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Disclosure of Key Performance Indicators for Intangible Assets in the Pharmaceutical Industry

ABSTRACT

Objective: This study investigates the most frequently disclosed KPIs used by pharmaceutical companies to report internally generated intangible assets, based on a document analysis of annual and supplementary reports.

Method: For this purpose, we used the European Commission's Scoreboard database. The pharmaceutical sector was selected to assess the impact of intangible assets in this industry. Reports from 48 pharmaceutical companies were analyzed; among them, 13 disclosed KPIs related to intangible assets and thus constituted the basis for the analysis. The KPIs identified in these reports were classified as financial or non-financial.

Originality/Relevance: The measurement and reporting of internally generated intangible assets have long been a challenge for corporations. This study addresses this gap by analyzing which KPIs are currently used to disclose these assets. From this perspective, we highlight KPIs as essential communicators of internally generated value.

Results: The analysis demonstrated that the most frequently used and disclosed indicators were CapEx, OpEx, EBIT, number of employees, and Scope 1 and 2 greenhouse gas (GHG) emissions. Furthermore, a lack of standardization in KPIs was observed, along with the absence of calculation detail in many cases, which hinders comparability across companies.

Theoretical/Methodological contributions: The study uses a public database (Scoreboard) to select and relate financial data to the specific KPIs employed in the industry.

Keywords: KPIs, Intangible assets, Pharmaceutical industry, Corporate disclosure, R&D.

Jorge Marcelino Nunes Junior
University of São Paulo (USP)
São Paulo, Brazil
jorgenunes@usp.br

Ricardo Luiz Menezes da Silva
University of São Paulo (USP)
São Paulo, Brazil
rlms@fearp.usp.br

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1 INTRODUCTION

In the pharmaceutical industry, the scarcity of new drugs and the expiration of existing patents may reduce future research productivity, since sales finance research and development (R&D) investments (Cardinal & Hatfield, 2000). In this context, firms' ability to sustain high levels of innovation increasingly depends on the internal development of technological competencies and innovative capabilities.

McMillan et al. (2003) argue that organizations should develop innovations internally, whose output can be assessed using indicators such as the number of patents under their control. De Carolis (2003) corroborates this relationship between knowledge-generation capacity and patent counts, reinforcing the idea that internally generated intangible assets constitute strategic resources for the firm. In the pharmaceutical industry, this logic is particularly relevant: Artz et al. (2010) show that greater investments in R&D translate not only into an expanded drug pipeline and more patents but also into improved organizational performance. Despite their importance, intangible assets remain difficult to measure and disclose consistently and comparably in financial statements (Kianto et al., 2020). In response to these practical and informational limitations, initiatives have emerged to standardize metrics, including proposals for key performance indicators (KPIs) and frameworks that combine financial and non-financial indicators, with the objective of making communication about intellectual capital more transparent and useful for investors and other stakeholders (WICI, 2016).

To operationalize this proposal, the World Intellectual Capital Initiative (WICI) introduced KPIs to measure critical value-creation factors. These indicators are defined as quantitative metrics that reveal performance trends over time and translate intangible dimensions into structured and comparable information (WICI, 2016). This emphasis on KPIs aligns with the debate on integrated reporting, in which non-financial indicators function as

links between strategy and reporting, aligning strategic objectives, supporting managerial narratives, and informing decision-making, as discussed in the literature on the disclosure of intangible assets (Dumay & Guthrie, 2017; Vitolla et al., 2019).

Beyond their measurement function, KPIs play a central role in integrated reporting by supporting the strategic narrative of senior management, facilitating the integration of financial and non-financial information, and helping to reduce information asymmetries between managers and stakeholders. They also contribute to the evaluation of the drivers and outcomes of integrated reporting (Vitolla et al., 2019).

In line with these arguments, the European Financial Reporting Advisory Group (EFRAG, 2020) has noted that several academic studies suggest that financial statements are gradually losing relevance because they fail to adequately capture the intangible dimensions of corporate assets. In 2021, EFRAG issued a report on improving the recognition, measurement, and disclosure of internally generated intangible assets. The report also highlights that KPIs can help users of financial information better understand managerial performance. However, it emphasizes that KPIs must be clearly defined and consistently applied over time to ensure their usefulness (EFRAG, 2021).

Within this broader context, Marion (2022) notes that organizations have historically undergone successive transformations, accompanied by the adoption of different methods to assess the value of corporate assets. Such methods emerged as mechanisms for capturing, organizing, and transforming data into information relevant for managerial decision-making. The author also highlights that, since the early development of accounting, questions have been raised about the measurement of intangible assets, which has stimulated the search for instruments to support the generation and processing of information on their value.

In 2022, the Joint Research Centre (JRC) – the science and knowledge service of the European Commission – published the Science for Policy report evaluating corporate R&D

investments in 2021. The report highlights a sustained increase in R&D investments in the pharmaceutical industry in recent years (Grassano et al., 2021). Such investments may generate future economic benefits that are not necessarily recognized in financial statements (EFRAG, 2021).

Recent studies highlight the challenges associated with recognizing intangible assets in financial statements. Bagna et al. (2024) and Koonce et al. (2024) show that although both recognized and unrecognized intangible assets affect performance, recognized intangibles tend to exhibit greater elasticity, whereas unrecognized intangibles present higher average stocks and growth rates, evidence that a substantial portion of intangible value remains off the balance sheet. Masulis et al. (2023) further emphasize the importance of these assets by demonstrating that announcement returns and post-merger performance increase with the target firm's proportion of intangible assets, indicating that intangible-asset acquisitions are an important source of value creation. Uddin et al. (2022) add that pre-existing intangible assets mitigate the adverse effects of pandemics on stock prices and operating performance—an effect attributed to both internally generated and acquired intangibles and mediated by investor sentiment, customer loyalty, and managerial capability. Xie and Zhang (2023) and Nani (2023) emphasize that measurement challenges – particularly the choice of measurement unit (e.g., evaluating an isolated data point versus an entire database), measurability, and reliability – make the valuation of these assets complex. Ho et al. (2023) show that in jurisdictions where recognition has been restricted, many firms have not compensated for the resulting information gap through alternative disclosures due to concerns related to intellectual property costs and credibility. Taken together, these studies help explain the heterogeneity and absence of KPIs related to patents and other intangible assets in corporate reports and reinforce the need to improve measurement criteria, disclosure standards, and research, including experimental studies, to evaluate potential regulatory alternatives.

KPIs are strategic, quantifiable metrics that reflect critical success factors; however, it is essential to evaluate their reliability to avoid decisions based on weak or insufficiently robust data (Souifi et al., 2022). Furthermore, the absence of standardization hampers comparability across firms and reduces the informational usefulness of KPIs (Mansuino et al., 2024). In the pharmaceutical industry, intangible assets – such as patents, clinical data, human capital, and R&D pipelines – shape future revenue potential, create entry barriers, and sustain competitive advantage. Consequently, their measurement and communication are crucial for investors, managers, and regulators. In this study, the research gap extends beyond regulatory initiatives such as those proposed by EFRAG and focuses on the practical difficulties of recognizing and measuring these assets. Specifically, the study investigates the extent to which companies communicate the value of intangible assets through KPIs, particularly when these assets are not formally recognized in financial statements, and the quality and consistency of such disclosures. Accordingly, the research question guiding this study is: What are the main KPIs used to assess and disclose intangible assets in the pharmaceutical industry? The objective of this study is therefore to map the most frequently disclosed KPIs used by pharmaceutical companies and to evaluate how these indicators contribute to communicating organizational performance and value creation in an R&D-intensive industry, providing relevant evidence for analysts, investors, and policymakers.

The selection of the pharmaceutical industry is justified by its distinctive economic, technological, and informational characteristics. It is an industry strongly dependent on intangible assets, such as scientific knowledge, clinical data, patents, human capital, and organizational capabilities, whose importance became even more evident during the COVID-19 pandemic. The pandemic triggered a significant increase in R&D investments, accelerated the development of vaccines and medicines, and expanded patenting activity and technological acquisitions, making it essential to understand how these assets are measured

and communicated. However, many of these assets and their associated economic benefits remain underrepresented in traditional financial statements, thereby increasing information asymmetries between managers and external users. Although institutional initiatives such as those proposed by EFRAG highlight the limitations of current accounting models, the central justification for this study is practical: to examine how pharmaceutical companies report the value of intangible assets through KPIs in the absence of consistent accounting recognition, and to assess the quality and consistency of such reporting practices. In a sector characterized by high uncertainty and strong dependence on R&D, well-defined KPIs may help reduce information asymmetries and support strategic decision-making.

This study provides theoretical, empirical, and practical contributions. Theoretically, it organizes the literature on KPIs related to intangible assets in the pharmaceutical industry, connecting measurement, disclosure, and the impact of R&D investments. Empirically, the study identifies the KPIs effectively disclosed by pharmaceutical companies and assesses the quality, consistency, and transparency of these indicators. Practically, the findings can help managers define and standardize KPIs aligned with innovation strategies, support investors and analysts in evaluating value and risk, and guide regulators and policymakers in discussions about disclosure standards and measurement practices. The main beneficiaries include investors and financial analysts, managers and R&D reporting or strategy teams, regulators, and researchers in accounting, governance, and innovation. By identifying which KPIs are used and evaluating their quality in communicating intangible assets, this study aims to fill a practical gap highlighted during the pandemic, contributing to improvements in the quality of corporate reporting information and fostering a more consistent understanding of performance in knowledge-based industries.

2 THEORETICAL FRAMEWORK

2.1 Recognition, measurement, and disclosure of intangible assets

The earliest classification of intangible assets dates back to 1972, the year in which Eliseu Martins defended his doctoral thesis on the valuation of intangible assets. Martins (1972) interprets goodwill as superprofits – returns above normal levels attributable to factors not recognized in the accounting records as intangible assets. Later studies, such as Merofa (2007), revisit this historical perspective by examining the evolution of the measurement of intangible assets in the pharmaceutical industry.

Petty and Cuganesan (2005), in a study of the voluntary disclosure of intellectual capital among companies listed in Hong Kong from 1992 to 2002, found that initial adherence to voluntary disclosure practices was low but increased over time, and that there is a positive correlation between voluntary disclosure and financial performance. In a study of the Brazilian pharmaceutical industry, Merofa (2007) found no statistically significant relationship between intangible assets and value creation in the analyzed sample, suggesting that some firms may not be fully leveraging their intangible assets to generate market value. Despite this, Merofa emphasizes that knowledge is a continuous source of competitive advantage in the pharmaceutical industry, which heavily depends on R&D, patents, and trademarks. The author also argues that patent citations, along with R&D information and patent counts, provide relevant signals regarding firms' intangible assets.

In 2010, the Accounting Pronouncements Committee (CPC) issued CPC 04, which establishes that an intangible asset should be recognized when it is probable that it will generate future economic benefits for the entity and when its cost can be measured reliably (CPC 04, 2010). However, many intangible assets do not meet these criteria and are therefore not recognized in the balance sheet. In the same year, Chander and Mehra (2010) emphasized that, due to the absence of physical attributes, intangible assets manifest primarily as internal

knowledge, innovative processes, organizational practices, intellectual capital, and know-how, making their measurement and accounting recognition particularly challenging.

When examining corporate reports from companies in the Indian pharmaceutical industry, Chander and Mehra (2010) identified human capital as the most frequently disclosed intangible asset. The authors attribute this emphasis to a paradigm shift in Indian corporations, which increasingly view employees as strategic assets rather than mere expenses. They also observe that strengthening human capital tends to complement and enhance the value of physical capital. At the same time, Chander and Mehra point to weaknesses in the quality of local disclosures, indicating considerable room for improvement. As the authors note when citing the Annual Report of Satyam Computers Ltd. (2007, p. 92), "the computation of the true value of a company requires a comprehensive assessment of both tangible and intangible assets." In this sense, structured disclosure of intangible assets and systematic management of intellectual capital can improve the information available to report users and support both managerial and external decision-making (Chander & Mehra, 2010).

Zéghal and Maaloul (2011), in a review of the literature on intangible assets, observed that voluntary disclosure may mitigate the limitations of financial statements in measuring these assets. According to the authors, prevailing accounting methods, still strongly anchored in assumptions derived from tangible assets, are insufficient for adequately measuring the value of intangibles. This inadequate accounting treatment may, in turn, lead to inefficient allocation of resources. Also in 2011, when examining the disclosure of intangible assets through the Value Chain Scoreboard™, Kang and Gray (2011) found that many firms in emerging markets use this methodology as an alternative disclosure tool. Furthermore, according to their sample, Brazil was among the five countries with the highest number of companies reporting such information. The authors also argue that country-specific factors,

such as economic policies and judicial systems, are closely associated with the level of disclosure of intangible assets (Kang & Gray, 2011).

In 2012, Herrera-Rodriguez and Macagnan (2012) analyzed the transparency of disclosures related to intangible assets, such as human capital and social relational capital, among banks in Brazil, Panama, and Spain, finding that Brazilian banks exhibited greater transparency compared with those in the other countries. Subsequently, Schiemann et al. (2015) argued that "the recognition of intangible assets is a determinant of voluntary intellectual capital disclosure" (Schiemann et al., 2015, p. 259). The authors further note that regulatory procedures for recognizing intangible assets extend beyond the scope of financial statements and influence broader corporate disclosure practices.

Jaara and Rahman Elkotayni (2016) examined the impact of intangible assets on the market value of pharmaceutical firms in Jordan and found that higher investments in patents and other intangible assets are associated with higher market value. However, the authors emphasize that reported patent costs have a positive but relatively small effect on market value, and no direct relationship was identified between patent costs and market value growth. They also highlight the common practice of withholding information about patent development, possibly as a strategy to protect competitive advantages (Jaara & Rahman Elkotayni, 2016).

Givoly et al. (2019), when investigating the relevance of KPIs disclosed in corporate annual reports, found that although firms disclose numerous KPIs, these indicators tend to lose informational value when details about their calculation are absent or when the indicators change over time.

Rahman et al. (2019) analyzed 21 companies in Bangladesh's pharmaceutical and chemical industries and found a positive association between intellectual capital disclosure and corporate performance. The authors suggest that expanding and improving intellectual

capital disclosures may enhance performance, as companies that disclose more information tend to achieve better results.

EFRAG (2020) notes that although the value of the world's most successful companies resides largely in their intangible assets, corporate reports still provide limited relevant information about these resources. The report also highlights a major challenge: the lack of standardization and variability in KPIs. Furthermore, it emphasizes that accurate measurement of intangible assets is important not only for external disclosure but also for generating internal information that supports the management of intangible resources and more informed managerial decision-making, particularly regarding risk-taking and potential mergers and acquisitions (EFRAG, 2020).

Finally, Iacob (2022), in a study of the performance of companies in the Romanian pharmaceutical industry using return on equity (ROE) and return on assets (ROA), found that between 2017 and 2020 these firms experienced substantial growth in their business activities.

2.2 The pharmaceutical industry and the measurement of intangible assets

The contemporary pharmaceutical industry is characterized by a knowledge-intensive business model in which competitiveness and profitability depend critically on intangible assets – such as patents, trademarks, know-how, clinical data, and intellectual capital (Martin et al., 2026; Doruk, 2025; Bagna et al., 2024). Recent literature confirms the centrality of these assets while also highlighting persistent challenges related to their identification, measurement, and consistent disclosure. With respect to recognition, studies identify patents, trade secrets, and clinical data as the primary sources of value, whose generation derives from investments in R&D and intellectual property protection (Martin et al., 2026; Yang & Wu, 2023; DePamphilis, 2022). However, internally generated assets face formal recognition constraints under IAS 38, which affect reporting quality and encourage alternative information practices, such as patent buckets and evergreening (Ma & Zhang, 2023; Gerhardt

et al., 2025; Martin et al., 2026). In terms of measurement, the literature has proposed several approaches to capture the prospective value of clinical development projects, including net present value (NPV) models and real options, as well as econometric methods such as Hedonic Q. These approaches are often used alongside traditional accounting proxies, such as the ratio of intangible assets to total assets (Bieske et al., 2023; Doruk, 2025; Yang & Driffield, 2022; Pham et al., 2024). Nevertheless, barriers such as high clinical failure rates and the lack of standardized metrics continue to limit comparability and the informational usefulness of these measures (Bieske et al., 2023; Bavdaž et al., 2023; Muchtar et al., 2023; Bagna et al., 2024). Recent studies also emphasize the need for more specific KPIs related to R&D pipelines and intellectual capital, as well as the growing relevance of digital assets in pharmaceutical innovation systems (Bieske et al., 2023; Dženopoljac, 2024; Fan et al., 2024; Martin et al., 2026). Against this backdrop, this research shifts the focus from theoretical propositions to empirical practice. Specifically, we investigate which KPIs pharmaceutical companies actually disclose, assess the quality and consistency of these indicators, and compare them with recommendations found in the academic literature. The study offers theoretical contributions (an industry-specific systematization of KPIs), empirical contributions (a mapping and assessment of disclosure practices), and practical contributions (insights for managers, analysts, and regulators seeking greater comparability and transparency in corporate reporting).

3 METHODS

The study began with a literature review conducted using the ScienceDirect database with the following keywords: KPIs, pharmaceutical, performance, key, and key ratios. The objective was to explore in greater depth the relationship between intangible assets and KPIs and to examine how these topics have been addressed in the literature over time.

Additionally, the Scoreboard database was used. This database offers information on the level of R&D investment by companies within the industry. It functions as an investment monitoring panel and is published by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It enables the identification of variables such as the percentage of R&D investment over time, net sales growth, and related metrics. These data are important because they serve as a basis for analyzing intangible assets in relation to investments aimed at industry development.

The pharmaceutical industry was selected due to its high intensity of intangible assets – particularly R&D, patents, clinical data, and human capital – and the strategic relevance of these assets for the drug development pipeline, future revenues, and competitiveness. This characteristic makes the sector an appropriate empirical context for analyzing how KPIs communicate the value of intangible assets. Of the 486 organizations listed in the Scoreboard database, 48 were examined. Among these, only 13 disclosed KPIs related to the study's focus. To facilitate data interpretation, the identified KPIs were initially classified into financial and non-financial KPIs. Subsequently, the non-financial KPIs were subdivided into the following categories: customers, employees, sustainability, corporate social responsibility (CSR), and other KPIs. This categorization was adopted to improve the understanding and organization of the indicators by area. Indicators designed to measure customer-related aspects were classified as customer KPIs, and the same procedure was applied to the remaining categories.

For the selected companies, financial statements for the fiscal years 2021 (released in 2022) and 2022 (released in 2023) were analyzed, with particular attention to the balance sheets and explanatory notes. The purpose of this review was to identify the key performance indicators most frequently disclosed by pharmaceutical companies with respect to intangible assets. In addition, information from other materials available on the companies' investor

relations or earnings-release portals, which are intended to communicate the organization's value to the market, was also examined.

After tabulating the companies' data, the analysis sought to identify patterns in the KPIs disclosed, including which indicators appeared most frequently, which companies reported them, which companies disclosed the highest and lowest numbers of KPIs, and which companies presented KPIs with the highest quality according to the literature. As a criterion for KPI quality, the study adopted the framework proposed by Givoly et al. (2019), which suggests that a KPI should demonstrate year-to-year consistency and comparability in its calculation.

Table 1

KPIs identified in pharmaceutical company reports

Non-Financial KPIs	Financial KPIs
Employees' belief that AstraZeneca is a great place to work	KPI CapEx
PSI-R Process Safety Incident Rate	KPI OpEx
KPI Severity of Injury	KPI Revenue
Number of employees	KPI Cash Flow Generation
Recordable Incident Rate (RIR) for Bayer employees	KPI Earnings per Share
Employee turnover rate	Sales
Frequency of occupational injuries resulting in absence per million working hours	EBITDA
Women in senior management	EBITDA before special items
Genmab Group % men	EBITDA margin before special items
Genmab Group % women	EBIT (Operating profit)
Men directors and above (%)	EBIT before special items
Women directors and above (%)	Profit before income tax
Men below director level (%)	Net profit (from continuing and discontinued operations) (EUR)
Women below director level (%)	Earnings per share (from continuing and discontinued operations) (EUR)
Men promoted (%)	Earnings per core share (from continuing operations) (EUR)
Women promoted (%)	Free cash flow
Employee absenteeism	Net financial debt
Average Corporate Philosophy Survey Score (5-point scale)	Capital expenditure (Recently invested capital)
Percentage of female recruitment	Return on capital employed (ROCE) (%)
Percentage of mid-career hires	Total dividend payout
Employee engagement/satisfaction (5-point scale)	Dividend per share
KPI Patient Access	Ratio of R&D expenses to sales - Agricultural sciences (%)
Customer Experience Indicator (CEI) Aggregate KPI	Proportion of R&D expenses to sales - Pharmaceuticals (%)
Net Promoter Score (NPS-T)	Proportion of R&D expenses to sales -

Non-Financial KPIs	Financial KPIs
	Consumer Health (%)
Sustainability Scorecard Performance	Personnel expenses (Including pension expenses – EUR million)
Scope 1 and 2 greenhouse gas emissions	Research and development expenses
Scope 3 greenhouse gas emissions from relevant categories	Revenue growth, DKK
Offsetting of remaining Scope 1 and 2 greenhouse gas emissions by 2030	Revenue growth
Total energy consumption (petajoules)	R&D costs (% of revenue)
Energy consumption per unit (YoY)	Gross margin
Energy efficiency (kWh/EUR 1,000)	EBITDA margin
Hazardous waste generated (thousand metric tons)	Effective tax rate
Industrial waste disposal per unit (compared to fiscal 2020)	Equity ratio
Water use (millions of m^3)	NIBD/EBITDA
Renewable electricity share	Return on equity
Water abstraction per unit (compared to fiscal 2020)	ROIC** before special items
Total Scope 1 emissions (tCO2e)	ROIC
Total Scope 2 emissions (tCO2e)	Revenue (DKK Million)
Efficiency in the procurement of raw drugs based on the "Tsumura Procurement Policy"	Operating expenses (DKK Million)
Reduction in the number of wild raw drug items used (compared to fiscal 2020)	Operating Profit Margin
Reduced use of plastics (compared to fiscal 2020)	Overseas Revenue Ratio
GHG Emissions (compared to fiscal 2020)	Internally-discovered pipeline ratio
Number of women in low- and middle-income countries needing modern contraception services satisfied due to Bayer-supported interventions	DOE
Number of smallholder farmers in low- and middle-income countries supported by product-services and partnerships	ROE
Number of universities teaching four or more Kampo medicine courses	Loss after income tax (USD)
Number of people in underserved communities whose self-care is supported by Bayer interventions	Adjusted net loss (USD)
Number of Recalls	Loss attributable to owners (USD)
Percentage of Products Affected	Sales and distribution expenses (USD)
Publications	Administrative expenses (USD)
Percentage of physicians prescribing 10 or more Kampo formulations	Research and development expenses (USD)
Number of users of the medical website	Adjusted EBITDA
Number of impact breakdowns	Domestic net sales
Rate of progress in acquiring the Health Promotion and Productivity Management certification	Net sales from businesses conducted in China
Number of treatment guidelines listing Kampo formulations (Type B and above)	
Progress in TU-100 development in the US	
Mergers and Acquisitions of a traditional Chinese medicine company	
Rate of achievement of the annual production plan	
Turnover	
Labor productivity in factories (compared to fiscal 2021)	

Note. List of indicators extracted from the annual and sustainability reports of the companies analyzed. KPIs were categorized as "non-financial" (customers, employees, sustainability, CSR, and others) and "financial" (results, margins, expenses, and ratios). For verification, we mapped each KPI against the points of interest highlighted by EFRAG. Items without reported values in the sources were included as references for disclosure. The meanings of acronyms mentioned in the text are: KPI (Key Performance Indicator); Genmab (Danish biotechnology company); EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization); NIBD (Net Financial Debt); ROIC (Return on Invested Capital); DOE (Debt to Equity Ratio); ROE (Return on Equity).

4 RESULTS

4.1 Presentation of Results

The investigation covered 48 companies in the pharmaceutical industry. However, after reviewing the financial statements and supplementary reports, only 13 companies (27% of the initial sample) effectively disclosed KPIs. This group comprises AstraZeneca, Bayer, Genmab, Genscript Biotech, Krka Pharmaceutical, Novo Nordisk, Novozymes, Oxford Nanopore Technologies, Qiagen, Shionogi, Swedish Orphan Biovitrum, Tsumura, and UCB.

Table 2

Companies investigated

Companies	Country	% of AI
Astellas	Japan	36.27%
AstraZeneca	United Kingdom	61.28%
Bayer	Germany	51.11%
Boehringer Ingelheim	Germany	9.58%
Bristol Myers	USA	-
Csl	Australia	45.39%
Daiichi Sankyo	Japan	10.28%
Eisai	Japan	23.59%
Johnson & Johnson	USA	49.93%
Merck	USA	38.00%
Novartis	Switzerland	51.89%
Novo Nordisk	Denmark	21.31%
Otsuka	Japan	29.50%
Roche	Switzerland	23.26%
Takeda	Japan	64.91%
Ucb	Belgium	64.00%
Beigine	China	0.64%
Ono pharma	Japan	7.83%
Shanghai	China	8.87%
China R pharmaceutical group	China	12.98%
Grifols	Spain	45.15%
Ipsen	France	52.87%
Novozymes	Denmark	16.79%
Richter Gedeon	Hungary	17.30%
Qiagen	Netherlands	46.08%
Santen Pharmaceutical	Japan	25.19%
Genmab	Denmark	0.48%
Alkermes	Ireland	-
Nippon Shinyaku	Japan	-
Fosun International	China	8.21%
Enn Natural Gas	China	8.54%
Jd Health International	China	3.39%
Wuxi Apptec	China	3.70%
Cspc Pharmaceutical	France	5.26%
Servier	France	-

Companies	Country	% of AI
Merieux Alliance	China	1.72%
Sino Biopharmaceutical	Ireland	2.99%
Jazz Pharmaceuticals	Japan	69.10%
Shionogi	Denmark	7.34%
H Lundbeck	Denmark	-
Alk Abello	China	3.07%
Genscript Biotech	United Kingdom	0.59%
Oxford Nanopore Technologies	Italy	4.23%
Recordati Pharma	Slovenia	63.47%
Krka Pharmaceutical	Sweden	3.70%
Swedish Orphan Biovitrum	Germany	81.21%
Grünenthal	Japan	-
Tsumura	Japan	-

Note. The percentage of intangible assets was calculated as the ratio of intangible assets to total assets. For some companies, it was not possible to determine the values due to a lack of available data regarding their intangible assets.

In AstraZeneca's reports (Table 3), eight KPIs are identified: five financial indicators – cash generation, CapEx, OpEx, revenue, and earnings per share – and three non-financial indicators, such as an employee perception index and a sustainability scorecard. Among the financial indicators, those associated with eligibility under the EU taxonomy stand out: eligible CapEx at 14%, eligible OpEx at 2%, and the Revenue KPI at 0%. The company explains the low revenue eligibility by stating that its core business does not fall within the sustainable activities outlined by the taxonomy, which helps clarify the discrepancy between R&D expenditures and the share of revenue classified as eligible.

When these findings are compared with the literature, they align with studies that highlight the dominance of financial KPIs in corporate reporting and the challenge of translating investments in intangible assets into comparable and normatively suitable metrics (Givoly et al., 2019; WICI, 2016; EFRAG, 2021). The focus on eligible CapEx and OpEx reflects both regulatory pressure for sustainability transparency and the limitations of accounting standards in recognizing internally generated intangibles. Consequently, companies often rely on proxies or alternative classifications to signal value to the market. The AstraZeneca case illustrates this tension and reinforces the importance of critically

assessing the quality and consistency of KPIs, which constitutes the central objective of this study.

Table 3

AstraZeneca KPIs - EUR million

Key Performance Indicator (KPI)	Description	Index
KPI CapEx	Indicator of capital expenditure on sustainable activities	0.14
KPI OpEx	Indicator of operating expenses on sustainable activities	0.02
KPI Revenue	Indicator of revenue from sustainable activities	0
KPI Cash Generation		EUR 9.808m
KPI Earnings per share	-	EUR 2.12
Employees' belief that AstraZeneca is a great place to work	-	0.86
Sustainability of Scorecard performance	- Performance assessment of nine focal areas, each consisting of a series of indicators. For a focal area to be considered 'green', at least 70% of the indicators within it must have achieved their targets.	7|9

Source: Adapted from the company's financial report.

Note. Sustainability scorecard performance: This KPI was listed for the company, but it did not include details of the criteria used to determine that the indicator reached 70%.

AstraZeneca also discloses an employee satisfaction indicator, without detailing its calculation, reporting that 86% of employees believe the company is a good place to work. The company further published a scorecard comprising nine focus areas, classifying each area as "green" when at least 70% of internal indicators met their targets; during the period analyzed, seven of the nine areas achieved this threshold. However, the absence of a methodological description of the satisfaction index and the lack of transparency regarding the scorecard's composition and target criteria limit the informational usefulness of these KPIs (Table 3).

Comparing these findings with the literature reveals two relevant issues. First, studies on intangible disclosure and KPIs indicate that perceptual or self-reported indicators contribute to reducing information asymmetry when they have a clear definition and are

supported by longitudinal data (Givoly et al., 2019; WICI, 2016). Second, using scorecards and internal metrics reflects current practice of supplementing financial disclosures due to regulatory limits on recognizing intangible assets (EFRAG, 2021; Chander & Mehra, 2010). However, without clear calculation methods and target definitions, these tools hinder comparisons between firms and limit accurate assessments of human capital management. Overall, the AstraZeneca case demonstrates the existence of relevant informational efforts, but it also highlights insufficient transparency and comparability. This reinforces the need to evaluate not just whether KPIs exist, but also their methodological quality, which is the primary objective of this study.

Next, we analyze the KPIs reported by Bayer, which disclosed 35 indicators organized into categories (financial, non-financial, innovation, employees, and environmental protection). One notable KPI is PSI-R (process safety incidents per 200,000 hours worked), which increased from 0.08 to 0.11, indicating a deterioration in operational safety during the observed period. Bayer also reports sustainability KPIs (such as energy efficiency and water use) and human capital indicators (e.g., number of employees). Despite the broader scope and diversity of indicators compared to AstraZeneca, explanatory gaps were again identified regarding the methodology used to calculate certain KPIs. According to the literature, such gaps reduce both comparability and informational value in corporate reporting (Givoly et al., 2019; Bagna et al., 2024).

Table 4

Bayer KPIs - EUR million

Key Performance Indicator (KPI)	Description	Index
PSI-R Process Safety Incident Rate[1]	Process Safety Incident Rate	0.11
KPI Severity of Injury	Through the Interlex Platform, employees can report a safety	-

Key Performance Indicator (KPI)	Description	Index
	incident quickly, easily, and anonymously	
Number of women in low- and middle-income countries who need modern contraception services satisfied due to Bayer-supported interventions.	-	44
Number of smallholder farmers in low- and middle-income countries supported by products, services, and partnerships.	-	52
Number of people in underserved communities whose self-care is supported by Bayer interventions.	-	49
Scope 1 and 2 greenhouse gas emissions.	-	3.03
Scope 3 greenhouse gas emissions from relevant categories.	-	8.90
Compensation for remaining Scope 1 and 2 greenhouse gas emissions in 2030.	-	0.45
Sales	-	50,739
EBITDA	-	13,515
EBITDA before special items	-	13,513
EBITDA margin before special items[2]	-	26.60%
EBIT (Operating profit)	-	7,012
EBIT before special items	-	9,257
Profit before income tax	-	4,67
Net profit (from continuing and discontinued operations) (EUR)	-	4,15
Earnings per share (from continuing and discontinued operations) (EUR)	-	4.22
Earnings per core share (from continuing operations) (EUR)	-	7.94
Free cash flow	-	3,111
Net financial debt	-	31,809
Capital expenditure (Capital recently)	-	3,639
Return on capital employed (ROCE) (%)	-	7.7
Total dividend payout	-	2,358
Dividend per share	-	2.40
Proportion of R&D expenditure to sales - Agricultural Sciences (%)	-	10.1
Proportion of R&D expenditure to sales - Pharmaceuticals (%)	-	17.3
Proportion of R&D expenditure to sales - Consumer Health (%)	-	3.6
Number of employees	-	101,369
Personnel expenses (Including pension expenses – EUR million)	-	12,619
Recordable Incident Rate (RIR) for Bayer employees	-	0.37
Total energy consumption (petajoules)[3]	-	35.5
Energy efficiency (kWh/EUR 1,000)[4]	-	194
Hazardous waste generated (thousand metric tons)	-	276
Water usage (millions of m³)	-	53
Research and development expenses	-	6,572

Source: Adapted from the company's financial report.

Notes. [1]PSI-R: To prevent releases of substances and energy, the causes of process safety incidents (PSIs) are analyzed and relevant results communicated to the entire Bayer Group. PSI-R indicates the number of PSI incidents per 200,000 hours worked. In 2022, the PSI-R was 0.11 (2021: 0.08); [2]Before special items (taxes, interest and amortization); [3]Peta-joule: unit of measurement of energy equivalent to one billion joules; [4]Ratio between total energy consumption and external sales

Novo Nordisk reported only two KPIs (Table 5), both similar to those reported by AstraZeneca: eligible CapEx and eligible OpEx, with no Revenue KPI disclosed. The

company reported eligible CapEx of 13% and eligible OpEx of 0%, explaining that its operational activities do not fall within the sustainable categories defined by the EU Taxonomy. This pattern indicates that even when sustainability-related KPIs are disclosed, measurement outcomes may result in zero values for certain indicators depending on the regulatory definition adopted and the nature of the company's activities.

Compared to the literature, these findings align with studies highlighting the prevalence of financial KPIs and the challenge of translating intangible investments into comparable and qualifying metrics (Givoly et al., 2019; WICI, 2016; EFRAG, 2021). The dominance of eligible CapEx indicates an effort to connect long-term investments to external sustainability standards. However, the reported zero value for OpEx emphasizes the practical limitations of such classifications and the possible underrepresentation of operational activities related to innovation. Thus, Table 5 indicates that although Novo Nordisk discloses sustainability-related KPIs, their interpretation and informational usefulness depend strongly on regulatory framing and methodological transparency, aspects that this study seeks to evaluate comparatively.

Table 5

KPIs for the company Novo Nordisk

Key Performance Indicator (KPI)	Description	Index
KPI CapEx	Indicator of capital expenditures on sustainable activities	13%
KPI OpEx	Indicator of operating expenditures on sustainable activities	0

Source: Adapted from the company's financial report.

The company UCB, in turn, disclosed only one KPI, patient access (Table 6). However, the company did not provide its calculation method, which compromises its

validity. Furthermore, the indicator's actual value was not disclosed; only the existence of such a KPI was mentioned.

Table 6

KPIs for the company UCB

Key Performance Indicator (KPI)	Description	Index
KPI Patient Access	This KPI aims to measure and encourage prompt access for patients requiring our newly launched solutions through improvements	-

Source: Adapted from the company's financial report.

Note. The company did not present any value.

Novozymes disclosed 23 KPIs (Table 7), including financial metrics such as revenue growth, margins, ROE, and ROIC; non-financial indicators like the number of employees, employee turnover, and occupational safety; and sustainability metrics, such as CO_2 emissions from Scopes 1, 2, and 3, along with the share of renewable electricity. The presence of both economic performance and environmental impact indicators suggests an effort to connect financial value with environmental risks and resources in their corporate communication. However, not all KPIs are accompanied by methodological descriptions or time-series data, which limits the ability to evaluate the quality of the information (Table 7).

These results align with studies indicating the increasing inclusion of sustainability KPIs alongside the ongoing dominance of financial indicators in corporate reports (Givoly et al., 2019; Bagna et al., 2024). The disclosure of emissions supports environmental transparency recommendations (WICI, 2016; EFRAG, 2021), but the usefulness of such KPIs depends on standardization and consistency over time, conditions that are often missing in practice. The Novozymes case thus demonstrates both the growth in the variety of KPIs disclosed and the practical limitations that still affect comparability and interpretation.

Table 7

KPIs for the company Novozymes

Key Performance Indicator (KPI)	Description	Index
Revenue Growth, DKK	-	16%
Revenue Growth	-	9%
R&D Costs (% of Revenue)	-	11.40%
Gross Margin	-	54.60%
EBITDA Margin	-	34.40%
EBIT Margin before Extraordinary Items	-	26.40%
EBIT Margin	-	26%
Effective Tax Rate	-	19.10%
Equity Ratio	-	50.80%
NIBD/EBITDA	-	1
Return on Equity	-	28.60%
ROIC** before Special Items	-	19.90%
ROIC	-	17.60%
Earnings per Share (EPS), Diluted DKK	-	13,19
Dividend per Share (Proposed for 2022) DKK	-	6
Total Number of Employees	-	6781
Employee Turnover Rate	-	11.4%
Frequency of Occupational Injuries with Absence per Million Work Hours	-	1,7
Women in Senior Management	-	33%
CO2 Emissions from Operations (Scope 1+2)*** 1,000 tons	-	161
CO2 Emissions from Supply Chain (Scope 3)**** 1,000 tons	-	734
Renewable Electricity Share	-	82%
Total Water Consumption m³	-	8720

Source: Adapted from the company's financial report.

Note. Descriptions for individual KPIs were not provided.

Qiagen disclosed six KPIs (Table 8): two financial ones (eligible CapEx and OpEx), two related to customers (including Net Promoter Score — NPS), and two categorized as "other." Notably, both eligible CapEx and OpEx were reported as zero, with the company explaining that no capital or operational expenditures qualified as eligible under the EU Taxonomy. The inclusion of the NPS explicitly incorporates a customer satisfaction metric, while the remaining KPIs lack a detailed methodological explanation.

Table 8

KPIs for the company Qiagen

Key Performance Indicator (KPI)	Description	Index
Customer Experience Indicator (CEI) Aggregate KPI	Product performance and delivery, Quality and speed of telephone support	94%
Net Promoter Score (NPS-T)	Customer service and technical support	
Number of Recalls	-	6
Percentage of Products Affected	-	0.09%
Capital Expenditure KPI	-	0%
Operational Expenditure KPI	-	0%

Source: Adapted from the company's financial report.

Relating these findings to the literature confirms ongoing debates about the dominance of financial KPIs and the challenge of translating innovative and operational activities into suitable and comparable indicators (Givoly et al., 2019; WICI, 2016; EFRAG, 2021). The zero values reported for CapEx and OpEx demonstrate how regulatory standards and business features can cause the underrepresentation of innovation-related investments. Simultaneously, the adoption of NPS indicates a move toward including stakeholder-focused non-financial metrics, though its effectiveness depends on disclosing its formula, time horizon, and historical data series.

GenMab (Table 9) disclosed 19 KPIs, of which three are financial and sixteen non-financial – eleven related to employees and five to sustainability. The emphasis on human capital is notable: GenMab was the only company in the sample to report growth percentages by gender and promotion indicators disaggregated by gender, in addition to metrics on female representation across hierarchical levels. This level of detail highlights a strong focus on diversity and talent management, potentially providing useful insights into organizational capital when paired with definitions and historical data for comparison.

Table 9

KPIs for the company GenMab

Key Performance Indicator (KPI)	Description	Index
Total Scope 1 Emissions (tCO2e)	-	283,1 (tCO2e)
Total Scope 2 Emissions (tCO2e)	-	110,7 (tCO2e)
Total Scope 1 and 2 Emissions (tCO2e)	-	393,8 (tCO2e)
Electricity Consumption (MWh)	-	3127 (MWh)
Renewables Share (%)	-	94%
Genmab Group % Men	-	42%
Genmab Group % Women	-	58%
Men Directors and above (%)	-	49%
Women Directors and above (%)	-	51%
Men Below Director Level (%)	-	37%
Women Below Director Level (%)	-	63%
Men Promoted (%)	-	40%
Women Promoted (%)	-	60%
Total Employees	-	1660
Employee Turnover	The employee turnover rate is calculated by dividing the FTE (Full-Time Equivalent) that voluntarily left since the beginning of the year by the average FTE	7%
Employee Absence	The absenteeism rate is measured as the proportion of absence due to illness, pregnancy-related sick leave, and occupational injuries and illnesses, compared to a regional standard average of working days in the year, adjusted for holidays	2%
Revenue (DKK Million)	-	14.595
Operating Expenses (DKK Million)	-	8.238
Operating Profit (DKK Million)	-	6.357

Source: Adapted from the company's financial report.

Tsumura (Table 10) disclosed 23 KPIs, of which two are financial and 21 are non-financial, showing the highest concentration of non-financial indicators among the companies analyzed. Seven indicators relate to sustainability, while nine correspond to internal operational metrics (e.g., productivity, certifications, and market penetration). The predominance of operational indicators suggests a strong emphasis on operational monitoring and non-financial outcomes, although their informational usefulness depends on clearly defining calculation methodologies and providing historical series to evaluate consistency and trends.

Table 10

KPIs for the company Tsumura

Key Performance Indicator (KPI)	Description	Index
Domestic Net Sales	-	JPY 124.698 million
Percentage of physicians prescribing 10 or more Kampo formulations	-	32%
Number of universities teaching four or more Kampo medicine courses	-	78 universities
Number of medical website users	-	Not disclosed
Number of detailed impacts	-	4.77 million
Number of treatment guidelines listing Kampo formulations (Type B and above)	-	99
Progress in TU-100 development in the US	-	Currently in advanced Phase II
Net business sales in China	-	JPY 15.3 billion
Mergers and Acquisitions of a traditional Chinese medicine products company	-	In negotiations with several companies
Annual production plan completion rate	-	Not disclosed
Labor productivity in factories (compared to fiscal 2021)	-	102%
Average Corporate Philosophy survey score (5-point scale)	-	4.06 points
Progress rate in acquiring the Health Promotion and Productivity Management certification	-	Preparation for acquisition
Percentage of female recruitment	-	44%
Percentage of mid-career hires	-	55%
Employee engagement/satisfaction (5-point scale)	-	3.58 points
Effectiveness in raw drug procurement based on the “Tsumura Procurement Policy”	-	Beginning of the implementation of the Tsumura Procurement Policy
Reduction in the number of wild raw drug items used (compared to fiscal 2020)	-	Elimination of an item
Reduced use of plastics (compared to fiscal 2020)	-	-
GHG emissions (compared to fiscal 2020)	-	0,129
Energy consumption per unit (YoY)	-	-4.80%
Water intake per unit (compared to fiscal 2020)	-	0,06
Industrial waste disposal per unit (compared to fiscal 2020)	-	-

Source: Adapted from the company’s financial report.

Note. Descriptions for individual KPIs were not provided.

Shionogi (Table 11) disclosed eight KPIs, all financial. Among them, earnings per share (EPS) stands out, an indicator also reported by AstraZeneca, Novozymes, and Genscript Biotech – facilitating basic comparisons of shareholder performance across companies in the sample. However, the exclusive emphasis on financial indicators limits the visibility of intangible capital, such as human capital or sustainability initiatives, thereby constraining a more comprehensive evaluation of value creation from intangible assets.

Table 11

KPIs of the company Shionogi

Key Performance Indicator (KPI)	Description	Index
Revenue (JPY Billion)	-	JPY 426.7 billion
Operating Profit (JPY Billion)	-	JPY 158.5 billion
Operating Profit Margin	-	37.1%
Overseas Revenue Rate	-	16.9%
Internally-discovered pipeline ratio	-	61%
EPS	-	JPY 619
DOE	-	3.9%
ROE	-	17.8%

Source: Adapted from the company's financial report.

Note. Descriptions for individual KPIs were not provided.

Genscript Biotech (Table 12) disclosed ten KPIs, all financial, including revenue and profitability indicators similar to those reported by Shionogi and Oxford Nanopore Technologies. Oxford Nanopore Technologies (Table 13) reported five KPIs – three financial and two non-financial – one related to employees and the other to corporate social responsibility.

Table 12

KPIs for the company Genscript Biotech

Key Performance Indicator (KPI)	Description	Index
Revenue (USD)	-	839.529
Gross Profit (USD)	-	409.553
Loss After Income Tax (USD)	-	-355.121
Adjusted Net Loss (USD)	-	-298.230
Loss attributable to owners (USD)	-	-95.477
Loss per share (in cents)	-	-4,53
Gross Profit (USD)	-	410.196
Sales and Distribution Expenses (USD)	-	167.690
Administrative Expenses (USD)	-	186.036
Research and Development Expenses (USD)	-	405.996

Source: Adapted from the company's financial report.

Note. Descriptions for individual KPIs were not provided.

Oxford Nanopore reports a mix of financial and non-financial KPIs that reflect typical tensions between accounting performance and intangible value creation. Financial metrics

such as Life Science Research Tools (LSRT) revenue and a high gross margin (53.3%) indicate strong revenue-generating ability in its main segment. However, negative adjusted EBITDA suggests that operational profitability has not yet caught up with sales performance, possibly due to heavy investment and scaling costs. Conversely, the non-financial KPIs, particularly the share of women in leadership positions (46.6%) and the cumulative number of scientific publications (>11,000), indicate important intangible assets, including human capital, scientific reputation, and technological diffusion. These findings support literature suggesting that intangible resources (R&D, publications, human capital) underpin competitive advantage even when traditional financial indicators show weaker operational results (Givoly et al., 2019; WICI, 2016; EFRAG, 2021). In this sense, the Oxford Nanopore case illustrates the importance of not only reporting KPIs but also providing methodological clarity and historical series, enabling the evaluation of whether strong scientific capital and leadership diversity effectively translate into sustainable value creation.

Table 13

KPIs for the company Oxford Nanopore Technologies

Key Performance Indicator (KPI)	Description	Index
SRT Revenue	LSRT's revenue comes from selling our sequencing products to global customers who use our technology for scientific research and public health. Currently, it also includes a small portion of revenue from customers who use our sequencing products for clinical and applied uses.	169.7 billion
SRT Gross Margin	The gross margin percentage is LSRT's gross profit as a percentage of LSRT revenue.	53.30%
Adjusted EBITDA	Adjusted EBITDA is the year's loss before financial income, interest on loans, lease interest, income tax, depreciation, amortization, and exceptional items.	- 104.9 billion
Women in Senior Leadership Positions	The percentage of women in leadership roles worldwide. Includes women on the Board, Operating Committee, and those who directly report to Operating Committee members (excluding administrative support).	46.60%
Publications	The cumulative number of scientific publications that include nanopore sequencing as an experimental method, as reported in publicly available online resources.	>11.000

Source: Adapted from the company's financial report.

Krka Pharmaceutical (Table 14) disclosed only two KPIs – eligible CapEx and eligible OpEx – both of which are financial indicators already seen in other companies in the sample. The exclusive presence of these metrics indicates a focus on connecting investments to EU taxonomy sustainability criteria but offers limited information about intangible assets, highlighting the limitations of reports that emphasize financial metrics over indicators that reflect intangible value.

Table 14

KPIs for the company Krka Pharmaceutical

Key Performance Indicator (KPI)	Description	Index
KPI CapEx	-	EUR 88.399 Thousand
KPI OpEx	-	EUR 31.334 Thousand

Source: Adapted from the company's financial report.

Note. Descriptions for individual KPIs were not provided.

The reports of Swedish Orphan Biovitrum (SOB) (Table 15) identify three KPIs, including two financial indicators – eligible CapEx and eligible OpEx – and one non-financial indicator. The recurring emphasis on eligible CapEx and OpEx, also observed among other companies in the sample, highlights the prominence of EU taxonomy-related metrics but provides limited direct insight into intangible assets such as R&D or human capital.

Table 15

KPIs for the company Swedish Orphan Biovitrum (SOB)

Key Performance Indicator (KPI)	Description	Index
KPI CapEx	-	84%
KPI OpEx	-	35%
Turnover	-	39%

Source: Adapted from the company's financial report.

Note: Descriptions for individual KPIs were not provided.

4.2 Discussion of Results

Table 16 shows some data from the 2022 and 2023 Scoreboards of the companies that disclosed KPIs.

Table 16

Some data released on the SCOREBOARD 2022 and 2023

Company	Country	R&D expenses (EUR million)		Staff		Market value (EUR million)		Net sales (EUR million)	
		2022	2023	2022	2023	2022	2023	2022	2023
AstraZeneca	United Kingdom	7110,2	8943,4	83100	83500	156440,6	186607,4	33036,4	41581,7
Bayer	Germany	5515,0	6630,0	99637	101369	1079,1	51557,6	44081,0	50739,0
Genmab	Denmark	339,0	588,3	1212	1660	386,6	23346,6	1141,4	1962,6
Genscript Biotech	China	316,4	365,7	5260	6213	4056,4	23346,6	451,2	586,6
Krka pharmaceutical	Slovenia	154,6	162,6	11511	11598	1175,6	3246,6	1565,8	1717,5
Novo Nordisk	Denmark	2192,4	2926,2	47792	55185	1134,4	185702,1	18947,1	23795,2
Novozymes	Denmark	243,20	238,69	6527	6781	278,6	13006,1	2011,90	2360,37
Oxford nanopore technologies	United Kingdom	101,1	95,0	705	922	697,9	2556,0	158,5	224,7
Qiagen	Netherlands	167,7	178,0	6028	6178	1888,6	9671,8	1988,0	2009,2
Shionogi	Japan	564,3	622,4	5693	5680	2027,9	14984,2	2590,9	3015,8
Swedish Orphan Biovitrum	Sweden	192,8	226,9	1559	1556	308,5	6505,8	1517,0	1689,5
Tsumura	Japan	56,5	53,7	3921	4032	2493,4	1733,4	1001,5	989,8
Ucb	Belgium	1519,0	1513,0	8561	8703	252,1	13634,8	5471,0	5140,0

Source: Scoreboard 2022 and 2023

As shown in Table 16, among the companies reporting KPIs in their financial statements, AstraZeneca had the highest R&D spending, ranging from about EUR 7 billion to nearly EUR 9 billion during the period analyzed. In contrast, Tsumura reported the lowest R&D investment, at EUR 56.5 million, which slightly decreased to EUR 53.7 million in 2023.

Regarding the number of employees, Bayer stands out among the companies analyzed, with more than 100,000 employees in 2023. At the opposite end of the spectrum is Oxford Nanopore Technologies, with 922 employees.

When comparing the companies' market capitalizations, AstraZeneca slightly surpasses Novo Nordisk, with a market value exceeding EUR 186 billion. The company with

the lowest market capitalization in the sample is Tsumura, with a value slightly above EUR 1 billion.

In terms of net revenue, Bayer again leads the group in 2023, reporting more than EUR 50 billion. Conversely, Oxford Nanopore Technologies recorded the lowest net revenue, at approximately EUR 224 million.

Regarding the quality of the KPIs disclosed, most organizations do not clearly specify the formulas used to calculate their indicators, which limits their informational value. In many cases, disclosures also lack historical data or longitudinal information, preventing the analysis of changes over time. These limitations weaken the analytical robustness of the KPIs by reducing standardization and consistency, which are essential for meaningful year-to-year comparisons (Givoly et al., 2019). Furthermore, in some instances, KPIs are disclosed but reported as zero, justified by the nature of the companies' activities. Examples include the OpEx KPI reported by Novo Nordisk and the industrial waste-disposal-per-unit KPI reported by Tsumura. Such cases illustrate how regulatory definitions or sector-specific operational characteristics may lead to the reporting of indicators that provide limited empirical information for performance assessment.

4.2.1 Summary of the Analysis

Table 17 summarizes the most frequently cited KPIs and the respective companies that disclosed them.

As shown in Table 17, no specific KPIs related to patents were identified, despite patents being recognized in the literature as key indicators of productivity and market value (Artz et al., 2010; De Carolis, 2003; Jaara & Rahman Elkotayni, 2016). Such information might be reported in other documents or presented in non-standardized formats; however, its absence among the KPIs limits direct insight into the portfolio of assets under development. In contrast, the most commonly reported indicators are financial KPIs, particularly OpEx,

CapEx, and EBIT. In addition to fulfilling regulatory requirements, especially those associated with EU taxonomy eligibility, these indicators are immediately useful for valuation analyses. For example, CapEx figures feed into free cash flow projections and enable indirect inferences about investments that may generate future intangible assets.

Table 17

Most cited KPIs

Companies	Financial KPIs			Non-Financial KPIs	
	OpEx	CapEx	EBIT	N° Employees	Emissions GEE scope 1 and 2
AstraZeneca	X	X			
Krka	X	X			
Novo Nordisk	X	X			
Qiagen	X	X			
Sob	X	X			
Bayer			X	X	X
GenMab			X	X	X
Genscript			X		
Novozymes			X	X	X
Shionogi			X		
Total	5	5	5	3	3

Among the most frequently disclosed non-financial KPIs are the number of employees and GHG emissions (Scopes 1 and 2). Emissions reporting follows the GHG Protocol, which defines Scope 1 as direct emissions and Scope 2 as indirect emissions associated with purchased energy (Lentino et al., 2020). While these KPIs contribute to a better understanding of human capital and environmental risks, their practical usefulness depends on their methodological quality, including clear definitions, explicit calculation formulas, and the availability of historical series. From the perspective of report users, financial KPIs facilitate comparability and rapid assessment by investors and analysts, but they tend to underrepresent future value drivers associated with intangible assets. Non-financial KPIs, in turn, can reduce informational gaps when disclosed transparently and consistently; otherwise, their informational effectiveness is limited. These findings therefore reinforce the importance of

assessing not only the presence of KPIs but also their consistency, transparency, and alignment with metrics that adequately capture the value of intangible assets.

5 CONCLUSION

This study examined which KPIs companies in the pharmaceutical industry effectively disclose to communicate internally generated intangible assets. The results indicate that disclosures mainly focus on financial indicators, especially CapEx, OpEx, and EBIT, while KPIs directly related to patents and the R&D pipeline are rare or absent in the analyzed reports. Although eligible CapEx and OpEx are useful for valuation analyses (for example, in free cash flow projections), their predominance reflects a tendency for companies to signal investments through financial metrics. While this facilitates immediate accounting comparisons, it does not necessarily ensure transparency regarding the prospective value generated by intangible assets.

Additionally, recurring issues were found in the quality of disclosures. Many KPIs lack clear definitions, calculation formulas, and historical series, which weakens comparability and lessens their informational value for analysts, investors, and other stakeholders. These findings provide empirical support for concerns raised by Givoly et al. (2019) and by standard-setting bodies. In the pharmaceutical industry, where a significant portion of assets and revenue potential relies on intangible resources such as R&D, clinical data, and know-how, this limitation is especially important, as it increases information asymmetry and makes it more difficult to assess risk and the potential for value creation.

From a practical perspective, the findings suggest three main implications. First, managers should complement financial KPIs with clear and standardized metrics related to the R&D pipeline and intellectual capital, accompanied by transparent methodologies and historical series. Second, analysts and investors should exercise caution when inferring future

value solely from CapEx and OpEx indicators. Third, regulators and standard-setters may prioritize guidelines that encourage more detailed and comparable disclosures of internally generated intangible assets.

Regarding limitations and directions for future research, the analysis was based on 48 firms included in the Scoreboard database, of which 13 disclosed relevant KPIs. The length of the documents and the heterogeneity of reporting formats limited the sample's expansion. Future studies could expand both the time frame and the sample size, use semi-automated coding procedures to accelerate KPI extraction, and empirically examine the link between non-financial KPIs (such as pipeline indicators and scientific publications) and market performance. These efforts may lead to practical proposals for standardization that improve the informational value of corporate reporting.

Also, future research could adopt artificial intelligence and automated text-processing tools, such as Python scripts, natural language processing (NLP) techniques, automated text extraction and classification, and machine learning methods, to broaden the sample, accelerate KPI extraction, and enable more detailed analyses. These tools might help identify disclosure patterns, automatically assess the presence of formulas or methodological explanations, and examine relationships between non-financial KPIs and market performance. Using such methods could increase the scale, reproducibility, and depth of empirical evidence on intangible asset disclosure in the pharmaceutical industry.

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Divulgação dos Principais Indicadores-Chave sobre Ativos Intangíveis no Setor Farmacêutico

Jorge Marcelino Nunes Junior
Universidade de São Paulo (USP)
São Paulo, Brasil
jorgenunes@usp.br

Ricardo Luiz Menezes da Silva
Universidade de São Paulo (USP)
São Paulo, Brasil
rlms@fearp.usp.br

RESUMO

Objetivo: *Este estudo buscou investigar os KPIs mais divulgados por empresas farmacêuticas para reportar ativos intangíveis gerados internamente, a partir da análise documental de relatórios anuais e auxiliares.*

Método: *Para isso, foi utilizado a base de dados do Scoreboard da Comissão Europeia, no qual a escolha das empresas, objetivou-se selecionar o setor farmacêutico porque queria-se verificar o impacto dos ativos intangíveis nesse setor. Analisaram-se relatórios de 48 empresas do setor farmacêutico; 13 delas divulgaram KPIs relacionados a ativos intangíveis, que foram objeto da análise. Os KPIs encontrados nesses relatórios foram classificados em financeiros e não financeiros.*

Originalidade/Relevância: *A mensuração e reporte de intangíveis gerados internamente tem sido um desafio para as empresas ao longo do tempo. Este estudo problematiza essa lacuna ao analisar quais KPIs têm sido utilizados para divulgação dos ativos intangíveis gerados internamente. A partir dessa perspectiva, destacamos os KPIs como mediadores de comunicação do valor gerado internamente.*

Resultados: *A análise dos relatórios demonstrou que os indicadores mais utilizados e divulgados foram CAPEX, OPEX, EBIT, número de funcionários e quantidade de emissões de Gases de Efeito Estufa (GEE) do escopo 1 e 2. Além disso, foi observado uma falta de uniformização nos KPIs e ausência do cálculo em muitos casos, dificultando a comparação entre empresas.*

Contribuições Teóricas/Metodológicas: *O estudo fez uso de uma base de dados disponibilizada (Scoreboard) para selecionar e correlacionar dados financeiros com KPI utilizados.*

Palavras-chave*: KPIs, Ativos intangíveis, Setor farmacêutico, Divulgação corporativa, P&D*

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