Business and Competitive Intelligence Maturity Models Enhancing Decision-Making for Entrepreneurs: A Systematic Literature Review

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Abstract: Entrepreneurs are essential for the growth of any economy. Hence it is imperative to ensure that sufficient support functions are put into place to support entrepreneurs and their entrepreneurial initiatives. Business intelligence (BI) and Competitive intelligence (CI) enable organisations to convert raw data into meaningful insights, which significantly enhances the quality of strategic and operational decision-making, by doing so contributing to the overall sustainability of an organisation. The importance of applying BI and CI as support functions within the entrepreneurial space can contribute significantly to growth and sustainability. This study aimed to examine existing BI and CI maturity models as presented in academic literature, with the objective of identifying models that could potentially support enhanced decision-making among entrepreneurs. Through a systematic literature review, this study identified existing BI and CI models, and their adaptations, spanning over the years 2010 – 2023. Scopus was used as the database of choice due to its comprehensive coverage of academic journals, and its inclusion of a vast array of disciplines and top-quality peer-reviewed journals. The use of a PRISMA flow diagram and Mendeley ensured that the 75 articles that were identified from an initial search on Scopus, were carefully filtered through using a pre-defined inclusion/exclusion criteria. The 10 articles that complied with all the inclusion criteria for this study were then synthesised using visualisation and textual analysis. The findings of this study contribute to entrepreneurs enhancing their BI and CI capabilities through the application of various maturity models. The findings of this study also contribute to more agile and competitive business decision-making within the entrepreneurial space.

Keywords: Business Intelligence, Competitive Intelligence, Maturity Models, Decision-making, Entrepreneur

1. Introduction

In today's hypercompetitive and data-intensive business environment, organisations are under immense pressure to make informed, timely, and strategic decisions. The ability to collect, analyse, and act upon relevant intelligence has become a defining factor in achieving sustainable competitive advantage. Two pivotal disciplines, Business Intelligence and Competitive Intelligence enable this process. While BI focuses on the internal optimisation of operations through data analytics, CI provides strategic foresight by monitoring external market dynamics, competitors, and trends (Ahmad, 2015). Both disciplines can empower decision-makers, particularly entrepreneurs, to navigate uncertainty and complexity. To maximise the effectiveness of BI and CI, organisations increasingly rely on maturity models, which are structured frameworks that assess current capabilities, identify growth stages, and guide development. Business Intelligence Maturity Models (BIMMs) offer benchmarks for technological adoption, data governance, and analytical readiness, while Competitive Intelligence Maturity Models (CIMMs) evaluate an organisation's ability to systematically gather and apply external insights. The purpose of this research was to examine existing BI and CI maturity models in academic journal articles, with the goal of identifying industry-specific adaptations for enhanced decision-making by entrepreneurs. Through a systematic literature review, this study explored existing BI and CI maturity models in academic literature, for possible adaptation by entrepreneurs. By synthesising the current body of knowledge from the Scopus database between the years 2010 and 2023, this study creates an awareness for entrepreneurs to adapt existing BI and CI maturity models for decision-making.

2. Literature Review

Maturity models are structured frameworks that are used to assess the capabilities of organisations. The foundation of maturity models is rooted in the Capability Maturity Model (CMM), which was established in the 1980's by the Software Engineering Institute (SEI), at Carnegie Mellon University. The characteristics of the CMM are reflected in table 1. From the 1990's the concept of maturity models expanded into different disciplines, seeing the original CMM being adapted for various fields such as Project Management, IT governance, Human Capital Management, Business Intelligence and Competitive Intelligence (Becker, Knackstedt & Pöppelbuß, 2009). In the early 2000's SEI developed a new maturity model Capability Maturity Model Integration (CMMI) to address some of the limitations of their original CMM.

Table 1: Characteristics of CMM (SEI, 1992:18)

Maturity Level	Characteristics	Focus of Measurements
1. Initial	Ad hoc, chaotic	Establishing baselines for planning and estimating
2. Repeatable	Processes depend on individuals	Project tracking and control
3. Defined	Processes are defined and institutionalised	Definition and quantification of intermediate products and processes
4. Managed	Processes are measured	Definition, quantification, and control of sub-processes and elements
5. Optimised	Improvements are fed back to processes	Dynamic optimisation and improvement across projects

Business Intelligence and Competitive Intelligence maturity models can play a crucial role in assisting entrepreneurs to systematically build and enhance their intelligence capabilities. Business intelligence and competitive intelligence models are structured frameworks that can allow entrepreneurs to assess their current use of data and information, identify gaps, and plan for gradual improvements in intelligence practices (Popovič et al., 2012). For entrepreneurs, particularly those operating in resource-constrained or rapidly changing environments, such models are invaluable in guiding the development of both internal analytical competencies and external strategic awareness. BI maturity models can support entrepreneurs in optimising internal data usage through improved reporting, analytics, and forecasting, which leads to more informed operational and strategic decisions. Conversely, CI maturity models can help entrepreneurs evolve from reactive market responses to proactive, intelligence-driven strategic planning by improving their ability to monitor competitors, detect trends, and respond to shifts in the external environment. As these capabilities mature, entrepreneurs become better equipped to navigate uncertainty, identify new opportunities, and maintain a competitive edge. Therefore, BI and CI maturity models are not merely tools for assessment, they are developmental roadmaps that empower entrepreneurs to transition from intuition-based decision-making to structured, insight-driven strategies. Table 2 serves as a conceptualisation of the relevance of BI and CI maturity models for entrepreneurs.

Table 2: Conceptualising BI and CI maturity models for entrepreneurs (Stewart & Dewan, 2022; Madureira, Popovič, & Castelli, 2023)

Dimension	Business Intelligence (BI) Maturity	Competitive Intelligence (CI) Maturity	Relevance to Entrepreneurs
Definition	A BI Maturity model is a framework that measures an organisation's internal capabilities It measures how organisations use their internal data and analytics to drive business decisions and guides them on how to improve.	A CI Maturity Model is a framework that measures an organisations competitive intelligence capability. It helps organisations assess and improve their competitive intelligence capabilities.	Entrepreneurs need both internal BI and external CI intelligence to make well-rounded decisions.
Focus Area	BI focuses on internal operations such as, performance metrics, historical and predictive data.	CI focuses on external factors such as market trends, competitor actions, customer behaviour, regulatory shifts.	BI and CI can assist entrepreneurs to balance internal efficiency and external awareness. Through streamlining internal processes and gaining insight into external factors.
Maturity Stages	The stages of BI maturity range from a prenatal stage, where BI is used minimally all the way until full optimisation where BI is then used fully within an organisation. Leading to strategic decision-making.	The stages of CI range from a basic stage where CI is used as a reactive means all the way up to an expert stage where CI practices are highly optimized, and the focus is on maximizing the benefits.	BI and CI enables staged development for entrepreneurs with limited resources.
Decision-Making Support	BI supports data-driven decisions based on business processes	CI supports strategic decisions based on environmental scanning	BI and CI can enhance quality, speed, and confidence in

Dimension	Business Intelligence (BI) Maturity	Competitive Intelligence (CI) Maturity	Relevance to Entrepreneurs
			entrepreneurial decision-making.
Risk Management	BI identifies operational inefficiencies and forecasts trends.	CI anticipates threats from competitors and market shifts.	BI and CI can equip entrepreneurs to manage both internal and external risks.
Scalability & Growth	BI maturity indicates readiness for scaling operations.	CI maturity indicates readiness to compete in broader or more complex markets.	BI and CI can assist entrepreneurs in planning for sustainable growth.
Innovation Enablement	BI uses internal insights to refine products and services.	CI identifies market gaps and unmet consumer needs.	BI and CI drive innovation based on data and market intelligence.
Tools, Technologies and examples	BI utilises tools such as dashboards, data warehouses, predictive analytics and visualization tools. **Example:** Gartner BI Maturity Model – The Gartner BI Maturity Model provides entrepreneurs with a way to identify the level of development their BI and analytics initiative must reach, to support entrepreneurial goals.	CI focuses more on Web scraping, social listening, competitor benchmarking, SWOT analysis. **Example:** Unified Competitive Intelligence Maturity Model (UCIMM) – The UCIMM offers entrepreneurs a structured path to transform fragmented market insights into strategic, scalable, and competitive decision-making capabilities.	The tools used to implement BI and CI will be guided by the maturity level of BI or CI and the business needs.

3. Methodology

A clear roadmap of the research process is crucial to ensure the validity, reliability and credibility of research findings. This study followed a qualitative research approach, with interpretivism as the philosophical paradigm which underpinned the study. Interpretivism was chosen for this study because this study endeavoured to interpret existing BI and CI models and identify adaptations which could be utilised by entrepreneurs for decision-making. A systematic literature review was the research method chosen to address the key question of this research namely, "What are the existing BI and CI maturity models and how can they be used by entrepreneurs for enhanced decision-making"? A systematic literature review was chosen for this study to ensure transparency, reproducibility, and rigor in identifying, selecting, and synthesizing existing literature (Siddaway, Wood & Hedges, 2019). The systematic review process was guided by the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework which facilitated a structured and replicable method of data selection and reporting, illustrated in figure 1.

A carefully constructed search query, using terms such as "Business Intelligence", "Competitive Intelligence" and "Maturity Models" was developed to search for journal articles in the Scopus database. Scopus was chosen for this study due to its comprehensive coverage of academic journals, and its inclusion of a vast array of disciplines and top-quality peer-reviewed journals. The initial search on Scopus, for this study, yielded a response of 75 articles. The articles from the initial search were then filtered based on a pre-defined inclusion criteria which included the following. The articles had to be peer-reviewed, written in English and published between the years 2010 and 2023. All the qualifying articles were then exported into Mendeley Reference Manager for organisation, duplicate removal, and systematic screening by title, abstract, and full-text availability.

After the full screening process was concluded, 10 eligible articles (See table 3) were downloaded from Scopus which were then included in the qualitative synthesis of this study. Data from the 10 articles was extracted and organised using Microsoft Excel, which facilitated coding, classification, and a comparative analysis of the BI and CI maturity models. Keywords from the 10 articles were grouped together in Microsoft Excel and WordArt was used to generate the word cloud (See Figure 5). Focus was given to the models' structure, dimensions, and industry adaptations. The findings of this study were presented through visualisations generated using VOSviewer and WordArt, each supported by a corresponding narrative to contextualise and interpret the visual data.

Table 3: Articles included in systematic literature review (own source developed for this study, 2025)

Title of Article	Authors	Year
Exploring business intelligence and its depth of maturity in Thai SMEs	Boonsiritomachai, McGrath and Burgess	2016
A framework for developing a domain specific business intelligence maturity model: Application to healthcare	Brooks, El-Gayar and Samikar	2015
Business intelligence governance framework in a university: Universidad de la costa case study	Combita Niño, Cómbita, Morales and Ortega	2020
A Framework for ranking critical success factors of Business Intelligence based on the Enterprise Architecture and Maturity Model	Farshadi, Nazemi and Abdolvand	2022
Measuring the maturity of business intelligence in healthcare: Supporting the development of a roadmap toward precision medicine within ISMETT hospital	Gastaldi, Pietrosi, Lessanibahri, Paparella, Scaccianoce, Provenzale, Corso and Gridelli,	2018
The development of data analytics maturity assessment framework: DAMAF	Gökalp, Gökalp, Gökalp and Koçyiğit	2023
Business intelligence strategy: A utilities company case study	Hawking and Sellitto	2015
Toward Better Understanding and Use of Business Intelligence in Organizations	Olszak	2016
Development of a competitive intelligence maturity model: Insights from Moroccan companies	Oubricha, Hakmaouia, Bierwolfb and Haddanic	2018
Integration of big-data ERP and business analytics (BA)	Shi and Wang	2018

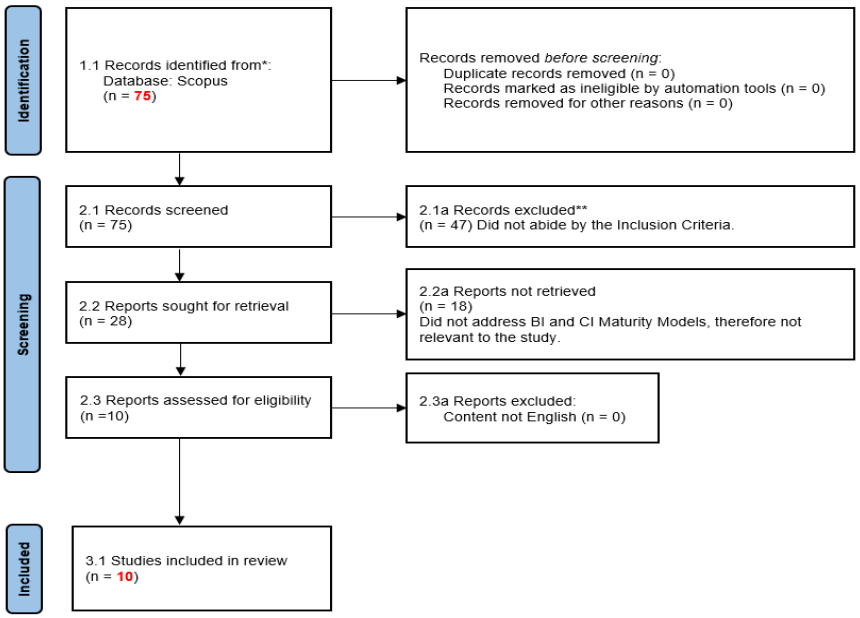

Figure 1: PRISMA Flow Diagram (own source developed for this study, 2025)

4. Findings and Discussion

This section presents a synthesis of visual and textual analysis derived from keyword co-occurrence, VOSviewer bibliometric mapping, and thematic clustering of literature on Business Intelligence, Competitive Intelligence, and Maturity Models. Each visualisation is accompanied by a narrative to highlight research patterns and thematic focus areas.

Figure 2 maps the historical evolution of research themes from 2016 to 2024. Early research focused on BI adoption and maturity model conceptualisation. Core terms such as “business intelligence”, “maturity model”, and “decision” form a dense centre, reflecting foundational concerns with analytics-driven decision-making. From 2018 onwards, research expanded toward empirical validation and sector-specific applications. CI-related terms remain less prominent, indicating a gap in model development for competitive insight. By 2022, there was a visible shift to keywords such as 'business environment' and 'business value', denoting a focus on strategic alignment and organisational impact. Technological enablers like AI, big data, and enterprise systems emerge as supporting themes. This progression shows a movement from theory-building to strategic application. The underrepresentation of CI maturity elements signals a need for integration. For entrepreneurs, these insights reinforce the value of developing internal and external intelligence maturity concurrently.

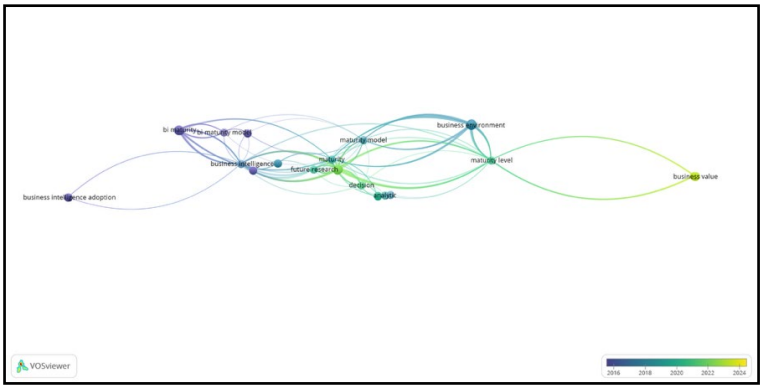

Figure 2: Overlay Visualisation of BI–CI Thematic Timeline Map: 2016–2024 (own source developed for this study, 2025)

Figure 3 presents a broader thematic map of keyword co-occurrence in BI and CI literature. BI remains dominant, supported by high-frequency terms such as 'data analytics', 'business intelligence projects', and 'enterprise architecture'. CI terms are visible but less interconnected, reinforcing their peripheral role. Health care and SMEs appear as prominent application domains, suggesting sector-specific uptake. The map reveals increasing attention to implementation, project management, and guiding principles, indicating operational maturity. Keywords like 'competitive advantage' and 'assessment framework' show that research is shifting to evaluating outcomes. Business value and strategic justification are emerging as recent focal points. AI, cognitive systems, and integration platforms indicate the role of digital transformation. Despite technological advances, CI-related maturity constructs are still underdeveloped. This highlights the need for dual-focused intelligence frameworks for entrepreneurs and strategic decision-makers.

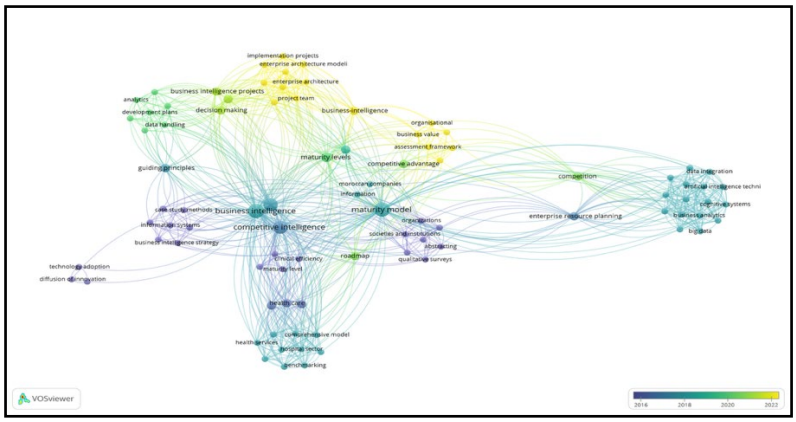

Figure 3: Comprehensive Keyword Network Map for BI and CI Literature (own source developed for this study, 2025)

Figure 4 captures the bibliographic co-occurrence of key terms between 2018 and 2021. Central to the network are the terms 'business intelligence', 'competitive intelligence', 'maturity model', and 'information analysis'. Early research (dark blue) is concentrated on defining and evaluating maturity constructs. Over time, the network shifts towards terms such as 'decision-making', 'information management', and 'business intelligence projects'. This signals a maturing field focused on application and strategic integration. Maturity levels and competitive advantage emerge as key evaluation themes. However, CI remains static in visibility, pointing to a limited bibliographic footprint. BI terms are more dynamic and well-cited, suggesting broader adoption and cross-disciplinary relevance. This reinforces the idea that CI maturity is an emergent field with development potential. For entrepreneurs, these findings advocate for intelligence systems that incorporate both internal control and external adaptability.

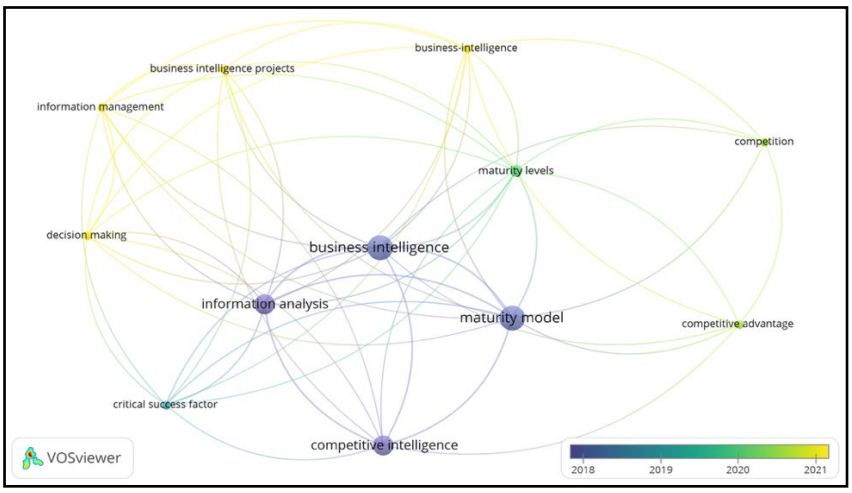

Figure 4: Bibliographic Overlay Visualisation of Keyword Occurrence: 2018–2021 (own source developed for this study, 2025)

The word cloud in Figure 5 visually highlights the prominence of key terms across the 10 academic journal articles. Dominant terms include 'Maturity', 'Intelligence', 'Business', and 'Model', indicating core conceptual interests. Clusters of related terms such as 'analytics', 'data', 'enterprise', and 'competitive advantage' show a convergence on performance and insight-driven decision-making. BI is heavily represented, while CI appears moderately and with fewer contextual terms. Critical success factors, assessment frameworks, and governance are present, suggesting a focus on strategic enablers. Health care, SMEs, and utilities emerge as key industry contexts. Methodological terms like 'qualitative surveys' and 'semi-structured interviews' reflect a qualitative research orientation. Thematic gaps include scenario planning and early warning systems under CI. This imbalance highlights the underdevelopment of competitive intelligence maturity frameworks. For entrepreneurial contexts, the word cloud reveals a growing need for integrative models that align BI and CI in pursuit of sustainable competitive advantage.

Figure 5: Word Cloud Based on Keyword Frequency from 10 Academic Journal Articles (own source developed for this study, 2025)

5. Conclusion

This study provided an overview of existing Business Intelligence and Competitive Intelligence maturity models, highlighting their relevance and application potential for entrepreneurial decision-making. Through VOSviewer bibliometric mapping, keyword co-occurrence analysis, and thematic clustering, it is evident that BI maturity models are more extensively developed and widely adopted, with a clear focus on enhancing internal data-driven capabilities, strategic alignment, and technological integration. Conversely, CI maturity models remain underexplored, signalling a critical gap in frameworks that support external insight generation, such as competitor analysis and market trend monitoring. For entrepreneurs operating in fast-paced and uncertain environments, this imbalance presents both a challenge and an opportunity. The study recommends the development of integrative BI-CI maturity frameworks that combine internal and external intelligence to support holistic, agile, and informed decision-making. Bridging this gap can empower entrepreneurs to not only optimise internal operations but also adapt strategically to competitive pressures, ultimately fostering innovation and long-term sustainability.

Ethics Declaration

Ethical clearance was obtained from the University of Johannesburg's, College of Business and Economics (CBE) Research Ethics Committee. Ethics clearance for this research was approved on 10 August 2022. Reference number: 2022SCiiS038.

AI Declaration

The authors declare that the Artificial Intelligence (AI) tool, ChatGPT by OpenAI, was used. The AI assistance was limited to idea organisation and all intellectual content, critical analysis, and final interpretations were conducted by the authors. The use of AI tools complied with ethical standards and authorship criteria.

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