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BUSINESS INTELLIGENCE IN THE CONTEXT OF THE INTELLECTUALIZATION OF ANALYTICAL INFORMATION SYSTEMS

Abstract. Business Intelligence (BI) systems have long served as a primary mechanism for decision support by providing standardized metrics, consistent semantic logic, and stable analytical artifacts such as reports and dashboards. This paradigm enables reproducibility of analytical outputs and comparability of indicators within recurring managerial cycles. At the same time, the intellectualization of analytical systems, the rapid growth and heterogeneity of data sources, and the increasing prevalence of iterative and context-dependent decision questions expose limitations of an artifact-centered BI approach. These limitations emerge across the “data–interpretation” chain, including issues of integration and data quality, the rigidity of predefined analytical logic, the proliferation of analytical artifacts and the rising effort required to maintain them, as well as interpretation gaps between user context and the analytical model. The paper provides a theoretical and analytical examination of BI in the context of intelligent analytical ecosystems and systematizes the key constraints of traditional BI practices with respect to requirements for timeliness, flexibility, and controllability of analytical results. Based on this analysis, the study proposes an author’s hybrid BI–RAG concept in which BI artifacts remain the canonical representation of standardized metrics and act as a “source of truth” for recurring decision scenarios, while retrieval-augmented generation (RAG) is introduced as a conversational interface for accessing analytical information. In the proposed approach, the RAG layer supports contextual explanation, navigation to relevant BI artifacts, and iterative request formalization, while emphasizing an evidence-based interpretation principle grounded in relevant knowledge sources. The scientific novelty of the work lies in formalizing the hybrid interaction model through an actor model, a reference architecture of the BI–RAG setup, and a generalized workflow model for decision-request handling. The workflow representation indicates that introducing a “RAG-first” stage can reduce the number of process steps between a user’s request and access to relevant analytical information in cases where the request can be addressed through explanation or routing to an existing canonical BI view. The results have theoretical significance for the development of approaches to organizing modern analytics ecosystems and practical value for designing hybrid analytics access solutions under data governance requirements and controlled change management.

Keywords: analytical information systems, decision support systems, data analytics, artificial intelligence, retrieval-augmented generation (RAG), data-driven decision-making, analytical ecosystems.

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BUSINESS INTELLIGENCE В УМОВАХ ІНТЕЛЕКТУАЛІЗАЦІЇ АНАЛІТИЧНИХ ІНФОРМАЦІЙНИХ СИСТЕМ

Анотація. Системи Business Intelligence (BI) тривалий час залишалися основним інструментом підтримки управлінських рішень завдяки використанню стандартизованих метрик, узгодженої семантичної логіки та артефактів у вигляді звітів і дашбордів. Такий підхід забезпечував відтворюваність аналітичних результатів і порівнюваність показників у межах повторюваних управлінських циклів. Водночас інтелектуалізація аналітичних систем, зростання обсягів і різноманітності даних, а також поширення ітеративних і контекстно-залежних управлінських запитів зумовлюють появу обмежень артефактно-орієнтованої парадигми BI. Ці обмеження проявляються на різних етапах аналітичного ланцюга дані - інтерпретація, зокрема на рівнях інтеграції та якості даних, жорсткості наперед визначеної аналітичної логіки, масштабування кількості артефактів і складності їх підтримки, а також розриву інтерпретації між користувачем і аналітичною моделлю. У статті здійснено теоретико-аналітичний розгляд ролі BI в умовах інтелектуалізації аналітичних систем та систематизовано ключові обмеження традиційних BI-підходів із урахуванням вимог оперативності, гнучкості та керованості аналітичних результатів. На основі цього запропоновано гібридну концепцію BI–RAG, у межах якої BI-артефакти зберігаються як канонічне представлення стандартизованих метрик і слугують джерелом істини для повторюваних управлінських сценаріїв. Тоді як retrieval-augmented generation (RAG) розглядається як діалоговий інтерфейс доступу до аналітичної інформації. RAG-орієнтований підхід використовується для контекстного пояснення результатів, навігації до релевантних BI-артефактів, формалізації ітеративних запитів та підтримки доказового принципу інтерпретації на основі релевантних джерел знань. Наукову новизну роботи становить формалізація гібридної моделі взаємодії у вигляді Use-Case діаграми, референсної архітектури BI–RAG та узагальненої процесної моделі опрацювання управлінського запиту. Запропонована процесна модель демонструє, що введення етапу попередньої взаємодії з RAG-інтерфейсом може скорочувати кількість процесних кроків між запитом користувача та доступом до релевантної аналітичної інформації у випадках, коли запит може бути задоволений шляхом пояснення або маршрутизації до наявного BI-представлення. Отримані результати мають теоретичне значення для розвитку підходів до організації аналітичних екосистем і практичну цінність для проектування гібридних рішень доступу до аналітики з урахуванням вимог data governance та керованості змін.

Ключові слова: аналітичні інформаційні системи, системи підтримки прийняття рішень, аналітика даних, штучний інтелект, *retrieval-augmented generation (RAG)*, прийняття рішень на основі даних, аналітичні екосистеми.

1. Introduction

Business Intelligence (BI) information systems are widely regarded as a class of decision support systems intended for the collection, processing, analysis, and visualization of data in order to improve the quality of managerial decision-making [1]. By relying on standardized metrics, reporting practices, and analytical visualization instruments, BI systems have for a long period served as a foundational toolkit for organizational analytics and management control. A synthesis of research on BI and analytics also confirms the maturity of this domain as a distinct class of information systems and highlights the diversity of approaches used to assess their effectiveness [2].

The contemporary analytical environment is characterized by an increase in both the volume and the heterogeneity of data, accompanied by higher expectations regarding the speed of interpretation and decision-making. The continuous growth of data and information that require timely interpretation increases the importance of effective visualization for decision support. Conventional analytical procedures may be time-consuming, particularly when preparing analyses for large and heterogeneous datasets [3]. An additional factor is the increasing involvement of non-specialized users in data-related activities, which amplifies the importance of interface accessibility, interpretability of results, and reduction of user cognitive load.

The rapid development of artificial intelligence (AI) technologies has contributed to the intellectualization of analytical systems, including the broader adoption of machine learning and automated decision-support mechanisms in digital environments [4]. Within the BI discourse, this trend is reflected, among other notions, in the concept of augmented analytics, which extends the boundaries between traditional BI (reporting, OLAP, dashboards) and AI-enabled analytics [5]. A distinct role is played by Natural Language Interfaces to Data (NLID), which are considered in the literature as a means of enabling non-technical users to interact with data without requiring knowledge of query languages such as SQL, including through conversational interaction scenarios [6].

Research problems arise regarding the extent to which the traditional BI paradigm - centred on predefined data models, metrics, and reporting forms - remains sufficient under the conditions of analytical systems intellectualization, accelerated decision-making, and the expansion of the analytics user base. The practical significance of this problem is associated with aligning BI capabilities with contemporary requirements for timeliness, flexibility, and explainability of analytical outcomes; its theoretical significance lies in the further development of approaches to designing analytical information systems as hybrid solutions, in which classical BI components are combined with intelligent mechanisms for data interaction. In practical terms, these changes transform the organizational role of BI systems. In particular, the share of irregular (ad-hoc) requests increases, and such requests require not only access to aggregated indicators but also rapid clarification of context, including metric definitions, applied filters, calculation assumptions, and the boundaries of interpretation. Under these conditions, the traditional interaction model request stakeholder, analyst, report may increase the analytical lead time and may amplify dependence on specific expert roles, which complicates the scaling of the analytical function within an organization.

2. Related work

Related work on BI and analytics can be grouped into four streams relevant to this paper. First, BI is studied as an organizational and technological mechanism for transforming data into managerial insights and supporting recurring decision cycles. Second, the augmented analytics agenda examines how AI/ML automates parts of the analytics lifecycle and shifts interaction toward more user-centric and semi-automated workflows. Third, research on natural-language interfaces to data investigates conversational querying and multi-turn clarification as a way to reduce access barriers for non-technical users. Fourth, retrieval-augmented generation is emerging as a general paradigm for evidence-grounded assistants, creating a foundation for hybrid analytics access where explanations and navigation are supported by retrieved organizational knowledge. This paper positions its contribution at the intersection of these streams by proposing a hybrid BI-RAG concept and formalizing it through interaction and workflow models.

Recent publications underline that the continuous growth in both volume and variety of information that must be interpreted and analyzed rapidly drives the need for new forms of visualization to support managerial decision-making, while standard analytical procedures are often time-consuming [3]. This framing is consistent with a broader body of BI and analytics research that treats Business Intelligence and Analytics as an evolving domain aimed at transforming data into actionable insights and decision support, shaped by changing data characteristics and technological capabilities [7].

International research emphasizes the evolution of Business Intelligence and Analytics beyond static reporting toward wider analytics practices that combine data, methods, and organizational processes [7]. Within this trajectory, the concept of augmented analytics highlights the increasing automation of parts of the analytics lifecycle through AI/ML techniques and the strengthening of user capabilities in interacting with data and interpreting results [5].

A distinct and rapidly developing research stream concerns Natural Language Interfaces to Data (NLIDB/NLI) and the transition from one-shot queries to conversational analytics, where dialogue context is used to disambiguate and refine user intent across multiple turns [6]. In this context, text-to-SQL approaches - particularly those based on deep learning - have shown strong progress; surveys note that several challenges remain open, keeping the field active in both research and development [8].

Retrieval-augmented generation (RAG) has emerged as a prominent paradigm combining retrieval with generation and is discussed as a state-of-the-art foundation for conversational agents and knowledge-centric assistants

[9]. In analytics settings, this creates a pathway for hybrid solutions in which traditional BI components are complemented by intelligent, context-aware access to data and organizational knowledge.

Within Ukrainian scholarly discourse, BI is frequently examined in relation to decision support systems, OLAP technologies, and data mining, with attention to architectural principles and future integration directions [10]. Another line of work proposes aligning expert systems with the Business Intelligence 2.0 concept through integration with OLAP, data mining, and knowledge management components [11]. Additionally, publications explicitly addressing the integration of AI and business analytics for managerial decision support discuss key implementation barriers and expected benefits from automation [12]. Contemporary Ukrainian works also analyze opportunities and challenges of business analytics in management under digital transformation conditions [13].

3. Purpose of the study

To examine the role of Business Intelligence systems under the intellectualization of analytical systems.

Objectives of the study:

- To synthesize approaches to viewing Business Intelligence as a class of analytical information systems and decision support systems.
- To characterize current changes in the analytical environment related to data growth and heterogeneity and the involvement of non-specialized users.
- To analyze the fundamental principles of BI operation (metrics, reporting, dashboards) in the context of contemporary analytical needs.
- To identify limitations of traditional BI approaches with respect to timeliness, flexibility, and contextual interpretation of analytical results.
- To outline directions for the transformation of BI as a component of a modern analytical ecosystem in the context of intelligent data interaction approaches.

4. Results and discussion

4.1 Business Intelligence as a class of analytical information systems

Business Intelligence (BI) can be described as a class of analytical information systems that supports managerial decision-making by organizing data flows and producing structured analytical outputs for interpretation. In Ukrainian academic and educational literature, BI is typically discussed together with related concepts and technologies of intelligent data processing and analytical infrastructure, including Data Warehouse, OLAP, and Data Mining as core elements of the analytical toolkit [14].

From a practical standpoint, BI solutions institutionalize analytics in an organization through repeatable forms of analytical representation, most commonly in the form of reports, dashboards, and interactive exploration mechanisms. These artifacts allow organizations to monitor indicators, compare results over time, and reproduce analytical logic across different stakeholder groups. At the architectural level, such reproducibility is achieved by linking analytical artifacts to consolidated data stores and to an agreed analytical logic (e.g., shared structures, metrics, and calculation rules) [11]. To conceptualize BI as a class of analytical information systems, it is useful to represent it as a layered architecture in which reporting and visualization artifacts are outcomes of upstream processes of integration, storage, and formalization of analytical logic. This framing explains the reproducibility of reports and the consistency of metric definitions across an organization (Figure 1).

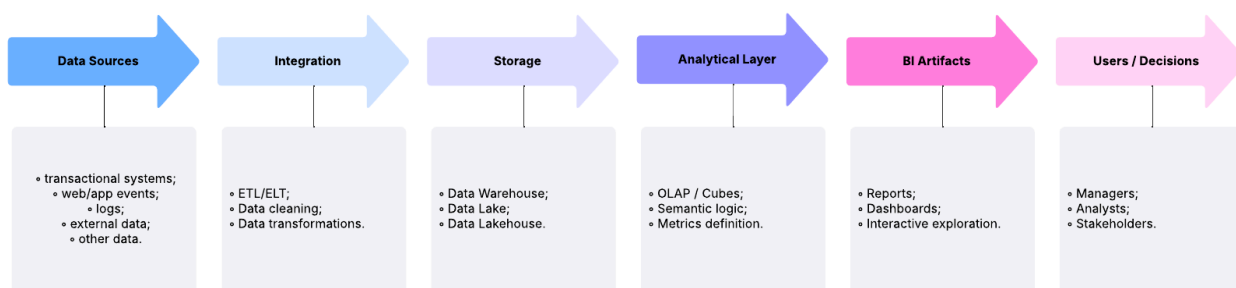


Fig. 1 Layered conceptual architecture of BI in the data-to-insight chain

In this framing, BI is not limited to visualization as such. Rather, it represents a structured approach to packaging analytical knowledge into stable artifacts that can be consumed by multiple user groups. This approach presupposes that a relevant part of analytical questions can be formalized into measurable indicators and represented via predefined structures.

BI artifacts can be differentiated by the decision-support tasks they serve. Table 1 shows that reports, dashboards, and interactive exploration differ in purpose and user interaction patterns, which provides a basis for discussing evolving analytical requirements and the limitations of traditional BI approaches in subsequent sections.

Table 1

BI artifacts and decision-support tasks		
BI artifact	Primary purpose	Typical user interaction
Reports	Standardized periodic reporting	reading, comparison over time
Dashboards	Operational monitoring of key indicators	overview, filtering by preset dimensions
Interactive exploration	Analytical investigation of specific questions	ad-hoc filtering, drill-down, segmentation

4.2 Actual evolution of analytical requirements under the intellectualization of analytical systems

Current analytical practice indicates a growing interest in intelligent, AI-assisted mechanisms for interacting with data and for automating parts of the analytics lifecycle. In particular, a Gartner press release reports the results of a survey of 403 analytics or AI leaders (conducted between October and December 2024), where over 50% of respondents reported that their organizations use AI tools for automated insights and natural-language capabilities for analytics or AI development [15]. This evidence is consistent with the broader premise that intellectualized interfaces are increasingly expected to shorten the cycle between a question and an interpretable analytical output.

Empirical findings from industry surveys suggest that the evolution of requirements is not limited to user interfaces; it is also driven by stronger expectations regarding data reliability and controllability. For example, BARC's Data, BI and Analytics Trend Monitor 2025 identifies data security and privacy as the leading global priority and data quality management as the second, while data governance remains among the top trends [16]. This highlights that, in an AI-influenced analytics environment, organizations increasingly emphasize robust data practices, without which analytical conclusions are difficult to reproduce and trust.

Under these conditions, the nature of analytical requests shifts. Alongside standardized reporting and routine monitoring, irregular (ad-hoc) questions become more prominent, typically requiring iterative refinement, drill-down, and contextual clarification. Such tasks increase the importance of interactive exploration and short feedback loops between users and analytical environments.

The analytics user base expands, making user-centric requirements more salient. The existence of large, recurring end-user surveys in the BI/analytics domain indicates the maturity of systematic evaluation practices focusing on practical value and user-oriented characteristics [17]. In the context of intellectualization, this translates into requirements for lowering access barriers, improving consistency of meaning across stakeholder groups, and ensuring transparency of metric definitions.

Finally, modern analytics increasingly demands contextualization, explainability, and reproducibility. Stakeholders expect not only values and visual summaries, but also clarity on:

- which data were used;
- how indicators were computed;
- under which assumptions results are valid for managerial interpretation.

Intellectualization does not imply a simple replacement of BI; rather, it changes the balance of requirements, from a dominant focus on reporting and visualization toward combining rapid, dialogue-like access to data with disciplined data practices such as quality, security, governance. This framing provides a basis for examining limitations of traditional BI approaches in the subsequent section.

4.3 Limitations of Traditional Business Intelligence Approaches

Traditional BI solutions remain effective for standardized reporting and monitoring tasks. However, under the intellectualization of analytical systems and the evolving requirements discussed in the previous section of this article, a set of limitations becomes more visible. Evidence from research on information visualization and decision-making suggests that dashboards should not be treated as a direct guarantee of better decisions; rather, effects depend on the properties of the presented information and the context of use [18].

BI typically delivers outputs through artifacts (reports and dashboards) that structure information for quick review and comparison. Experimental research highlights that the mechanisms through which dashboards influence decision-making are non-trivial and depend on visualization-related factors and user perception; the literature also notes that, despite the widespread use of analytics, knowledge about how dashboards enhance decision-making remains limited [19]. This aligns with review research that systematizes the effects of information visualization on judgment and decision-making and reports that outcomes may vary depending on context and on the evaluation criterion [18]. Figure 2 summarizes the placement of commonly discussed limitations of traditional BI within the data-to-insight pipeline.

Traditional BI relies on predefined structures that are embodied in concrete artifacts. As the diversity of questions and the number of stakeholders increase, an artifact-based model may lead to proliferation of dashboards and reporting variants:

- multiple pages;
- versions;

- role-specific views.

Attempts to build universal dashboards have inherent constraints, because different roles and decision scenarios require different context, different levels of granularity, and different perspectives on what is relevant. As a result, BI maintenance becomes a continuous activity involving:

- modifications;
- change coordination;
- versioning;
- preservation of metric consistency;
- ensuring interpretability for end users.

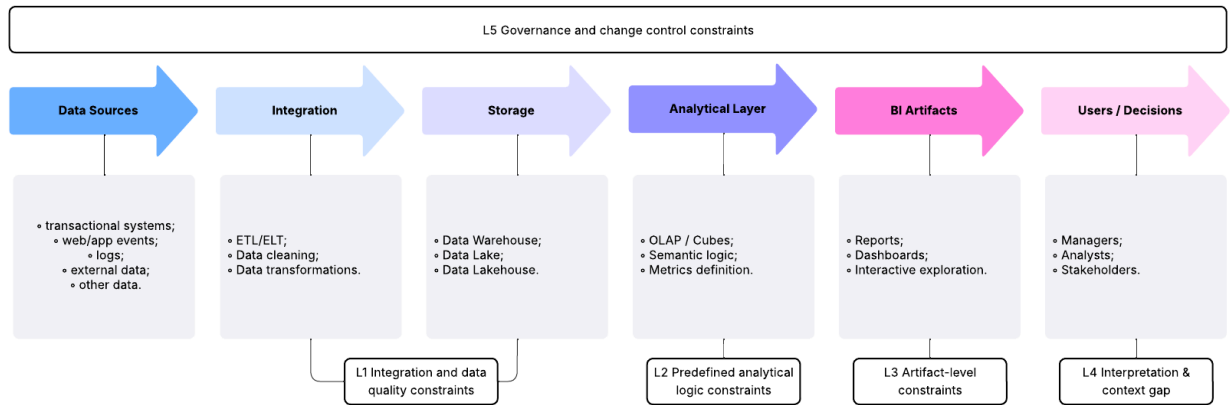


Fig. 2 Mapping of traditional BI limitations to stages of the data-to-insight pipeline

This limitation is especially relevant under the logic of the previous section: as questions become more iterative and context-dependent, embedding answers into dashboards can require substantial effort for maintaining and evolving the artifact layer as a knowledge interface. To summarize the key limitations discussed in this part and their underlying mechanisms, Table 2 presents a compact mapping from limitation to mechanism and practical implications.

Table 2

Limitations of traditional BI: mechanism and implications for analytical practice

Limitation	Mechanism	Implication
Dashboards do not guarantee improved decision quality	- Decision outcomes depend on information characteristics and decision context; - visualization effects can be context-dependent.	Need for contextualization, transparency of assumptions, and interpretability beyond visual summaries.
Artifact-based delivery increases maintenance effort	- Answers are embedded into reports and dashboards; - growing diversity of stakeholders and questions leads to more artifact variants and frequent changes.	Growth of operational workload: - change coordination, - versioning, - metric consistency, - user communication.
Universal dashboards have inherent limits	- Different roles require different granularity, filters, and definitions; - one interface cannot satisfy all decision contexts simultaneously.	Need for segmentation of artifacts, role-oriented views, or complementary interaction modes
Metric and semantic rigidity limits ad-hoc analysis	Predefined metric logic and semantic structures constrain the types of questions that can be answered without re-modeling	- Increased time-to-answer for novel questions; - pressure toward more flexible approaches.
Upstream data issues propagate to BI artifacts	Integration complexity and data quality problems affect correctness and trustworthiness of BI outputs	- Need for disciplined data practices; - otherwise BI artifacts lose credibility.

Figure 3 summarizes a generalized workflow of decision-request handling in an artifact-centered BI model, highlighting typical stages of clarification, sourcing, development, and approval.

The effectiveness of BI artifacts depends not only on visualization but also on the quality and consistency of input data. Intellectualization further strengthens this dependency due to the need for heterogeneous data and shorter preparation cycles. Research on heterogeneous data integration indicates that integration in the big-data era becomes increasingly difficult due to format diversity, semantic heterogeneity, and structural differences, with persistent challenges related to semantics and unstructured data [20].

Data quality constitutes another persistent limitation in BI contexts. Review research addressing data quality in BI emphasizes the systemic nature of data-quality issues and the need for proactive measures to ensure reliable analytics [21]. Industry survey evidence is consistent with the practical salience of these topics: BARC Trend Monitor 2025 identifies data security & privacy and data quality management among leading priorities [16].

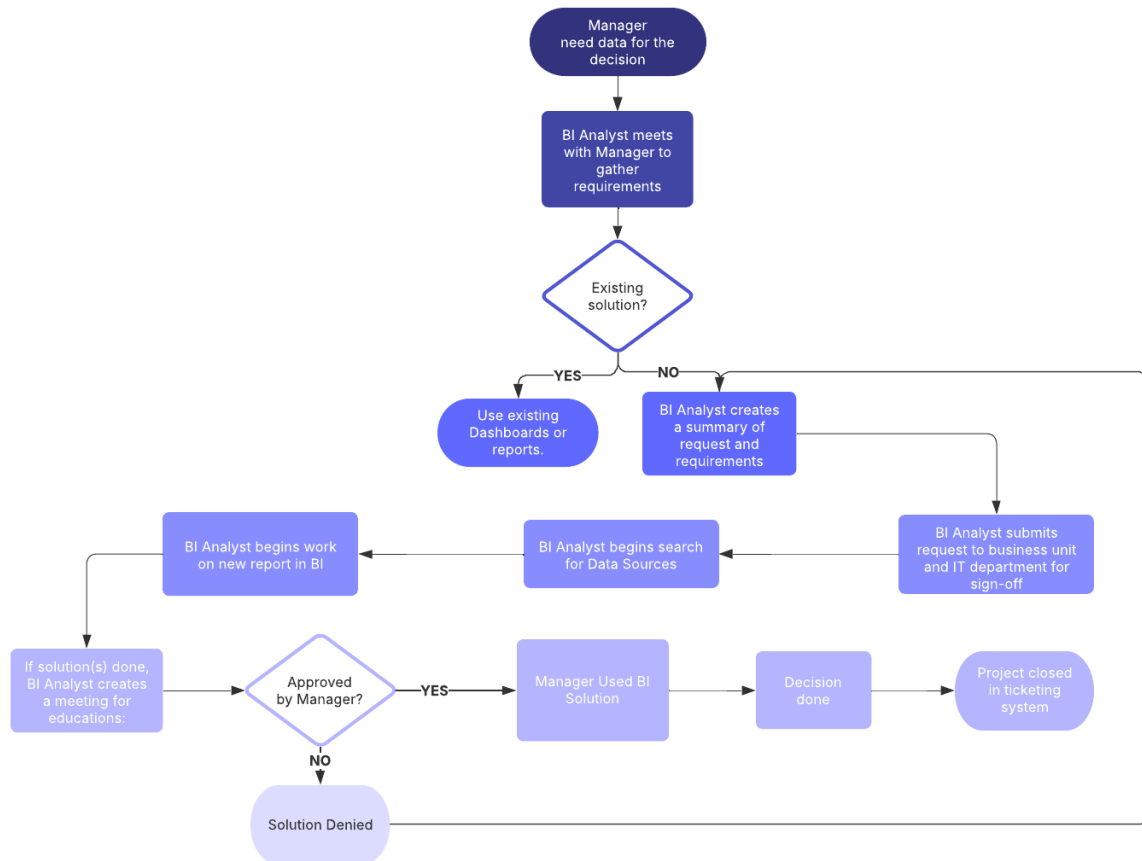


Fig. 3 Generalized workflow of decision-request handling with traditional BI system

As analytics user bases expand and self-service practices grow, organizations increasingly need mechanisms that ensure consistent metric meaning, access control, controlled change processes, and reproducibility of analytical conclusions. The academic literature frames data governance as an organizational-technical discipline with defined building blocks and dimensions aimed at managing data as an organizational asset [22].

Studies on data governance implementation emphasize significant obstacles and resource costs, which may increase the lead time for changes in data and metrics and create tension with timeliness requirements [23]. This implies that modern analytics environments face not only a demand for faster answers but also a demand for disciplined data practices that require institutional effort. The discussed role of data governance can be interpreted as a cross-cutting requirement that improves consistency and controllability of analytical outputs, while simultaneously increasing organizational complexity of change. To summarize this tension, Figure 4 presents a conceptual trade-off among timeliness, governance, and flexibility of analytical interactions.

Even with technical infrastructure in place, BI outcomes depend on organizational acceptance, user skills, decision processes, and change management practices. A systematic review of BI adoption factors highlights the multiplicity of determinants that influence successful BI adoption across contexts [24]. In addition, research on BI implementation emphasizes the importance of implementation approaches and the interaction of organizational factors that can enable or hinder BI acceptance [25].

Collectively, these limitations suggest that traditional BI is effective within stable artifact-based practices supported by disciplined data management, but modern analytical environments increasingly expose tensions among timeliness, flexibility, and governance. This tension motivates the transformation of BI and the emergence of hybrid approaches, which are discussed in the next section.

4.4 Hybrid BI–RAG concept for modern analytical ecosystems

Previous sections have shown that traditional BI approaches are effective for standardized reporting and monitoring. However, in contemporary analytical environments, limitations become more visible due to the iterative and context-dependent nature of questions, the expansion of the analytics user base, and the need to maintain metric consistency and controlled change processes. This section presents an author's conceptual model for reinterpreting the role of BI within an analytical ecosystem. The model separates two complementary interaction modes:

- BI as a layer of standardized artifacts and metric definitions. Serving as a source of truth for recurring decision cycles.
- RAG-based conversational access as an intelligent interface that supports contextual, iterative, and explanatory interaction with analytical information.

The proposed concept distinguishes two mutually reinforcing modes of analytical interaction:

- Artifact mode (BI) represents analytical outputs as reports and dashboards based on predefined metrics, filters, and slices. Its advantages include standardization, temporal comparability, and procedural reproducibility. Artifact mode is less flexible when questions require iterative refinement, alternative contexts, or non-standard combinations of dimensions
- Conversational mode (RAG-based access) is defined as a natural-language interface for asking questions and refining them iteratively, obtaining explanations of metrics, filters, and assumptions, and navigating existing BI artifacts. In this mode, the evidence-based principle is essential: textual interpretations are grounded in retrieved knowledge sources rather than in implicit assumptions.

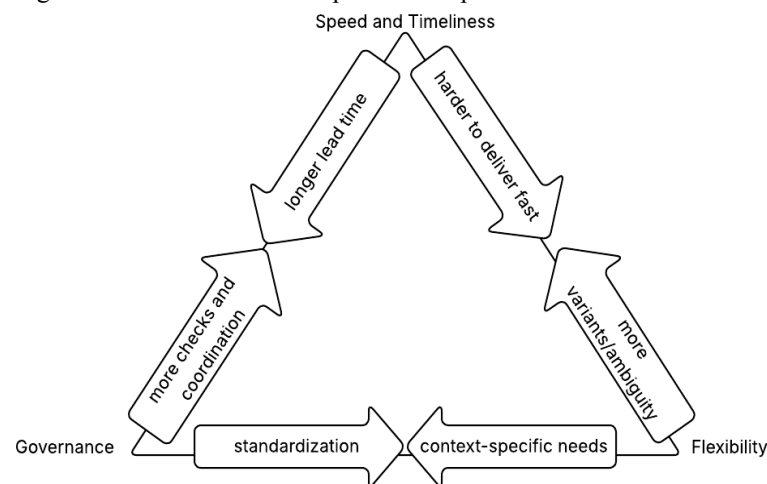


Fig. 4 Conceptual trade-off among speed, governance, and flexibility in analytical systems

Crucially, the conversational mode does not replace BI artifacts as canonical representations of metrics; rather, it complements them by providing contextualization, explainability, and reduced access barriers for users.

For a practical description of a hybrid model, it is useful to explicitly define actors and typical interactions. This makes it possible to formalize where organizational workload arises and to identify which interaction steps can be shifted into a conversational layer without compromising controllability and consistency. Within the proposed framework, the following typical actors can be distinguished:

- decision stakeholders (executives, domain owners, product/marketing managers) as request initiators;
- analysts, BI developers responsible for metrics, artifacts, and interpretations;
- data engineers, data owners responsible for integration and data availability;
- governance, security function responsible for standards, access control, and change control;
- conversational component (RAG assistant) acting as an interface that retrieves relevant knowledge sources and produces responses with references to those sources or to relevant BI artifacts.

These roles imply a set of recurring interactions that determine how analytical questions are formulated, validated, and answered. Figure 5 visualizes the proposed actor-level interaction model for the hybrid BI–RAG approach.

The proposed concept assumes that standardized metrics and their canonical visual representations remain within the BI layer, while the conversational component leverages structured knowledge for explanation and navigation, providing users with a shorter path to relevant information. A reference architecture can be described through the following building blocks:

- BI layer: data sources, integration, storage, analytical logic/semantic layer, BI artifacts.
- Knowledge base: metric definitions and assumptions, filtering rules, source descriptions, artifact catalog, interpretation guidance, typical scenarios.
- Retrieval subsystem: selection of relevant evidence from the knowledge base and/or artifact metadata conditioned on permissions and query context.
- Generation subsystem: response construction that includes a textual interpretation, references to the used evidence, and, when needed, clarification questions or recommendations to open a relevant BI artifact.

- Interaction channel: a chat interface as the entry point for users, supporting routing to BI artifacts or providing contextual explanations.

To clarify the proposed hybrid concept, it is useful to consider a process model of decision-request handling in which BI artifacts remain the canonical representation of metrics, while a RAG-based conversational interface becomes the primary entry point for user interaction with analytical information. Unlike an artifact-centered approach, where the path to an answer typically involves requirements clarification, data sourcing, artifact development or modification, and approval cycles, the proposed scenario shifts a portion of these operations into an initial conversational stage focused on clarification and navigation.

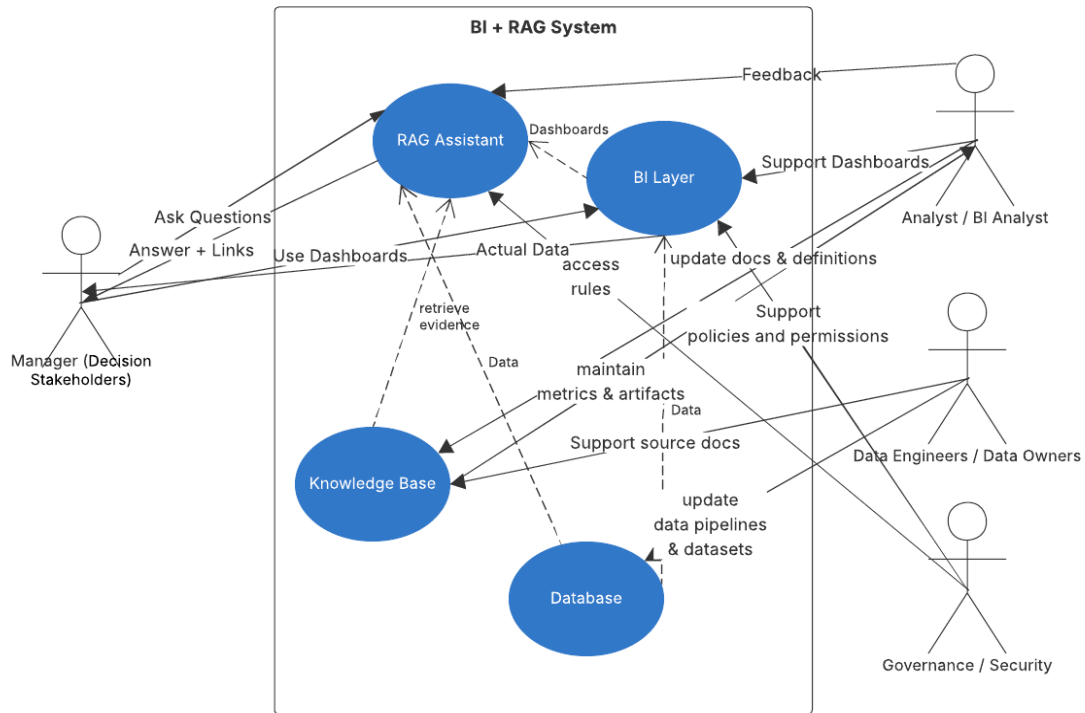


Fig. 5 Use-case actor model of hybrid BI-RAG System

Figure 6 presents a generalized workflow of request handling under integration of a RAG approach with a BI system. The key difference is the introduction of the step using a RAG chat before submitting a formal request, which changes the trajectory of interaction between the user and the analytics function. When the user initiates the process via the conversational interface, the system may provide an answer within the available context or route the user to a relevant existing BI artifact. In such cases, the need to formalize the request through an analyst is reduced, and the number of intermediate coordination steps is decreased because typical clarifications occur before launching a full artifact-development cycle.

If the conversational interface cannot satisfy the information needed, the process transitions to the traditional workflow: an analyst produces a structured summary of the request and requirements, identifies data sources, develops or modifies a BI artifact, and proceeds through approval and handover steps. Thus, within the proposed model, the RAG interface does not remove the role of the analytics team; instead, it acts as a preliminary interaction layer that may reduce the number of cases in which a full artifact creation or maintenance cycle is triggered by questions that can be resolved via navigation, contextual clarification, or explanation of existing definitions. This highlights a potential effect of the proposed approach: a reduction in the number of process steps between a decision request and obtaining relevant analytical information for requests that can be resolved via navigation, contextual clarification, or explanation of existing definitions.

It is important to emphasize that Figure 6 illustrates not automated decision-making, but a structural change in how access to analytics is organized. Provided that the knowledge base and artifact catalog contain sufficient relevant content, an answer or a route to a canonical representation can be obtained through a shorter interaction chain. This illustrates the intended mechanism of the proposed approach: reducing the number of coordination steps in scenarios where requests can be resolved through explanation or routing to an existing canonical BI view. While the separation of tasks and the limitations of the hybrid model are addressed in the subsequent subsections.

To avoid interpreting the hybrid model as a full replacement of BI, the relationship between BI and RAG is described through decision-support task classes. The proposed separation is as follows:

- BI tasks: periodic reporting, KPI monitoring, dashboards for recurring decision cycles where standardization and comparability are primary.
- RAG tasks: explaining metric and filter logic, locating definitions and interpretation guidance, navigating the artifact catalog, producing short contextual briefs, and supporting iterative refinement of questions.

- Hybrid tasks: scenarios where a contextual question requires routing to a BI artifact for verification/monitoring, or where outputs from an artifact require clarification of assumptions, metric definitions, or filtering logic.

Requirements and limitations of the proposed concept. Implementing the hybrid concept requires conditions that preserve controllability and reliability:

- Quality of the conversational layer depends on the quality of retrieval and the knowledge base: incomplete metric definitions, missing filtering rules, outdated artifact descriptions, or ambiguous formulations reduce correctness and reproducibility.
- Conversational access must be aligned with governance and security requirements: permissions-aware access to data and artifacts, controlled change processes, versioning of metric definitions, and avoidance of parallel unofficial interpretations of indicators.
- Reliability should be supported through evidence-based responses: references to used sources, explicit assumptions and scope limitations, and, where necessary, clarification questions rather than categorical statements under insufficient context.

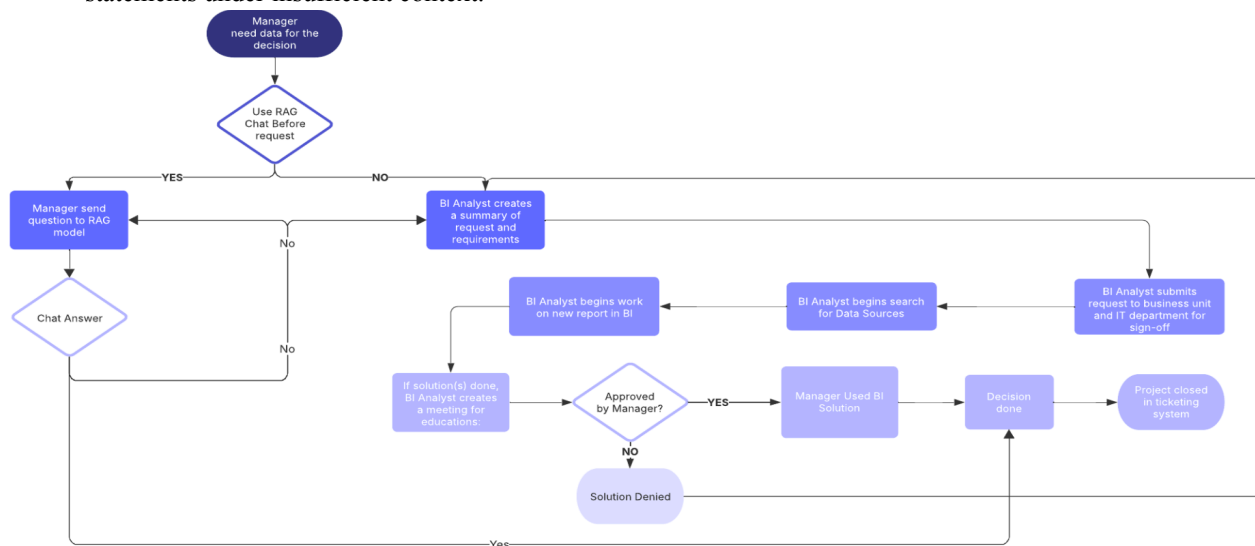


Fig. 6 Generalized workflow of decision-request handling with RAG and BI system

The proposed concept treats BI as a necessary layer of standardized artifacts and metrics, while RAG-based conversational access serves as a complementary interface for iterative, contextual, and explanatory scenarios. The as-is versus to-be process comparison conceptually explains how the hybrid model may reduce the organizational burden of the artifact layer without violating requirements for metric consistency and controlled change.

5. Conclusion

Business Intelligence systems have long served as a core instrument for decision support by providing standardized metrics, semantic consistency, and stable analytical artifacts such as reports and dashboards. However, the intellectualization of analytical systems, the growing diversity of data sources, and the shift toward iterative, context-dependent questions intensify the limitations of an artifact-centered BI paradigm. In particular, BI effectiveness depends on how well predefined analytical logic matches the actual managerial context, while the proliferation of dashboards and continuous modifications increase the maintenance burden for analytics teams and complicate metric consistency. Strengthening data governance improves controllability and reproducibility of analytical outputs, yet it also amplifies the tension between response speed, flexibility, and change-control requirements.

To address these limitations, this paper proposes a hybrid BI-RAG concept in which BI artifacts are preserved as canonical representations of standardized metrics, whereas a RAG-based conversational interface is treated as an interaction layer enabling contextual explanation, navigation to relevant artifacts, and structured escalation to the analytics team when a request cannot be satisfied by existing definitions or artifacts. The work provides an actor model and a reference architecture for the hybrid setup, as well as a generalized workflow model showing that introducing a RAG-first step can reduce the number of process steps in scenarios where information needs can be met through explanation or routing to an existing canonical BI view.

Future research should focus on formalizing quality criteria and empirically validating the proposed model, including evaluation of retrieval quality and grounded answer quality, assessment of how knowledge base completeness affects escalation rates and analytics workload, and further specification of governance procedures as a prerequisite for scaling conversational analytics access in organizational settings.

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Надійшла до редакції: 01.02.2026

Прийнята до друку: 15.09.2026

Опубліковано: 30.09.2026