clusters k (e.g., from 1 to 20) and then calculates the sum of squared errors within
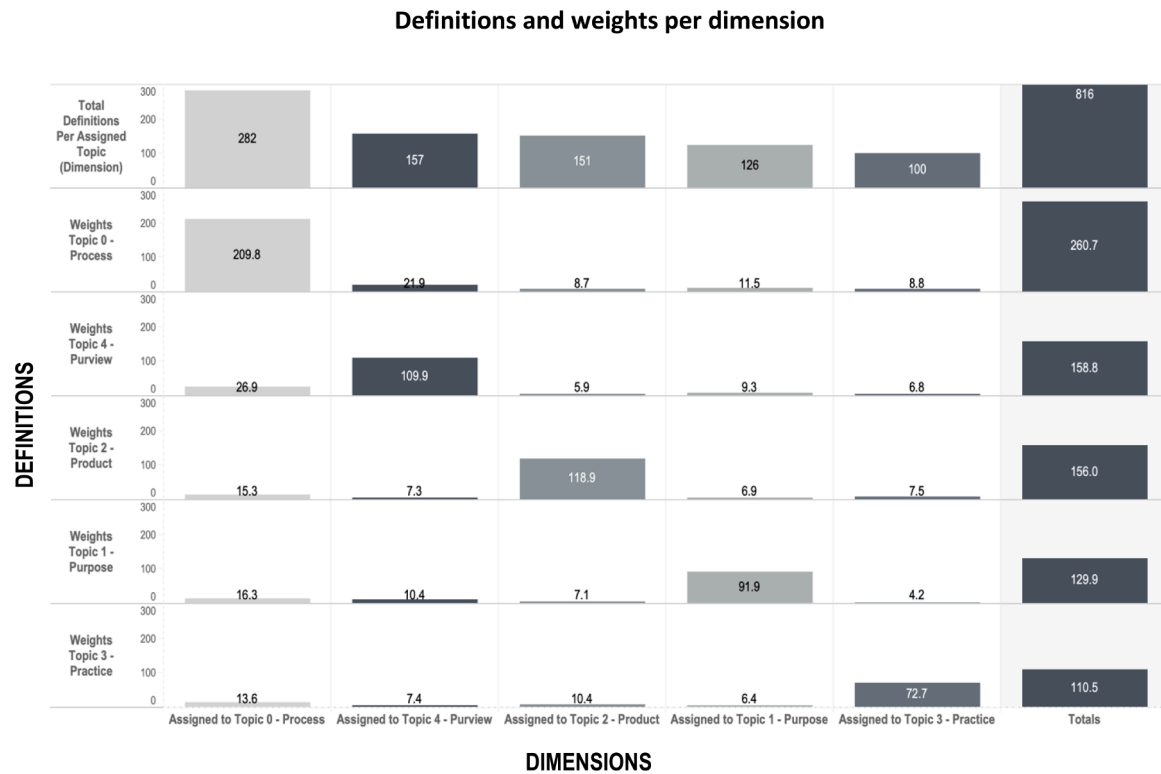
Definitions and weights per dimension

Fig. 3. Number of definitions and respective weights per dimension (assigned to topic). Definitions and weights per dimension.

clusters (SSE) for each k value, which is the sum of the distances of all data points to their respective cluster centers. The SSE values for each k were plotted on a scatter plot as a function of the number of clusters (Fig. 2). The optimal number of clusters reflects the highest drop in SSE value. The resulting angle in the plot is five, the final value for this setting. The second setting is the number of representative words that best describe each topic, and was set to twenty. The third set of settings are the values for alpha (α) and beta (β) in the a priori distributions. Since there is no theory-based method for selecting the best, we used the recommended values for $\alpha=0.01$ and $\beta=0.001$. The fourth setting is the number of iterations, which was set to 1,000. Finally, the value for the parallel threads setting was set to 1.

2.3. Analysis of competing hypotheses

The ACH focused on testing the hypothesis for the core defining dimensions. The ACH is an eight-step procedure based on fundamental insights from cognitive psychology, decision analysis, and the scientific method. It is a surprisingly effective, proven process that helps analysts avoid common analytical pitfalls. Because of its thoroughness, it is especially useful for controversial issues when analysts want to leave an audit trail to show "what they considered and how they arrived at their judgment," as stated in Heuer's (1999) seminal book Psychology of Intelligence Analysis. ACH breaks down a complex problem into its component parts. Thus, the starting point for ACH is hypothesis generation. For this study, the hypotheses are derived from the outcome of topic extraction—the core defining dimensions. The ontology enabled the provision of meaning to the results of topic extraction. Therefore, we tested the hypotheses that CI defining dimensions can be identified by analyzing the existing definitions in the relevant literature using the following sub-hypotheses:

H1: Process is a core defining dimension of CI.
H2: Purview is a core defining dimension of CI.
H3: Product is a core defining dimension of CI.
H4: Purpose is a core defining dimension of CI.

H5: Practice is a core defining dimension of CI.

Developing a matrix of evidence and arguments that support or refute the various sub-hypotheses involves evaluating how each element or argument provides such evidence. The process consists of analyzing the content of each definition, individually and across the previously identified defining dimensions and descriptors. The functional ontology supported the basic assumptions and logical deductions and conclusions, which were compared for inconsistencies. Sensitivity analysis considered how conclusions would be affected if crucial evidence or arguments were false, misleading, or interpreted differently. A double check of the validity of the critical evidence and arguments driving the results of the analysis was then performed. The conclusions are discussed in the results and discussion sections of this study.

2.4. Development of a unified view on CI: proposed definition

The confirmed hypotheses (CI's key defining dimensions and the corresponding descriptors) were integrated into a unified view and comprehensive definition. Ontology supported this inferential process. The integration, based on inductive reasoning, grouped the descriptors into increasingly complex concepts. This grouping allowed for more precise and accurate definition without the loss of meaning. Conversely, the decomposition of complex concepts into simpler concepts allows for a more precise but inherently longer definition of CI. The result is the proposed "modular" definition of CI. The resulting meta-inferences were only possible through the mixed-methods approach adopted for this study.

3. Results & discussion

We expected to identify CI's core defining dimensions and corresponding descriptors to synthesize a unified view and modular definition. The main outcome of the first strand was the development of an ontology for CI. In short, it enabled the identification of key terms, their meanings, and the relationships between them. The result of the second

Table 2

Contribution of the unified view compared to most cited and recent CI definitions ordered by citations. **Unified view versus most cited and recent definitions.**

REFERENCE	CITATIONS (Google Scholar)	DEFINITIONS	Process	Practices	Product	Purview	Purpose
Unified View	N/A	CI is the process, and forward-looking practices used to produce knowledge on the competitive environment's purview with the purpose of improving the organization's performance.	1	1	1	1	1
Kahaner, 1997	1004	Competitive intelligence is a systematic program for gathering and analyzing information about your competitor's activities and general business trends to further your own company's goals.		.5	.5	.5	1
Bose, 2008	400	Competitive Intelligence is a vital component of a company's strategic planning and management process … allows a company to anticipate market developments proactively rather than merely react to them … is external intelligence about the firm s competitors.	1	.5	.5	.5	.5
Xu et al., 2011	381	Competitive Intelligence involves the early identification of potential risks and opportunities by gathering and analyzing information about the environment to support managers in making strategic decisions for an enterprise.	.5		.5	1	1
Liebowitz, 2006	307	Competitive Intelligence have both internal and external components … is used to solve both short-term and long-term problems … the greatest value is strategic planning … has a gathering, analysis, and management component … for the CI analyst to base his or her opinions … for forecasting external and internal trends looking 3 to 5 years out and beyond… to determine how the organization can best prepare for these new situations. For analysis to be actionable, it should be forward looking and decision relevant.	.5	.5	.5	1	.5
Nicholas, 2000	306	Competitive intelligence is about information gathering and use, looking for opportunities and threats; driven by the expression of the managers needs and expectations, focused on finding the information believed to be wanted, which they would like to have.	.5		.5		.5
De Almeida, 2016	83	Competitive intelligence is a process that produces and disseminates actionable information from and about the firm's external and competitive environments to help managers in decision-making and achieve a competitive advantage.	1	.5	1		1
Pellissier, 2013	62	Competitive Intelligence is a process or practice that produces and disseminates actionable intelligence by planning, ethically and legally collecting, processing and analysing information from and about the internal and external or competitive environment to help decision-makers in decision-making and provide a competitive advantage to the enterprise.	1	1	.5	1	1
Bartes, 2014	22	Competitive Intelligence is … a forecast of the future, in the area of strategic management, … a system application discipline, … information in connection with the analyst's person, … principle of a government intelligence service, … two-level activity … continuous monitoring of the company's surroundings … intelligence analysis of information … output should be new knowledge – intelligence … there must be a proposal for the hypothesis realised by the competitor, an engineering activity, …legality and ethics in the activity. CI as the creator of materials for strategic decision-making of the company's top management.	.5	.5	1	.5	.5
Maungwa, 2018	17	Competitive Intelligence is understood as the interpretive product of a process for gathering and analysing external data and information to the end of improving decision-making—serves as a research, development, and innovation framework for organisations that seek to improve their competitiveness through the use of high-value data and information in their processes, products, and service.	1		1	.5	1
Cavallo et al, 2020	14	Competitive Intelligence is a process that generates actionable information about the firm and its external environment to help firms in making market-related decisions.	1		.5	1	1

strand, the quantitative method topic extraction, is the identification of five core defining dimensions, represented by twenty descriptors and their respective weights on each dimension. The inductive inference process to synthesize the meaning of the descriptors allowed the identification and naming of each defining dimension. The third strand confirmed all sub-hypotheses identified through core dimensions, using the ACH method. The meta-inferences from the results of these three strands provided a thorough answer to the research question of this study: a unified view and a modular definition of CI. The unified view of CI results from the inductive integration of the descriptors in the core defining dimensions. The modular definition results from the deductive deconstruction of the CI concept. Both the inductive and deductive inference processes were supported by the previously developed ontology. The machine-guided inductive exploratory identification of descriptors and the human-guided deductive explanatory identification of dimensions, both supported by the literature-based ontology, matched perfectly. In summary, the main findings are as follows: 1) the optimal number of core defining dimensions is five; 2) the twenty descriptors for each dimension were identified; 3) the research question

and the exploratory five core defining dimensions were identified, named, and confirmed; resulting in 4) a unified view and modular definition for CI.

3.1. Number of core defining dimensions

The Elbow Method was used to calculate the optimal number of clusters for topic extraction. The result is the unique identification of five core defining dimensions, which correspond to the number of clusters where the sum of squared errors (within clusters) design the "elbow" shape, as shown in Fig. 2.

Fig. 3 shows how the topic extraction technique maps each of the 816 definitions from the definition corpus to the five optimal topics computed by core defining dimensions using the Elbow Method. The top row highlights Topic 0 (Process) as the most prominent, followed by Topics 4 (Purview) and 2 (Product), and last by Topics 1 (Purpose) and 3 (Practices). This result could explain why the adoption of CI is low, as only about 15% (126 out of 816) of the definitions are assigned to Purpose. No business executive or academic will invest their time

Process core defining dimension descriptors and respective weights
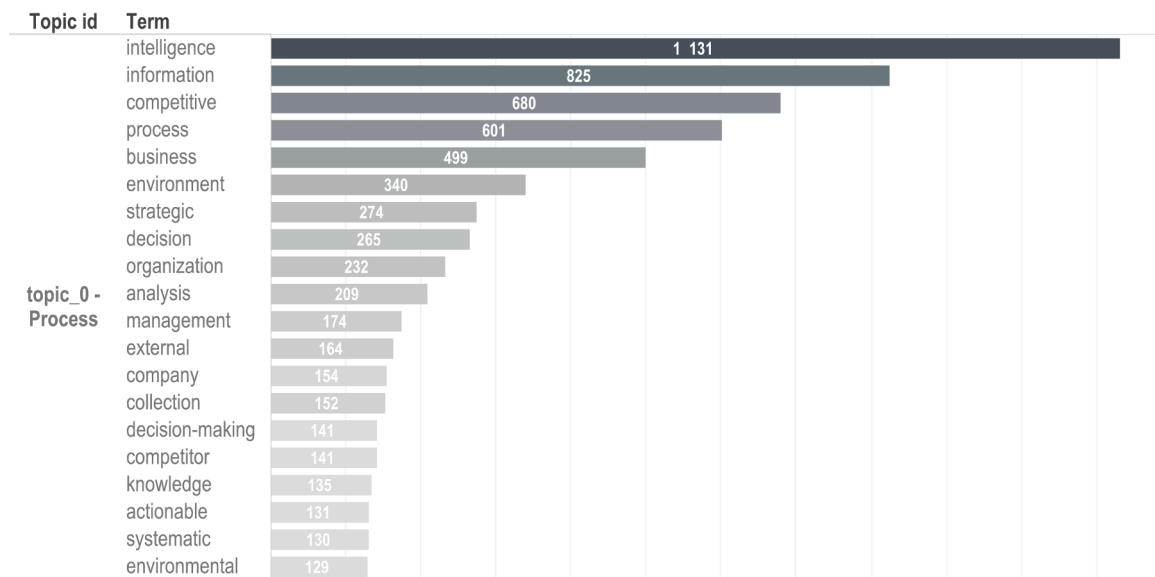

Fig. 4. Process topic assigned terms and respective weights. Process core defining dimension descriptors and respective weights.

without understanding the purpose of CI. The columns represent the weighting of each dimension in the set of assigned definitions to each core defining dimension. In other words, since each definition addresses multiple dimensions to explain the meaning of CI, each column highlights the weight given to each dimension in a set of definitions that mainly explain one of the dimensions. As expected, the diagonal from the second row to the last row shows the highest weights, indicating that the definitions have been correctly assigned to the dimension they mainly explain. However, it is also clear that the definitions are usually focused on one or two, at most three dimensions, indicating the lack of explanatory power of the CI meaning (see Table 2 for more details on this issue). In our understanding, this fact underlines the need for a broad and precise definition of CI, the aim of this study. Finally, and although topic 0—the Process dimension—is the most represented with the highest number of assigned definitions (282 out of 816), it loses representativeness in the total sum compared to all other dimensions (260 out of 816). This means that the Process dimension is usually addressed along with the other dimensions when defining what CI is. The other dimensions are usually used to explain CI in more focused definitions.

3.2. Descriptors of the core defining dimensions

Based on the five optimal clusters, the topic extraction method identified 20 terms (descriptors) for each of the assigned topics (defining dimensions). The assigned descriptors follow their respective weights on the definition corpus for each defining dimension.

3.3. Validation of hpotheses and identification of the core defining dimensions

ACH and CI ontology were applied next to test the validity of the main research question and its sub-hypotheses. As the hypotheses resulted from the topic extraction method and were thus mathematically

validated, the validation focused on ensuring that the resulting terms were understandable: this process enabled the identification and naming of each of the core defining dimensions. The verification of each sub-hypothesis is discussed in detail below[1].

H1: Process as a core defining dimension of CI

Topic_0 confirms H1. Fig. 4 shows the key descriptors and their respective weights for the CI Process as core defining dimension. The terms assigned to this topic with the highest weights, namely intelligence (1131), information (825), and competitive (680), highlight the CI Process (601) as the most relevant defining dimension for CI. The rest of the terms encapsulate the Intelligence Cycle, the intelligence development process, and refer to the collection (152), analysis (209), and decision (265) phases. The characteristics of the CI Process emphasize its importance to strategic (274) decision making (141), the need to be systematic (130), to make its output actionable (131), and to be a knowledge (135) and information management (174) activity, focusing on the business (499) environment (340, 129) in which the company (154) and its competitor(s) (141) play, while covering both the external (164) and organizational (232) perspectives.

The three definitions that best illustrate this topic_0 - CI Process are those by Calof and Skinner (1998), Diffenbach (1983), and Oraee et al. (2020), where the probabilities of each definition belonging to this topic are ~0.998, ~0.997, and ~0.996, respectively. The transcript for the most representative definition is as follows: "Competitive Intelligence is a systematic program …to find new opportunities and remain competitive. CI can be defined as actionable recommendations resulting from a systematic process that involves planning, collecting, analyzing, and disseminating information about the external environment with respect to opportunities or developments that may affect the competitive situation of a company or country. CI is proactive, with the intention of predicting what will happen …; involves analyzing information, not just finding and applying best judgment; a systematic process for gathering information and recognizes that the most valuable information is available internally; ethical; involves targeted deep sources of

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[1] Three critical notes for reading this section are as follows: 1) italics highlight key terms; 2) round brackets "()" are used for convenience to refer to the weighting of each term; and 3) terms are in their lemma version.

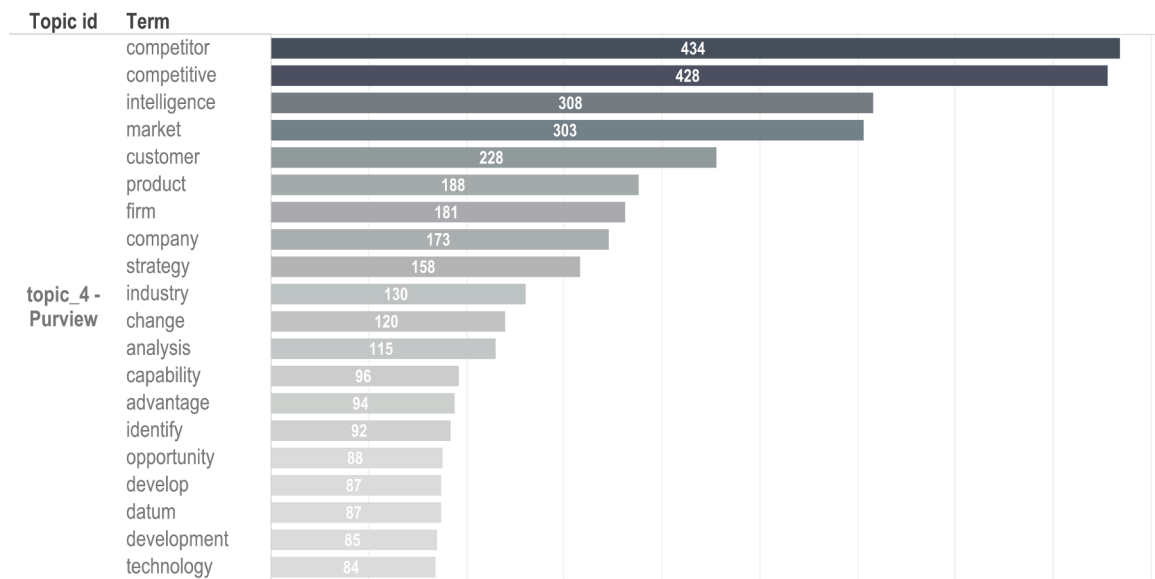## Purview core defining dimension descriptors and respective weights

Fig. 5. Purview core defining dimension descriptors and respective weights. **Purview core defining dimension descriptors and respective weights.**

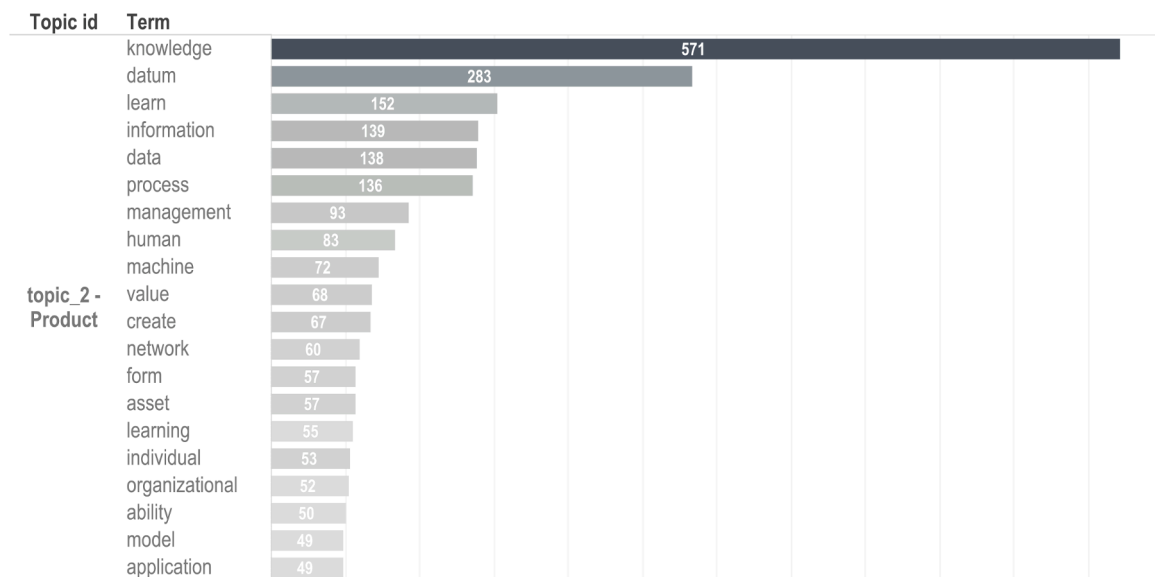## Product core defining dimension descriptors and respective weights

Fig. 6. Product topic assigned key terms and respective weights. **Product core defining dimension descriptors and respective weights.**

information, CI is extremely detailed; involves a multi-step process called the CI wheel that includes defining intelligence needs and planning the intelligence project, gathering data, analyzing data, and disseminating intelligence, … which helps shape the decision."

H2: Purview as a core defining dimension of CI

Topic_4 confirms H2. The key descriptors for the CI Purview as core defining dimension, according to Fig. 5, are primarily the components of a company's (173) ecosystem. These terms delineate the domain in which opportunities (88) for developing (85) competitive (94) advantage are identified (92) and strategized (158). The supporting capability (96) for the development (85) of intelligence (308) is derived from the analysis (115) of data (87) on the changing (120) external and internal

factors. The external factors include the macro, meso, and micro environments while the internal factors cover the environment of the company (181). The macro environment includes the political, economic, social, technological (84), and legal factors. The meso-environment addresses the market (303). The micro environment addresses the customer (228), product (188), industry (130), and competitors (434) to which the company belongs. Intelligence (308) developed (87) from these overlapping domains leads to many intelligence concepts such as competitor intelligence, market intelligence, business intelligence, or marketing intelligence, to name a few. Referring to our literature review, the existing gap in addressing the purview as core defining dimension prior to this study may explain the confusion around the

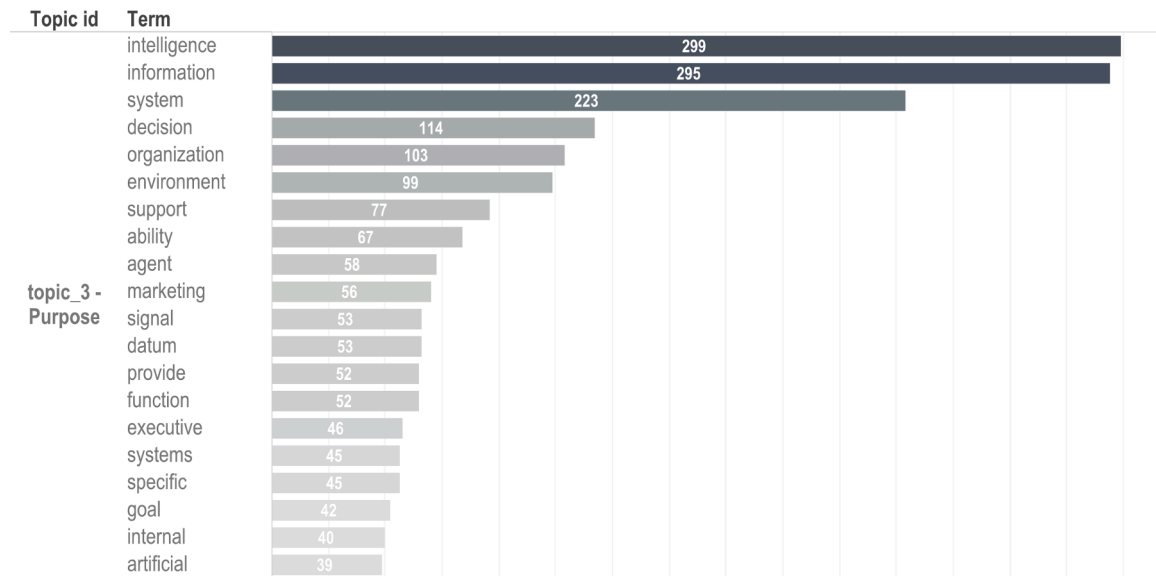## Purpose core defining dimension descriptors and respective weights

Fig. 7. Purpose topic assigned key terms and respective weights. **Purpose core defining dimension descriptors and respective weights.**

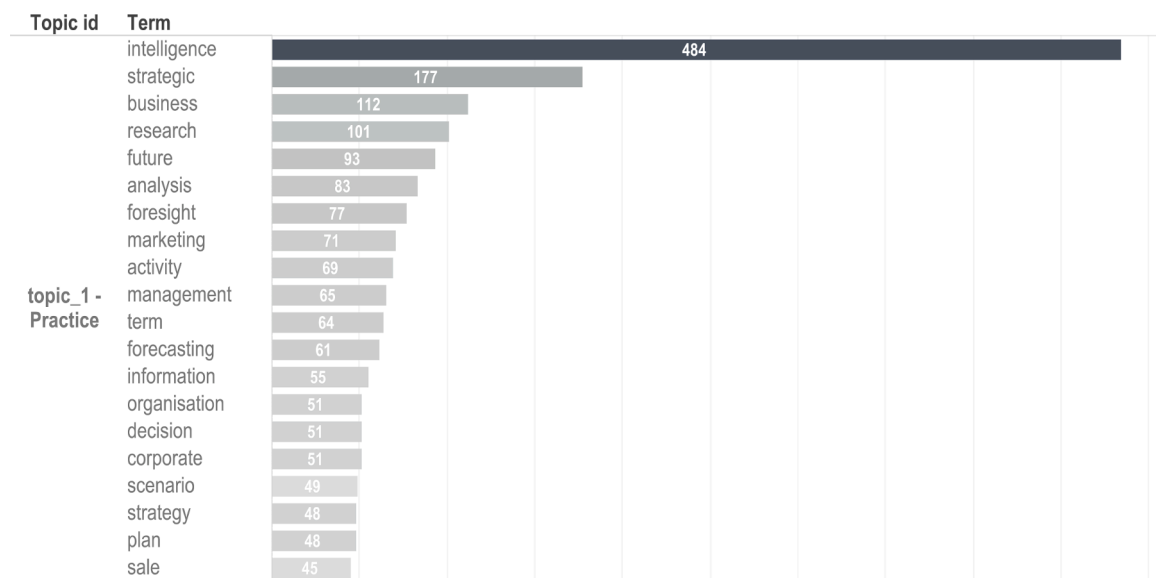## Practice core defining dimension descriptors and respective weights

Fig. 8. Practice topic key assigned terms and respective weights. **Practice core defining dimension descriptors and respective weights.**

concept and meaning of CI, and the current levels of polysemy and synonymy definitions analyzed. This fact adds to the originality and contribution of this study by delineating the body of knowledge and supporting the evolution of CI from a mere practice to a science.

The three definitions that best illustrate topic_4 - CI Purview are those by Sigalas et al. (2013), Du Toit (2013), and Prescott (1999). The probabilities for each definition belonging to this topic are ~0.994, ~0.994, and ~0.992, respectively. The most representative definition is "Competitive Advantage (Stipulative Definition) … exploiting market opportunities and neutralizing competitive threats above the industry average. Competitive Advantage (Operational Definition) … the above industry average exploitation of a) all market opportunities and, b)

complete (exploitation of) the market opportunities; neutralization of a) all competitive threats, b) complete (neutralization of) the competitive threats. (Measured by) … firms that have a higher level of competition than the industry average are assumed to have a competitive advantage."

H3: Product as a core defining dimension of CI

Topic_2 confirms H3. Fig. 6 shows the main descriptors and their weights for CI Product as core defining dimension. The term with the highest weighting, knowledge (571), reveals the ultimate output of CI. Its emergence (57) results from the verification of knowledge gained from understanding information (139), which, in turn, is a product of data (283, 131) processing (136). The various stages along the way to

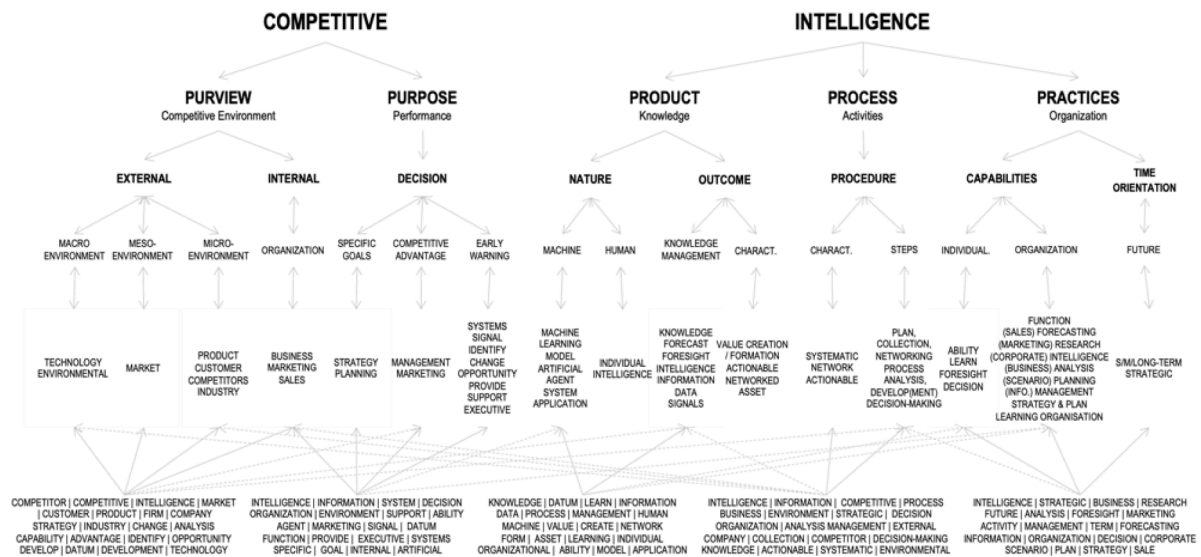**Fig. 9.** Modular definition and top-down and bottom-up meta-inferences development process. **CI unified view and modular definition.**
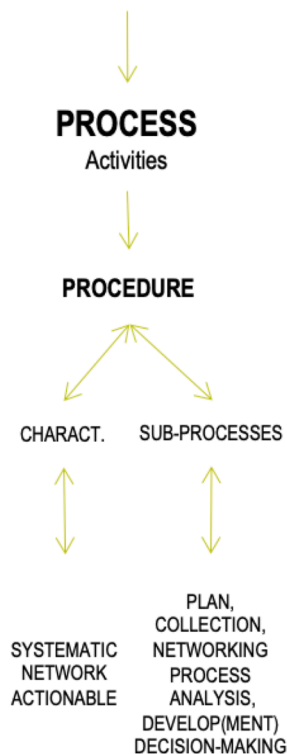

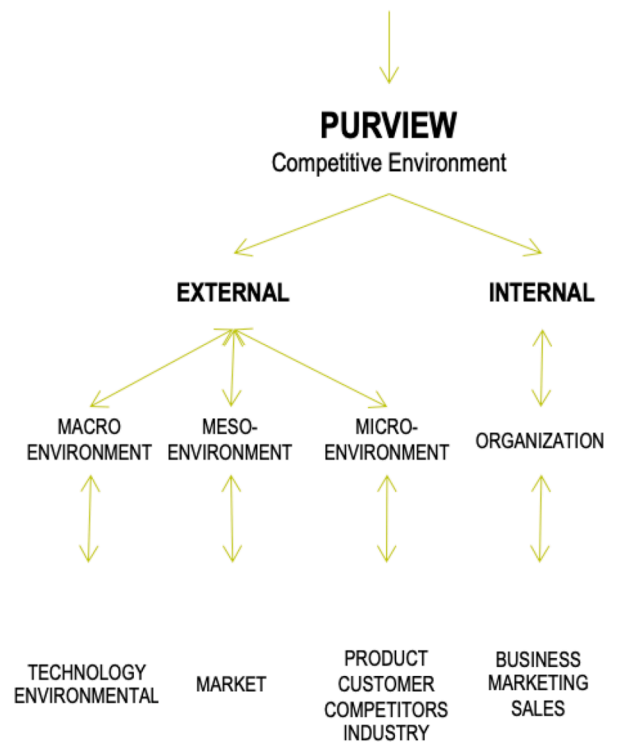**Fig. 10.** CI Process core defining dimension detail. **CI process dimension modular components.**

Fig. 11. CI Purview core defining dimension detail. **CI Purview dimension modular components.**

knowledge and wisdom are an almost obvious connection with the Wisdom Pyramid (Ackoff, 1999). The nature of this product can be

either human (83) or artificial, using machine (72) and deep learning (55) models (49), such as convolutional networks (60). The application (49) of knowledge as an organizational (52) asset (57) to create (67)
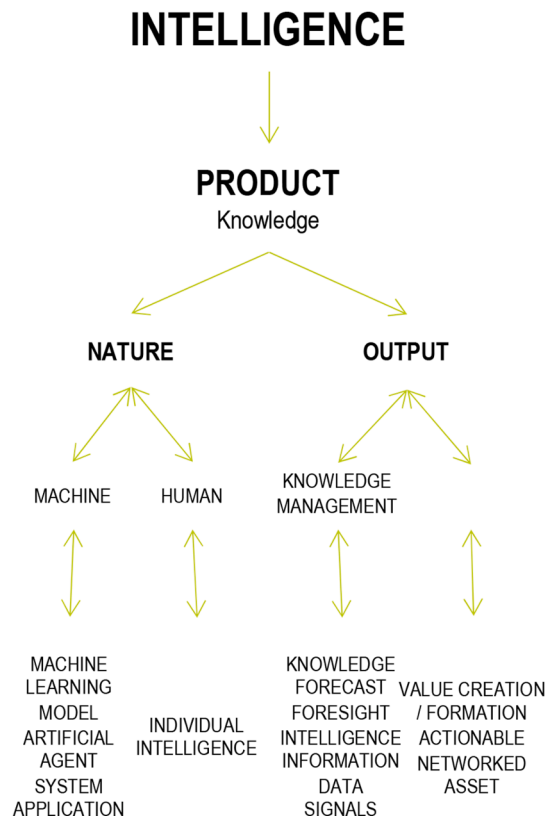
CI Product dimension modular components

Fig. 12. CI Product core defining dimension detail. **CI Product dimension modular components.**

CI Purpose dimension modular components

Fig. 13. CI Purpose core defining dimension detail. **CI Purpose dimension modular components.**

value (68) also provides an explicit link with the knowledge-based view of the firm (Conner, 1991, p. 199) and the absorptive capacity (Cohen and Levinthal, 1990) and organizational learning (Duncan, 1979) theories of knowledge management (93) and learning organization (50) (152).

The three definitions that best illustrate this Topic_2 - Product are those by ODSC (2020), Kurtti et al. (2013), and Hair (2007), where the probability that all these definitions belong to this topic is ~0.995. The transcript for the most representative definition is as follows: "Graph Database uses graph theory to store, map, and query relationships of data elements. Essentially, a graph database is a collection of what are called nodes and edges. A node represents an entity such as a product or customer, while an edge represents a connection or relationship between two nodes. Each node contained in a graph database is defined by a unique identifier, a set of outgoing and/or incoming edges, and a set of key/value pairs. Each edge is defined by a unique identifier, a starting and/or ending node, and a set of properties. Graph databases are well suited for analyzing relationships."

H4: Purpose as a core defining dimension of CI

Topic_3 confirms H4. Fig. 7 shows the key descriptors and their weights for the CI Product as core defining dimension. Neglecting the obvious goal (42) of producing intelligence (299) from information (295) and datum (53), the terms assigned to this topic emphasize the purpose of CI as a decision (114) support (77) system (223). This means that CI is the ability of a particular agent, whether artificial or human, to identify and process signals and datum from the external and internal environment to support the achievement of a particular goal. In practice, this means a function or setting up of management or marketing
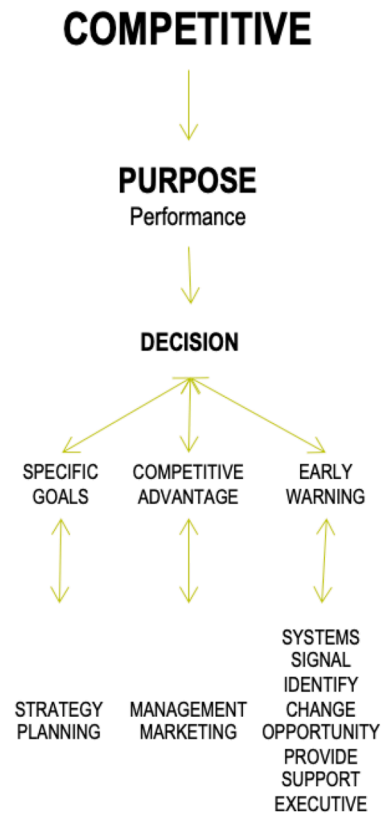
information systems to successfully guide the organization towards its desired goals.

The three definitions that best illustrate Topic_3 - Purpose are those by Legg and Hutter (2007), Wirth (2018), and Fuld+Co. (2018), where the probabilities of these definitions belonging to this Topic are ~0.998, ~0.992, and ~0.989, respectively. The transcript of the most representative definition is as follows: "Intelligence involves a confusing mix of concepts. … Measures an agent's ability to achieve goals in a wide range of environments. … three essential components: an agent, environments, and goals. Clearly, the agent and the environment must be able to interact with each other, i.e., the agent must be able to send signals to the environment and receive signals from the environment. Similarly, the environment must be able to receive and send signals to the agent. Take the agent's perspective on this communication and label the signals sent from the agent to the environment as actions and the signals sent from the environment to the agent as perceptions."

H5: Practice as a core defining dimension of CI

Topic_1 confirms H5. Fig. 8 shows the key descriptors and their weights and they define CI as a set of forward-looking practices. These derive from organizational (51) activities (69) that include research (101) and analysis (83) to support decisions (51) that inform future (93) oriented short-, medium-, and long-term (93) strategies (48) and planning (64). Examples of such practices include strategic (177), business (112), and corporate (51) intelligence (484), marketing (71) research (101), futures (93), strategic (177) foresight (77), sales (45) forecasting (61), information (55) management (65), and scenario (49) planning (48).

The three definitions that best illustrate Topic_1 - Practice are those by McGregor (2011), Andresen and Bergdolt (2017), and Pereira et al.
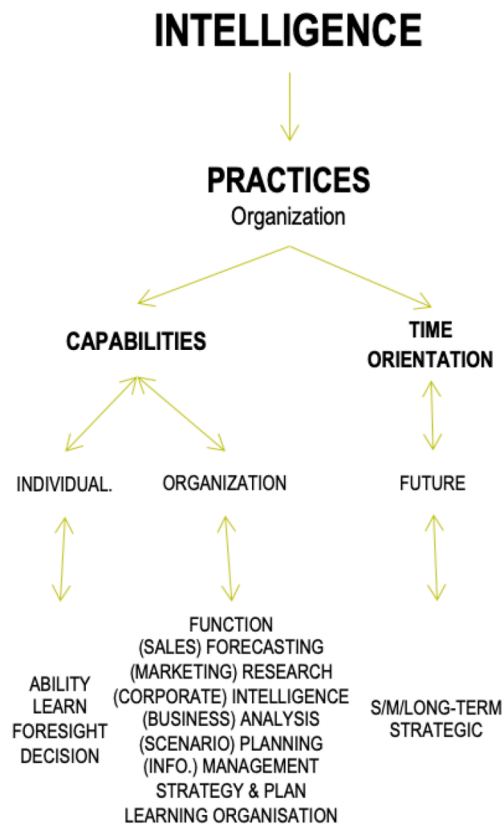
CI Practice dimension modular components

Fig. 14. CI Practice core defining dimension detail. **CI Practice dimension modular components.**

(2020), where the probabilities of these definitions belonging to this Topic are ~0.994, ~0.99, and ~0.989, respectively. The transcript of the most representative definition is as follows: "Business Intelligence results from the consideration of integrated data that leads to useful information on which to base strategic decisions ... through the process of integrating Consumer Intelligence, gained from integrating data about the market, people gain consumer acumen. ... Gathers through consumer acumen. Consumer acumen underscores the need for people to understand how their actions and behaviors related to financial management affect their decision making as consumers and how this, in turn, affects financial outcomes for individuals and families."

3.4. Meta-inferences: induction of the unified view and modular definition

The results of the previous sections enabled the induction of meta-inferences to support the development of a unified view and modular definition for CI. The synthesis of CIs core defining dimensions led to the following overarching definition: CI is the process and forward-looking practices used in producing knowledge about the competitive environment to improve organizational performance. This definition aims to provide a summary and an accurate overview of the concept. The top-down approach to defining CI can be extended to provide increasingly precise definitions. The reverse process, synthesis of key descriptors, provides a more detailed bottom-up approach to defining CI and related concepts. Fig. 9 shows a summary of the overall process supported by the working ontology.

The modular approach to defining CI can be understood by reading the schema vertically and horizontally. The horizontal reading allows

for a more precise, but also increasingly comprehensive definitions of CI. The definition presented in the previous paragraph at the core defining dimension level is the shortest and most comprehensive. However, a much more comprehensive definition can be derived from the next horizontal level of concepts: CI is the process that drives a set of activities enabled by capabilities that support predictive organizational practices to produce machine- and human-driven characteristic knowledge management about external and internal competitive environments, with the goal of supporting performance-based decision making. Vertical reading provides an in-depth explanation of each dimension. Since it is important to thoroughly understand the various dimensions of CI to grasp the integrated concept, a detailed explanation follows. Nevertheless, it has to be highlighted that the integration of the dimensions yields more than their mere sum. The explanatory complementarity between the dimensions may explain why it has been so difficult to reach a consensus in defining CI.

Beginning with the most prominent dimension, the CI Process (Fig. 10) is a series of activities that follow a procedure with certain characteristics and sub-processes. It is systematic (methodical), networked (a collective exercise rather than an individual affair), and actionable (not an end, but as part of the overall process that makes an organization competitive). It is worth highlighting that the sub-process of identifying intelligence needs, which is usually one of the first processes, does not appear in the top keywords. This may be due to two factors: 1) intelligence needs are often referred to as Key Intelligence Topics and Questions (KITs and KIQs); 2) words with three or fewer letters are eliminated during text preparation for the topic extraction, which would exclude them from this analysis. The rest of the sub-processes are well known and established in any intelligence development discipline.

CI Purview (Fig. 11) covers the entire competitive environment. The external environment addresses the macro environment forces in general, which affect the meso market geographies in which the organization operates and influences the micro industry forces and actors, such as customer and consumers, suppliers, competitors, complementors, substitutes, and the other stakeholders. The internal environment is also the subject of intelligence development to improve the performance of the organization's functions with data that are already available.

CI Product (Fig. 12) dimension is concerned with both the output and the outcome of CI Process and Practice. The nature of this output can be both machine and human, both complementing each other. The output is basically the creation of knowledge in its various forms (e.g., know what, know why, know how) and its management within the organization. Knowledge as an output must also meet some characteristics, such as the creation of added value, that it is actionable and networkable (collective knowledge) and provides value to the organization. The last characteristic highlights the importance of CI to the knowledge-based theory of the firm (Grant, 1996; Spender, 1996; Nonaka and Takeuchi, 1995).

The CI (Fig. 13) Purpose dimension deals with the ultimate goal of any organization, performance. The antecedent of performance is the decisions the organization makes in three areas. First, the specific decisions regarding strategy and planning. Second, creation, development, and sustainability of competitive advantages through the allocation of resources (management) and the development of profitable customer and consumer loyalty (marketing). Third, supporting decisions that must be made today to take advantage of future opportunities. It should be noted that the terms risk or threat do not appear as keywords in this or any other dimension. In fact, they do not appear among the top one hundred keywords. This fact raises several questions: Why is it that risk and threat do not appear as keywords? Can this dismissive attitude toward risk and threat explain CI's low acceptance of risk management? These could be avenues for future research.

CI Practice (Fig. 14) dimension is primarily concerned with the skills needed and time orientation in developing intelligence. Given that performance improvement and decision making can only occur in the
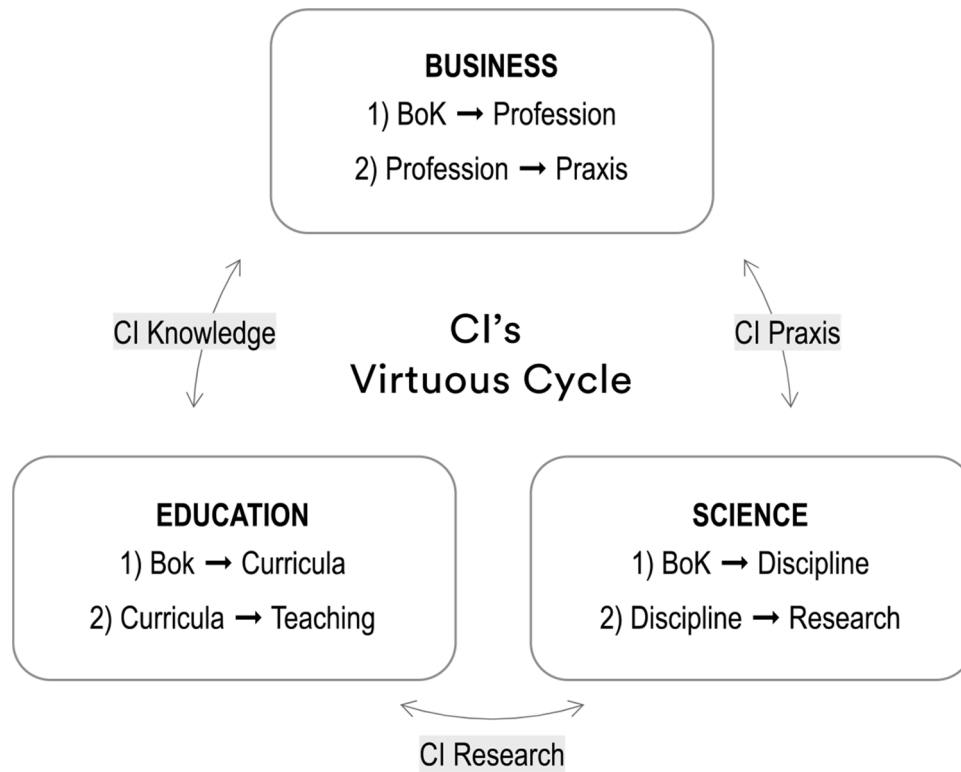
Fig. 15. Author's development. Virtuous Cycle of CI.

present, the future-directed time orientation becomes apparent. Most importantly, it establishes an important distinguishing characteristic of CI from, for instance, information or knowledge management. The latter two are concerned with existing information or knowledge, whereas CI, with developing foresight. In other words, developing insights about what is plausible in the future. Moreover, these insights need to be strategic and support the organization's short-, medium-, and long-term goals, and not just have ad hoc nice-to-have requests for tactical insights. The other side of intelligence practice is the need for both individual and organizational capabilities. These support time orientation not only by helping to anticipate but also to learn and support or influence decision making and its implementation. In larger organizations, this may take the form of a dedicated function. In any case, the organization must learn from its cognition development and decision making to become a learning organization (Daft and Weick, 1984).

Finally, as an expected contribution of the modular definition, the combination of key terms from each dimension allows for the definition of terms not only within the CI domain, but also of related terms from other domains. These definitions allow to mitigate the confusion of term meanings and terminology, thus helping to reduce polysemy and synonymy. Using the terms mentioned in Section 1 to illustrate polysemy (business intelligence; competitor intelligence) and synonymy (competitive strategy; strategic planning; market research), the following section attempts to define and delineate them. Using the modular definition framework from Fig. 9, business intelligence is the process and practices used in producing knowledge with the internal business information to improve organizational performance. Using the same logic, competitor intelligence is the process and forward-looking practices used in producing knowledge about competitors to improve organizational performance. The terms used as synonyms earlier are now defined as follows: market research is the process and practices of researching the external market environment to support specific decisions to achieve specific objectives; strategic planning is the process and practices that support specific decisions regarding the development of strategy and the planning of its execution; competitive strategy is a set

of decisions about how an organization operates in the competitive environment to achieve a specific objective. Finally, it should be noted that the above definitions are not intended to define these terms comprehensively, but rather to highlight the differences between these terms and CI.

Table 1 compares the unified view's overarching definition with the top five previously most cited definitions on Google Scholar and with the most recent, relevant published definitions. The analysis was intended to highlight the contribution of the unified view in terms of both accuracy (coverage of all dimensions) and precision (explanatory power of the concepts used). In addition, the modular definition identifies the core defining dimensions and the respective key descriptors in a structured manner, allowing for more precise definitions of intermediate concepts in CI.

3.4.1. Limitations of the study

Although this unified view is based on scientific and practical literature, there is a lack of empirical confirmation, which is the next step in our research program. A survey of the entire CI community to confirm the general findings or in-depth expert interviews to verify the inner details and idiosyncrasies of the field are crucial to solidify and further validate the conclusions of this research. Given the complexity of the CI concept and the variety of audiences, from novices to experts, from scholars and educators to managers, the author points out the need to go beyond the general, broad definition and to read carefully the more detailed explanations by dimension and level.

4. Conclusion

This study provides a unified view and modular definition for CI. Although it adds to previous knowledge by providing the first holistic view of the CI field, the ultimate goal is to serve as a foundation for future practice and research. Clarifying and defining the view narrows the body of knowledge of CI, which is fundamental to the scientific and pedagogical development of the field as well as to its recognition as a

profession. Finally, it contributes to academic and business adoption by identifying the critical dimensions addressed in research, establishing the practice or business function, and developing curricula to support teaching. Thus, the potential impact spans academia, business, and society.

This study fulfills the need for a unified view to justify the theory and practice of CI: "CI is the process and forward-looking practices used in producing knowledge about the competitive environment to improve organizational performance." The proposed definition aims to eliminate the existing polysemy and synonymy in CI terminology. Thus, it serves as a basis for future practice, research, and teaching. Clarifying the meaning of CI should drive acceptance in business and lay the foundation for the establishment of CI science. Furthermore, a more consensual definition will enable the delineation of the body of knowledge of CI, reversing the existing vicious cycle that hinders the development of the discipline. CI scholars can, therefore, conduct research and develop curricula based on a shared understanding of CI. This increases the quality of CI education and general awareness, which promote acceptance in the business community. Increasing practice modifies empirical findings, completing virtual cycle with more scientific research, education, and business practice, as shown in Fig. 15.

The modularity of the definition provides information about the process to be followed, the viewpoint to be focused on, the product to be achieved, the purpose to be sought, and the foundations for successful practice. For brevity, the authors have referred to these five core defining dimensions as the "5Ps of CI" to encourage application and use. The application of these guidelines in an integrated manner in practice and theory can improve the effectiveness and efficiency of CI. Ultimately, it will enable CI to fulfill its mission by improving the quality of decision making and thus, the sustainable development of firm performance.

CRediT authorship contribution statement

Luís Madureira: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Project administration. **Aleš Popovič:** Conceptualization, Validation, Supervision, Project administration, Writing – review & editing. **Mauro Castelli:** Conceptualization, Validation, Writing – review & editing, Supervision, Project administration.

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