

How Can We Promote Impact/ESG Investing?

- Clarifying the Skeptical Reasons and Benefits of Addressing Impact & ESG Investing in the Age of Artificial Intelligence -

By

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Investing in the Age of Artificial Intelligence -

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ABSTRACT

Drawing upon professional experiences in Impact/ESG consulting and investment, this thesis explores the efficacy of Impact and ESG investments in enhancing corporate value. Chapter 1 introduces the complex landscape of these investments, outlining common misconceptions and the diverse definitions that prevail across different stakeholders. Chapter 2 delves into the metrics and standards used to assess these investments, highlighting the confusion caused by multiple rating systems and the impact on stakeholder decisions. Chapter 3 presents an event study focusing on the stock market reactions to ESG ratings changes, revealing that while negative ratings significantly influence market behavior, positive changes do not. This suggests that investors primarily use ESG ratings for negative screening. Chapter 4 extends the discussion to the role of artificial intelligence (AI) in impact investment, assessing both its potential and risks within the context of future societal impacts. Chapter 5 explores the practical applications of impact investments, particularly how they can address global health challenges through initiatives like the Triple I.

The conclusion synthesizes these insights, arguing for a redefinition of ESG and impact investment frameworks that align with corporate strategies. It proposes that blending these investments with robust business models and transparent metrics can lead to sustainable corporate growth and greater stakeholder satisfaction. This thesis provides a roadmap for companies and investors aiming to genuinely enhance corporate value and societal welfare through impact and ESG investment practices.

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Chapter 1:

Reasons and solutions for skepticism towards Impact / ESG (Environmental, Social, and Governance) Investment and Initiatives

1-1: Definition of Impact/ESG Investing

The recent years have witnessed a marked proliferation in impact and Environmental, Social, and Governance (ESG) investing, predominantly catalyzed by burgeoning evidence that a corporate strategy orientated towards substantive ESG concerns correlates with superior management standards and augmented financial returns. While ESG investing has established a more prolonged presence within the financial landscape, impact investing emerges as a relatively nascent domain. As delineated in a collaborative discourse by the CFA Institute, Global Sustainable Investment Alliance, and Principles for Responsible Investment (PRI), impact investing is defined as "the endeavor to engender positive, quantifiable social and/or environmental outcomes in conjunction with a financial gain". Concurrently, ESG investment entails "the integration of environmental, social, and governance (ESG) considerations into investment decision-making processes and exerting influence over the entities or assets invested in (referred to as active ownership or stewardship)" (CFA Institute, Global Sustainable Investment Alliance, & Principles for Responsible Investment, 2023). Nonetheless, a significant degree of ambiguity persists in differentiating between ESG/sustainability and impact investing, exemplified by the prevalent misconceptions illustrated in Exhibit 1.

Exhibit 1: The spectrum of investment approaches

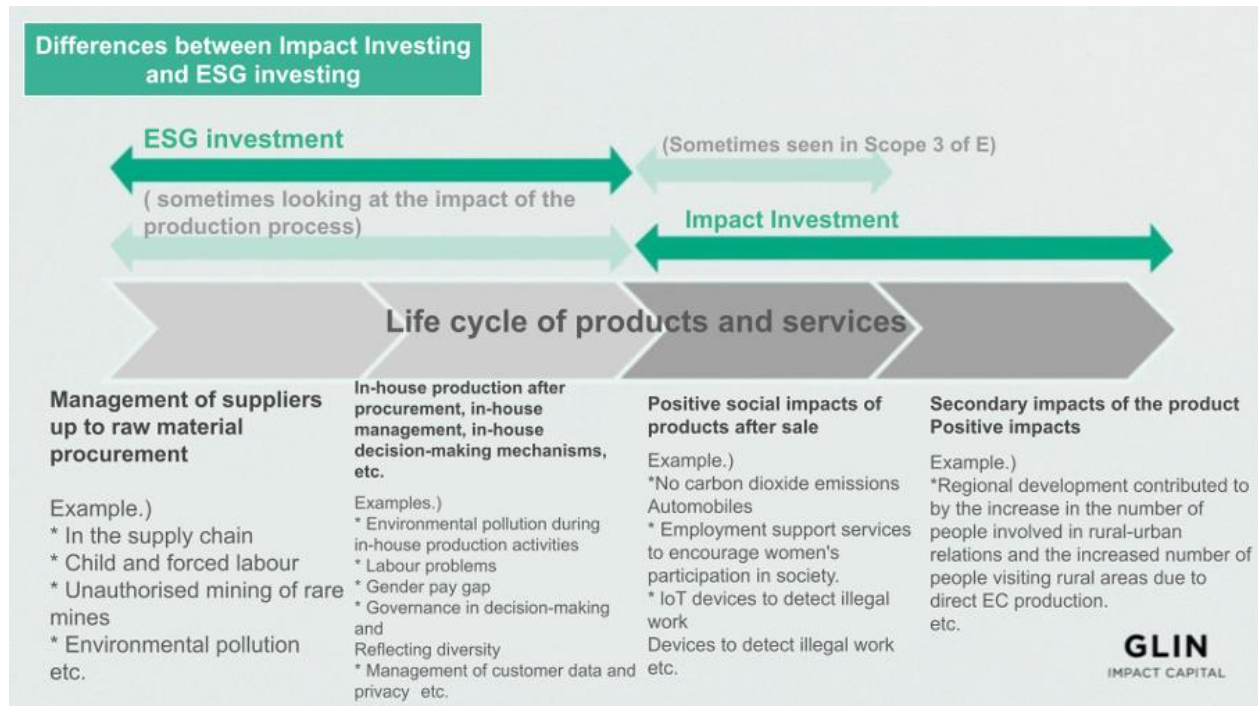
		Responsible investment			Impact investing		
		Traditional	Screening	ESG integration	Themed	Impact-first	Philanthropy
		Competitive returns				Targeted social and/or environmental impact	
FOCUS	Limited or no focus on ESG factors of underlying investments	Negative or exclusionary screening and positive or best-in-class screening, based on criteria defined in a variety of ways (i.e. by product, activity, sector, international norms.)	The use of qualitative and quantitative ESG information in investment processes, at the portfolio level, by taking into account ESG-related trends, or at the stock, issuer or investee level.	The selection of assets that contribute to addressing sustainability challenges such as climate change or water scarcity.	Environmental or social issues which create investment opportunities with some financial trade-off.	Focus on one or a cluster of issues where social and environmental need requires 100% trade-off.	
	EXAMPLES	<ul style="list-style-type: none"> Ethically-screened investment fund Best-in-class SRI fund 	<ul style="list-style-type: none"> Long-only public equity fund using ESG integration to create additional value 	<ul style="list-style-type: none"> Clean energy mutual fund Emerging markets healthcare fund Microfinance structured debt fund 	<ul style="list-style-type: none"> Fund providing debt or equity to social enterprise or trading charity 		

The spectrum of investment approaches

Source: Adapted from Bridges Ventures (2012)

The categorization presented above is contestable, as investments prioritizing impact can indeed generate competitive returns. Amidst efforts to broaden the scope of impact investing, such as through initiatives like the Impact Investing Initiative for Global Health, the conventional perceptions depicted in Exhibit 1, prevalent within both academic and professional spheres, engender misconceptions and propagate the myth that impact investing is inherently less lucrative compared to traditional and ESG investments. This widespread misunderstanding and confusion culminate in a missed global investment opportunity. As illustrated in Exhibit 2, this discourse differentiates "ESG" indicators as externalities emanating from corporate activities, whereas "Impact" is delineated as the direct or indirect repercussions attributable to a company's products or services. For instance, workforce issues such as mental health concerns and harassment are categorized under ESG indicators. Conversely, services aimed at supporting employment to enhance healthcare accessibility for employee welfare are identified as impact indicators.

Exhibit 2: The differences between Impact Investing and ESG investing



Source: GLIN Impact Capital

As delineated in Exhibit 2, the terminologies and categorizations pertinent to Environmental, Social, and Governance (ESG) and Impact Investing remain subjects of ongoing discourse and lack consensus. Consequently, a global ambivalence and perplexity regarding the merit of ESG and Impact Investing pervade among various stakeholders, encompassing investors, corporations, employees, governmental entities, and Non-Profit Organizations (NPOs).

1-2: Reasons for Skepticism Towards Impact/ESG Investing

(1) Measurement of ESG sustainability is subjective and lacks universal agreement or guidelines.

While more corporations are incorporating ESG goals into their strategic frameworks, the absence of a uniform mechanism for reporting on ESG achievements is notable. There exists no singularly agreed-upon definition of what constitutes ESG or sustainability, nor is there consensus on the methodologies for data collection and analysis, or on the determination of material issues. Scholarly inquiries into the correlation between ESG parameters and financial outcomes frequently grapple with obstacles stemming from inconsistent nomenclature and categorizations. For instance, Meuer identified 33 distinct definitions of corporate sustainability in use, highlighting the prevailing ambiguity surrounding

the concept of corporate sustainability (Meuer, 2019). Similarly, Douglas argued for the necessity of standardizing objectives, data quality, and methodological approaches (Douglas, 2017). The current landscape is fraught with the potential for disparate evaluation methodologies among assessment providers, inconsistencies in metrics, and variability in corporate disclosure practices (Exhibit 3). This scenario results in corporations facing uncertainty regarding the extent or prioritization of their sustainability strategies.

Exhibit 3: Target Market, scope of data considered in rating methodology, and model characteristic of market

Data Provider	Target Market	Market Coverage (#of firms)	Indicators (#)	Key Issues (#)	Model Methodology	Rating Scale	Advisory Offered to Companies
Market							
Bloomberg	Investors & Companies	> 10,000	700	120	Model	100-0	No
FTSE Russell	Investors	> 4,000	350	125	Hybrid	5.0-1.0	No
MSCI	Investors	> 6,000	1,000	37	Hybrid	AAA to CCC	Yes
Thomson Reuters	Investors	> 6,000	400	178	Hybrid	A+ to D-	No
ESG-Exclusive							
Arabesque	Investors	> 4,000	200 ⁷	NA	Model	100-0	No
Covalence	Investors & Companies	> 3,400	NA	50	Hybrid	100-0 ⁹	Yes
CSRHub	Companies	> 17,000	NA	NA	Model based	100-0	No
Ethos	Investors	> 1,650	NA	NA	Analyst based	-	No
Inrate	Investors	> 2,600	NA	NA	Hybrid	A+ to D-	No
Oekom Research	Investors	> 3,500	100	37	Analyst based	A+ to D-	Yes
RobecoSAM	Investors & Companies	> 2,400	survey ⁸	120	Hybrid	Gold, Silver, Bronze	Yes
Sustainalytcis	Investors	> 6,500	70	21	Analyst based	100-0	Yes
VigeoEIRIS	Investors & Companies	> 3,200	330	38	Hybrid	Double+to double-	Yes
Specialized							
CDP	Investors	> 2,000	175	2			

Furthermore, the capacity of firms to differentiate between material and non-material Environmental, Social, and Governance (ESG) issues varies, potentially resulting in divergent long-term performance

outcomes. Khan discovered that companies that integrate "material" ESG considerations into their operations exhibit significantly superior performance compared to those that concentrate on non-material ESG issues or disregard ESG considerations altogether (Khan, 2016). Drawing on this insight, Rockefeller Asset Management formulated the Rockefeller ESG Improvers Score™ (REIS), defined as "a metric that evaluates a firm's progression in addressing material ESG concerns relative to its industry counterparts." They conducted a retrospective analysis on a hypothetical portfolio comprising companies ranked in the top quintile as ESG Improvers, which demonstrated a consistent annual outperformance of 3.8% relative to those categorized as ESG Decliners in the lowest quintile (Exhibit 4). This examination spanned U.S. all-cap equities from 2010 to 2020, revealing a pattern where the extent of outperformance incrementally intensified across each quintile, evidencing a distinct and uniform trend (Clark, 2020).

Exhibit 4: Rockefeller ESG Improvers Score (REIS): Top Quintile Firms Outperform

Rockefeller ESG Improvers Score™ (REIS): Top Quintile Firms Outperform

Growth of \$1

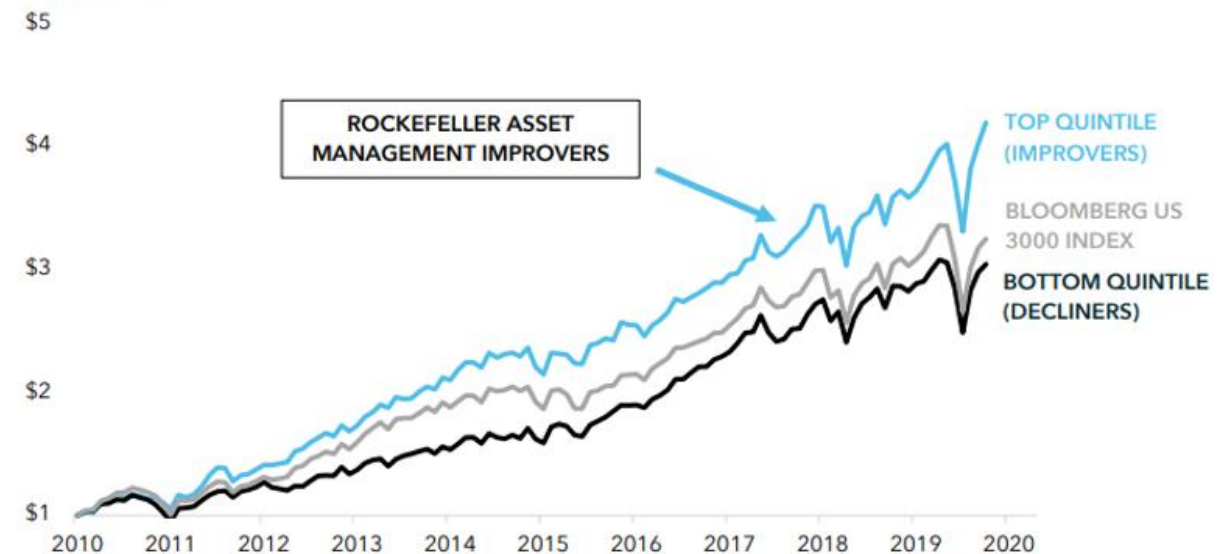


Exhibit-1: Cumulative returns of the top and bottom quintile of ESG improvers compared against the Bloomberg 3000 benchmark index covering data from 2010 - 2020.

Source: Rockefeller Asset Management

Conclusion is based on an optimized hypothetical ESG Improvers Portfolio, which seeks to isolate pure ESG Improvement while controlling for sector and factor biases. The hypothetical back-tested performance shown here was not calculated in the same manner as the Bloomberg Rockefeller ESG Improvers Index™ Family because, among other things, no quality and low volatility factors were applied and no negative screens were included in the analysis. The back-tested hypothetical performance information shown is not that of a Bloomberg Rockefeller ESG Improvers Index. Transaction costs not considered in this analysis; reflects the reinvestment of all distributions. It is not possible to invest directly in an index. Actual performance will differ. Please refer to the disclosures and methodology at the end of this presentation for additional information regarding the universe, methodology and inherent limitations.

(2) Insufficient third-party assurance organizations for impact/ESG data

Two primary challenges emerge when investors and issuers engage with impact/Environmental, Social, and Governance (ESG) concerns. Initially, the inconsistency in the precision and interpretation of data from impact/ESG rating agencies can yield inconsistent outcomes when attempting to correlate with financial returns and other variables, fostering skepticism towards impact/ESG. Berg conducted an analysis of the variation in ESG ratings across six notable rating agencies, including MSCI and S&P Global GPIF, identifying those discrepancies in measurement—encompassing indicator sets and measurement methodologies—constituted the predominant source of divergence, surpassing issues of scope and weighting (Berg, 2019). They also noted that a rater’s overarching perception of a company influenced the assessment of specific categories. This issue of inconsistency was further explored by Dimson, who posited that the ESG scores from leading rating agencies lack coherence (Dimson, 2020). Despite improvements, ESG ratings from major agencies continue to demonstrate poor correlation, particularly in specific regions like Japan (GPIF 2019) and in emerging markets. The Future Investment Initiative (FII) Institute additionally critiqued the key performance indicators (KPIs) utilized by significant rating agencies for their limited applicability to the conditions of emerging markets and their disproportionate emphasis on disclosure over annual performance metrics (FII Institute., 2022).

The second challenge, partially attributable to the issues, revolves around the absence of objectivity in the comprehension and measurement of ESG and sustainability, coupled with the deficiency of third-party entities capable of validating the accuracy and integrity of data. As both international and national regulatory bodies intensify their involvement in dictating disclosure requirements, the availability of data is expected to increase alongside the proliferation of third-party assurance organizations. For instance, in January 2023, the European Union implemented the Corporate Sustainability Reporting Directive (CSRD), which mandates more stringent disclosure of social and environmental information by corporations, aiming for greater contemporaneity. Nevertheless, it is imperative for future efforts to extend beyond the CSRD and other regional initiatives to collectively address these challenges at a societal level.

(3) Lack of clarity on financial returns of impact/ESG initiatives

A notable segment of the corporate sector harbors skepticism towards the formulation and execution of Environmental, Social, and Governance (ESG) strategies within their organizational framework, attributable to the absence of objective benchmarks for assessing the nexus between a corporation’s impact/ESG endeavors and its financial outcomes. The discourse regarding the influence of ESG and

socially responsible practices on financial performance has been longstanding, with a plethora of research indicating a positive association (Whelan, 2021). For instance, Kim deduced that high levels of competitive behavior amplify the financial benefits derived from socially responsible initiatives (Kim, 2015). Conversely, their findings also suggested that in environments characterized by minimal competitive intensity, the absence of social responsibility initiatives does not detrimentally affect financial performance. Nirino observed that within the food and beverage industry, social initiatives positively influence financial performance, whereas environmental initiatives exhibit negligible or adverse effects (Nirino, 2019). Such divergent perspectives regarding the impact of corporate sustainability commitments on financial performance engender skepticism towards corporations based on their sustainability engagement levels.

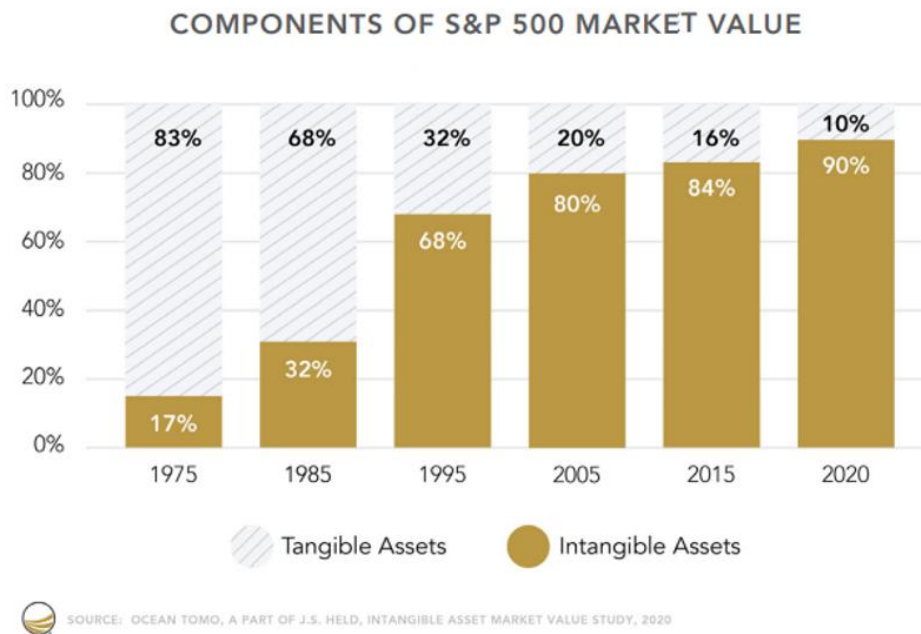
The ambiguity surrounding the verification process exacerbates corporate and investor doubts regarding the authenticity of ESG disclosures. Furthermore, the obscurity concerning the financial dividends of ESG initiatives for corporations' fuels investor reluctance towards the adoption and sustained application of ESG strategies by businesses. In essence, the dual absence of subjectivity and objectivity in defining and quantifying sustainability and ESG practices may render corporations indecisive, and investors bewildered when evaluating the efficacy or deficiency of corporate disclosures, thereby rendering ESG itself more susceptible to scrutiny. It is posited that the delineation and quantification of sustainability ought to maintain uniformity across corporations, rating agencies, and governmental entities.

1-3: Benefits of Engaging in Impact/ESG Investing

While certain observers contend that the paradigm of impact/Environmental, Social, and Governance (ESG) investing remains somewhat esoteric and not wholly embraced by the conventional investment community, as previously delineated, the proportion of intangible assets relative to a company's market valuation has been on an ascendant trajectory annually. Within the U.S. marketplace, intangible assets constitute 90% of market capitalization (Ocean Tomo., 2020) as Exhibit 7 shows. Distinguished from tangible assets by their non-physical nature yet employed over multiple years, intangible assets have increasingly become pivotal in determining corporate value, with human resources undeniably forming the crux of these assets. Augmenting the value of human capital invariably enhances the worth of intangible assets, thereby fostering a sustainable augmentation of corporate value (Ministry of Economy, Trade and Industry, 2022). This implies that investments in human capital and organizational reforms, as

explicit exemplifications, broadly amplify employees' soft skills and sense of affiliation, anticipated to yield elevated labor productivity. Despite persisting skepticism towards the categorizations of "intangible assets" and "human capital," there is an observable trend towards integrating impact/ESG considerations into market capitalization, a phenomenon stakeholder, including investors, cannot afford to overlook. It is anticipated that investors will persist in their focus on non-financial metrics not overtly delineated in financial statements, such as the caliber and volume of human resources and investments in information technology. This discourse elucidates the benefits accruing from stakeholder engagement in impact/ESG investment and its repercussions.

Exhibit 7: Components of S&P 500 Market Value



Our examination of the extant literature reveals that alongside a growing propensity among investors to allocate capital to entities engaged in Environmental, Social, and Governance (ESG)-related pursuits, the voluntary revelation of ESG-centric information may precipitate reduced capital costs and serve as a financial safeguard during calamitous events. As elucidated in section 1-1, the domain of impact and ESG investment has witnessed a notable surge in recent times. PricewaterhouseCoopers posits that global asset managers are projected to escalate their assets under management (AUM) pertaining to ESG criteria, with forecasts suggesting an increase to \$33.9 trillion by 2026 from \$18.4 trillion in 2021. This trajectory, characterized by an estimated compound annual growth rate (CAGR) of 12.9%, positions ESG

assets to constitute 21.5% of global AUM within a span of less than five years (PricewaterhouseCoopers, 2020).

Disclosure of ESG-specific data offers an additional vector of information, enabling investors to make informed decisions. Research indicates a prevailing investor sentiment that ESG-relevant data bear significance to financial outcomes, thereby influencing investment choices. Krueger orchestrated a survey which underscored the investor consensus that “climate change possesses substantial financial ramifications for portfolio entities and that climate risk considerations are pivotal in the investment process” (Krueger, 2020). The survey unveiled that 39% of respondents were actively endeavoring to diminish carbon footprints within their investment portfolios. Should investors pivot their portfolios towards entities exhibiting superior ESG metrics, referred to as “green firms”, and divest from those with inferior metrics, termed “brown firms”, the asset prices of green firms are likely to ascend, consequently diminishing their cost of capital.

Furthermore, scholarly discourse on Corporate Social Responsibility (CSR) argues and demonstrates that participation in CSR activities offers a protective hedge against overarching downside risks, including financial downturns and economic upheavals like the COVID-19 crisis. Lins discerned that during the financial turmoil of 2008-2009, entities with heightened social capital, as gauged by CSR intensity, registered superior stock returns, enhanced profitability, and secured greater debt financing compared to their low-CSR counterparts (Lins, 2017). Recent investigations suggest that companies with robust ESG credentials experienced significantly milder declines in stock valuations during the market downturn precipitated by the COVID-19 pandemic onset (Albuquerque, 2020) (Pastor, 2020).

Although myriad studies advocate the merits of ESG information dissemination, it is articulated that certain “determinants” exist for companies opting for this voluntary disclosure. Christensen identify three principal determinants: first, generic organizational and managerial attributes, encompassing firm size, ownership structure, geographical location, corporate governance robustness, and the educational background and training of managers. Secondly, the nature of an entity’s commercial activities and external incidents—entities within “polluting” and “controversial” sectors such as alcohol and tobacco, as well as entities that elevate their disclosures subsequent to environmental disasters or accidents. Lastly, the influence of external stakeholders and societal pressures on CSR reporting practices, with

observations of social activists, institutional investors, government bodies, and policymakers propelling entities towards initiating or expanding CSR disclosures (Christensen, 2021).

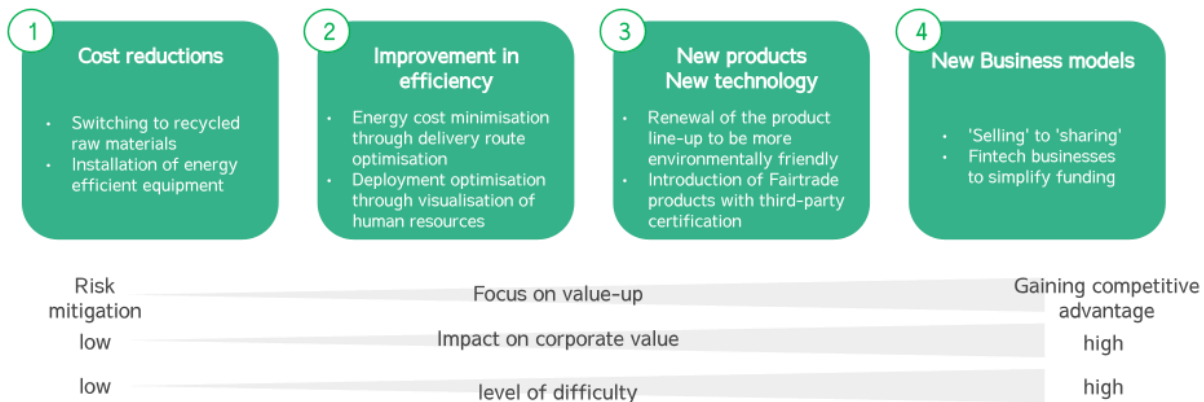
The elucidation and guidance from preeminent bodies regarding the spectrum of ESG-related data corporations should divulge, especially the standards proposed by the International Sustainability Standards Board (ISSB) under the auspices of the International Financial Reporting Standards (IFRS), are anticipated to alleviate the confusion and challenges referenced in section 1-1, culminating in an uptick in entities voluntarily communicating their ESG performance metrics.

Improvement of Corporate performance related to corporate value through implementation of ESG activities

I believe that corporate ESG activities improve corporate value and performance through four channels.

Exhibit 8: Value Drivers from an ESG Perspective

Valuing up by integrating ESG (increasing corporate value) is primarily done through four channels. Opportunities detected by ESG DD can be incorporated into this framework to systematically consider valuation enhancement measures.



(1) Reduction in Expenditure

Diminishing operational costs presents a less complex strategy compared to alternative approaches, offering a straightforward path to risk mitigation. Advancements in energy efficiency can substantially curtail energy consumption, thereby reducing associated costs. The United States Environmental Protection Agency posits that through strategic investments in the insulation and upkeep of buildings, the majority of American corporations could slash their energy expenditures by as much as 30% (U.S. Environmental Protection Agency., 2024). Further, McKinsey discerned that adept ESG deployment could buffer the repercussions of escalated operational costs, such as heightened expenses for raw materials, water, and carbon emissions, potentially impacting operating profits by up to 60% [McKinsey &

Company., 2019]. Additional research underscores the economic viability of minimizing food wastage, evidenced by an examination of over 700 firms across 17 nations. Entities operating within the sectors of food production, retail, hospitality, and dining experienced a median financial return of \$14 for each \$1 allocated towards the mitigation of food loss and waste (Champions, 2017).

(2) Enhancement in Operational Efficiency

Another conduit is productivity, which presents a relatively straightforward target for corporate intervention. Comparable initiatives can engender efficiency gains leading to cost reductions. For instance, diminishing energy consumption for truck deliveries precipitates a more efficient allocation of time. Furthermore, an extensive body of research corroborates the notion that ESG-related enhancements foster increased productivity and engagement within the workplace. Organizations characterized by high trust, those implementing "soft features", report 74% reduced stress levels, 106% greater energy at work, 50% higher productivity, 76% increased engagement, 13% fewer sick days, and 40% lower burnout rates (Schroders., 2023) (Zak, 2017).

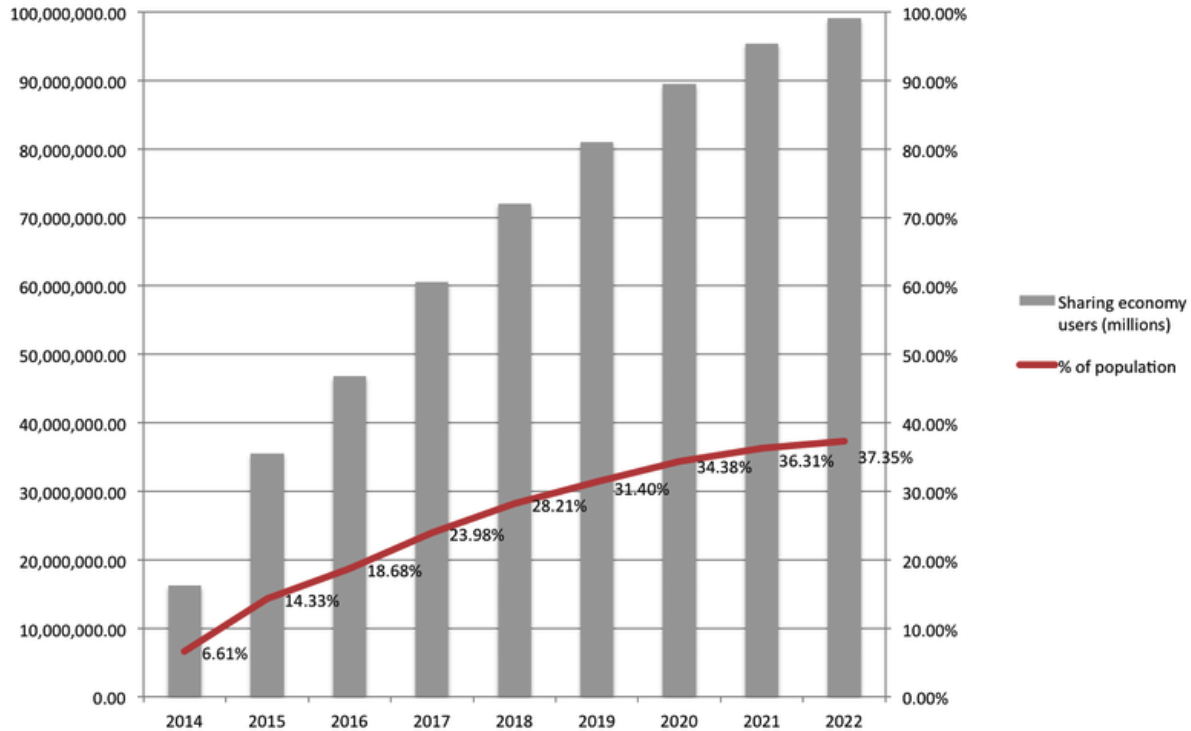
(3) Innovation in Products and Services

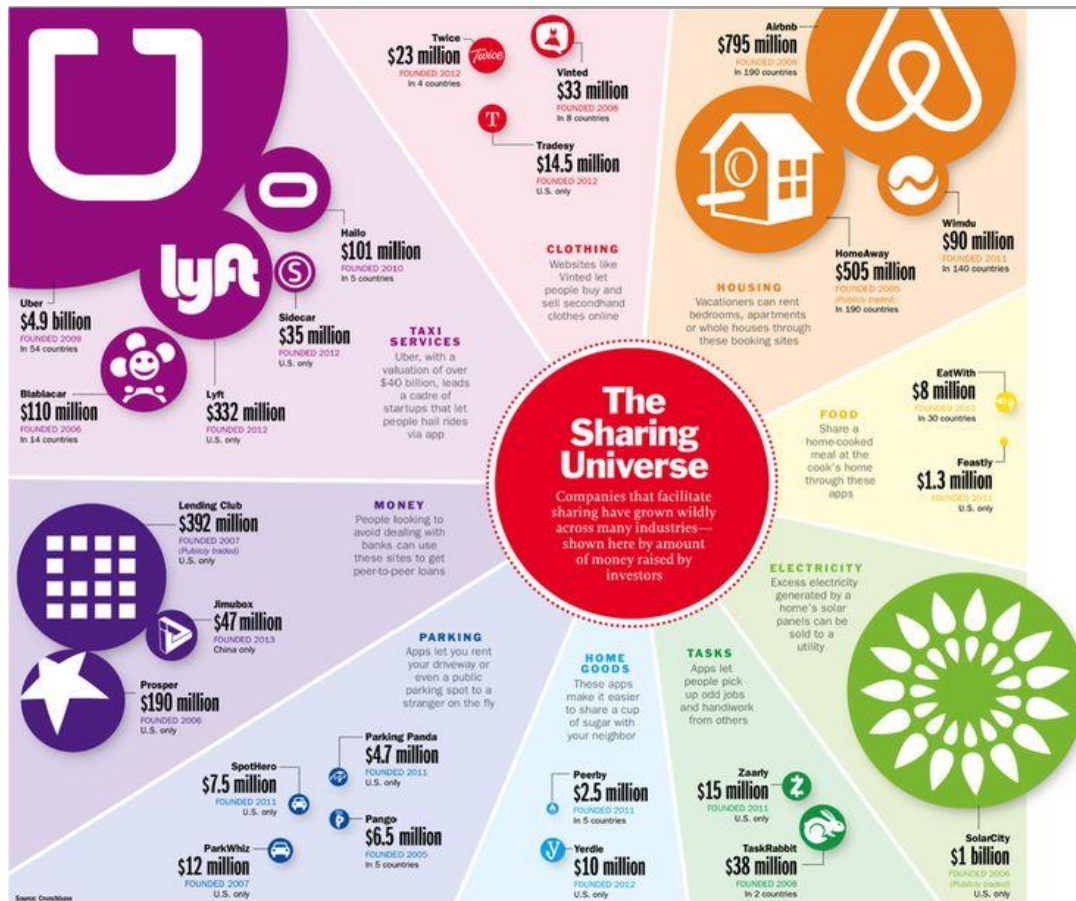
Despite the greater complexity associated with this channel compared to the preceding ones, the incorporation of Environmental, Social, and Governance (ESG) metrics into corporate strategy can catalyze the development of novel products and technologies through enhanced innovation. Numerous investigations underscore the pivotal role of diverse teams in driving innovation. The International Labour Organization, utilizing a probabilistic model derived from survey responses from nearly 13,000 companies worldwide, deduced that enterprises characterized by "an inclusive business culture and inclusive policies" have a 59.1% likelihood of fostering creativity, innovation, and openness (International Labour Organization., 2019). Moreover, Boston Consulting Group observed that entities with below-average diversity metrics reported merely 26% of their revenues from innovations, in stark contrast to those with above-average diversity metrics, which reported 45% (Boston Consulting Group. , 2017). Additionally, evolving consumer preferences are influencing the criteria for product development. Research conducted by McKinsey and NielsenIQ indicates that products featuring ESG-related assertions enjoyed a 1.7 percentage-point growth advantage (with a Compound Annual Growth Rate (CAGR) of 6.4% during 2018-2022) in sales compared to those devoid of such claims (McKinsey & Company and NielsenIQ., 2023).

(4) Evolution of Business Models

The full integration of ESG metrics could revolutionize the foundational business model itself. An illustrative model is the circular business paradigm, defined by the Ellen MacArthur Foundation as “a system in which materials are perpetually repurposed and nature is regenerated.” Retail giants such as IKEA and Uniqlo are modifying their business strategies to incentivize consumers to extend the lifecycle of products. Initiatives include the pilot of second-hand stores and the offering of vouchers or discounts for the return of items or the donation of used goods. Another archetype is the sharing economy model, which facilitates the communal utilization of resources or services amongst individuals or corporations, with Airbnb and Zipcar serving as prominent examples. As delineated, I posit that the strategic integration of ESG considerations into business models will augment enterprise value through cost reduction, operational efficiencies, the introduction of innovative products and services, and the genesis of novel business models. Although the integration of ESG-driven initiatives into business strategies is seen as broadly beneficial, it is pertinent to acknowledge that the scale of impact varies across different corporations, industries, and geographical regions.

Exhibit 10: The market size of sharing economy





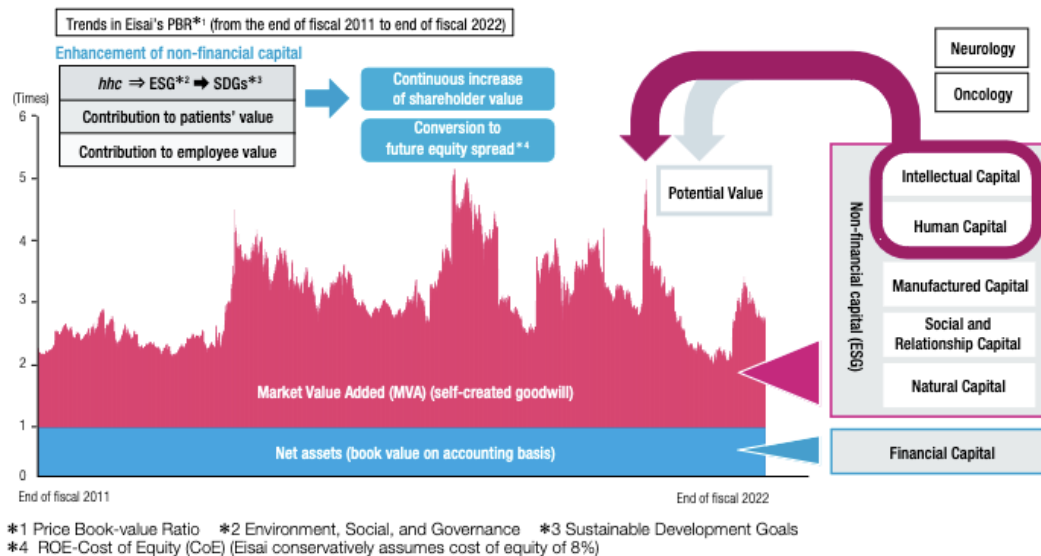
Chapter 2:

Attempts to Analyze the Relationship Between "Impact" and "Corporate Value" - Analysis from Pharmaceutical Industry Cases -

2-1: Efforts by companies to disclose ESG/impact-related information

Entrepreneurial endeavors by enterprises to disclose information related to Environmental, Social, and Governance (ESG) and impact indicators are increasingly prevalent as companies and investors shift their focus towards non-financial capitals such as human capital, intellectual property, and social contributions. These efforts aim to foster initiatives that enhance corporate value. It is imperative to evaluate corporate value on the basis of 'corporate value = financial value + non-financial value (impact value)' to fully realize a company's potential. Eisai, a prominent Japanese corporation, exemplifies active involvement in the dissemination of non-financial information, having identified six types of non-financial capital—Intellectual capital, Human capital, Manufactured capital, Social and Relationship capital, and Natural Capital—that constitute their corporate valuation (see Exhibit 11).

Exhibit 11: The six types of capital that comprise Eisai's corporate value



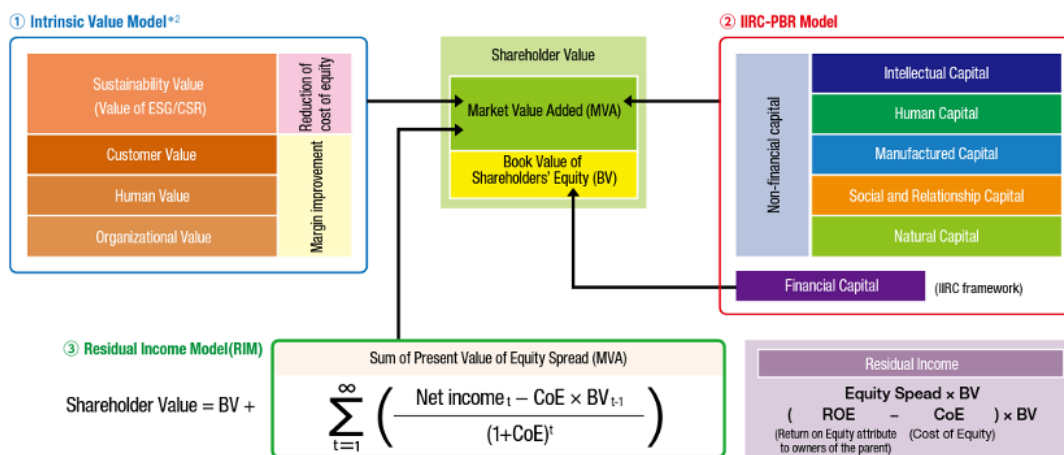
Starting from FY2021, Eisai has published an Integrated "Value Creation Report," which aims to communicate the social value they generate over the medium- to long-term to their stakeholders.

Complementary to the Value Creation Report, Eisai has issued an Environmental Report that details the group’s activities toward environmental conservation, and a Human Capital Report that summarizes their approach to human capital management along with related Key Performance Indicators (KPIs). While numerical data are indispensable for managers and investors to gauge and share, quantifying non-financial capital poses significant challenges. The former Chief Financial Officer (CFO) of Eisai, Mr. Yanagi, has formulated the Yanagi Model (see Exhibit 12), which correlates ESG factors with corporate value. In collaboration with the Impact-Weighted Accounting Initiative (IWAI) at Harvard Business School, he developed a model that utilizes multiple regression analysis to quantify the impact through what he terms the delayed penetration effect of ESG. Yanagi advocates that investor engagement is crucial for unlocking corporate value. By employing such models, he endeavors to quantify the value of non-financial capital, thereby facilitating thorough and critical discussions regarding a company's intrinsic value.

Eisai published an Integrated "Value Creation Report" from FY2021, aiming to convey social value created by themselves over the medium- to long-term to its stakeholders. Alongside the Value Creation Report, they have published an Environmental Report outlining the group's environmental protection activities and a Human Capital Report summarizing their approach to human capital and related KPIs.

Exhibit 12: Non-Financial Capital and Equity Spread Value Relevance Model - Toward the Visualization of “Invisible Value” -

■ Non-Financial Capital and Equity Spread Value Relevance Model *1 —Toward the Visualization of “Invisible Value”—



*1 Source based on the following reference: "ROE Revolution and Financial Strategies" CHUOKEIZAI-SHA (2017)

*2 "Financial Strategies for Maximizing Corporate Value" Doyukan (2009)

In accounting, labor costs are typically viewed as detractors from profitability. Nonetheless, as illustrated by Eisai's fiscal year 2019 example, investments in human capital that are projected to enhance the Price-to-Book Ratio (PBR) over a future period, such as five years, are classified not merely as costs but as value creators (social impacts) under the principles of the Impact-Weighted Accounting Initiative (IWAI). According to IWAI's methodology, the 'positive social impact created' is quantified by aggregating the positive and negative influences of Eisai's total payroll, which amounts to 35.8 billion yen. This total includes considerations such as the marginal utility of wages, disparities in pay and promotion opportunities, gender pay gaps, the ratio of female to male managers, diversity, and contributions to local communities (see Exhibit 13).

Exhibit 13: Eisai created a 26.9-billion-yen positive value

**Eisai created 26.9 billion yen positive value
(Human resources investment efficiency of 75%)**

Eisai Employee Impact Accounting (Non-consolidated)		(Unit: Billions of yen)			
Fiscal Year	2019				
Number of Employees	3,207				
Revenue*1	246.9				
EBITDA*1	61.1				
Total Salaries Paid	35.8				
Employee Impact	Impact	EBITDA (%)	Revenue (%)	Wages (%)	
Wage Quality*2	34.3	55.99%	13.87%	95.83%	
Employee Opportunity*3	(0.7)	-1.17%	-0.29%	-2.00%	
Subtotal	33.5	54.82%	13.59%	93.83%	
Labor Community Impact					
Diversity*4	(7.8)	-12.70%	-3.15%	-21.73%	
Contributions to Local Communities*5	1.1	1.81%	0.45%	3.09%	
Subtotal	(6.7)	-10.89%	-2.70%	-18.64%	
Total Impact	26.9	43.93%	10.89%	75.19%	

*1 Revenue and EBITDA have been allocated from segment information

*2 Marginal utility and wage gender gap adjusted

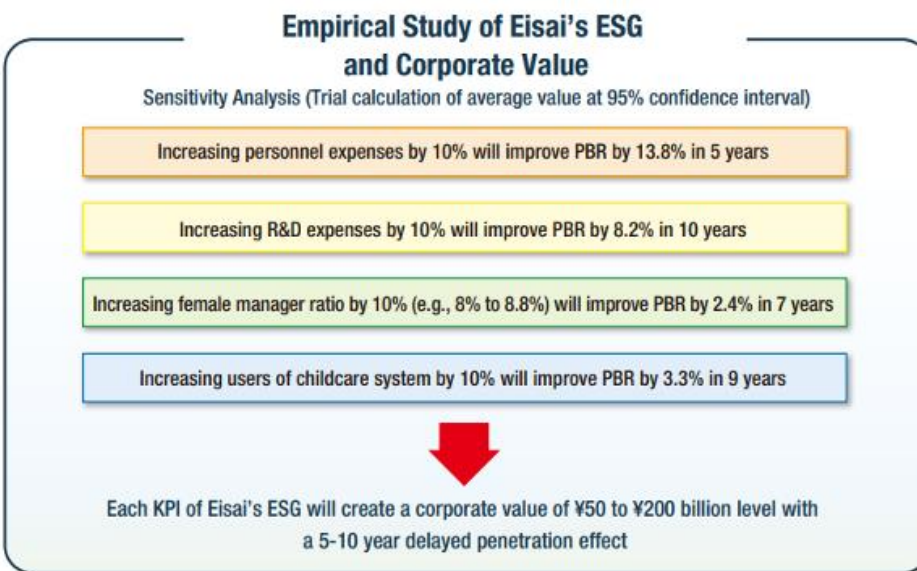
*3 Gender gap in promotion/salary increase adjusted

*4 Gender gap in employment against average demography adjusted

*5 Local unemployment rate x number of employees x (annual salary – minimum safety net)

Furthermore, in its 2021 Value Creation Report, Eisai examined the correlation between ESG-related Key Performance Indicators (KPIs) and PBR using data spanning 28 years, which included 88 in-house ESG KPIs. The analysis revealed that a 10% increase in personnel expenses, research and development costs, the proportion of female managers, and the usage of childcare short-time systems contributed to an improvement in PBR over the long term (see Exhibit 14).

Exhibit 14: Empirical Study of Eisai's ESG and Corporate Value



Eisai has also introduced an "ESG Value-Based Income Statement," which redefines "ESG EBIT" by treating personnel and research and development costs as strategic investments, subsequently adding them back to the traditional operating profit reported in the income statement. While conventional operating profits have shown significant fluctuations, ranging from 50 to 120 billion yen, the ESG EBIT consistently hovers around the 300-billion-yen mark. This demonstrates that despite potential declines in profit due to heightened expenditures on R&D and personnel—aimed at advancing strategic pharmaceutical drug pipelines—it is imperative to reconceptualize these expenditures as long-term investments in patient care and human capital, rather than succumbing to short-term financial perspectives (Exhibit 15).

Exhibit 15: ESG Value-based Income Statement

ESG Value-based Income statement

(Unit: Billions of yen)

	Fiscal 2018	Fiscal 2019	Fiscal 2020	Fiscal 2021	Fiscal 2022
Revenue	642.8	695.6	645.9	756.2	744.4
Cost of sales	184.5	175.7	161.3	174.8	177.8
Portion for personnel expenses associated with manufacturing activities Human capital	13.6	14.2	14.2	16.2	16.6
Conventional gross profit	458.3	519.9	484.6	581.4	566.6
ESG gross profit	471.9	534.1	498.8	597.6	583.2
R&D costs	144.8	140.1	150.3	171.7	173.0
R&D costs Intellectual capital	144.8	140.1	150.3	171.7	173.0
(Portion for personnel expenses)	45.6	46.4	47.4	54.1	64.7
Selling and administrative expenses	228.2	256.3	281.4	366.4	358.3
Portion for personnel expenses associated with operating activities Human capital	87.1	88.0	90.5	101.3	100.2
Other income	0.9	2.0	(1.2)	10.5	4.8
Conventional operating profit	86.2	125.5	51.8	53.7	40.0
ESG EBIT	331.6	367.8	306.7	342.9	329.9

ESG gross profit = Revenue – Cost of sales + Personnel expenses associated with manufacturing activities (human capital)

ESG EBIT = Operating profit + R&D costs (intellectual capital) + Personnel expenses associated with manufacturing activities and operating activities (human capital)

2-2: Visualization of social and environmental impact and its impact on corporate value

Identifying market assessments of business strategies and innovations that yield social and environmental benefits is pivotal. If these assessments can be effectively communicated, it is anticipated that a larger pool of investors will be drawn to impact investing, thereby channeling more risk capital towards projects aimed at addressing social issues.

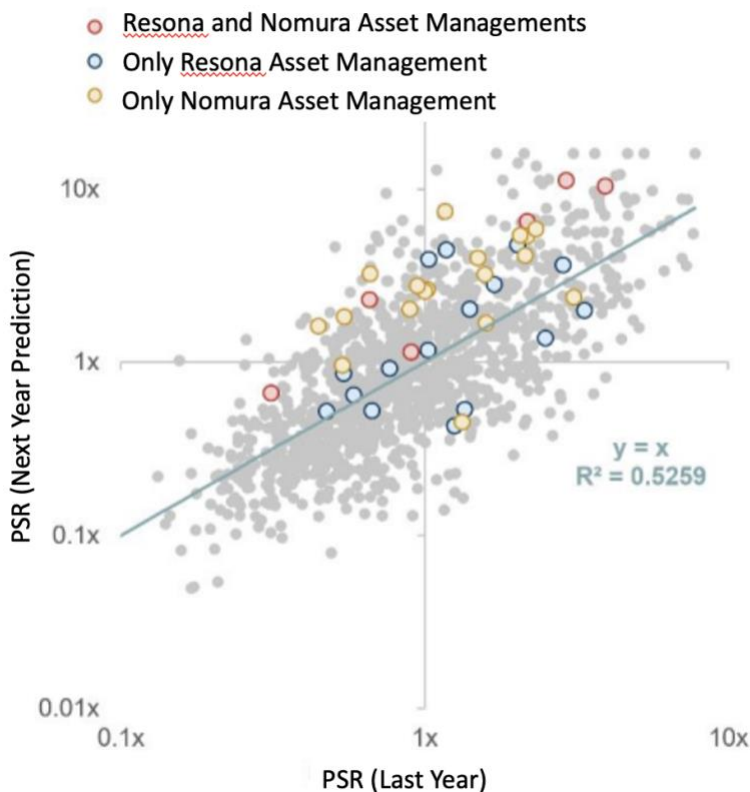
In the study titled "Visualizing Sustainable Growth and Quantifying Impact Embedded in Stock Prices: Creating a Common Outcome Label Using Generative AI," Nomura Securities Group ("Nomura") reflects on the progress Japanese companies have made over the past decade, positioning them as valuable

long-term assets. However, it is acknowledged that these advancements have not necessarily translated into higher valuations. Nomura observes that to enhance Price-to-Book (P/B) ratios, corporations need to effectively communicate their growth prospects and associated risks through dialogues with investors [Nomura Holdings., 2023]. To this end, Nomura is dedicated to developing a robust methodology that showcases the inherent latent value of companies—value that may not be readily apparent through conventional financial data or macroeconomic factors. This latent value is often a critical component of a company's sustainable growth potential, particularly prevalent among Japanese firms.

Furthermore, Nomura has determined that the potential value highlighted in the Impact Report typically exerts a positive influence on stock prices. This effect is attributed to impact investors—those who commit to long-term investments—evaluating and investing based on a company's prospects for sustainable growth (see Exhibit 16). Such findings underscore the significance of transparently articulating the social and environmental impacts of business activities as they play a crucial role in shaping investor perceptions and, ultimately, corporate valuations.

Exhibit 16: Potential Value of Companies Included in Impact Reports of Managed Companies

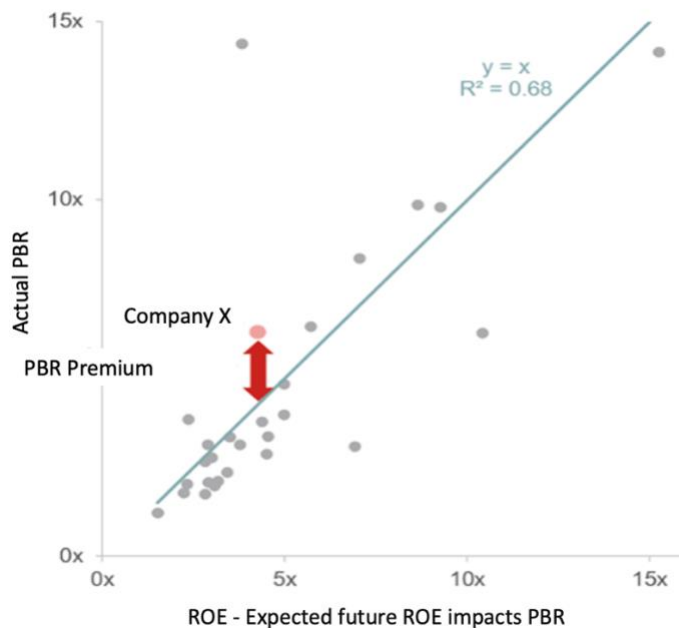
Correlation between PSR (Price-to-Sales Ratio) and earnings growth



Therefore, Nomura has been attempting to quantify potential value, visualizing potential value using common outcome indicators (outcome labels) based on existing frameworks such as IRIS+, UN Impact Radar and Keidanren Impact Index, comparing outcome indicators among companies using a generated AI, comparing potential Nomura is working to visualize the content of value, and to estimate the impact of potential corporate value implicit in stock prices using a stock price valuation model.

In the report, Nomura also developed a quantitative model, the "ROE/Short-term Growth Model," which explains PBR regarding ROE and short-term growth for 29 Japanese software and services companies, including SaaS and SaaS companies. Although the coefficient of determination of this model was sufficiently high at 0.68, there was an error between the PBR estimated from the model and the actual PBR, which we defined as the "PBR premium discount. In other words, factors that ROE and short-term growth potential cannot explain can be interpreted as creating PBR premiums and discounts and being traded in the market. By breaking down the analysis to the level of "outcome labels," which are closely related to each company's social and environmental impact of each company, we can expect to gain insight into what kind of impact and related initiatives are valued by the market. Nomura created an "outcome label model," a model that explains PBR premiums and discounts using the outcome label as a factor, to analyze how each company's outcome label contributes to impact premiums and discounts. (See Exhibit 17).

Exhibit 17: Model Predicted PBR and Actual PBR



As the potential value of impact companies is revealed through this approach, it is expected that no matter what business category the business company may be in, the increased expectations for sustainable growth will be reflected in the stock price, improving competitiveness. Furthermore, for investors, focusing on corporate impact and investing in companies that pursue sustainability for society will help make their investment portfolios more sustainable.

Chapter 3:

The Influence of ESG Ratings on Market Performance and a Portfolio Example as an ESG Investor: An Event Study Approach

3-1: Introduction

This chapter investigates the tangible impacts of Environmental, Social, and Governance (ESG) rating changes on stock prices, exploring the potential of ESG ratings to inform portfolio management strategies. Initiating with event studies, I observed that the market reacts negatively to downgrades in ESG ratings, with no significant response to upgrades, suggesting a prevalent negative screening by investors based on ESG scores. Leveraging these insights, particularly the significant adverse reactions to downgrades to BBB or lower, I constructed a portfolio that combines ESG rating screening (A or above) with fundamental financial screening (Return on Equity (ROE) > 15% and Return on Invested Capital (ROIC) > Weighted Average Cost of Capital (WACC)). This portfolio demonstrated superior returns and a higher Sharpe ratio compared to a market portfolio.

3-2: Awareness of the Problem Today

Contemporary enterprises exert considerable effort in responding to ESG ratings, raising questions about the tangible benefits of such responses. This research aims to determine the actual utility of ESG ratings in the market and whether strategic efforts to maintain or improve these ratings can enhance long-term corporate value. An event study was conducted focusing on how investors react to changes in MSCI ESG ratings, the most widely used among stakeholders.

3-3: Data and Event Study

Data

The analysis utilized historical data encompassing:

- MSCI ESG ratings from 1999 to the third quarter of 2020.

- Daily data from the S&P 500¹ on stock prices, market capitalization, ROE, Return on Assets (ROA), ROIC, and WACC spanning 2000 to 2020, sourced from the Bloomberg terminal.
- Daily historical risk-free rates derived from the Fama/French 3 Research Factors.²

Event Study Methodology

The impact of ESG rating changes on stock prices was assessed through event studies, a methodology well-suited for evaluating the influence of specific events—here, changes in a company's ESG rating—on stock performance.

- **Universe and Time Frame**

- The analysis focused on the S&P 500 as of March 31, 2024, with a review period for ESG rating changes from 2010 to the third quarter of 2020.

- **Event Definition**

- Events were delineated as changes in ESG ratings, encompassing both upgrades and downgrades (±1 or more, ±2 or more, transitions between AA/A and A/BBB). ESG ratings are updated annually with varying schedules across different securities.

- **Estimation of Capital Asset Pricing Model (CAPM) and Calculation of Abnormal Returns**

- The CAPM was employed to estimate abnormal returns attributable to these events, using data from the estimation window (t-90 to t-31).
- Abnormal returns were calculated over the event window (t to t+30), providing insights into the immediate financial implications of ESG rating changes on stock prices.

$$r_{i,t} = \hat{\alpha}_i + \hat{\beta}_i r_{m,t} + \epsilon_{i,t} \quad \hat{\epsilon}_{i,t}^* = r_{i,t}^* - \hat{\alpha}_i - \hat{\beta}_i r_{m,t}^*$$

The diagram illustrates the timeline of the event study. It shows a horizontal axis with time points t-90, t-31, t, and t+30. A bracket labeled 'Estimation window' spans from t-90 to t-31. Another bracket labeled 'Event window' spans from t to t+30. An 'x' is placed at the time point t, indicating the start of the event.

¹ S&P 500 firms as of Mar 31, 2024. I do not take into changes in S&P 500 constituents during our sample period, which may cause survival bias.

² https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/F-F_Research_Data_Factors_daily_CSV.zip

This comprehensive analysis aims to elucidate the strategic importance of ESG ratings in financial markets and inform stakeholders on effective ESG integration in investment decisions.

- **Statistical Testing Methodology**

- Utilizing specified statistical formulas, I rigorously tested the null hypothesis that the standardized average cumulative abnormal return (SCAR) is zero, aiming to determine the statistical significance of our findings.

$$\hat{\epsilon}_i^* \sim N(0, V_i) \text{ where } V_i = I\sigma_{\epsilon_i}^2 + X_i^*(X_i^T X_i)X_i^{*T}\sigma_{\epsilon_i}^2, X_i^* = [1, R_m^*]$$

$$\overline{SCAR} = \frac{\overline{CAR}}{\overline{Var(CAR)}} \sim N(0, 1) \text{ where } \overline{CAR} \text{ is average cumulative abnormal return over event window.}$$

- **Results**

- The analysis revealed a statistically significant negative response in the market to downgrades in ESG ratings at the 5% significance level. The extent of negative abnormal returns was more pronounced for ratings downgraded by two or more levels compared to a single level. Additionally, the market's reaction was more adverse when ESG ratings dropped below an A rating compared to a decrease below AA. Conversely, upgrades in ESG ratings did not yield statistically significant results. These outcomes are detailed further in Exhibit 19.

3-4: Conclusion of the Event Studies and Implications for the ESG Investment Approaches

The results from our event studies, as illustrated in Exhibits 18 and 19, provide compelling evidence that declines in ESG ratings are met with significant selling pressures, indicative of a trend towards negative screening based on ESG metrics. These findings offer valuable insights for both corporate strategists and investors, underscoring the financial repercussions of ESG ratings and the critical need for maintaining elevated ESG standards to mitigate adverse market impacts.

Exhibit 18: Abnormal returns from t-30 to t+30

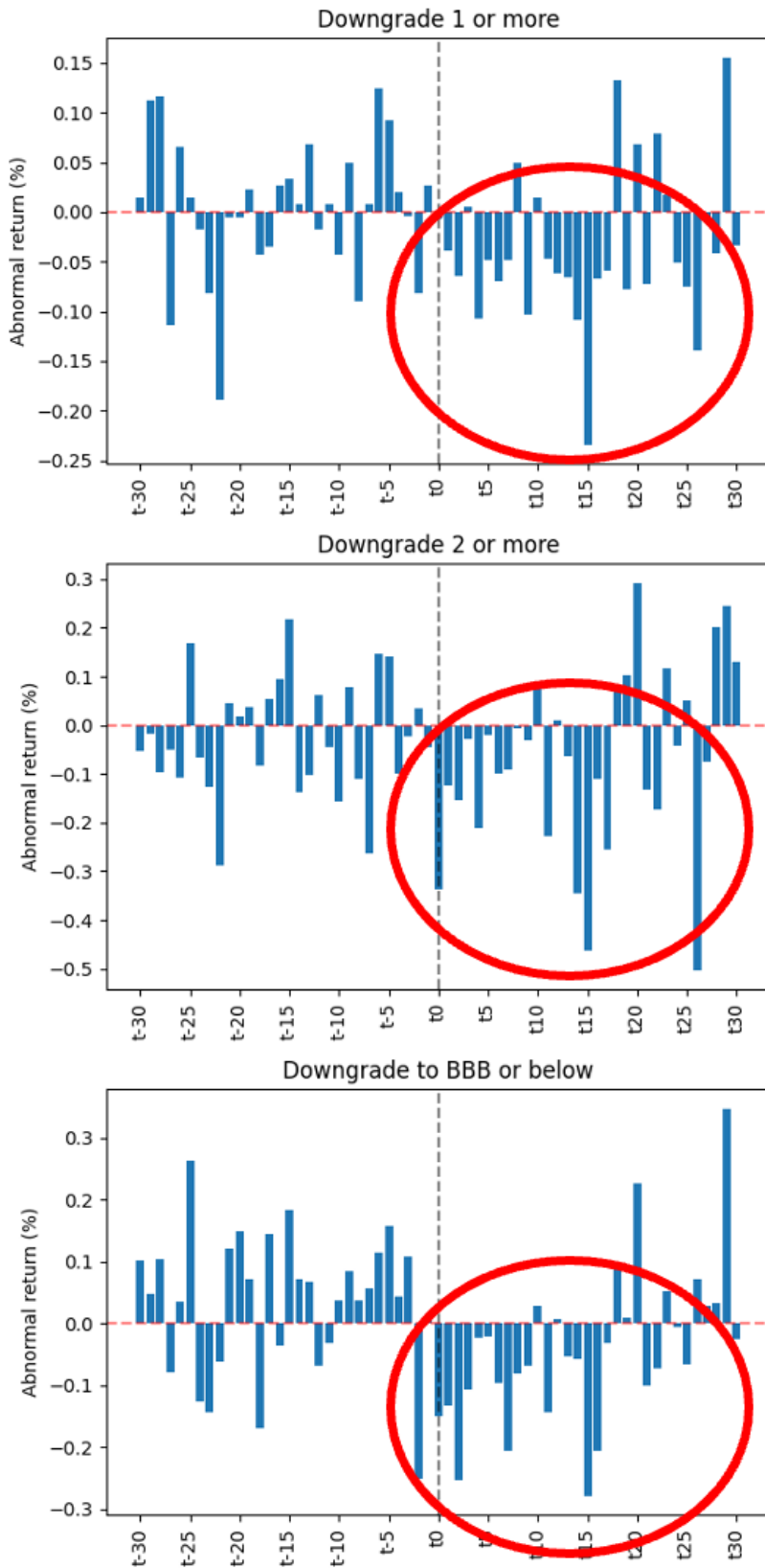


Exhibit 19: Event study results

(Unit: bps)	Pre Announcement	Announcement	Post Announcement	p-value of SCAR sample	# of
Up 1 or more	0.2	5.7	1.3	0.28	855
Down 1 or more	0.3	-0.7	-3.7	0.01	630
Up 2 or more	2.6	-22.1	0.6	0.97	121
Down 2 or more	-2.7	-33.3	-6.1	0.01	115
Up to AA or above	4.6	7.5	2.7	0.63	134
Down to A or below	-1.5	-9.6	-2.3	0.34	107
Up to A or above	0.9	0.7	-0.1	0.96	222
Down to BBB or below	2.2	-18.1	-4.8	0.03	168

3-5: Investment Approaches and Financial Analysis

Investment Approaches

- **Objective:**

- The fund is designed to achieve consistent returns by favoring long positions in companies that are less likely to be negatively screened by global investors based on ESG ratings.

- **ESG Ratings Utilization:**

- MSCI ESG Ratings are employed as the primary metric for selecting equities due to their broad acceptance among institutional investors.

- **Geographic Focus:**

- The investment strategy is confined to the U.S. market, reflecting the predominant coverage of U.S. equities within MSCI ESG ratings, which represent 63.32% of more than 2,900 equities as of April 30, 2024 (MSCI, n.d.) (MSCI, n.d.).

Financial Analysis

- **Long-Term Financial Screening:** The study employs financial screening as a strategy for long-term engagement by applying specific financial thresholds: Return on Equity (ROE) greater than 15% and a Return on Invested Capital (ROIC) exceeding the Weighted Average Cost of Capital (WACC). This principle underscores the necessity for companies to not only exceed their cost of capital but also to efficiently manage their assets and equity to foster sustainable economic returns.

- **Justification for ROE Criterion Greater Than 15%:**
 - **Efficiency and Management Effectiveness:** A high ROE signifies effective utilization of equity to generate profits, indicative of robust management and operational efficiency. This metric serves as a proxy for assessing the capability of a firm's executives to yield substantial returns on the equity provided by shareholders.

 - **Superior Profitability:** Firms with an ROE surpassing the 15% threshold generally exceed industry averages, demonstrating their adeptness at transforming investments into significant financial outcomes. This level of profitability suggests a competitive advantage in generating economic gains relative to their peers.

 - **Quality Investment Filter:** Employing a criterion of ROE greater than 15% assists investors in identifying companies likely to deliver superior returns while avoiding entities characterized by subpar financial performance, thus enhancing the overall quality of the investment portfolio.

- **Rationale for ROIC Exceeding WACC:**
 - **Identification of Efficient Capital Utilization:** Companies achieving an ROIC greater than their WACC are effectively using their invested capital, indicative of strategic resource allocation. This metric is crucial for investors aiming to identify firms that are proficient in managing their capital to generate returns that exceed the costs associated with raising that capital.

 - **Evaluation of Risk-Adjusted Returns:** The comparison of ROIC to WACC facilitates an assessment of whether a firm is generating adequate returns commensurate with the risks undertaken. This analysis is essential for determining the viability of investments in companies based on their ability to manage and utilize capital effectively.

- Assessment of Long-Term Investment Appeal: Entities that consistently maintain an ROIC above their WACC typically display stable and reliable performance over extended periods. This consistency is a key indicator of a company's long-term investment potential and sustainability, providing investors with a critical metric for long-term strategic investment decisions.

This financial analysis framework leverages stringent criteria to ensure that investment choices align with high standards of profitability and capital management, thereby fostering a sustainable investment portfolio with potential for substantial long-term gains.

3-6: Security Selection Process and Portfolio Construction

- Initial Screening Using MSCI ESG Ratings:
 - The portfolio construction process commenced with a negative screening based on MSCI ESG ratings. Stocks from the S&P 500 exhibiting a rating of 'A' or higher were initially considered, yielding 180 potential candidates. This selection was predicated on the observed significant market reactions to downgrades in ESG ratings, particularly those deteriorating by two or more levels or falling to BBB or lower. This strategy aligns with common practices among fund managers who utilize similar negative screening criteria for ratings below BBB.
- Secondary Screening Based on Financial Metrics:
 - Subsequent to the initial ESG-based screening, a financial assessment was employed, as delineated in the Financial Analysis section. This involved applying thresholds of ROE greater than 15% and ROIC exceeding WACC, which narrowed the field from 180 stocks to 38 viable companies. This two-tiered screening process ensured that the remaining portfolio candidates not only met stringent ESG standards but also exhibited solid financial health.
- Portfolio Weighting Scheme:
 - The weighting of selected stocks in the portfolio was determined based on their market capitalization, ensuring a value-weighted approach that reflects the proportional size of each company within the investment portfolio.

3-7: Final Portfolio Holdings

- Portfolio Composition:

- The distribution of the S&P 500 companies by ESG ratings and fundamental financial criteria as of the end of 2019 (the most recent full-year data available for MSCI ESG ratings) is illustrated in Exhibit 20. Companies that matched the specified criteria and highlighted in yellow in the exhibit have been included in our portfolio, as detailed in Exhibit 21.

Exhibit 20: Distribution of S&P 500 by ESG ratings and fundamental criteria as of the end of 2019

	ESG Ratings				Total
	< BBB	A	AA	AAA	
Fundamental ✓	24	19	15	4	62
No Fundamental	254	82	49	11	396
Total	278	101	64	15	458

Exhibit 21: Portfolio companies (as of the end of 2019)

Companies	Companies
Accenture	Illinois Tool Works
Align Technology	Intel
Apple	Intuit
Biogen	Lam Research
Brown-Forman	Masco
Cadence Design Systems	Mastercard
Clorox	Mettler-Toledo
Colgate-Palmolive	Microsoft
Copart	NIKE
Deckers Outdoor	NVIDIA
Edwards Lifesciences	Pool
Electronic Arts	Robert Half International
Eli Lilly	S&P Global
Expeditors International of Washington	Skyworks
FactSet Research	Texas Instrument

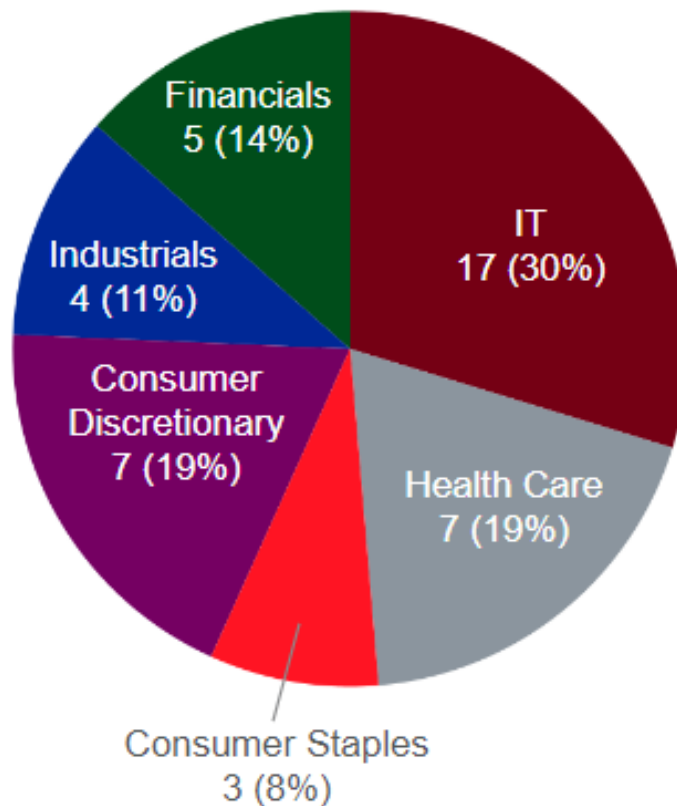
Fastenal	T. Rowe Price
Garmin	Vertex Pharmaceuticals
Home Depot	Visa
IDEXX Laboratories	Waters

- Sector Distribution:

- The portfolio predominantly includes companies from sectors such as Information Technology, Health Care, Consumer Discretionary, and Industrials, which are generally known for their strong profitability and alignment with high ESG standards. In contrast, sectors like Utilities, Energy, and Materials are underrepresented due to their frequent environmental challenges and often lower ESG scores, as elaborated in Exhibit 21.

This structured approach to portfolio construction not only adheres to stringent ESG and financial criteria but also ensures a diverse sectoral representation, thereby balancing risk and enhancing the potential for strong financial returns within an ethically responsible investment framework.

Exhibit 22: A Portfolio's Sector Distribution (as of the End of 2019)



3-8: Exit Strategy, Portfolio Risks, and Mitigation Measures:

Exit Strategy:

The defined exit strategy is activated when portfolio holdings deviate from established ESG or fundamental financial criteria. This approach ensures that the portfolio remains aligned with its initial investment thesis and ethical standards.

Risk Identification:

The primary risks to the portfolio include:

- ESG Rating Declines:
 - Equities with an initial ESG rating of 'A' that fall below 'BBB' pose a risk of not aligning with the portfolio's ethical investment criteria.

- Financial Performance Volatility:
 - Equities exhibiting unstable Return on Equity (ROE) and Return on Invested Capital (ROIC) that fail to consistently meet the set financial benchmarks threaten the financial integrity and expected performance of the investment.

Mitigation Strategies:

To mitigate these risks, the strategy includes continuous engagement with the portfolio companies concerning their ESG performance and financial metrics. This proactive approach aims to encourage improvements where needed and ensure compliance with the portfolio's investment criteria.

Performance Analysis:

- Comparative Performance:
 - The performance analysis reveals that our portfolio, as well as similarly constructed portfolios that solely utilize ESG ratings for screening, exhibit higher Sharpe ratios compared to the S&P 500, as detailed in Exhibit 6. This evidence the effectiveness of the ESG negative screening strategy commonly employed by today's global investors.

- Historical Performance Trends:
 - It is noteworthy that the return performances of these portfolios were below that of the S&P 500 up until around 2018, as illustrated in Exhibit 7. The historical performance trend, marked

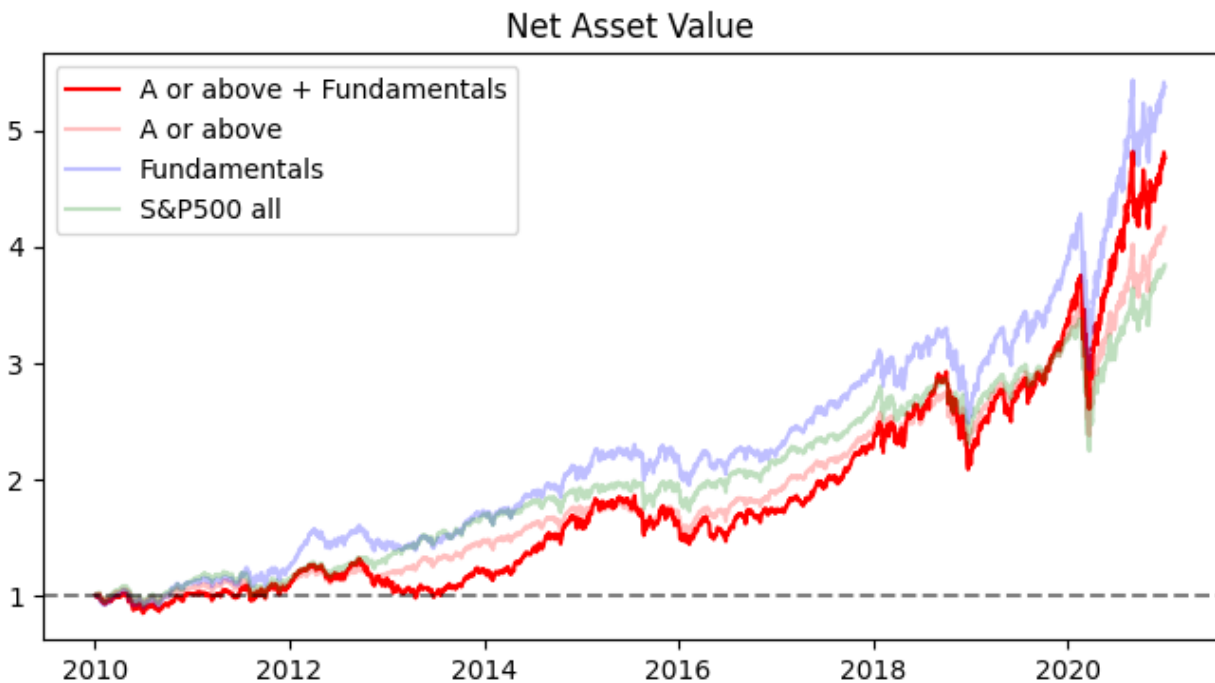
in red in the exhibit, suggests that ESG screening was not a predominant strategy among global investors in the early years before 2018.

This section highlights the importance of adaptive risk management strategies and continuous performance evaluation to align investment outcomes with the portfolio’s strategic objectives and ethical investment mandates.

Exhibit 23: Summary of portfolio performance

	Excess Return (mean)	Excess Return (std)	Sharpe ratio
S&P500	13.28%	17.46%	0.76
ESG Screening Only	14.02%	17.53%	0.80
Fundamentals Screening Only	16.63%	19.15%	0.86
My Strategy (ESG + Fundamentals Screening)	15.85%	20.70%	0.77

Exhibit 24: Net asset values of each strategy



3-9: How the companies improve and sustain the ESG ratings with combining the strategy

Based on the event study results, implication, and how ESG investors construct portfolio, it can be said that there are merits to avoid negative screening by the investors with endeavoring towards improving ESG ratings. However, how should the company realize it with pursuing the profits based on the strategies? Here, I would like to introduce one of the approaches to realize both of pursuing profits and ESG ratings the through materiality map creation.

Many institutional investors are incorporating ESG into their investment decisions, and the scale of ESG investment is accelerating and expanding. The response required for companies under stakeholder capitalism is to combine social value enhancement with economic value enhancement through the Tier 1-4 process in Exhibit 25. Materiality assessment can be created by building up the Tier 1~3 process from the bottom.

- Strategic Aspects

Materiality assessment is an integral part of corporate strategy. Clarifying business objectives enables a company to execute value-creating initiatives from a long-term perspective and conduct economically and socially beneficial business rather than focus solely on pursuing short-term and medium-term economic benefits. ESG initiatives positively correlate with corporate performance and can also improve employee engagement and retain and attract top talent, thereby contributing to a company's competitive advantage.

- ESG Aspects

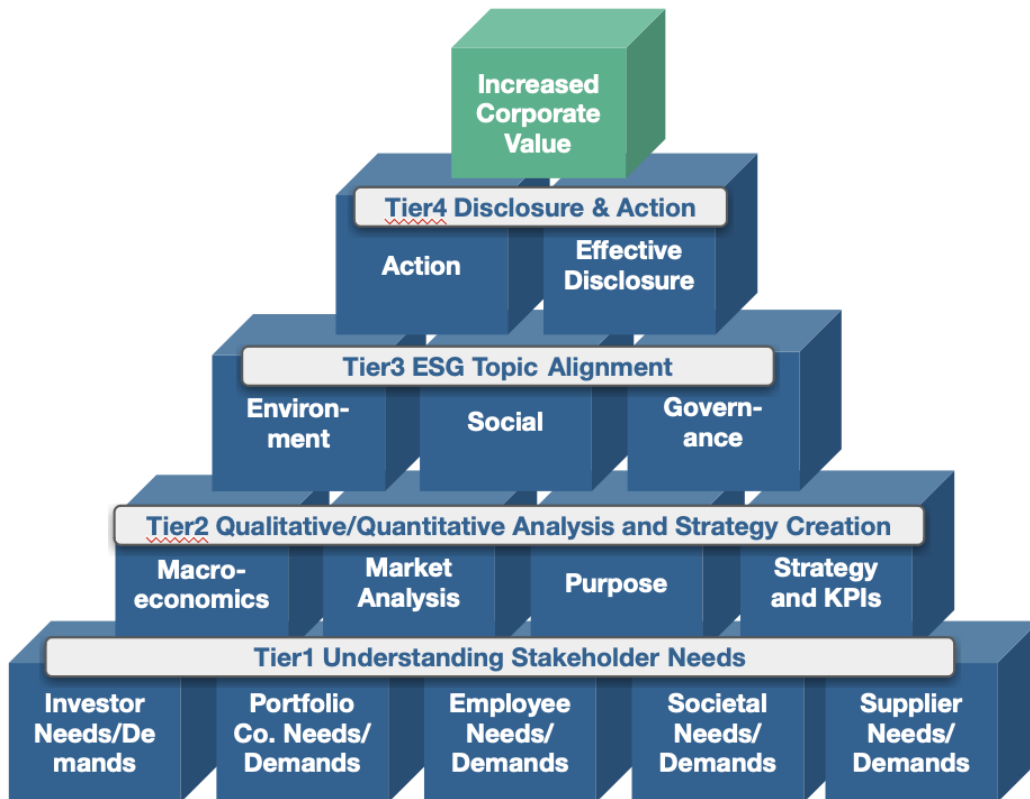
Materiality assessment leads to adequate disclosure of corporate initiatives and helps companies obtain an ESG rating evaluation. Global rating agencies such as MSCI and FTSE assign ESG ratings based on a company's publicly available information. Each industry sector has different items to be evaluated, resulting in a long list of over 400 items in total.

- Materiality Map Formulation

Based on the identified items material to the company by integrating corporate strategy and ESG ratings, the companies should prioritize items from the long list considering corporate strategy and narrow it down to around ten items. With the items that are more important to the company, they formulate a Materiality Map. The Materiality Map clarifies the direction of

management strategy, sets appropriate KPIs, utilizes resources (people, goods, and money) for corporate decision-making and management, and facilitates smooth communication with stakeholders seeking sustainability measures, thereby enhancing corporate value. The Map also enables smooth communication with stakeholders demanding sustainability measures, enhancing corporate value.

Exhibit 25: Materiality Map Creating Method



3-10: Conclusion

This chapter has critically examined the relationship between ESG rating improvements and stock market performance. Despite the intuitive expectation that better ESG standards should enhance a firm's valuation, empirical evidence suggests that the market response can be unexpectedly less from positive aspect. I would like to suggest four reasons why the market why stock-market value doesn't increase for firms that improve, while the event studies here demonstrated that the market will negatively react by negative screening with ESG ratings.

Investor Perceptions and ESG Ratings

The primary hypothesis explored here posits that investors use ESG ratings more frequently for negative screening rather than as a criterion for active investment. This phenomenon is supported by research indicating that while investors are quick to divest from companies with poor ESG performances to mitigate risk, they are not necessarily motivated to invest in companies solely based on their superior ESG scores (Flammer, 2020). This selective attention to ESG ratings can limit the positive impact on stock prices when companies improve their ESG performance.

Theoretical Analysis

From a theoretical perspective, the efficient market hypothesis might suggest that all known information, including ESG improvements, is already priced into stocks. However, Edmans argues that the market might underreact to non-financial changes like ESG improvements due to a focus on short-term financial returns (Edmans, 2011). This underreaction is especially pronounced if the benefits of ESG initiatives are long-term and thus harder to quantify in the short run.

Role of Fundamental Analysis

Furthermore, as suggested by Khan, Serafeim, and Yoon, while ESG can mitigate risks, many investors continue to prioritize traditional financial metrics over ESG scores (Khan, "Corporate Sustainability: First Evidence on Materiality.", 2016). Thus, unless ESG improvements directly contribute to financial performance, their impact on stock valuation can remain limited. This aligns with the fiduciary duties of fund managers who prioritize financial returns for their limited partners (LPs).

Case Studies and Counterpoints

Contrasting views, such as those from Acemoglu and Autor, highlight those improvements in ESG metrics, particularly in labor practices, do not always correlate with productivity gains or profitability (Acemoglu, 2013). These insights challenge the assumption that ESG improvements inherently add value, suggesting instead that the context and nature of ESG investments are crucial.

In conclusion, while ESG improvements for positive rating movements are beneficial from a risk management and corporate responsibility perspective, their direct impact on stock market value is not guaranteed. However, the findings underscore the necessity for investors and companies alike to avoid worsening ESG ratings, balancing them with traditional financial metrics for the stock market value.

Chapter 4:

Harnessing AI for Sustainable Development: Social Impact Perspectives

4-1: Background of the importance to consider AI's influence for the social impact

This chapter diverges from the previously discussed theme of ESG investing to delve into the influence of artificial intelligence (AI) on impact investing, a subject frequently debated among stakeholders such as asset owners, asset managers, and investees. Unlike ESG investing, which benefits from established metrics like those provided by MSCI and abundant historical data enabling analysis of stock price impacts, impact investing often lacks sufficient data and is inherently oriented towards defining, visualizing, and quantifying future societal impacts.

Artificial Intelligence (AI) stands at the forefront of technological advancement, poised to reshape industries, economies, and societies on a global scale. As we navigate the complexities of this transformative era, it becomes imperative to delve deeper into the multifaceted impacts of AI adoption and development. The motivation behind this research is twofold: to analyze the profound influence of AI on both economic landscapes and social structures, and to identify investment opportunities that promote financial prosperity and societal well-being. By understanding the drivers and challenges of AI development and adoption, this study aims to illuminate AI's implications for industries, communities, and the environment.

While acknowledging the inherent risks associated with leveraging AI, this analysis will also focus on the analysis of the transformative impact of AI on society and the economy, ranging from macroeconomic trends to micro-level implications. It aims to identify the key drivers and challenges shaping the development and adoption of AI technologies. Additionally, this study evaluates the potential social, economic, and environmental impacts arising from widespread AI deployment. It also explores investment risks and opportunities in the AI era, with a focus on ventures that offer both financial returns and positive social impact.

4-2: The Rise of AI

Artificial Intelligence (AI) emerges as a transformative force in our digital era, raising pivotal questions about its impact on organizations and its potential social and financial ramifications. According to the International Monetary Fund (IMF), reported in 2024, AI is poised to influence nearly 40% of jobs globally, both by replacing and complementing existing roles. In advanced economies, this impact intensifies, affecting up to 60% of jobs (IMF, 2024). This influence is dual-faceted; approximately half could enhance job functions and productivity, while the other half might lead to reduced labor demand, lower wages, and diminished hiring opportunities.

In emerging markets, characterized by less developed infrastructure and lower levels of skilled labor, the anticipated impact of AI ranges from 26% to 40%. This disparity underscores the varying challenges and opportunities that AI adoption presents across different regional contexts.

During the 2024 World Economic Forum, AI was a central topic of discussion among political and business leaders. Notably, attention was focused on Mistral, a French startup, which, at just nine months old, has allegedly developed a generative AI technology that surpasses the capabilities of established tech giants like OpenAI and Google (Financial Times, 2024). Mistral has been valued at €2 billion, in contrast to OpenAI's valuation at \$86 billion.

Moreover, the concept of AI prompts diverse interpretations regarding its definition. Fundamentally, AI can be succinctly described as the simulation of human intelligence processes by machines, designed to mimic human thought and actions. A more expansive definition posits that AI encompasses a machine's capability to perform cognitive functions analogous to those of the human brain, including perception, reasoning, learning, interaction with the environment, problem-solving, and creativity (McKinsey & Company, 2024).

Reflecting the versatility of the human mind, AI demonstrates a wide array of applications. From computer vision technologies that enable the identification of a missing child through publicly posted pictures, to advancements in natural language processing, AI exhibits extensive potential applications across various industries and domains (McKinsey Global Institute, 2018).

Exhibit 26: AI potential application

Exhibit 5

Some AI capabilities could be used for societal benefit.

NOT EXHAUSTIVE

Capability category	Relative maturity	Capability	Example of problems the AI capability can solve
Computer vision	More developed	Person identification (image and video)	Identifying a known missing child through publicly posted pictures and video (commonly referred to as facial recognition)
		Face detection (image and video)	Detecting the presence of people in surveillance camera footage
		Image and video classification	Identifying endangered animals in image and video for enhanced protection Detecting explicit content
		Near-duplicate or similar detection (images and video)	Detecting hate-speech content for removal of image or video
		Object detection and localization (images and video)	Detecting fires in satellite imagery
		Optical character and handwriting recognition (OCR, images)	Digitizing hard-copy records for quicker patient health history search
	Tracking	Tracking illegal fishing vessels via satellite imagery	
	Developing	Emotion recognition (image and video)	Measuring level of student engagement in classrooms
Speech and audio processing	More developed	Person identification (speech)	Verifying individuals through mobile phone for inclusive banking access based on sound and pattern of voice
		Speech-to-text (audio)	Real-time captioning for the deaf or people hard of hearing to facilitate live conversation
		Sound detection and recognition (audio)	Identifying chain-saw sounds in rainforests for alerts on illegal logging activities
	Developing	Emotion recognition (speech)	Assisting individuals on the autism spectrum who have difficulty in social interactions
Natural language processing	More developed	Person identification (text)	Detecting a paper's author through handwriting analysis and identification of syntax patterns
		Language translation (text)	Enabling larger distribution of online education services to underserved populations
		Other natural language processing (text)	Identifying plagiarism in student assignments to enhance instructor productivity
	Developing	Sentiment analysis (text)	Using automated review of public sentiment about specific topics to inform policy
		Language understanding	Enabling chatbots that understand abstract concepts and ambiguous language, eg, ones that can do second-level, nuanced health screens
Content generation	Developing	Content generation	Generating text and media (video, audio) content for educational purposes with quick production turnaround for wide distribution
Reinforcement learning	Developing	Reinforcement learning	Large-scale and high-speed simulation modeling, for example in drug trials, doing millions of simulations to determine best treatment for breast cancer in population with a specific genetic makeup
Deep learning on structured data	More developed	Structured deep learning	Identifying tax fraud and underreporting of income based on tax return data
Analytics	More developed	Analytics	Any analytics technique not involving deep learning, eg, for optimization, journey mapping, network analysis

SOURCE: McKinsey Global Institute analysis

Source: McKinsey Global Institute. (2018, December). Applying Artificial Intelligence for Social Good.

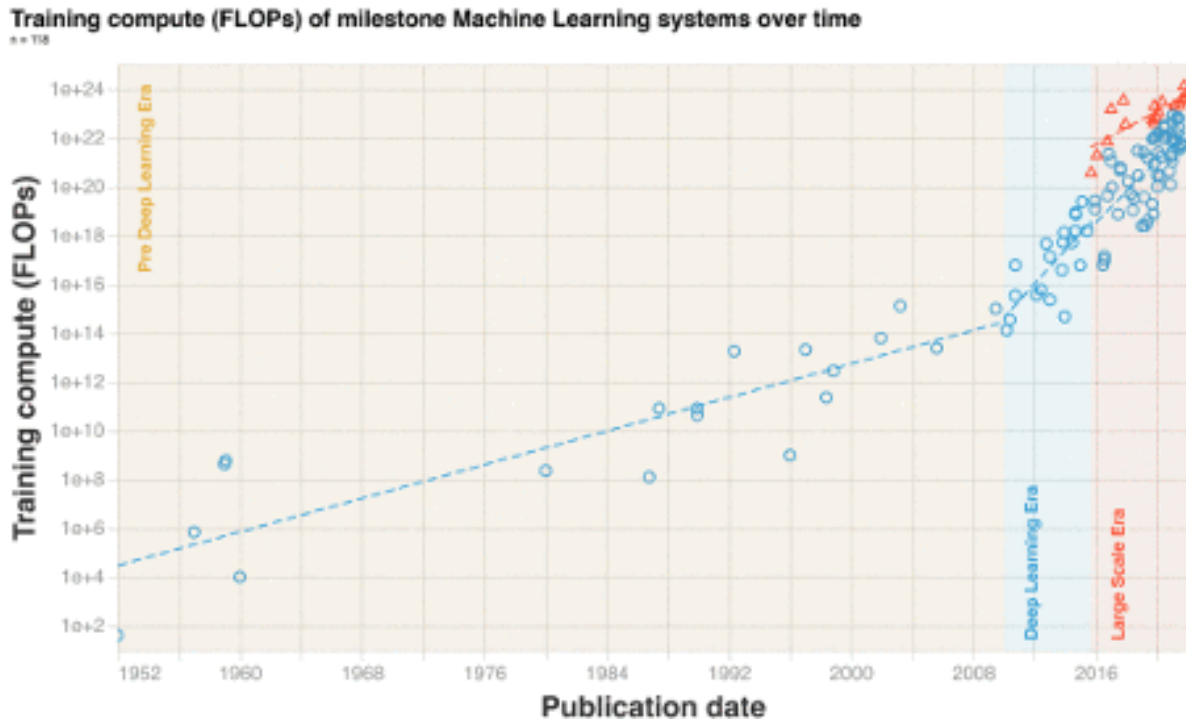
4-3: Key Enablers and Drivers of AI Development and Adoption

The recent advancements and widespread implementation of Artificial Intelligence (AI) are primarily propelled by significant technical developments. The key enablers of AI include enhanced computational performance, advancements in algorithms, and the availability of extensive datasets. It is the convergence of these factors that has fundamentally accelerated the evolution of AI (Sevilla, 2022). For example, the basis of generative AI, neural networks, was conceptualized in the 1960s, but their practical implementation became feasible only with these enabling conditions. Moreover, the term "machine learning" was originally coined by Arthur Samuel in the 1950s.

A fundamental requirement for developing large-scale AI systems is computational power, often referred to simply as compute (Vipra, 2023). The capacity of compute is measured in floating point operations per second (FLOPS), which assesses the number of computations a resource can execute per second. The demand and supply for computational power have risen exponentially. Historically, prior to 2010, the demand for computing resources for AI training adhered to Moore's Law, which posits that the number of transistors in an integrated circuit (IC) doubles approximately every two years. This doubling was expected to enhance the speed and capabilities of computers biennially (Sevilla J. H., 2022).

However, with AI's ascension in the early 2010s, the scaling of training compute power has intensified, now doubling approximately every six months. Furthermore, according to Andreessen Horowitz, a critical factor in the success of AI ventures is the access to compute resources at the lowest total cost (Andreessen Horowitz, 2023). In practice, a significant number of companies allocate over 80% of their total raised capital towards the acquisition of computing resources, underlining the pivotal role of computational capacity in the development and deployment of AI technologies.

Exhibit 27: Training compute of milestone ML systems over time



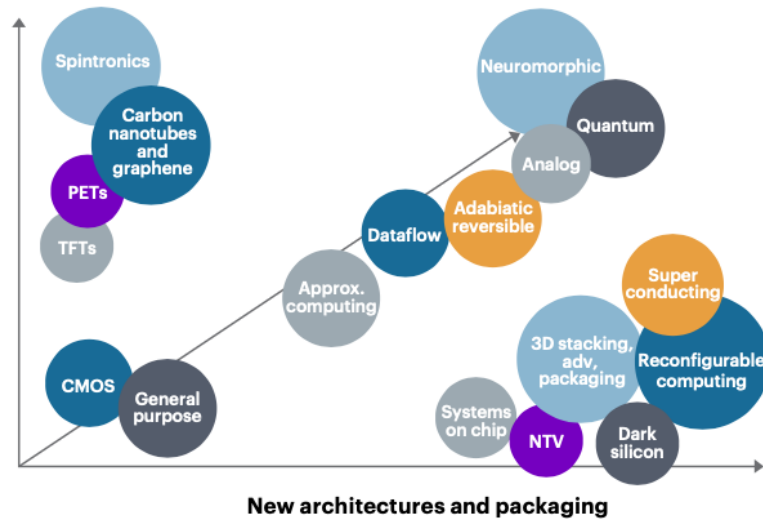
Source: Sevilla, J., Heim, L., Ho, A., Besiroglu, T., Hobbhahn, M., & Villalobos, P. (2022). Compute Trends Across Three Eras of Machine Learning.

The semiconductor industry has emerged as a crucial player in unlocking the full potential of Artificial Intelligence (AI), with access to computational resources serving as a catalyst for the growth of AI. However, it is essential to recognize that compute power is not solely derived from semiconductors; alternative methods such as quantum computing, spintronics, and 3D stacking also play significant roles, providing diverse routes for enhancing computing performance. This varied landscape highlights the dynamic nature of AI development, driven not only by Moore's Law but also by other alternative technological advancements.

Exhibit 28: Technology scaling options

The future of AI compute is uncertain and branching in many different directions

Technology scaling options along three dimensions. All dimensions, which are mutually exclusive, aim to squeeze out more computing performance.



Source: Accenture. (2022). Unleashing the full potential of AI.

The AI workflow consists of two main phases: training and inference (Accenture, 2022). The training phase, which uses training data to educate the model for making predictions, requires significantly higher compute power. In contrast, the inference phase, where the trained AI is applied for problem-solving, does not necessitate the highest computing power. This differentiation suggests that non-AI developing firms, such as an insurance company using AI solely for fraud detection, may not require the most robust compute capabilities. The demand for compute is intricately linked to the specific AI workflow employed.

Significant advancements in algorithms, particularly within deep learning frameworks such as generative adversarial networks (GANs), reinforcement learning, and convolutional neural networks, have profoundly impacted AI development (Michael L. Littman, 2021). GANs, especially, represent a pivotal breakthrough, forming the foundational technology for creating generative content, such as deep fakes. GANs involve two neural networks: a generator that creates data mimicking real instances and a discriminator that evaluates whether the data is real or generated. Continuous feedback refines the generator's ability to produce realistic data. This technology finds applications in fields like medical image augmentation, where it enhances AI model training for diagnosis by expanding datasets. Reinforcement learning involves an AI model acting as an agent trained to maximize a specific reward within a given environment. This algorithm has shown superior or comparable performance to humans in various fields, including autonomous driving and financial trading (Mwiti, 2023).

Finally, the availability of high-quality data is a critical aspect of AI advancement. The surge in data collection, particularly with the advent of "big data," has become a cornerstone for advancements in AI. The principle "garbage in, garbage out" holds true for AI, which utilizes numerical data, images, and much more, emphasizing the importance of high-quality input for successful outcomes. Within the domain of Artificial Intelligence (AI), machine learning represents a significant subfield. The success of machine learning is heavily reliant on the quality of the training dataset (Brown, 2021). This technology empowers computers to recognize patterns from the dataset without explicit programming. Based on the learned data, the model then makes predictions. Additionally, human programmers can incrementally fine-tune the model, adjusting parameters to refine outcomes over time.

In conclusion, while computational power is undeniably a driver of AI growth, it is crucial to acknowledge that the unprecedented surge in AI advancements could not have been achieved without simultaneous improvements in algorithms and data.

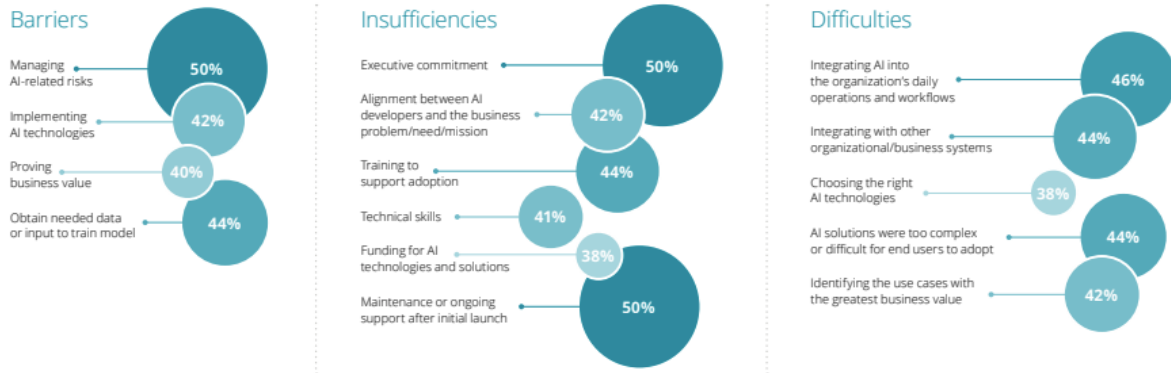
4-4: AI Adoption by Industry

AI development has experienced a substantial surge, leading to significant increases in the adoption of AI across various industry sectors. As highlighted in a 2024 report, a remarkable 79% of business leaders stated that they have deployed full-scale AI applications (Deloitte, 2022). This is a substantial increase from a 2018 report, where only 21% of respondents indicated that 47% of businesses had integrated at least one AI capability, marking a 20% increase from 2017 (McKinsey & Company, 2018). Despite this rapid growth, challenges remain for a considerable portion of businesses. In 2024, 37% of businesses reported struggling to demonstrate the business value of their AI initiatives (Deloitte, 2022). This difficulty arises from various obstacles encountered in scaling AI initiatives, with the top three challenges being insufficient funding for AI technologies and solutions, a shortage of technical skills, and the complexity of selecting the right AI technologies.

Exhibit 29: Challenges in scaling AI initiatives

Challenges in scaling AI initiatives

N=2,620 respondents



Source: Deloitte. (2022, October). State of AI: Fifth Edition.

There are significant variations in AI deployment across different industries and job functions. Notably, service operations have the highest level of AI adoption across various job functions. Sector-wise, telecom, high-tech, and financial firms are at the forefront of AI adoption (McKinsey & Company, 2018). The disparity in adoption rates can be attributed to the nature of tasks within different job functions. Service operations, characterized by repetitive tasks, are particularly suited to AI applications, which excel in handling such routine activities. In contrast, job functions related to strategy and corporate finance, which require a higher degree of human decision-making, exhibit lower AI adoption rates.

Figure 30: AI adoption by industry



Source: McKinsey & Company. (2018, November). Notes from the AI frontier: AI adoption advances but foundational barriers remain.

The primary catalyst for the adoption of artificial intelligence (AI) within various industries is the congruence between job scope and AI model capabilities. Although the trend towards increased adoption is evident, numerous enterprises remain at a nascent stage in the utilization of AI, contending with the complexities of harnessing its full potential. The trajectory of AI implementation is anticipated to escalate, particularly with advancements in generative AI technologies. These ongoing developments in AI are expected to serve as a driving force, significantly fostering further integration of AI across the industrial spectrum.

4-5: Identification of Advantages and Disadvantages of AI

As previously noted, the applications of AI are extensive, affecting various functions and industries. Yet, like any technology, AI presents both advantages and disadvantages when compared to the existing status quo.

Advantages:

- **Efficiency and Availability:** AI systems operate continuously (24/7) without human intervention, depending on the specific use case. They excel at automating mundane tasks such as data entry and enhancing the productivity of more complex tasks. This can lead to significant cost reductions for companies.
- **Reduction of Human Error and Risk:** Properly programmed AI systems can deliver consistently accurate results (Tableau, n.d.). In high-risk environments or tasks, such as operating in hazardous areas, AI can mitigate risks of injury or harm to human operators.
- **Unbiased Decision Making:** Human decisions are often influenced by biases. If AI systems are trained on unbiased data—a challenging but crucial condition—they can make decisions that are fairer, such as in loan approvals.

Disadvantages:

- **Job Losses:** Although AI can enhance productivity, it also poses risks to employment and wages in certain sectors. This issue will be explored further in subsequent sections.
- **Control and Transparency:** Some AI models, especially deep neural networks, are complex and can be difficult to control and interpret (China, 2024). These models often act as "black boxes" with

unclear internal processes, which can be problematic in sensitive applications like parole evaluations.

- **Prohibitive Costs for Training and Development:** The development of sophisticated AI models, such as Microsoft's Bing AI chatbot powered by OpenAI's ChatGPT model, can be extremely costly, requiring substantial investment with minimum of \$4 billion in infrastructure like GPUs from Nvidia, which are priced at around \$10,000 each chip (Leswing, 2023). The deployment of hundreds of these units is necessary not only for training but also for ongoing tasks such as text generation and other predictive functionalities.
- **Data Quality Issues ("Garbage in, garbage out"):** The efficacy of AI is heavily dependent on the quality of the training data. If the data is biased or non-representative, the AI's outputs will also be flawed, which is particularly problematic in high-stakes applications such as autonomous vehicles.

4-6: Risks and Ethical Considerations in AI Deployment

As we have seen above, while the advancements in artificial intelligence (AI) hold transformative potential for numerous industries, their implementation is not without significant risks and ethical considerations. A critical aspect of the debate surrounding AI revolves around the socio-economic impacts, particularly on employment and wage disparities.

Economic Displacement and Labor Market Polarization

The advent of AI-driven automation poses a dual-edged sword. On one hand, it promises substantial increases in productivity and operational efficiency; on the other, it threatens significant displacement of jobs. According to Daron Acemoglu and Pascual Restrepo, the rise in industrial robots in the workforce has led to considerable negative effects on employment and wages within certain sectors (Acemoglu & Restrepo, 2020). They argue that each robot replaces approximately three workers, and robot-heavy regions have witnessed sharper declines in both employment and wages. This automation has exacerbated income inequality, as lower-skilled jobs are more susceptible to being replaced by machines, leaving a subset of the workforce at a severe disadvantage.

Bias and Fairness in AI Systems

Beyond the economic implications, AI systems also raise profound ethical concerns, particularly regarding bias and fairness. Algorithms, inherently, are only as objective as the data fed into them.

Historical data used to train AI models often contain biases that can inadvertently lead the AI to perpetuate these biases. Solon Barocas and Andrew D. Selbst discuss how data mining and automated decision-making can reinforce existing inequalities by encoding prejudices into algorithmic systems, thereby affecting decisions in employment, healthcare, and criminal justice (Barocas & Selbst, 2016). For instance, if an AI hiring tool is trained on historical hiring data that reflects a gender bias, it may continue to favor one gender over another, despite equal qualifications.

Regulatory and Social Challenges

The rapid deployment of AI technologies often outpaces the development of corresponding regulatory frameworks, leading to gaps in governance that could pose risks to privacy, security, and ethical standards. The absence of stringent regulatory oversight can lead to situations where AI systems are deployed in ways that can have unforeseen negative impacts on society. This includes surveillance overreach, data privacy breaches, and the potential for AI-driven systems to be used in manipulative or coercive contexts.

Long-Term Societal Impacts

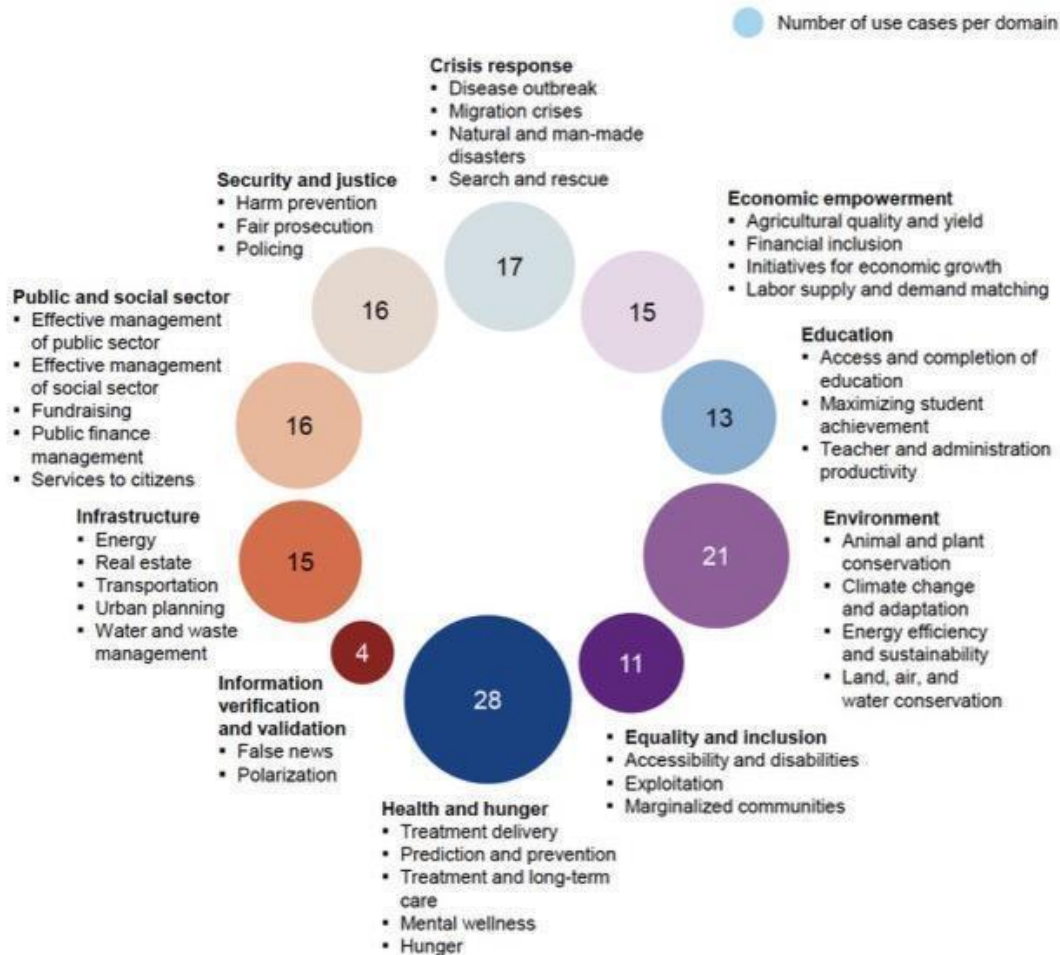
The long-term societal impacts of AI are profound and complex. As AI systems become more integrated into everyday life, their influence on social norms, human behavior, and the broader cultural ethos will continue to deepen. The potential for AI to influence public opinion, manipulate information, and reshape the political landscape presents challenges that require careful consideration and proactive management.

4-7: Analysis of Investment Risks and Opportunities in the AI Era

For investors, identifying the most financially attractive investment opportunities in the AI sector involves careful timing and an understanding of technology maturity. Sectors and companies that are early adopters of AI technologies often present the most potential for growth. It is noteworthy that early adoption extends beyond the tech sector into areas such as healthcare, automotive, and entertainment. Additionally, the customer service industry has seen improvements in productivity through AI integration, as evidenced by a study where customer support agents using AI tools experienced an average productivity boost of 14% (Brynjolfsson, 2023). From an operational standpoint, companies in the broader technology sector that can adapt their business models and invest strategically in AI

integration are likely to benefit the most. AI investment opportunities that generate a positive social impact fall into roughly ten categories, reflecting a broad spectrum of applications.

Figure 31: AI Investment Opportunities



Source: McKinsey Global Institute analysis

As the proliferation of artificial intelligence (AI) applications continues, ethical considerations and risks associated with its deployment are garnering increased scholarly attention. Ethical dilemmas, particularly within the domain of AI ethics, revolve primarily around the appropriate use and safeguarding of data, raising concerns not only among AI developers but also among the end-users impacted by the technology.

Ethical risks involved in employing AI for societal benefits mirror those observed in commercial applications. One major ethical concern is the potential for AI tools and methodologies to be misused by

those with access, such as regulators and developers, resulting in harm to individuals, organizations, and broader society. Furthermore, malicious applications of AI pose significant threats to personal safety and well-being, encompassing physical, emotional, and digital dimensions, as well as financial security. Organizations also face reputational and legal compliance risks arising from such malicious uses, although these risks may be less pronounced compared to those encountered by for-profit entities. On a macroscopic level, improper use of AI may compromise national security, economic and political stability, labor market balance, and critical infrastructure.

From an investment perspective, the disruptive nature of most AI technologies, coupled with their nascent developmental stages, introduces considerable uncertainty in their market outlook. Investors are advised to exercise prudence in assessing investment opportunities involving AI. A prevalent risk involves the mismanagement of AI investment weight within a portfolio. To mitigate such risks, investors are encouraged to meticulously analyze how AI's advancements and applications could potentially diminish or augment the long-term earnings potential and growth prospects of individual stocks.

4-8: Scenario Analysis for Future Outcome

As I delve into the implications of artificial intelligence (AI), it becomes beneficial to engage in scenario-based analysis. Although it is challenging to cover all potential outcomes exhaustively, this method remains a valuable tool for understanding the impact of specific variables and for identifying associated risks and opportunities. For decision-makers, scenario analysis is crucial for contingency planning and mitigating bias in strategic decisions.

Upon reviewing academic literature and public information, two principal frameworks for scenario planning regarding the future development of AI were explored. The first framework, a recent study by the International Monetary Fund (IMF), delineates three scenarios defined primarily by the speed and extent of AI development (Korinek, 2023):

1. **Scenario I:** Traditional, Business as Usual - AI advancements continue to enhance productivity and automate cognitive tasks, creating new opportunities for workers displaced by automation to transition into more productive roles.

2. **Scenario II:** Baseline, Artificial General Intelligence (AGI) in 20 Years - AI progresses towards achieving AGI within two decades, leading to a significant shift in labor dynamics as AI replaces many routine human tasks. This scenario is predicated on the assumption that human cognitive capacity is inherently limited.
3. **Scenario III:** Aggressive, AGI in 5 Years - An accelerated version of Scenario II, proposing that AGI and its consequential impacts on labor could materialize within five years, resulting in dramatic societal changes.

While the IMF's framework offers a straightforward initial analysis, it lacks a comprehensive, multidimensional approach needed to fully capture the far-reaching developments in AI. In response, a second, more detailed framework developed by the UK Ministry of Science is presented, offering a multidimensional view (Government Office for Science, United Kingdom , 2023).

UK Office of Sciences' Scenario Framework - This approach considers risks and opportunities across five dimensions: access, ownership, safety measures, public attitudes, and geopolitics. The scenarios extend to the year 2030 and reflect a policymaker's perspective, which influences the framework's orientation. These scenarios, while feasible and internally consistent, highlight the dynamic nature of future developments. It is plausible that actual outcomes may emerge as a blend of factors from multiple scenarios. Decision-makers are encouraged to seriously engage with these scenarios, stress-testing how strategic plans might perform under various conditions.

Policymakers are advised to develop indicators to promptly identify which scenarios are unfolding. As noted in the IMF publication, key indicators include the evolution of technological benchmarks, investment levels in AI, the adoption of AI technologies across the economy, and macroeconomic and labor market trends.

Scenario planning should be an iterative process, regularly updated to reflect new data and shifting perceptions. This approach helps in managing uncertainty and maximizes the responsiveness of stakeholders to the evolving landscape of AI. Finally, it is essential to recognize that as AI develops, the methodologies employed in scenario planning may need adaptation or could become obsolete, necessitating continual reassessment and methodological innovation (Michel, 2023).

Exhibit 32: Summary of Scenarios from UK Office of Sciences Framework

Scenario	Unpredictable Advanced AI	AI Disrupts the Workforce	AI 'Wild West'	Advanced AI on knife edge	AI disappoints
Generalities	<ul style="list-style-type: none"> - Open-source models by 2030 fulfill tasks automatically. - Outsized impacts from fast movers. Public unrest. 	<ul style="list-style-type: none"> - Narrow, capable and mostly secure AI systems automate areas. - Effects in limited sectors. Public backlash. 	<ul style="list-style-type: none"> - Diverse capable AIs operated by varied actors. - Divided public perceptions. - Authorities wrestle with control. 	<ul style="list-style-type: none"> - Claims of development of an AGI. - Growing concerns of AI overpassing regulation for all applications. 	<ul style="list-style-type: none"> - Capabilities improved only to an incremental level for narrow tools for specific problems. - Investors look for other hits.
Capabilities	<ul style="list-style-type: none"> - Human oversight is still needed. - Systems reason and interact with human users learning skills. 	<ul style="list-style-type: none"> - Tech firms compete for some domains. - Breakthroughs in AI's ability to interact with the world (robots, self driving). 	<ul style="list-style-type: none"> - Improvements in generative AI make human and AI content indistinguishable. - Malicious uses rise: cloning of biometric data. 	<ul style="list-style-type: none"> - Actor claims development of AGI. Operating autonomously. Little/no human oversight, training, self improving. 	<ul style="list-style-type: none"> - Developments from current capabilities are limited. - AI systems still require human oversight.
Ownership and Access	<ul style="list-style-type: none"> - Researcher institutions focus: computing, data. - Potential drag: semiconductor supply chains. 	<ul style="list-style-type: none"> - Big tech domination. Detrimental to smaller players. - Data center shortages force narrowed focus. 	<ul style="list-style-type: none"> - Diverse and non-concentrate: Big tech, startups and open-source. - Authoritarian states use AI for repression. 	<ul style="list-style-type: none"> - AGI claims to be developed by a big tech entity. - Restricted to paying users. - Smaller actors left behind. 	<ul style="list-style-type: none"> - Big tech lead. Slow progress due to quality issues. Smaller players catch up. - Investors look elsewhere.
Safety	<ul style="list-style-type: none"> - Bias and misinformation issues, mostly controlled. - Open source systems cause accidental/ intentional harm. 	<ul style="list-style-type: none"> - Perception of safety given restricted and controlled AI systems. - Concerns linger regarding bias detection. 	<ul style="list-style-type: none"> - Different AI systems abound. Difficult to monitor, regulate. - Criminal activities surge (scams, fraud, IP theft). 	<ul style="list-style-type: none"> - Concerns on: deception, regulation evasion. - Worst case: unregulated super intelligent systems. 	<ul style="list-style-type: none"> - Researchers reach milestones coping with developments. - Negative cases still prey on society's weak.
Level and Use	<ul style="list-style-type: none"> - Disrupted workforce, focus on augmenting. - As AI rolls out, inequalities widen, benefits for risk takers. 	<ul style="list-style-type: none"> - Deployments reduce costs in limited sectors: IT, accounting. - Inequalities due to the rise of AI managers. 	<ul style="list-style-type: none"> - Societal unrest as criminal uses proliferate. - Job losses partially covered with new sectors. 	<ul style="list-style-type: none"> - Wide business applications. - Labor markets upheaval. - Lifestyle improvements, also distress on existential risks. 	<ul style="list-style-type: none"> - Disappointing, limited uses and investing. - Unenthusiastic perceptions, limited lifestyle changes, limited training, access.
Geopolitics	<ul style="list-style-type: none"> - Supply chain tensions for semiconductors. - Escalation on Cyber incidents. - Cooperation to manage impacts is difficult. 	<ul style="list-style-type: none"> - Economic and technological competition among states. - Limited cooperation and information sharing. 	<ul style="list-style-type: none"> - Nations grapple with illegal, multi border criminals. - Authoritarian states use AI for surveillance. - Strained cooperation. 	<ul style="list-style-type: none"> - Big tech and states declare collaboration. - Newest AGIs defy global cooperation. - 2030s with struggling factions. 	<ul style="list-style-type: none"> - Will for global collaboration, given the issues of climate change. - Some countries face AI trained workforce shortages.

4-9: Analysis of the Social and Financial Impacts

Artificial Intelligence (AI) is catalyzing transformative changes across our society and economy, presenting both opportunities and challenges. It is crucial to understand these impacts to mitigate negative outcomes and enhance positive contributions.

Social Impact

AI is poised to significantly influence various social goals, predominantly positively. One notable area of impact is the labor market, where AI's ability to automate tasks could lead to both job displacement and the creation of new employment opportunities in fields such as data science and AI engineering. Beyond employment, AI promises to enhance quality of life through improvements in healthcare, education, transportation, and entertainment. For instance, AI's applications range from developing precise diagnostic tools and personalized learning programs to advancing autonomous vehicles and tailored entertainment solutions.

However, AI also poses risks to social equity, potentially perpetuating discrimination and exacerbating inequalities. Addressing these risks is essential to ensure AI contributes positively to society.

Economic Impact

AI's influence on economic metrics, particularly in relation to the UN's Sustainable Development Goals, is expected to be largely positive, driven by productivity gains and sustained economic output. AI could stimulate economic growth through innovation in products and services, task automation, and efficiency enhancements. For example, AI might revolutionize medical treatments, personalize marketing strategies, and streamline manufacturing processes.

Nonetheless, the transition to AI-driven economies requires careful consideration of the workforce. The potential job losses necessitate strategic responses, including upskilling and reskilling initiatives to keep the workforce relevant. The Boston Consulting Group emphasizes that the rise in automation should be balanced with the creation of new sectors and job opportunities requiring novel skills (World Economic Forum & The Boston Consulting Group, 2018).

Environmental Impact

AI's role in environmental management is becoming increasingly pivotal. It enhances decision support systems and provides sophisticated predictive models for climate change, valuable for both governmental and private sector planning. AI's potential to boost energy efficiency, foster sustainable products and services, and reduce traffic congestion marks it as a tool for environmental sustainability. However, it also presents challenges, such as increased energy consumption which may lead to higher carbon emissions, intensified production and consumption patterns, and a rise in electronic waste (IDC, 2023).

Chapter 5:

Insights for Impact Investing Initiative for Global Health (Triple I)

5-1: Objective

The Impact Investment Initiative for Global Health ('Triple I') has been established by the leadership of the Government of Japan following its endorsement at the G7 Hiroshima Summit in May 2023 and timed to coincide with the UN General Assembly in September of the same year (Triple I for Global Health, n.d.). The Initiative is significant because it mingles global health with the global investment world. It should link the investment, health and development sectors and provide complementary outcomes to previous initiatives.

Triple I is a visionary plan to promote investment in impact-driven enterprises that aim to address global health challenges, such as infectious disease control and other global health issues. It aims to achieve Universal Health Coverage (UHC), as set out in SDG targets 3 and 8, by promoting equitable access to primary health care (PHC), including maternal and child health, and to infectious disease crisis medicine (MCM) and other essential health services for the needy and disadvantaged. It contributes to restoring the COVID-19 epidemic to a higher level than before.

The initiative aims to contribute to the achievement of Universal Health Coverage (UHC) and the SDGs, mainly in developing countries, through increased sustainable financing and impact investment by facilitating private capital mobilization in addition to public funding from governments and Development Finance Institutions (DFIs) and to help solve social challenges in international health. The Initiative will also complement existing G7-supported work, such as the International Sustainability Standards Board (ISSB) of the International Financial Reporting Standards (IFRS) Foundation.

5-2: Target Areas

Global health challenges such as immunization, communicable diseases including HIV/AIDS, tuberculosis, malaria, polio, measles, cholera, neglected tropical diseases (NTDs), antimicrobial resistance (AMR), non-communicable diseases (NCDs) including mental health conditions, sexual and

reproductive health and rights (SRHR), maternal, newborn, child and adolescent health, healthy ageing, nutrition, water, sanitation and hygiene (WASH), financial protection and mitigation of catastrophic medical expenses, pandemic prevention, preparedness and response (PPR), digital health and others are targeted areas of the initiative (G7 2023 HIROSHIMA SUMMIT).

Also, the need for greater visibility and prioritization of investments in women's health outcomes are highlighted. This is due to a lack of proper measurements and assessment of the value and return of investments in the global women's health system, and women's health is not adequately represented in ESG indicators and impact investing. There is also a need to shift investments in women's health from hospitals and tertiary care to more community and primary health care level public health interventions.

The global economy has COVID-19 and considers that infectious disease outbreaks are likely to significantly impact market risks due to pandemic triggers and increased economic uncertainty. There will also be significant implications for maximizing digital technology, for example, in digital health, where digitization in medical and healthcare services is lagging globally and, therefore, not fully utilized in health management systems.

5-3: Investment targets

Triple I publish criteria for project and financial transaction investment targets related to global health issues (G7 2023 HIROSHIMA SUMMIT).

- *(a) Projects/ financial transactions which intend to solve issues/ create positive impacts in global health, especially in the target areas in sec. Three below.*
- *(b) Projects/financial transactions are targeted to products/services that mainly target/benefit LMICs and reach the poorest and most vulnerable to address the issues in the global south.*
- *(c) Projects/financial transactions with measurable social impacts/outcomes that could be reported, reviewed and verified with sound evidence.*
- *(d) Other efforts, such as capacity building relating to the mobilization of finance whose outcomes/impacts could be reported, reviewed and verified with sound evidence.*

5-4: Investment case studies

SORA Technologies

SORA Technologies combines aerial drone data and AI technology and employs it in Sierra Leone, western Africa, to efficiently detect puddles of water where there is a high risk of the bow flap of the mosquito that transmits the malaria pathogen breeding (Triple I for Global Health, 2023). The technology is attracting attention as a breakthrough because, until now, it has been challenging and not cost-effective to spray insecticides focused on puddles where there are blowflies. Malaria is estimated to have affected 247 million people worldwide in 21 years, with 619,000 deaths. Africa has the highest number of cases, with Sierra Leone being one of the most severe countries. SORA has a vision to eliminate malaria by 2030, and its impact will be a 'reduction in the number of cases' and a 'reduction in mortality'. They have significantly reduced the indispensable workforce and drug drops required for puddle detection. They have succeeded in increasing the efficiency of work by 70% in managing the source of camouflage and have also cut the cost of prevention by 81%, from USD 5.8 to USD 1.1 per person.

SARAYA

SARAYA is a Japanese company that manufactures detergents and disinfectants. It is considering developing a newly developed treatment for flea disease for the African market (SARAYA, 2023). Flea infestation is caused by parasites on the legs, which can cause various skin diseases and, in the worst cases, can lead to death. Most patients are low-income people, and the disease is a severe problem in Africa, Latin America and India, with an estimated 2 million people infected in Kenya alone. The company hopes to raise funds from the UN, governments of emerging and developing countries and other public institutions to promote the treatment.

5-5: Expected effects from Triple I

(1) Effects of impact investment rather than conventional investment

The Triple I initiative aims to redefine investment behaviors by emphasizing impact investing, which strives to generate both positive social and environmental impacts alongside traditional financial returns. The integration of an impact investment framework is expected to facilitate the accurate valuation of corporate entities by capturing both the tangible and intangible benefits derived from addressing social

issues. This approach encourages businesses to minimize negative impacts while enhancing positive contributions to the global healthcare agenda.

(2) New Value Creation Cycle

In light of increasing focus on previously overlooked social issues and the need to evaluate the impacts of corporate activities more comprehensively, a new cycle of value creation is proposed:

- **Articulation of Social Issues:** Translating both visible medical needs and less apparent social challenges into defined language.
- **Recognition by Businesses:** Identifying these issues within the corporate sphere.
- **Corporate Engagement:** Actively working to generate impactful outputs.
- **Securing Investment:** Attracting further financial support for these initiatives.
- **Outcome Generation:** Achieving medium-to-long-term social and economic impacts.
- **Impact Visualization:** Monitoring and displaying changes through impact visualization tools.
- **Reinvestment:** Channeling gains into addressing additional challenges, thereby perpetuating the cycle of value creation.

(3) Stakeholder Benefits

The implementation of Triple I offers diverse benefits, which may vary among different stakeholders:

- **Private Sector:** Enhances value visibility based on outputs and potentially increases business value reflected in market capitalization.
- **Investors:** Provides the opportunity for enhanced returns on investments enriched by non-financial values and supports investment decisions with logical, quantifiable impact data.
- **Public Sector:** Facilitates the advancement of healthcare initiatives with clear, logical frameworks and supports the assessment of outcome-based programs with empirical data.

5-6: Potential challenges in promoting Triple I

While focusing on social issues on a global scale, it is also imperative to focus on the impact on local market issues, but it is necessary to prepare a certain degree of proportionality so that it is not limited to companies with the capability to scale up. It may be a challenge to retain the expertise to incorporate IMM into management decision-making processes on their own, so it will be essential to augment the capacity of expert partners in the theory of change, identification of data to be collected,

implementation methodology, disclosure mechanisms, etc. It is also critical to provide subsidies, tax incentives or support measures for knowledge sharing and resource sharing for medium-sized enterprises and start-ups that are impact-oriented but have limited financial or human resources, as they must comply with international accounting standards such as IFRS and regularly respond to them.

A taxonomy of health care is needed to measure impact investments adequately. Developing methodologies and metrics to properly demonstrate the value and return of investments in women's health worldwide will be necessary. As a result, more investors will likely join the conversation and be willing to participate in initiatives to design a framework to measure impact investments. In addition to reporting Exhibits, there is a need to identify the key indicators along the value chain, considering the global health Theory of change and logic model frameworks within the global value chain.

It is essential to convince people worldwide that investment in health, not healthcare, is an investment, not a cost. Moreover, investor thinking needs to shift that health investment is not just about medicalized healthcare. Instead of pouring money into safe assets based on investors' traditional short-term thinking, there needs to be a shift to long-term investments as patient capital for primary health care.

There is a need for investor integration rather than the current fragmented funding. Many global health initiatives tend to focus on working with the public sector and public partners, and the role of the private sector is not always visible, even though the private sector plays a significant role. The role of multi-sectoral partnerships and mixed financing models combining public and private investment will become increasingly important.

Communicate compelling story narratives, messages, data and materials for investors to understand how global health can impact the essentiality of health in development to lift many countries out of poverty, such as improving education, sanitation, power and women's empowerment. They need to be made to understand how they can impact global health. Stories behind investments can have the effect of providing a qualitative human perspective. To compile data and indicators on the return on investment in women's health, including case studies and success stories, will be essential.

5-7: Insight for the challenges: Characteristics of unlisted companies that are compatible with Impact

Stakeholders' expectations for startups to disclose impact information are increasing. Here, I would like to introduce Impact Weighted Account (IWA) as the efficient framework to expand impact investing. Impact Weighted Accounting (IWA) constitutes a methodology and instrument that quantifies a corporation's societal impacts—both positive and negative—across environmental, employment, and product dimensions. This quantification is anticipated to enhance managerial decisions and stakeholder communications. A prevalent challenge among corporations is a lack of awareness regarding the significance of their impacts on diverse stakeholder groups. Implementing impact-weighted accounting enables a deeper understanding of how a corporation influences its stakeholders and ultimately its corporate value. Additionally, IWA facilitates the comparison of various impacts, including those traditionally challenging to quantify, by translating them into monetary terms.

Process of Implementing Impact Weighted Accounting (IWA)

- Systems Mapping:
 - This step involves mapping and prioritizing the interactions between corporate activities and relevant stakeholders to identify key impact areas.

- Formulation Development:
 - For the prioritized impact areas, we develop methods to monetize outcomes. This involves brainstorming and deploying tools from impact-weighted accounting frameworks to identify necessary information for monetization.

- Confirmation of Internal and External Data:
 - We gather all necessary data required for the monetization formulas. In cases where data has not yet been collected, we employ reliable estimates as substitutes.

- Adjustment of Formulas:
 - The monetization formulas are refined based on the availability and reliability of data.

- Monetization:
 - Impacts are quantified in monetary terms using the data that is currently available.

- Continuous Improvement of the Monetization Model:
 - Recognizing that quantification is not the endpoint but rather the commencement of ongoing efforts, it is crucial to manage the visualized impacts effectively. The goal is to continuously utilize this information to reduce negative impacts and enhance positive outcomes.

The three minimum requirements for a startup to be a good fit for IWA implementation are:

- **Management's understanding of the value of IWA and its commitment**
- **Resources such as time, people, expertise and data**
- **The presence of experts to support the management**

of IWA implementation is complex if management does not understand the concept of IMM and impact-weighted accounting if commitment is low, and if there is no support. In addition, startups, especially those at an early stage, must prioritize their business and cannot devote sufficient resources to impact-weighted accounting and impact evaluation. Customizing the calculation methodology based on the individual business and fine-tuning the method based on data limitations requires integrity, transparency, and expert support.

Impact calculations/evaluations are highly individualized, and it is not easy to create a standard of assurance, so obtaining a guarantee for impact calculations/evaluations is one of the challenges. Although it can be a wave that creates momentum, there is a limit to how much impact can be created by a single startup. Also, while the publication of papers is not a significant activity in Europe and the U.S., it has significant importance on investors' perceptions in Japan. Eisai's product impact calculation started with the publication of evidence-based documents, which led to an overweight from impact investors. This is a significantly high hurdle for a startup to tackle. There are certain hurdles to the penetration of visualization and monetization of impact, including the market's unique perception.

5-8: Proposal for the Triple I

Recommendation 1: Incorporation of Exposure to Toxic Substances as a Key Focus Area in Impact Investing

Given the extensive and often irreversible damage caused by toxic substances to human health and the environment, incorporating the mitigation of exposure to these substances into impact investing

strategies, such as Triple I, is not only necessary but imperative for sustainable development. The rationale for this recommendation is supported by a growing body of scientific evidence and aligns with global health and sustainability objectives.

Urgency and Scale of the Issue:

Exposure to toxic substances, ranging from heavy metals like lead and mercury to chemicals like pesticides and industrial solvents, poses severe risks to human health, including chronic diseases, developmental disorders, and even mortality. Populations in low- and middle-income countries (LMICs) are disproportionately affected due to inadequate regulatory frameworks and exposure in occupational settings. The global scale of this issue is highlighted by numerous studies, including those by the World Health Organization (WHO) and the International Agency for Research on Cancer (IARC), which classify numerous environmental pollutants as carcinogens.

Impact Investment as a Mechanism for Change:

Investing in initiatives that reduce exposure to harmful substances can lead to substantial public health benefits. For example, funding can be directed towards developing cleaner technologies in industries such as manufacturing and agriculture, which are major sources of environmental contaminants. Impact investments can also support the construction of infrastructure for safe waste disposal and the remediation of contaminated sites, which not only improve health outcomes but also contribute to economic development in affected regions.

Scientific Foundations and Economic Arguments:

The scientific rationale for reducing toxic exposure aligns with economic incentives for impact investors. Research demonstrates that the health benefits from reduced exposure translate into economic gains from decreased healthcare costs, increased worker productivity, and enhanced quality of life. These outcomes provide a compelling case for impact investments, as they generate measurable returns in terms of both social and economic impact.

Case Studies and Evidence of Effectiveness:

Several successful initiatives underscore the potential of impact investments in this area. For instance, projects funded by impact investors have led to the reduction of lead exposure in drinking water in several U.S. cities, showcasing significant improvements in public health and cognitive function among

children—a critical demographic often most affected by neurotoxic substances. Similar investments in cleaner cooking technologies in rural areas of developing countries have dramatically reduced respiratory diseases associated with indoor air pollution.

Aligning With Global Standards and Frameworks:

By focusing on toxic substance exposure, impact investments align with several Sustainable Development Goals (SDGs), including Good Health and Well-being (SDG 3), Clean Water and Sanitation (SDG 6), and Responsible Consumption and Production (SDG 12). The framework to quantify the social impact such as IWA can also be used. This alignment not only enhances the legitimacy and appeal of such investments but also attracts a broader base of investors who are committed to achieving these global targets.

Recommendation 2: Strengthening the Role of International Organizations in Impact Investment Strategies

International organizations play a pivotal role in global governance and development, facilitating cooperation across countries and sectors to address pressing global challenges. Enhancing their role within impact investment strategies can significantly amplify the effectiveness and reach of these investments, particularly in tackling complex issues like climate change, public health, and sustainable economic development.

Catalyzing Multilateral Efforts:

International organizations, such as the United Nations (UN), the World Bank, and various regional development banks, have the unique ability to mobilize resources, influence policy, and foster collaboration among states, private investors, and civil society. By integrating these organizations more deeply into impact investment frameworks, such as Triple I, investors can leverage their expertise and networks to implement large-scale projects with far-reaching benefits.

Framework for Standardization and Accountability:

One of the critical functions of international organizations in impact investing is to develop and enforce standards that ensure transparency, accountability, and effectiveness of investments. These entities can establish universal metrics for measuring impact, thus providing a consistent basis for assessing and comparing the performance of investments across different regions and sectors. This standardization is

crucial for attracting more substantial investment flows, as it reduces the risk and complexity associated with assessing impact.

Example of Effective Partnership:

The Global Environment Facility (GEF), a collaboration among 183 countries, international institutions, civil society organizations, and the private sector, offers a model for how international organizations can facilitate impactful investments. The GEF has successfully implemented projects that address biodiversity loss, climate change, and pollution, demonstrating substantial environmental and social returns. Such models can be replicated and scaled up with the active involvement of international organizations in impact investment strategies.

Enhancing Access to Capital:

International organizations often have access to substantial funding sources that are not readily available to private investors, including official development assistance (ODA) and special funding mechanisms for low-income countries. By playing a more active role in impact investing, these organizations can unlock new funding streams for high-impact projects, particularly in underserved markets and sectors.

Building Capacity and Providing Technical Assistance:

Many developing countries lack the capacity to design, implement, and manage projects that attract impact investment. International organizations, with their vast experience and resources, can provide the necessary technical assistance and capacity building to these countries. This support can include training, management assistance, and technology transfer, which are vital for ensuring the success and sustainability of impact investments.

Propelling Global Cooperation and Policy Alignment:

In an increasingly interconnected world, international organizations can act as platforms for aligning policies and regulations across countries to support impact investments. This alignment is crucial for addressing transboundary challenges and ensuring that investments do not inadvertently lead to adverse outcomes in one region while benefiting another.

Conclusion

This thesis has explored the complexities surrounding Impact and ESG (Environmental, Social, and Governance) investing, reflecting on the practical challenges and skepticism prevalent at the operational level regarding their true effectiveness in enhancing corporate value. Drawing upon approximately a decade of my direct experience in the field of impact and ESG consulting and investment, the research delved into the reasons why, despite their purported benefits, these forms of investment often encounter significant resistance and implementation hurdles in practice.

A crucial insight from this analysis is the existing confusion over the definitions and scopes of Impact and ESG investments. These terms frequently overlap and are ambiguously used among different stakeholders, leading to a proliferation of metrics that further complicates the landscape for corporate and investor engagement. Such a situation not only escalates the confusion but also amplifies the disarray among stakeholders, as evidenced by the indiscriminate use of varying metrics for rating and assessment purposes. The research presented here reveals that these inconsistencies can exacerbate the challenges in aligning these investments with genuine corporate value enhancement.

Furthermore, in Chapter 3, the empirical evidence analyzed through event studies suggests that while investors do react to declines in ESG ratings by divesting, which supports the utility of ESG metrics for negative screening, there is no corresponding significant positive reaction for improvements in these ratings. This outcome indicates that investors might not utilize positive ESG performances to guide investment decisions, preferring instead to rely on traditional financial metrics. This points to a broader issue within the investment community, where ESG improvements are not necessarily valued as indicators of potential financial returns, but rather, are viewed as benchmarks for minimizing risks.

The implications of this research are profound for both academia and industry practice. For corporates, it is imperative to embed ESG and Impact considerations within the core strategic frameworks rather than treating them as peripheral or supplementary strategies. This integration necessitates a thorough understanding of stakeholder expectations and a strategic alignment of business operations with sustainability goals to foster long-term value creation.

Additionally, the insights gained from the integration of AI technologies, as discussed in Chapters 4 and 5, underscore the potential of advanced analytical tools to enhance the precision of impact assessments and the efficiency of ESG implementations. These technologies can serve dual purposes: improving operational efficiencies and meeting investor and stakeholder expectations for sustainable practices.

In conclusion, this thesis argues for a more nuanced and integrated approach to Impact and ESG investing, advocating for clearer definitions, standardized metrics, and strategic alignment with core business objectives. The future trajectory of ESG and Impact investing will likely hinge on the ability of businesses to convincingly integrate these strategies into their overall management frameworks, thereby making a compelling case to investors that sustainable practices do indeed correlate with superior financial performance. Future research should continue to explore these themes, aiming to resolve the discrepancies in Impact and ESG definitions and to substantiate the linkages between sustainable practices and financial outcomes, thereby contributing to a more stable and predictable investment environment.

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