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Generativity is a Core Value of the ESJ: A Decade of Growth

Erik Erikson (1902-1994) was one of the great psychologists of the 20th century¹. He explored the nature of personal human identity. Originally named Erik Homberger after his adoptive father, Dr. Theodore Homberger, he re-imagined his identity and re-named himself Erik Erikson (literally Erik son of Erik). Ironically, he rejected his adoptive father's wish to become a physician, never obtained a college degree, pursued independent studies under Anna Freud, and then taught at Harvard Medical School after emigrating from Germany to the United States. Erickson visualized human psychosocial development as eight successive life-cycle challenges. Each challenge was framed as a struggle between two outcomes, one desirable and one undesirable. The first two early development challenges were 'trust' versus 'mistrust' followed by 'autonomy' versus 'shame.' Importantly, he held that we face the challenge of **generativity** versus **stagnation in middle life**. This challenge concerns the desire to give back to society and leave a mark on the world. It is about the transition from acquiring and accumulating to providing and mentoring.

Founded in 2010, the European Scientific Journal is just reaching young adulthood. Nonetheless, **generativity** is one of our core values. As a Journal, we reject stagnation and continue to evolve to meet the needs of our contributors, our reviewers, and the academic community. We seek to innovate to meet the challenges of open-access academic publishing. For us,

¹ Hopkins, J. R. (1995). Erik Homburger Erikson (1902–1994). *American Psychologist*, 50(9), 796-797. doi:<http://dx.doi.org/10.1037/0003-066X.50.9.796>

generativity has a special meaning. We acknowledge an obligation to give back to the academic community, which has supported us over the past decade and made our initial growth possible. As part of our commitment to generativity, we are re-doubling our efforts in several key areas. First, we are committed to keeping our article processing fees as low as possible to make the ESJ affordable to scholars from all countries. Second, we remain committed to fair and agile peer review and are making further changes to shorten the time between submission and publication of worthy contributions. Third, we are looking actively at ways to eliminate the article processing charges for scholars coming from low GDP countries through a system of subsidies. Fourth, we are examining ways to create and strengthen partnerships with various academic institutions that will mutually benefit those institutions and the ESJ. Finally, through our commitment to publishing excellence, we reaffirm our membership in an open-access academic publishing community that actively contributes to the vitality of scholarship worldwide.

Sincerely,

Daniel B. Hier, MD

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Abstract

This study's aim is twofold: (1) to explore the effect of mergers and acquisitions (M&As) on bidders' social and environmental performance, and 2) to determine the potential drivers of this process by focusing on corporate governance characteristics. The analysis is based on M&As performed by firms listed on the Milan Italian Stock Exchange during the 5-year period of 2018–2022. The research data were retrieved from the FactSet and Refinitiv Eikon databases and examined using regression analyses. The findings demonstrate that M&As positively affect social and environmental performance, as long as good corporate governance practices are in place. The current research draws on stakeholder-agency theory and identifies the potential drivers of the value creation process in the M&A context enhancing the limited existing literature on this topic. The findings highlight the role of corporate governance in strengthening the impact of M&As on bidders' non-financial performance, offering valuable practical implications. First, investors and financial analysts should develop a comprehensive perspective to assess the M&A's impact on non-financial performance. Second, regulators should consider strengthening specific corporate governance requirements. Finally, policymakers should encourage M&As undertaken by firms with sustainability-oriented boards of directors.

Keywords: Corporate governance, M&As, social and environmental performance, stakeholder-agency theory

Introduction

A leading global consulting firm observes that “today, across the globe and industries, companies increasingly see sustainability-linked (green) M&A as a way to catalyze their strategies, stimulate growth, and improve operations while raising their environmental, social, and governance (ESG) profiles” [Raberger et al. (2024)], underlining the need to investigate the relationships between these transactions, sustainability and social and environmental performance. Despite its growing importance, this topic has been relatively understudied and has provided mixed results with regard to potential drivers.

The study of mergers and acquisitions (M&As’) impacts on firms’ performance has been widely addressed by scholars, focusing on the economic dimension and with mixed results [Alexandridis et al., (2013); Dunn et al., (2016); Lilien et al., (2020)]. Some scholars have underlined how management often implements these operations to achieve personal goals, undertaking opportunistic behaviors aimed at either exploiting an increase in a firm’s size (empire building) or reducing control over its activities. According to this perspective, M&As have been identified as value-destroying operations mainly driven by management’s selfish economic goals and negatively affected by entrenchment and earnings management [Berge et al., (1997); Masulis et al., (2007); Teti et al., (2017)].

Given that much of the literature has depicted these operations as a tool for pursuing management’s interests, with negative impacts on other stakeholders, it is important to understand the impact of these strategic operations on environmental and social performance.

The need to promote further research is emphasized by the increasing economic relevance of these transactions: in 2022, 57,736 M&As were completed for a total value of US\$ 3,342 billion [PWC, (2023)]. M&A’s transactions are high-impact strategic operations, as they can have disruptive effects on the stakeholders’ wealth, by implying a wide reorganization of firms.

Although the mainstream literature identifies an M&As’ positive contribution to value creation for stakeholders, research attention to this topic has still been limited, in particular with reference to the drivers enabling these transactions to enhance the social and environmental performance.

The literature has only recently addressed the M&As’ issue from this perspective and has focused on the assessment of the potential improvement of non-financial performance, while the key variables driving such processes and the factors determining a deal’s success have yet to be explored [Fatemi

et al., (2017); Tampakoudis & Anagnostopoulou, (2020); Vastola & Russo, (2021); Mihaiu et al., (2021); Caiazza et al., (2021); Barros et al., (2022); Huang et al., (2023); Rahman & Wu, (2023)].

M&As underline some typical agency problems, such as misalignment between management and stakeholders interests, information asymmetry, a strong need to monitor management activity, and management's tendency to undertake opportunistic behaviors. Hence, this study draws on the stakeholder-agency framework [Hill & Jones, (1992)], assuming that corporate governance mechanisms may facilitate the alignment between management and all stakeholders' interests in the M&A context [Asni & Agustia, (2022); Salvioni & Almici, (2022); Almici, (2023)].

According to this framework, this study aims to verify whether (1) M&As positively affect social and environmental performance, and (2) the bidder's corporate governance characteristics have a positive impact on this process.

To test the aforementioned hypotheses, the analysis focused on M&As carried out by firms listed on the Milan Stock Exchange during the 5-year period of 2018–2022. The study used a regression analysis based on data retrieved from the Eikon Refinitiv and FactSet databases by focusing on ESG scores as a proxy for social and environmental performance and specific corporate governance features. ESG scores have gained ground as reliable indicators of firm's non-financial performance, both in academic research and professional contexts [(Barros et al., 2022; Huang et al., 2023; Just et al., 2023; Zheng et al., 2023)]. The ESG rating is particularly appropriate for current research that assesses firm's impacts on social and environmental dimensions.

The main contributions of this study are as follows: adoption of a multidimensional perspective linking M&As, corporate governance, and social and environmental performance; enhancement of the extant literature regarding the M&As' contribution to social and environmental performance by strengthening firms' sustainability orientation; use of the stakeholder-agency theory approach by selecting specific corporate governance features—beyond those traditionally studied—to explain the drivers enabling M&As to create value in the long run; and a focus on the post-merger effects on social and environmental performance rather than the impacts of ESG performance on M&As' success. The research findings show that M&As may positively affect both social and environmental performance, creating value for stakeholders. In addition, specific corporate governance characteristics facilitate M&As' enhancement of non-economic results, satisfy social and environmental expectations, and discourage management's opportunistic behaviors. This is a new perspective that addresses the value-creation issue by linking M&As, social and environmental performance, and corporate governance, according to the interdependent view of stakeholder-agency

theory. These findings will be of interest to investors, financial analysts, policy makers and regulators, as they underline how stakeholders can benefit from external growth strategies that are typically seen as driven by economic interests as long as firms have the best corporate governance practices in place.

The remainder of the paper is structured as follows. Sections 2 and 3 present the literature review. Section 4 discusses the theoretical framework and the research hypotheses. Section 5 explains the methodology and data collection, while Section 6 discusses the main results. The last one – Section 7 - is dedicated to conclusions.

The effect of M&As on non-financial performance

M&A transactions are based on strategic decisions that strongly impact the firm's life cycle and performance producing disruptive effects, and significant changes in the bidder's structure. M&As are driven by various motivations, including the following: to expand the firm's presence in primary or secondary markets and new geographical areas, to develop synergies with other firms, to acquire new competencies, to obtain competitors' technological assets, to grow faster than internal growth allows, and to increase efficiency and competitiveness through economies of scale [Okafor, (2019); Eulerich et al., (2022); Vinocour et al., (2022); Darayseh & Alsharari, (2023)]. Darayseh & Alsharari (2023) focused on the banking sector and, identified the main factors leading to successful M&As, with regard to income, growth, costs, survival, diversification, security, and risk.

Although the abovementioned determinants are recognized as being distinctive of these strategic operations, part of the literature has seen M&As as tools for achieving opportunistic goals, referring to management's selfish interests, with negative effects on the value-creation process [King et al., (2004); Dunn et al., (2016); Lilien et al., (2020); Amano, (2022)]. This topic has been investigated by focusing mainly on shareholders and on the economic effects in terms of abnormal returns for shareholders by highlighting results that are mixed and far from conclusive [Renneboog & Vansteenkiste, (2019); Lilien et al., (2020); Ahmed et al., (2023)].

The academic literature has mainly focused on the analysis of the effects on M&As' performance generated by sustainability identified as an independent variable.

In this regard, [Teti et al. (2022)] focused on the analysis of the effects of each of the ESG pillar on takeover performance; they observed that – on a stand-alone basis – the governance system positively affects the achieved results, unlike social and environmental systems that are not relevant for M&A's value creation. Zrigui et al. (2024) investigated the impact of ESG performance on the valuation of M&A transactions, demonstrating that social

and environmental aspects drove the acquisition premium while the governance dimension did not appear to be relevant.

Some scholars have investigated the effects of non-financial performance on specific aspects related to M&As, such as the cross-border M&As' business efficiency and diversification discount [Byoung-jin, (2021)]; the relationship between the pre-deal target's and acquirer's sustainability and deal timing [Cardillo & Murad, (2023); Ma, (2023)]; the impact of differences between acquirer and target countries in terms of environmental sustainability, and the intensity of cross-border mergers [Ahmad et al., (2023)]; the link between differences in ESG performance and time to completion (TTC), consisting of the number of days between the announcement and closing of a deal [Just et al., (2023)]; and the negative effects of the size of green M&A listed companies on the development of the rural ecological environment [Zhou et al., (2023)].

On the opposite, little attention has been given to the analysis of M&As' effects on non-economic performance (in particular, socio-environmental performance). Only recently have some scholars focused on M&As' social and environmental impacts by proxying non-financial performance using ESG scores [Aktas et al., (2011); Tampakoudis & Anagnostopoulou, (2020); Kim et al., (2021); Caiazza et al., (2021); Barros et al., (2022); Rahman and Wu, (2023)]. This perspective aims to explain whether these operations can contribute to value creation for stakeholders by focusing on the social and environmental dimensions as identifying the typical pillars of sustainability.

A clear prevalence of evidence demonstrates the improvement in performance after M&As.

A study by Aktas et al. (2011) revealed that the acquirer's social and environmental performance and financial gains improved after an M&A in which the target firm was SRI-aware. Similarly, Tampakoudis & Anagnostopoulou (2020), who examined 100 M&As completed by European Union firms during 2003–2016, discovered that the acquirer's ESG performance increased after an M&A transaction with a target firm whose pre-merger ESG performance was higher than the acquirer's ESG performance. Considering a sample of 3,941 deals completed in 41 countries and 12 economic sectors from 2002 to 2020, Barros et al. (2022) assessed the implications of M&As on bidder's sustainability, showing that the acquirer's global ESG score, environmental score, and social score improved in the year following the M&A. According to the authors, this effect can be explained by the increasing size of the acquirer, which determines higher scrutiny from stakeholder, financial markets, governments, media and society as a whole [Stanny and Ely, (2008)], thus stimulating the bidder to act in a more sustainable way [Barros et al., (2022)]. Other studies seem to confirm these

results. Mihaiu et al. (2021) analyzed 100 leading pharmaceutical companies between 2010 and 2020 and found a positive relationship between M&A transactions and firms' non-financial performance, which improved during the selected period. Rahman & Wu (2023) investigated the M&As' impacts on firms' environmental, social and governance performance, by analyzing 128 Chinese listed companies that have completed at least one M&A between 2011 and 2020. The results demonstrate how the acquisition of a target with high ESG scores contributes to the improvement of the acquirer's non-financial performance. With regard to the M&A's non-economic effects, Kim et al. (2021) observed how M&As improve environmental performance, by facilitating an increase in the number of green patent applications, while Caiazza et al. (2021) identified - by investigating deals completed between 2000 and 2019 in the U.S. - a positive correlation between M&As' long-term effects and firm's sustainability performance.

Conversely, few studies found that mergers either have no effect on the ESG performance of the acquirer in the long run [Fatemi et al. (2017)], or determine a worsening of non-financial performance, although in the presence of extraordinary situations of a widespread world-scale crisis. For example, Tampakoudis et al. (2021) analyzed a sample of 889 completed M&As announced by US firms between January 1, 2018, and July 31, 2020 (during the COVID-19 pandemic) by highlighting a significant negative value effect of ESG performance for the acquirer's shareholders. Lastly, Vastola & Russo (2021) showed that M&As can lead to three main outcomes in terms of the acquirer's sustainability: significant advancement ("embedding sustainability"), slight improvement ("adding sustainability"), and decrease ("losing sustainability").

As studies on M&As' effects on non-financial performance are limited and provide mixed results, further analysis is necessary to understand whether and to what extent these strategic decisions are made according to social and environmental stakeholders' expectations.

In this regard, the extant literature underlines the need to understand these strategic operations' impacts on the fulfillment of social and environmental expectations, according to a stakeholder-agency perspective.

The impact of corporate governance on mergers and acquisitions

M&As have been identified in the literature as specific investments implying agency costs and as a consequence of the traditional conflict between management's and stakeholders' interests. Several studies have addressed the M&A topic according to the corporate governance perspective by verifying the presence of potential relationships between specific corporate governance features and these strategic operations, without achieving shared results

[Starks and Wei, (2013); Andriosopoulos et al., (2016); Ellis et al. (2017); Teti et al., (2017); Teti et al., (2022); de Sousa Barros et al., (2021)].

In this regard, Andriosopoulos et al. (2016) found that the presence of institutional investors in the acquirer's shareholding structure positively affected M&A performance. With reference to the impacts on bid premiums, Stulz (1998) observed that the voting power of the target's largest shareholders affected the acquirer's tendency to increase the bid price. Gaspar et al. (2005) demonstrated that targets with dominant short-term shareholders are likely to get lower bid premiums.

More generally, it has been observed that the higher quality of the bidder's corporate governance than the target's corporate governance usually implies higher cumulative abnormal returns for the bidder [Starks and Wei, (2013); Ellis et al., (2017); Hussain and Loureiro, (2022)]. Some authors have observed how the high number of executive directors, together with the Chief Executive Officer (CEO) duality, facilitates deals carried out according to the exclusive management's interests, which are usually affected by management's orientation of overestimating its capabilities and thinking that target companies are undervalued because they are not well managed (the so-called "hubris hypothesis") [Roll, (1986); Hayward & Hambrick, (1997); Malmendier & Tate, (2008); Redor, (2016)].

In particular, the literature has observed how the high incidence of non-executive directors reduces the risk of behaviors driven by the so-called "hubris effect" and orients M&As toward all stakeholders' wealth according to sustainability, equity, transparency, and global responsibility principles. Therefore, outside directors provide a relevant contribution to M&A decisions, when all costs and benefits must be assessed in a proper and objective way to ensure that the deal will create value [Redor, (2016)].

More generally, Teti et al. (2017) found that board independence, CEO duality, and the level of CEO fixed compensation positively affect the economic results of an acquisition by generating value for bidders. Similarly, Tampakoudis et al. (2018) observed that board size was negatively related to the abnormal returns of the announcement period, while high shareholders' voting rights showed a positive effect.

With specific reference to the above-stated corporate governance features, other studies have verified the presence of a relationship between these features and post-M&A bidder's performance by highlighting the results. Indeed, on the one hand, several studies have underlined that firms with a high proportion of independent board members achieve better results when M&As take place, improving the acquirers' share performance [Ben Amar et al., (2011); Chadam, (2018); Defrancq et al., (2021)]. This probably occurs because independence strengthens the directors' ability to provide fair

and objective judgement over management and makes their supervision more effective.

On the other hand, some scholars have demonstrated that either board independence has no significant impact on abnormal acquirer's returns [Garcia & Herrero, (2022)] or a negative relationship exists. This latter can happen when independent directors are excessively involved in monitoring the firm [Faleye et al., (2011)], thus sacrificing their advisory role to management, particularly in the selection of target firms [Baldenius et al., (2014)].

As concerns CEO duality, the results are far from conclusive, as the evidence is mixed and highlights different perspectives. The majority of studies have demonstrated how this corporate governance feature might lead to wealth destroying M&As, thereby confirming the entrenchment hypothesis stated by agency theory [Masulis et al. (2007); Goranova et al., (2010)]. Indeed, CEO duality also entails the risk that the CEO monopolizes board meetings (Endrikat et al., 2021) and uses their unopposed supremacy to make opportunistic decisions, neglecting the shareholders' expectations of long-term value creation (Berger et al., 1997; Elyasiani et al., 2015; Teti et al., 2017). By contrast, organization theory highlights that stronger and quicker decision-making—facilitated by CEO duality—is a desirable attribute in the case of M&As [(Baliga et al., (1996)]. Other studies demonstrated that the relationship between CEO duality and acquirer's value creation is either not significant [Chadam, (2018); Defrancq, (2021)] or positive in terms of acquirer's returns [Garcia & Herrero, (2022); Tampakoudis et al., (2022)].

With reference to the CEOs' compensation issue, some authors have investigated the relationship between executive compensation and M&A deals. For example, based on evidence that larger companies pay higher salaries to their managers [Girma et al., (2006); Choi et al., (2020); Barros et al., (2022)] and that the stronger reputation of these latter provides them with greater remuneration, Xue et al. (2020) argued that top executives may be tempted to undertake M&A transactions to expand firm size (the "empire building" phenomenon). However, an increase in corporate dimensions could be desirable by any director, because – as Hahn and Lasfer (2011) argue – even non-executive directors' compensation can be influenced by the company size: as larger firms are more complex to govern and supervise, non-executive directors' pay should increase to reflect their more demanding role.

Other studies have investigated the corporate governance system's effects by focusing on other characteristics, such as the level and distribution of board ownership, board size, and block-holder control. According to Carline et al. (2009), these characteristics show a statistically significant impact on the economic performance of acquirers by demonstrating that the board's direct stock ownership identifies an incentive for making strategic decisions in the firm's interest. Large outside block holdings positively affect

mergers' operating performance, and board size has a negative effect on the bidder's post-merger performance. With specific reference to board size, the mainstream literature has underlined the presence of a negative relationship between large boards and acquirer performance, arguing that large boards tend to be slow to take bureaucratic decision processes, which hamper their ability to monitor management [Teti et al., (2017)]. Hence, small boards should be preferred because they can more effectively fulfill their advisory and supervisory roles over CEOs, thanks to higher cohesion, greater coordination, and better communication [Jensen, (1993); Khorana et al., (2007); Tampakoudis et al., (2018)].

However, the results are mixed, as some authors argue that large boards can positively affect an acquirer's performance [Bauguess & Stegemoller, (2008); Ghosh & Dutta, (2018); Tampakoudis et al., (2022)], while other scholars have identified no significant relationship between board size and M&A returns [Masulis et al., (2012); Defrancq et al., (2021)].

As regards the corporate governance characteristics selected for assessing the impacts on post-merger performance, the literature has also focused on gender diversity. Women have psychological traits, such as helpfulness, sensitivity and attention to the needs of others, which make them more emphatic with stakeholders [Kramer et al., (2006)] and more interested in sustainability matters. In this regard, Defrancq et al. (2021) concluded that female directors play a key role in preventing the value-destroying operations initiated by management and contribute to creating value for the acquirer's shareholders. According to Levi et al. (2014) companies with higher percentages of female directors engage in fewer acquisitions and, when M&As are implemented, pay lower takeover premiums. With reference to the US S&P 1,500 firms in the period 1998–2010, Chen et al. (2016) observed that firms with higher gender diversity on the board carry out fewer and smaller M&A transactions. Nonetheless, a study by Huang & Kisgen (2013) demonstrated that female managers implement more profitable acquisitions than men.

Only a few studies have conducted a broader analysis by integrating into the investigation of the relationship between M&As and corporate governance, the related effects on ESG performance. Taglialatela et al. (2022) demonstrated how specific blockholders' characteristics positively affect the social and environmental performance of M&A target firms. Similarly, Zheng et al. (2021) demonstrated how the M&As can be useful for improving environmental sustainability, due to the mediating effect of corporate governance. Kapil & Kumar (2023) investigated the relationship between corporate governance characteristics and firms' sustainability performance, focusing on Indian acquires. The findings underlined a positive association between institutional and foreign ownership and sustainability performance.

Specific contextual factors, such as firm size, industry and legal framework, should also be analyzed to understand their impact on the relationship between corporate governance and M&As.

Regarding firm size, Calza et al. (2021) emphasize its importance for environmental collaboration. Moreover, a study by Li and Wang (2023) concerning the Chinese market proved the existence of a positive correlation between firm size and CSR orientation of corporate governance, because larger firms possess abundant resources to carry out effective CSR engagement.

As concerns the industry, M&A strategies can be used to protect and relaunch business after a crisis. Cho and Chung (2022) argue that companies acquire their less productive peers when a macroeconomic shock occurs. According to Andriuškevičius and Štreimikienė (2022), energy operators have implemented M&A strategies to revitalized their activities after the Covid-19 pandemic, also focusing on the green transition: by doing so, energy companies have managed tensions and changes in global demand in order to stay solvent. Similarly, Deloitte (2021) underlined that M&As in the oil and gas sector help achieve scale economies, reduce costs and allow operation within the available cash flow. Moreover, geopolitical attributes are recognized in M&As occurring in strategic sectors, such as the energy one [Bridge, (2008)].

The industry role in M&As has also been analyzed with reference to the implications for the CEO's acquirer reward. According to Grinstein and Hribar (2004), the belonging of acquirer and target company to different industries, a condition that should limit the synergy and integration problems in M&A operations, seems to have little impact on the remuneration of the CEO's acquirer. Considering the industry and risk degree of M&As, part of the existent literature argues that transactions made within the same sector are easier [Tampakoudis et al., (2021)] and less risky than diversifying acquisitions [Garcia & Herrero, (2022)], probably because they are characterized by lower information asymmetry. However, other studies state the contrary, underlining that many M&As have been conducted in order to diversify the bidder's portfolio so that the exposure to industry-specific risks can be reduced [Cho & Chung, (2022)].

Also, the legal framework in which an M&A takes place can influence the success of the operation in terms of value creation. In this regard, Defrancq et al. (2020) investigated the effects of CEO duality in the acquirer with reference to M&A transactions conducted in Continental Europe, the companies of which tend to have a controlling shareholder. The authors discovered that the presence of strong laws in the acquirer's country mitigates the consequences of CEO duality. The legal context can also affect the risk degree of an M&A: evidence exists that firms involved in cross-border

acquisitions may experience more difficulties than companies from the same country, because differences in legislation, as well as in culture, can impede their integration [Garcia & Herrero, (2022)]. Lastly, the success of an M&A can be influenced by the degree of state intervention in the economy based on the national law, as emphasized by Mihaiu et al. (2021) through a comparison of M&A transactions completed in the Chinese and the US pharmaceutical sectors.

Thus, the aforementioned studies underline the presence – in the M&As’ internal and external context – of a relationship between the corporate governance system and ESG performance, by highlighting the need to examine this topic in-depth and fill the gap in the existing literature.

Indeed, the analysis of the literature underlines how existing studies have used the corporate governance approach to explain M&As’ effects according to two main perspectives: focusing on economic performance rather than socio-environmental performance and neglecting the main implications of corporate governance features in terms of sustainability orientation. This study aims to contribute to the existing literature by analyzing the relationships between M&As and stakeholders’ social and environmental expectations, as affected by specific corporate governance characteristics overcoming the traditional agency problem.

Theoretical framework and hypothesis development

M&As have been seen by some authors as strategic tools used by management to pursue selfish economic interests by exploiting information asymmetry between the involved parties. In this regard, the literature has underlined how M&As emphasize the traditional misalignment between management’s and shareholders’ interests by recalling the so-called “agency problem” [Jensen and Meckling, (1976)]. This issue relates to managers’ opportunistic behaviors in exploiting their information advantage over shareholders (principals), who must bear the costs of monitoring CEOs’ activities.

Some studies have been conducted to understand the specific reasons for management’s opportunistic behavior in the M&A context. The literature has underlined how managers prefer to keep financial resources available by discouraging the distribution of cash to shareholders to avoid controls from external agents, which typically occur in the case of external sources of financing. Other studies have observed how bad deals usually relate to management’s efforts to increase its compensation, especially when it is based on the firm’s size, which—after the M&A—is likely to increase [Stulz, (1990); Trautwein, (1990); Khorana and Zenner, (1998); Grinstein and Hribar, (2004); Harford and Li, (2007)].

However, the increasing diffusion of CSR and sustainability principles has boosted the idea that firms should consider not only shareholders' economic expectations but also all stakeholders' expectations (economic and non-economic). According to this belief, a broader approach than the classical "agency-theory" framework has been established, known as the "stakeholder-agency theory," that states that all stakeholders—not just the shareholders—have legitimate claims toward their firms [Hill & Jones, (1992)].

In particular, this research is grounded on a modern and interdependent view of stakeholder theory implying that the value creation over the long-run depends on the ability of a firm to fulfill all relevant and intertwined stakeholders' expectations.

However, the implementation of such a process requires the development of specific governance mechanisms aimed at ensuring a trade-off between the management goals and the achievement of results consistent with all relevant stakeholders' expectations (economic and non-economic).

This framework expands the number of relevant actors by promoting integration between shareholders and stakeholders, whose interests should be protected by management's activities according to a specific agency mandate. The M&A issue can be framed within this theoretical framework by highlighting the need to implement specific tools for monitoring CEOs' activities to ensure the achievement of strategic goals for the wealth of all stakeholders by avoiding value-destroying deals aimed exclusively at reaching CEO's interests [Masulis et al., 2007; Teti et al., (2017)]. This approach provides a different view compared to the existing literature, according to a revised perspective of traditional stakeholder theory and agency theory, to identify a potential driver of the value-creation process launched by M&As. The academic literature has not yet identified the factors that enhance post-merger social and environmental performance; rather, previous studies have focused on the effects of the target's ESG performance and neglected the potential relationships with the corporate governance system. They have also neglected the implications of M&As in terms of social and environmental expectations and agency costs (costs arising from the incomplete alignment between managers' and shareholders' interests). In fact, the establishment of a sustainability-oriented corporate governance system can contribute to the fulfillment of social and environmental expectations, as well as economic expectations, by reducing the risk of opportunistic management behaviors. For example, it has been observed that a board of directors in which the majority of members are independent, may facilitate value creation in the long run by enabling the safeguarding of the ecosystem and the protection of human rights [Salvioni and Almici (2022)]. In this regard, M&As usually imply a strong reorganization of the firm's involvement, with potential positive impacts on

social and environmental dimensions as long as the governance system ensures the effective monitoring of management activity.

Indeed, managers' decisions are negatively affected by the so-called "managerial entrenchment," that is, "the extent to which managers fail to experience discipline from the full range of corporate governance and control mechanisms including board monitoring, market control, and compensation-related to company performance" [Berger et al., (1997)]. Managerial entrenchment is commonly identified as a corporate governance problem that occurs when managers make themselves irreplaceable and pursue personal interests with opportunistic behaviors. It is generally measured by factors such as management ownership, board independence, chief executive officer tenure, CEO duality and the manager's compensation. In this regard, several studies have underlined that in the case of M&As, management usually takes opportunistic behaviors and misbehaviors generally aimed at safeguarding their economic interests by neglecting non-economic stakeholders' expectations and performing value-destroying deals [Grinstein and Hribar, (2004); Harford and Li, (2007); Teti et al., (2017)]. To avoid value-destroying M&As, the literature has underlined the relevant role played by the board of directors, which is formally in charge of making strategic decisions and monitoring CEOs' activities [E-Vahdati et al., 2019; Naciti, 2019; Salvioni and Almici, (2022)].

In this regard, the literature has underlined how the corporate governance system's orientation toward sustainability is facilitated by a board of directors complying with specific requirements, facilitating the convergence of traditionally conflicting interests by overcoming the misalignment between management and stakeholders and reducing related agency costs.

According to stakeholder-agency theory, two general hypotheses were formulated (H1 and H2), related to impacts on social and environmental performance:

H1: M&As positively affect the bidder's social performance

H2: M&As positively affect the bidder's environmental performance

To identify potential variables affecting the relationship between M&As and social and environmental performance, this study aimed to verify the following third hypothesis (H3):

H3: The acquirer's corporate governance mechanisms positively impact H1 and H2

H3 was tested with reference to specific corporate governance characteristics that are considered enablers of the convergence of involved

interests (both economic and non-economic) by mitigating the agency problem effects.

Hence, this study focuses on the corporate governance features that have been selected by the mainstream literature to explain M&As' performance (especially the economic one) [Berger et al., (1997); Masulis et al., (2007); Teti et al., (2017); Tampakoudis et al., (2018)]. It adds new variables to previous studies affecting social and environmental performance according to a sustainability-based perspective.

In particular, H3 was tested according to the following corporate governance variables.

1) Board size

The extant literature has analyzed the potential impacts of board size on an acquirer's post-merger economic performance with mixed results. The main findings are presented in Section 3.

However, the relationship between board size and social and environmental performance in connection with M&As is understudied, highlighting a gap in the research. In this regard, the board size may affect the effectiveness of decision-making processes as well as the ability of the board to monitor management activity, impacting the firm's non-financial performance.

2) Board's gender diversity

Many studies have demonstrated a positive relationship between the presence of female directors and the enhancement of firms' sustainability orientation. The decision to consider this variable as promoting a firm's sustainability orientation is based on the belief that women are more sensitive than men to ethics, diversity, and social themes, boosting specific attention to all stakeholders. These findings are explained in Section 3.

However, no studies have investigated the relationship between gender diversity and post-M&A's social and environmental performance.

3) The presence of non-executive board members

Through their oversight function, non-executive directors discourage and prevent the opportunistic behavior of CEOs and other managers, thus ensuring that all corporate decisions and actions are implemented in the interests of shareholders and other stakeholders [Johnson et al., (1996); Redor, (2016); Mayur & Saravanan, (2017)].

In this regard, although many studies have examined the relationship between the presence of non-executive directors and sustainability [Zhang et al., (2013); Sundarasan et al., (2016); Grishunin et al., (2022)], the literature has not yet clearly explained how this relationship works in the M&A context. Non-executive directors should facilitate overcoming the agency problem, by promoting transactions based on the alignment between the interests of management and stakeholders.

4) Board independence

The literature has underlined how a high number of independent directors strengthens the effectiveness of control over management activity by facilitating the fulfillment of all stakeholders' expectations (both economic and non-economic) [Fama & Jensen, (1983); Zattoni & Cuomo, (2010); Defrancq, (2021)].

Apart from one study by Kapil & Kumar (2023), which demonstrated a positive relationship between the proportion of Indian bidders, the effects of board independence on corporate sustainability in M&A operations have remained almost unexplored. The presence of independent members is expected to orient M&As toward the achievement of goals fulfilling all stakeholders' expectations.

5) CEO separation

CEO separation occurs when the CEO of a company does not serve as the chairperson of the board. From the perspective of agency theory, CEO separation increases corporate governance effectiveness because it strengthens board oversight [Morck et al., (1989); Endrikat et al., (2021)] and avoids CEO entrenchment [Elyasiani et al., (2015); Teti et al., (2017)].

Prior studies have also explored the effects of CEO duality on firms' sustainability performance but not in the context of M&As. The above-stated points underline the need to investigate the relationship between CEO separation and post-M&A non-financial performance.

6) Sustainability into CEOs' compensation

The integration of sustainability into CEOs' remuneration can facilitate overcoming the agency problem by stimulating convergence between traditionally conflicting interests. In this regard, the literature has underlined—even with controversial results—the presence of a positive relationship between sustainability integration into CEOs' compensation and social and environmental performance [Thorne et al., (2010); Callan and Thomas, (2011); Hong et al., (2016); Almici, (2023)].

Conversely, the above-stated relationship has not been investigated in the M&As' context.

7) Establishment of the sustainability committee

The majority of scholars have observed how the establishment of a sustainability committee promotes a focus on all stakeholders by identifying a specific body dedicated to social and environmental issues. [(Gennari and Salvioni, (2019); García-Sánchez et al., (2019); Endrikat et al., (2021)]. In this regard, this body may affect the post-M&A bidder's non-financial performance, as it mainly targets social and environmental issues; however, researchers have neglected to analyze the role played by sustainability committees within the M&A context.

The above-stated hypotheses are depicted in Figure 1.

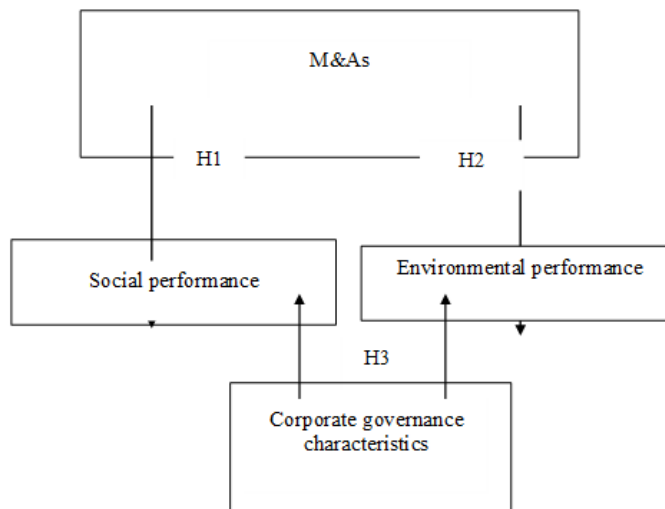


Fig. 1 The theoretical framework

Research design

Sample description

The analysis is focused on Milan Stock Exchange-listed companies on December 31, 2022, performing M&As over the five-year period from January 1, 2018, to December 31, 2022, considering the high relevance assumed by the sustainability issue in this period. Indeed, several initiatives have been promoted in the selected period (i.e., the European Regulation No. 2088/2019 about sustainable finance disclosure, the European Green Deal presented by the European Commission in 2019, the European Regulation No. 852/2020 about the taxonomy of sustainable economic activities, the European Recovery Plan in 2020, and the Corporate Sustainability Reporting Directive No. 2464/2022), highlighting the increasing relevance of the social and environmental dimension. The decision to focus on the Italian context rather than any other countries aims at filling a specific research gap, as the analysis of this topic has generally involved other countries, especially those notoriously characterized by a highly developed M&A market (i.e., the United States) [Hassan et al., (2007); Masulis et al., (2007); Teti et al., (2017)], and Europe in general [Tampakoudis et al., (2018)] by neglecting the Italian context. In particular, the focus on Milan Stock Exchange-listed companies allows consideration of the related corporate governance system's specificity, mainly in terms of control activities, which are in charge of specific bodies-as typically in insider systems-rather than of the market.

The selected sample includes 124 firms from the 517 listed on the Milan Stock Exchange that performed 340 M&As between 2018 and 2022;

deals were selected using the FactSet database. In particular, the deals included in the sample fulfilled the following requirements:

- The bidders are listed on the Milan Stock Exchange, with headquarters either in Italy or in the rest of the world.
- The targets are both listed and non-listed, with headquarters either in Italy or in other countries.
- Only mergers and acquisitions have been considered.
- M&As are completed and not only announced.
- All industries are analyzed, including financial, because even this industry is specifically regulated, in the last few years, financial firms have shown an increasing interest in social and environmental issues [Sobhani et al., (2012); Chew et al., (2016); Matuszak & Rozanska, (2020)].
- The bidders are ESG ranked in the Eikon Refinitiv database.

The industry classification of the 124 selected bidders refers to the Global Industry Classification Standard; Table 1 shows how the information technology (IT) industry is characterized by the highest acquirers' concentration (around 12%), while other industries show a fragmented distribution of the selected firms (between 0.81% and 4.84% for each industry). This finding is aligned with international evidence about the increasing number of M&As in the IT industry facing the challenges imposed by the digital transformation process and the new strategic needs induced by innovation [KPMG, (2021)]. Similarly, most of the targets belong to the IT industry (around 19%), followed by machinery and consumer discretionary industries.

With reference to geographical distribution, bidders have headquarters in Italy (only 5.6% of the sample consists of firms located in other European countries). In contrast, the share of firms with headquarters in foreign countries increases with regard to targets, with 37% located outside Italian boundaries (specifically 20% in Europe, 4% in Australia, and the remaining 13% in America). The above-described geographical distribution is also confirmed in terms of performed deals (Table 2): 37% consist of cross-border deals demonstrating firms' goals to expand geographically, while the remaining (67%) consist of domestic M&As. In addition, Table 2 shows how most deals are concentrated in 2018–2020 (around 68%); this period is also characterized by the highest share in terms of value deals, which equals 91% of the total value.

Table 1: Industry and geographical distribution of the sample

Industry	No of bidders	Italy	Europe	No. of targets	Italy	Europe	Australia	America
Household and personal products	2	2		7	5	1		1
Industrial conglomerate	3	3		4	3	1		
Consumer discretionary	4	4		25	20	4		1
Chemicals	3	3		4	1	2		1
Healthcare providers and services	4	4		16	12	2	1	1
Transportation Infrastructure	4	2	2	5	4			1
Financial services	5	5		16	13	1		2
Banks	5	5		13	13			
Construction & Engineering	5	4	1	7	2	4		1
Beverages	3	3		6	2	2	1	1
Machinery	4	4		32	20	7		5
Healthcare equipment & suppliers	5	5		7	3	1	1	2
Electric utilities	5	5		10	5	3		2
Oil, Gas & Consumable Fuels	2	2		2	2			
Automobiles	5	3	2	3		1		2
Diversified	3	3		3	2	1		
Telecommunication Services								
Gas utilities	5	5		12	10	1	1	
Multiutilities	6	6		16	8	5		3
Aerospace & Defence	2	2		3	1	1		1
Textiles, Apparel & Luxury Goods	4	4		3	3			
IT Services	15	14	1	64	37	13	10	4
Auto components	3	3		3	1	1		1
Insurance	5	5		17	10	7		
Electrical equipment	6	6		14	9	3		2
Pharmaceuticals	3	3		4	2	2		
Energy equipment and services	2	1	1	1				1
Semiconductors & semiconductor equipment	1	1		1		1		
Commercial services and supplies	2	2		14	9	2		3
Households durable	1	1		2	2			
Building products	4	4		11	7	1		3
Media entertainment	3	3		15	9	2		4
Total	124	117	7	340	215	69	14	42

Table 2: Deals' characteristics

Year	Number of M&A	Deal value (mln/€)	Domestic deal	Cross-border deal
2018	74	36.142,64	45	29
2019	84	29.439,40	56	28
2020	73	10.574,72	51	22
2021	67	6.026,99	36	30
2022	42	1.585,75	27	16
Total	340	83.769,50	215	125

Empirical model and variable measurement

Hypotheses 1, and 2 were tested by calculating the change in ESG performance-distinguishing between social, and environmental performance-before and after the M&A, as stated in Section 5.3.

Social and environmental performance are proxied by social and environmental pillars' scores retrieved from the Eikon Refinitiv database.

Hypothesis 3 was tested using multivariate statistical analysis, employing the following multiple regression models:

$$\text{Social_performance_change}_{it} = \beta_0 + \beta_1 \text{BoD_Size}_{it} + \beta_2 \text{BoD_Gend}_{it} + \beta_3 \text{BoD_NED}_{it} + \beta_4 \text{BoD_Ind}_{it} + \beta_5 \text{Ceo-Chair}_{it} + \beta_6 \text{BoD_Sust_Rem}_{it} + \beta_7 \text{Sust_Com}_{it} + \beta_8 \text{Size}_{it} + \beta_9 \text{Leverage}_{it} + \varepsilon_{it}. \text{ (Model 1)}$$

$$\text{Environ_performance_change}_{it} = \beta_0 + \beta_1 \text{BoD_Size}_{it} + \beta_2 \text{BoD_Gend}_{it} + \beta_3 \text{BoD_NED}_{it} + \beta_4 \text{BoD_Ind}_{it} + \beta_5 \text{Ceo-Chair}_{it} + \beta_6 \text{BoD_Sust_Rem}_{it} + \beta_7 \text{Sust_Com}_{it} + \beta_8 \text{Size}_{it} + \beta_9 \text{Leverage}_{it} + \varepsilon_{it}. \text{ (Model 2)}$$

The above-stated models refer to the social scores' change (Model 1), and environmental scores' change (Model 2) of firm *I* at period *t* by assuming that these changes are functions of specific corporate governance characteristics, other control variables, and error ε . In addition to the above, the use of non-linear models could be useful, although the available data do not allow such an estimation. In addition, the decision to use a linear regression model is consistent with the main literature [Andriosopoulos et al., (2016); Teti et al., (2017); de Sousa Barros et al., (2021); Teti et al. (2022)]

The models' variables are described in Table 3.

Table 3: Variables' description

Variables	Symbols	Descriptions
Change in bidder's Social performance	Social_performance_change	Change in Acquirer's social performance before (announcement date) and after (closing date) the M&A
Change in bidder's Environmental performance	Environmental_performance_change	Change in Acquirer's environmental performance before (announcement date) and after (closing date) the M&A
Board size	BoD_Size	Natural logarithm of the number of board members
Board gender diversity	BoD_Gend	Percentage of female directors on board
Non-executives board members	BoD_NED	Percentage of non-executive directors on board
Board independence	BoD_Ind	Percentage of independent directors on board
CEO-Chair separation	CEO-Chair	Dummy variable that equals 1 if the CEO and Chair are not the same person and 0 otherwise
Sustainability integration into executives' compensation	Bod_Sust_Rem	Dummy variable that equals 1 if the executive compensation is linked to sustainability targets and 0 otherwise.
Sustainability committee	Sust_Com	Dummy variable that equals 1 if the Sustainable committee is established and 0 otherwise
Firm size	Size	Average revenues
Leverage	Leverage	Average debt-to equity ratio

Changes in ESG performance (dependent variable)

In this study, the M&A's capacity to enhance social and environmental performance is proxied by ESG scores related to social and environmental pillars, which are commonly used by scholars to assess non-financial results [Widyawati, (2019); Del Giudice and Rigamonti, (2020); Rajesh, (2020)]. In particular, the dependent variable was identified by a change in social (Social_performance_change) and environmental performance (Environ_performance_change) measured before (that is, on 31 December of the year before the announcement date) and after the M&A (31 December of the year following the closing date). To assess their steadiness over time, these variables were compared with the average data related to the pre-acquisition period (t-1, t-2, t-3) and the post-integration period (t+1, t+2, t+3), according to recommendations in the literature [Martynova et al., (2007); Leepsa and Mishra, (2013); Jain et al., (2024)]. The acquisition year (t₀) was not considered, while the integration period (t+1') was identified separately within the post-integration period (t+1, t+2, t+3). Finally, a t-test was performed in order to determine the mean difference between the pre-acquisition period and the post-integration period, and to understand whether social and environmental performance before and after the M&A were statistically different. This methodological approach assumes that the changes in post M-A ESG performance reflect the impact of the transaction itself; however, bidders' non-financial performance may also be affected by external factors such as macro-economic conditions and industry trends.

In line with the extant literature [Rahman & Wu, (2024)], to calculate the change in social and environmental performance, the following formula introduced by Tampakoudis & Anagnostopoulou (2020) was used:

$$\text{Social_performance_change} = \frac{\text{AcquirerSocial_score}_{t+1} - \text{AcquirerSocial_score}_{t-1}}{\text{AcquirerSocial_score}_{t-1}}$$

$$\text{Environmental_performance_change} = \frac{\text{AcquirerEnvironmental_score}_{t+1} - \text{AcquirerEnvironmental_score}_{t-1}}{\text{AcquirerEnvironmental_score}_{t-1}},$$

where:

Acquirer (Social, Environmental)_score_{t+1} = the acquirer's performance at the end of the year after the closing date

Acquirer (Social, Environmental)_score_{t-1} = the acquirer's performance at the end of the year before the announcement date

Social_performance_change = the change that occurred in the ESG social score in the selected period

Environmental_performance_change = the change that occurred in the ESG environmental score in the selected period

To assess ESG performance, data were retrieved from the Refinitiv Eikon database, enabling the calculation of more than 450 firm-level ESG indicators by reducing the risk of potential bias and facilitating consistency with other databases. In particular, Refinitiv Eikon is considered a leading tool for retrieving ESG scores, as it has been used by several scholars to address non-financial performance issues [Arouri et al., (2019); Dick et al., (2019); Liang et al., (2020); Caiazza et al., (2021); Barros et al., (2022)]. In particular, this database calculates ESG performance according to a percentile-based methodology by classifying the ESG scores into four ranks: D (from 0 to 0.25), C (from 0.25 to 0.50), B (from 0.50 to 0.75), and A (from 0.75 to 1). The changes in performance calculated using the above-stated formulas were classified using these ranks.. The environmental and social scores retrieved from the Eikon Refinitiv database were calculated considering information that largely came from firms' corporate reporting (annual reports, sustainability reports, integrated reports, etc.). Hence, these data are based on information about social and environmental performance that is periodically disclosed in firms' reports, either on a voluntary basis or according to mandatory rules. The risk of this information being unreliable is mitigated by the assurance process, that is generally performed by external and independent auditors. Hence, the social and environmental scores retrieved from the Refinitiv Eikon database and used in this research can be considered reliable and effective indicators of the post-M&As' social and environmental performance.

The social scores refer to four categories: workforce, human rights, community, and product responsibility. "Workforce" weighs 10.1% on the overall social score and indicates the firm's capacity to ensure job satisfaction, healthy and safe workplaces, inclusion, and equal opportunities, while "human rights" – whose weight (14.6%) is the highest – refers to the firm's orientation to fundamental rights conventions. "Community", with a weight of 8.1%, refers to the firm's compliance with ethical principles, and "product responsibility" weighted at 8.7% refers to the firm's ability to provide high quality goods, and ensure consumers' health and safety.

The scores related to the environmental pillar are in three key areas: resource use, emissions, and innovation. "Resource use" weighs 8.1% and indicates the level of consumption of limited natural resources (air, water, land, etc.), while "emissions" (9.7%) refers to the firm's capacity to reduce emissions. "Environmental innovation" – which is the most relevant (weight 16.2%) – refers to the creation of market opportunities through new environmental technologies and processes or eco-designed products.

However, the use of only one ESG database could result in some biases and limitations. Indeed, scholars have underlined that ESG scores may vary significantly from one agency rating (i.e. Refinitiv, MSCI, Sustainalytics,

Vigeo Eiris) to another, because they measure and interpret the selected variables differently [Delmas et al., 2013; Baldini et al., (2018); Berg et al. (2022)]. The different weights assigned to the relevant variables may imply different impacts of ESG pillars on the final scores, often generating divergent ESG values depending on the involved agency [Clément and Robinot (2023)].

Corporate governance features (independent variables)

The independent variables consist of specific corporate governance features that have been investigated as possible factors affecting ESG performance changes. These variables have been selected considering the existing literature [Liao et al., (2015); Glass et al., (2015); Teti et al., (2017)] and the potential contribution that corporate governance bodies can provide to sustainability orientation and value creation for all stakeholders [de Villers et al., (2011); Salvioni & Almici, (2022); Almici, (2023)]. The selected corporate governance characteristics are sustainability-oriented and can be considered factors enabling alignment between stakeholders' and management's interests, by enhancing the social and environmental performance.

In particular, the selected variables are as follows:

- Board size is measured by the natural logarithm of the number of board members (Faizul, 2017).
- Board gender diversity is proxied by the percentage of female directors, as suggested by the mainstream literature [Ben-Amar et al., (2017); Safari, (2022); Garcia and Herrero, (2022)].
- The non-executive board members' variable refers to the percentage of non-executive directors that are members without managing functions and without fulfilling the independence requirements.
- Board independence is evaluated by the percentage of independent directors [Mallin & Michelon, (2011); Garcia and Herrero, (2022); Almici, (2023)]. According to Italian regulation, independent directors are non-executive board members who fulfill additional independence requirements (e.g. lack of kinship relationship with the company and its shareholders; lack of professional or financial relationship with the company and the companies controlled) (Art. 147-ter, fourth clause, Legislative Decree n. 58 of 24 February 1998).
- The CEO–chairman separation is assessed by a dummy variable that equals 1 when these two functions are in charge of two different individuals and 0 otherwise [de Villers et al., (2011); Tsang et al., (2021); Almici, (2023)].
- The relationship between executive compensation and sustainability targets is measured by a dummy variable that equals 1 when executive remuneration depends on the achievement of non-financial goals and 0 otherwise.

- The establishment of the sustainability committee is measured using a dummy variable that equals 1 if firms have established this body and 0 otherwise [Faizul, (2017)].

Data were retrieved from the Eikon Refinitiv database. Average data were calculated by considering the five-year period 2018–2022 for each of the above-stated variables.

Control variables

Control variables consist of bidder's size and firm leverage; the first one is measured by average revenues related to the selected period, while the second one is calculated using the debt-to-equity ratio. Both are typical control variables used to test M&As' impacts on firms' performance; in this regard, some studies have underlined the presence of a negative relationship between an acquirer's size and post-merger performance [Roll, (1986); Moeller et al., (2004); Masulis et al., (2007)], while others have demonstrated the lack of significance of this variable [Teti et al., (2017)]. The mainstream literature is about expecting that M&As involving large firms are likely to destroy value because managers are usually more entrenched, and the empire-building effect is more likely to occur.

With regard to leverage impacts, some studies have stated that this variable is not significant [Masulis et al., (2007); Teti et al., (2017)], while others have demonstrated the presence of a positive relationship between leverage and bidder's returns [Berger et al., (1997)] according to Jensen's (1986) position. In this regard, Jensen (1986) underlined that managers are generally reluctant to use debt financing to avoid control from external agents. According to Jensen's (1986) perspective, there should be a positive relationship between leverage and post-M&A's performance, as higher debts are likely to limit managerial discretion.

Results and discussion

Descriptive statistics and correlations

With reference to the main descriptive statistical results (mean, standard deviation, minimum, and maximum), Table 4 shows how the selected firms' social performance change ranged from -8.90% to 88.33%, with an average value of 9.99%, while the environmental performance change ranged from -31.23% to 90.33%, with an average value of 16.51%. On average, data demonstrate that M&As positively affect bidders' social and environmental performance rather than only pursuing management and shareholders' interests. The outliers (min and max) included in Table 4 show a wide range of changes in performance (both social and environmental), underlining the presence of dispersed values, far from the mean. This issue was addressed by

verifying the reliability of the above-stated average values by calculating the means related to the years before and after the M&A.

Table 4: Descriptive statistics

Variables	Mean	Std. Deviation	Min	Max
Change in Bidder's Social performance	9.99%	13.67%	-8.90%	88.33%
Change in Bidder's Environmental performance	16.51%	21.40%	31.23%	90.33%
BoD_Size	11.43	2.83	6.00	18.00
BoD_Gend	37.83%	6.62%	11.11%	54.55%
BoD_NED	72.75%	14.51%	36.11%	95.83%
BoD_Ind	55.93%	13.52%	15.88%	84.60%
CEO-Chair	0.86	0.34	0	1
Bod_Sust_Rem	0.40	0.49	0	1
Sust_Com	0.85	0.36	0	1
Size	2,187.77	5,905.23	0.27	48,218.20
Leverage	142.11%	250.07%	0.37	2,563.40%

To verify the steadiness of the above-mentioned data, the average of the social and environmental performance for each of the three years before and after the M&A, as well as the total average related to the pre-acquisition and post-integration periods (Table 5) were calculated. These are in line with the average change in social and environmental performance shown in Table 4.

Table 5: Social and environmental performance of selected firms

Panel: N. 124	Social_performance	Environmental_performance
t-3	34.22	45.66
t-2	35.99	44.65
t-1	41.55	49.88
t ₀	38.22	46.55
t+1'	41.98	54.23
t+1	42.01	52.66
t+2	42.02	54.65
t+3	38.22	55.89
Mean annual performance (M_pre)	37.25	46.73
Mean annual performance (M_post)	40.75	54.40
Change in bidder's performance (mean)	9.39%	16.41%

With regard to corporate governance characteristics, Table 4 shows how the selected firms' boards are medium-sized, consisting, on average, of 11 directors, with a minimum of 6 and a maximum of 18. Independent directors equal 56%, non-executive directors equal 72.25%, and female directors equal 37.83%. Furthermore, almost all selected firms establish the CEO-chairman separation, as well as the sustainability committee; in this

regard, the related average dummy variables equal 0.86 and 0.85, respectively (against the maximum, which equals 1).

These data are in line with the findings of Faizul (2017) and Almici (2023), which highlight a board's composition oriented toward sustainability. With reference to the control variables, the selected firms showed a high leverage ratio (142.11% on average), while their size-proxied by revenues-was, on average, limited.

Tables 6 and 7 show pairwise Pearson correlations for the dependent, independent, and control variables with reference to the change in social, and environmental performance, respectively. Table 6 underlines a positive correlation between the change in social performance and the independent variables, except for board size, board gender diversity, and sustainability integration into executives' compensation. In this regard, the statistically significant variables are directors' independence, the presence of non-executive directors, and CEO-chairman separation. Lastly, with reference to environmental performance, only directors' independence and the presence of non-executive directors are both positively correlated and statistically significant. In general, the correlation indexes shown in Tables 6, and 7 assume values far from either 1 or -1, suggesting that the multicollinearity problem is unlikely. The low multicollinearity is also supported by the variance inflation factor (VIF) measure; the coefficient is lower than 5 (Table 8).

Table 6: Pearson correlation matrix (dependent variable: change in bidder's social performance)

Variables		1	2	3	4	5	6	7	8	9	10
1	Change in bidder's Social performance	1									
2	Board size	-0.12	1								
3	Board gender diversity	-0.02	0.01	1							
4	Non-executives board members	0.26**	0.13	0.05	1						
5	Board independence	0.16*	0.01	0.09	0.01	1					
6	CEO-Chair separation	0.17*	0.05*	0.01	0.01	0.02	1				
7	Sustainability integration into executives' compensation	-0.01	-0.01	0.06	0.02	0.03	0.13	1			
8	Sustainability committee	0.06	0.01	0.01	0.06	0.08	0.01	0.02	1		
9	Firm size	0.06	0.03	0.07	0.02*	0.02	0.01	0.10	0.13	1	
10	Leverage	0.01	-0.07	0.13	0.02	0.01	0.01	0.05	0.06	0.11	1

Notes: *, ** indicate statistical significance at $p < 0.05$, $p < 0.01$

Table 7: Pearson correlation matrix (dependent variable: change in bidder's environmental performance)

Variables	1	2	3	4	5	6	7	8	9	10
1 Change in bidder's Environmental performance	1									
2 Board size	-0.12	1								
3 Board gender diversity	-0.06	0.06	1							
4 Non-executives board members	0.20*	0.14	0.05	1						
5 Board independence	0.03*	0.09	0.10	0.11	1					
6 CEO-Chair separation	-0.03	0.16	0.09	0.13*	0.14	1				
7 Sustainability integration into executives' compensation	0.67	-0.07	0.06	-0.02	0.05	0.13	1			
8 Sustainability committee	0.05	-0.11	-0.01	0.05	-0.07*	-0.04	0.21	1		
9 Firm size	-0.07	-0.11	-0.07	-0.02	-0.02	-0.03	-0.01	0.14	1	
10 Leverage	0.01	-0.03	-0.12	0.02	0.01	-0.01	-0.05	0.06	0.11	1

Notes: *, ** indicate statistical significance at $p < 0.05$, $p < 0.01$

Table 8: Multi-collinearity test (VIF)

Independent variables	Social ESG scores - VIF	Environmental ESG scores - VIF
Board size	1.235	1.334
Board gender diversity	1.246	1.234
Non-executives board members	1.261	1.456
Board independence	1.225	1.223
CEO-Chair separation	1.215	1.042
Sustainability integration into executives' compensation	1.252	1.232
Sustainability committee	1.581	1.113

Change in non-financial performance results (H1, H2)

The results shown in Tables 10, 11 and 12 support H1 and H2, demonstrating that M&As positively affect the achievement of non-economic benefits, enabling the safeguard of interests beyond those of management and shareholders. This result contrasts with the observations of some scholars [Dunn et al., (2016); Lilien et al., (2020); Amano, (2022)]. Thus, this study enhances the existing literature by providing specific results about M&A impacts on non-financial performance – in particular, social and environmental dimensions - and promoting a shift from the traditional economic perspective. In addition, these results offer a view focused on the M&A's impacts on bidders' non-financial performance, underlining a different perspective from other studies [Caiazza et al., (2021); Huang et al., (2023)], in which the focus is given to the contribution of the ESG pillars to the M&As success.

In particular, these findings strengthen the specific strand of literature that underlines a positive relationship between M&As and non-financial performance, as proxied by ESG scores [Tamakoudis & Anagnostopoulou, (2020); Gonzales-Torres et al., (2020); Mihaiu et al., (2021); Barros et al., (2022)]. In addition, this study's findings differ from those of previous studies that highlighted a negative relationship [Tampakoudis et al., 2021] or a lack of a significant relationship [Fatemi et al., (2017)] between the involved variables.

Table 9 shows that after an M&A transaction, bidders' social performance (94%), and environmental performance (95%) are usually improved. In contrast, the worsening of firms' performance after M&As is limited, ranging from a minimum of 5% (environmental performance) to a maximum of 12% (ESG performance). As shown in Table 11 social and environmental performance tended to improve to varying extents in the years after the M&A (post-integration period). The difference between the scores related to the selected years ($t+1$, $t+2$, and $t+3$) and the average of the pre-acquisition period is positive and generally increasing. The results are statistically significant, meaning they are a result of the merger, and are unlikely to be caused by chance.

With reference to the intensity of the performance increase, Table 12 illustrates the magnitude of the positive change in performance, which was calculated according to the Eikon Refinitiv ESG ranks shown in Table 9. Table 12 demonstrates that 59.32% of the selected firms improved their environmental performance by benefiting from a rank shift, of which 15.17% had a two-rank upgrade.

Social performance showed a higher increase than environmental performance, with 64.10% of the selected firms increasing their social scores with one rank shift, and 23.00% benefiting from a double rank shift.

The total average data which are equal to 11.09% for social performance, and 18.60% for environmental performance, are slightly higher than those shown in Table 5, as they were calculated by considering increases exclusively, while downgrades were not taken into account.

These differences are statistically relevant, so they can be assumed to result from M&As.

Hence, despite the average data (Table 5) underlining a higher increase in environmental performance than social performance after an M&A, the analysis of the changes indicates that the intensity of the increase (rank shift) (Table 12) is greater for social performance.

Table 9: ESG score range

Score range	Description	
0 to 25	First quartile (D)	Poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly
> 25 to 50	Second quartile (C)	Satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly
> 50 to 75	Third quartile (B)	Good relative ESG performance and above average degree of transparency in reporting material ESG data publicly
> 75 to 100	Fourth quartile (A)	Excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly

Table 10: Social and environmental performance change (number of firms)

	Increase	Decrease
Social_performance_change	117	7
Environmental_performance_change	118	6

Table 11: Statistical comparison between social and environmental performance

Pairs for comparison	Social_performance		Environmental_performance	
	Mean difference	t-value	Mean difference	t-value
(t+1') - M_pre	4.73	3.45	7.5	6.78
(t+1) - M_pre	4.76	3.66*	5.93	4.45*
(t+2) - M_pre	4.77	3.98*	7.92	6.54*
(t+3) - M_pre	0.97	0.33*	9.16	8.15**
M_post - M_pre	3.50	2.28*	7.67	6.54*

Table 12: Rank shift

	Social_performance_change			Environmental_performance_change		
	Number of bidders	Mean	t-value	Number of bidders	Mean	t-value
B → A	5	11.22%	7.32*	7	15.35%	8.93*
C → B	45	10.21%	9.81*	43	12.33%	7.65
D → C	8	8.99%	6.22*	9	8.35%	6.54*
D → B	8	12%	6.54*	5	23.78%	15.27*
C → A	9	13.01%		6	33.21%	22.11
No rank shift	42			48		
Total	117	11.09%		118	18.60%	

Consistent with what Barros et al. (2022) observed, the aforementioned results demonstrate how M&As positively affect the improvement of both social and environmental performance, which on average, are enhanced the most by the reorganization implied by these strategic operations. However, this study points to further elements to be considered: with reference to social performance, rank shifts are stronger than

environmental performance shifts. M&As are relevant opportunities for acquirers to renew the corporate culture in terms of higher inclusion, non-economic employee satisfaction, accessibility, effective gender policies, and safeguarding human rights, security, and health. Social issues play a relevant role in terms of value creation, by contributing to problem-solving, such as cultural friction and brain drain [Huang et al., (2023)]. At the same time, external growth provides (1) more sustainable resources in terms of financial assets, skills, and green patents that can be used to mitigate the firm's impacts on the environment and (2) the opportunity to develop more efficient and low-impact business models.

In general, the overall improvement of the bidders' social and environmental bidder's performance after M&As can be explained by other causal mechanisms, including the acquisition of a target characterized by high ESG scores, by translating cultural values of the target into the bidder's cultural system; the beginning of a strategic reorganization process based on the integration of sustainability principles; the public scrutiny that M&As bring to the involved firms; and the pressure exerted on firms by the sustainability disclosure regulation (European Directive 2022/2464, Italian Legislative Decree 2024/125), which provides a strong stimulus for the management to behave according to sustainability principles.

Once the contribution of M&As to fulfilling social and environmental expectations in the long run was understood and explained, it was important to identify the drivers of this process. To do so, a regression analysis was performed using specific governance characteristics as independent variables [Teti et al., (2022)].

Regression analysis (H3)

The results shown in Tables 13, and 14 support Hypothesis 3, even with reference to specific corporate governance features and with different effects depending on the selected performance (social, or environmental). The overall R^2 is 55% with regard to social performance, and 53% with reference to environmental performance, meaning that these models explain nearly 55%, and 53%, respectively, of the variation in non-financial performance changes before and after selected M&As. In addition, the F-stat indicates that a null hypothesis is rejected ($P < 0.0001$) (Table 13) and ($P < 0.0000$) (Table 14).

The explanatory variables for this analysis refer to the board's characteristics, consisting of board size, gender diversity, non-executive directors, board independence, CEO–chairman separation, integration of sustainability into a CEO's remuneration, and establishment of a sustainability committee. Two additional control variables are classified as bidder's size and bidder's leverage ratio.

The changes in social performance can be explained in terms of specific corporate governance characteristics, namely the presence of non-executive directors, the independence of directors, and the CEO–chairman separation (Table 13). In fact, the coefficients (β) related to these variables are positive and statistically significant meaning that corporate governance features may facilitate the improvement of non-economic performance when an M&A transaction occurs. In particular, with reference to social performance, the selected variables assume the following values: $\beta = 0.38$ and $P = 0.0241$, $\beta = 0.44$ and $P = 0.0423$, and $\beta = 0.06$ and $P = 0.0459$. Indeed, M&As can enable the reorganization of firm's policies, according to principles such as inclusion, transparency, protection of human rights, and safeguard of all involved interests (economic and non-economic); however, the achievement of these results requires a board of directors ensuring effective control over the management's activity.

With specific reference to environmental performance, the significant variables include only the presence of non-executive directors and their independence (assuming $\beta = 0.36$ and $P = 0.049$ and $\beta = 0.56$ and $P = 0.02$, respectively), while CEO–chairman separation is not significant. The presence of non-executive and independent directors affects the undertaking of strategic decisions, facilitating the fulfillment of environmental expectations by emphasizing the relevance of monitoring activities and the agency-stakeholder framework in the M&A context. The magnitude of the impacts of the corporate governance features—explained by the respective coefficients β —is higher with reference to environmental performance than social performance, thus underlining the increasing attention paid to the ecosystem's safeguard. In particular, these findings highlight the coherence of the selected theoretical framework, as management activity may be oriented toward the fulfillment of non-economic expectations by specific monitoring activities performed by non-executive and independent directors. The relevance of non-executive independent directors in order to facilitate value-creating M&As—on the one hand—confirms what was stated by previous literature and—on the other hand—contributes according to the main perspectives: it addresses the impact of non-executive directors in the M&A context and it investigates the effects of board independency on post-M&A performance by focusing on non-financial effects rather than economic effects that have been preferred by the mainstream literature [Teti et al., 2017; Chadam, 2018; Naciti, 2019; Defranco et al., (2021)].

The analysis of these governance characteristics with regard to post-merger social and environmental performance, is an innovative element of this study, demonstrating the leading role played by governance within the value creation process. In fact, with reference to environmental performance, the presence of independent and non-executive directors facilitates the

undertaking of strategic decisions promoting green investments, as well as the development of specific skills to improve the relationship between the firm and the environment.

Similarly, CEO–chairman separation’s coefficient is positive and significant in explaining social performance by reducing the risk of management entrenchment. Indeed, the appointment of different people for these two roles increases the effectiveness of corporate governance by facilitating the alignment between management’s and stakeholders’ interests, as well as the undertaking of strategic decisions according to sustainability principles and increasing attention for all stakeholders [Hambrick & D’Aveni, (1992); de Villers et al., (2011)]. In particular, CEO–chairman separation reduces agency costs by overcoming the traditional conflict between management and stakeholders. This variable is not significant with reference to environmental performance, which benefits more from non-executive independent directors in order to safeguard all stakeholders according to transparency, global responsibility, and shared wealth principles.

This study’s findings are aligned with the mainstream literature, which assumes that CEO duality facilitates value-destroying M&As, while CEO separation can contribute to the improvement of post-M&A performance. In this regard, this study confirms the presence of a positive relationship between CEO separation and post-M&A performance, as stated by Masulis et al. (2007), Kelton and Yang (2008), Goranova et al. (2010), and Teti et al. (2017).

The other corporate governance features are not significant in explaining the change in bidder performance after an M&A transaction; the board size, gender diversity, the integration of sustainability in CEO’s compensation, and the establishment of the sustainability committee do not affect management in terms of performing M&As and impacting on social and environmental performance. In this regard, corporate governance features that traditionally affect a strategic firm’s orientation toward sustainability do not facilitate-conversely to expectations-the fulfillment of stakeholders’ social and environmental expectations.

With reference to board size, this study’s findings underline the lack of a significant relationship, confirming the results achieved by other authors with reference to the M&A context [Masulis et al., (2012); Teti et al., (2017); Defrancq et al., (2021)]. This study underlines the leading role played by variables directly related to the control mechanisms over the management activity, while the number of board’s members (on average 11.43) is not significant. These findings refer specifically to the M&As’ context, in which board size is not a relevant variable to avoid transactions performed in the exclusive interest of entrenched managers; in contrast, in a more general context, board size has been considered a variable that positively affects a firm’s performance [Mayur and Saravanan (2017); Karim et al., (2022)].

With reference to M&As, the risk of performing deals that negatively impact social and environmental expectations requires stronger monitoring tools to prevent opportunistic behavior by management. Indeed, the current analysis refers to transactions that deeply influence firm's structure, requiring the revision of strategic plans as well as huge investments. Therefore, these operations impact the potential effects that the number of board members is likely to generate – under ordinary conditions – on the firm's social and environmental performance.

Similarly, board gender diversity and the establishment of a sustainability committee are not significant, even if the mainstream literature has underlined the importance of these corporate governance features for orienting the firm's activity toward sustainability principles and value-creating transactions. In this regard, this study contributes to the existing literature by investigating the role played by the sustainability committee in the M&A context, conversely to previous literature that has addressed this issue by considering other contexts. The lack of a significant relationship is likely to be attributed to the soft role played by this body in terms of management's sustainability orientation; indeed, the most relevant role is played by strong monitoring variables, such as the non-executive independent directors and CEO–chairman separation. The findings regarding the influence of these corporate governance features on firms' non-financial performance refer specifically to the M&As' context. Indeed, in the absence of M&As, the literature has often underlined a positive relationship between board gender diversity and a firm's performance [Charles et al. (2018); Usman et al., 2019; Guizani and Abdalkrim, 2022]. In this regard, M&As are disruptive events that modify the effects that the corporate governance system may have – under ordinary conditions – on firms' performance.

Otherwise, with reference to the topic of board gender diversity, this study's results are aligned with what was observed by some authors in terms of a lack of significant relationship between gender diversity and M&A's financial value creation by also providing an analysis based on non-financial results [Ahern and Dittmar, (2012); Chadam, (2018); García & Herrero, (2022)]. The evidence provided by this study differs from that shown by other studies in terms of establishing a positive relationship between the selected variables [Huang and Ksigen, (2013); Levi et al., (2014); Chen et al., (2016); Defrancq et al., (2021)].

With reference to the integration of sustainability goals into CEO compensation, this study highlights the lack of significance of this variable in terms of improving non-financial performance in the M&A context. In this regard, the findings are misaligned compared to what was stated by some scholars arguing that there is a positive relationship between this variable and the enhancement of non-financial performance; this misalignment is explained

by the specific analysis context: M&As. Indeed, the integration of sustainability into CEO compensation has-with reference to M&A transactions-a low influence compared to specific mechanisms aimed at facilitating monitoring activities over management. The analysis of this topic according to the sustainability and M&A perspective provides new insights compared to the previous literature; in this regard, the literature has mainly focused on the effects generated by CEO compensation on the acquirer's financial performance, neglecting the implications in terms of non-financial performance. In addition, attention was mainly focused on the analysis of the fixed compensation impacts rather than on considering the variable components; in this regard, Teti et al. (2017) underlined a positive relationship between CEO fixed compensation and post-M&A financial performance.

Similarly, the selected control variables (firm size and leverage) were not significant in explaining the M&As' impact on social and environmental performance. In this regard, this study confirms what was observed by Teti et al. (2017) in terms of the non-significance of these variables. In contrast, the findings are misaligned with the literature claiming the presence of a relationship between the acquirer's size, leverage, and post-M&A performance. With reference to the leverage variable, the lack of significance can be explained by considering the selected firms' corporate governance system-the insider one-which typically delegates controls to specific internal bodies rather than to the market (market for control).

This study's findings are consistent with the current literature with reference to the relationship between M&As and ESG performance. Recent studies have underlined how these strategic operations can contribute to the optimization of results in favor of all stakeholders. However, this study contradicts the idea that M&As are value-destroying operations, even if there is a clear need to establish specific monitoring governance mechanisms to allow value creation for all stakeholders. Thus, this study provides an innovative perspective to the existing literature, by identifying corporate governance as a potential driver of the value creation process.

Table 13: Social ESG scores

Variables	Coefficient	Statistical significance	t-statistics
1. BoD_Size	-0.00628871961399296		-1.383023826135
2. BoD_Gender	-0.0487463563995019		-0.250451439280289
3. BoD_NED	0.383116069996874	*	2.46227309356784
4. BoD_Ind	0.440696054304058	*	2.18555906630533
5.CEO-Chair separation	0.0567219390410482	*	2.14467534673467
6. BoD_Sust_Rem	-0.00422517465517614		-0.155726449801811
7. Sust_Com	0.0209457351201844		0.570666994639123
8. Size	0.0000813783580676883		0.677123586268357
9. Leverage	0.0846117995749297		0.458987884456365
F-stat	21.30		

Prob > F	0.0001
R ² overall	0.550973482689021
Number of firms	124

Notes: *, ** indicate statistical significance at $p < 0.05$, $p < 0.01$

Table 14: Environmental ESG scores

Variables	Coefficient	Statistical significance	t-statistics
1. BoD_Size	0.00797688816673932		-1.12669176503743
2. BoD_Gender	-0.175818879018832		-0.580164386039548
3. BoD_NED	0.358794753215286	*	0.0491693774757041
4. BoD_Ind	0.557726505031703	*	0.0209457256037092
5.CEO-Chair separation	-0.0415321756212307		-1.43653296432231
6. BoD_Sust_Rem	0.0233196807786832		0.552006897564679
7. Sust_Com	0.0121823556979215		0.213168294432659
8. Size	-0.000170744173662427		-1.29964678145347
9. Leverage	0.147858744476428		0.733732452080867
F-stat	20.15		
Prob > F	0.0000		
R ² overall	0.533825694314818		
Number of firms	124		

Notes: *, ** indicate statistical significance at $p < 0.05$, $p < 0.01$

Conclusions, limitations, and main implications

This study's aim is twofold: (1) to verify whether M&As positively affect social and environmental performance and (2) to select the relevant enablers by focusing on corporate governance characteristics.

The findings show that M&As positively affect social and environmental performance, as proxied by the ESG score, as long as specific corporate governance requirements are fulfilled (board members' independence, CEO–chairman separation, and the presence of non-executive directors). With reference to changes in social and environmental scores, the reliability of the results was tested by calculating the average social and environmental performance in the three years before and after the M&A. Improvements were observed, demonstrating firms' growing awareness of non-economic issues. These scores increased after the M&As due to effective corporate governance systems, providing contrasting evidence to the research reporting the value destruction of M&As.

This study is aligned with the academic literature on the relationships between M&As and ESG performance and enhances it by identifying the potential drivers of this process.

Corporate governance features underline the need to establish specific control mechanisms so that CEOs safeguard all stakeholders' economic and non-economic interests. Thus, even the results related to the significant corporate governance variables are aligned with the previous literature,

although this study's perspective is different. In this regard, this study reveals that M&As can positively affect social and environmental performance due to established corporate governance systems.

This study contributes to the extant literature in several ways: (1) it strengthens the recent and limited evidence about M&As' roles in fulfilling social and environmental expectations by overcoming the traditional belief that these transactions either destroy value or benefit only shareholders; (2) it investigates the variables enabling this process by linking corporate governance, M&As, and non-financial performance, rather than focusing on only one dimension or only economic effects; (3) the selected corporate governance variables include additional aspects to those traditionally addressed by scholars, according to a sustainability-based perspective, to test whether specific corporate governance conditions facilitate the strategic orientation toward sustainability; and (4) it is based on the stakeholder-agency framework, which has rarely been used for the analysis of this topic.

The safeguard of social and environmental performance requires specific enabling conditions, mainly related to control activities performed by the board of directors' members, especially independent and non-executive members, and by CEO-chairman separation rather than by corporate governance features known to facilitate an orientation toward sustainability (e.g. integration of sustainability into CEOs' compensation, establishment of the sustainability committee, and gender diversity).

This evidence is consistent with insider systems' features, characterized by controls performed by specific corporate governance bodies rather than by the market. These findings are aligned with studies by Masulis et al. (2007) and Teti et al. (2017), demonstrating that these features may reduce agency costs and the risks of management implementing value-destroying strategies.

In terms of research implications, this study highlights the potential role that corporate governance can play in strengthening the impact of M&As' on bidders' social and environmental performance. The results underline the opportunity to: 1) further explore this issue by including listed firms in other countries' stock exchanges to perform a comparative analysis between insider and outsider systems; 2) investigate the cross-country regulatory differences and the related impacts on firms' non-financial performance. Second, this research focused only on social and environmental performance, and future studies could also consider economic performance. Third, this research demonstrates that M&As positively affect the achievement of social and environmental goals, even if these transactions typically have disruptive effects, by implying strong changes in the bidder's structure. It relies on Eikon Refinitiv ESG scores, and these findings could be validated using alternative

ESG measures providing reliable data referring to the targets in addition to the bidders, by overcoming specific data accessibility problems

This study's results may be of interest to investors, financial analysts, policymakers and regulators for its practical implications. First, investors and financial analysts can gain a greater awareness of the impact of M&As on non-financial performance, considering the growing relevance of ESG factors.

Second, policymakers should encourage M&As driven by a sustainability-oriented board of directors, providing the tangible and intangible resources needed to manage current social and environmental challenges (e.g. social inclusion, gender equality, climate change, pollution).

Third, the findings can provide regulators with useful insights into opportunities to strengthen specific requirements in terms of independence and appointment of non-executive directors and CEO-chairman separation, especially for listed firms.

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Las metamorfosis del capitalismo liberal y los desafíos de la era digital

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Resumen

La emergencia de la revolución digital y la inteligencia artificial (IA) ha atraído varias investigaciones sobre cuál será la reacción del sistema capitalista frente a los nuevos desafíos tecnológicos, económicos y sociales. El concepto de Capitalismo Digital (CD) que surge a fines del siglo XX, así como la publicación de Schiller (2000) que consideraba el CD como “*una nueva época que absorbe toda la economía política*” (Rivera, 2020), el tema del capitalismo y las nuevas técnicas digitales plantean nuevos modos de producción y nuevas fuentes de creación del valor económico así que diferentes relaciones entre los agentes económicos. Otros autores de inspiración marxista piensan, sin embargo, que el CD no es más que una dimensión del mismo capitalismo con el mismo modo de producción y donde lo único que cambia es el producto (digital) creado por el CD. Para estos intelectuales marxistas es poco probable que el capitalismo sea reemplazado en un futuro próximo.

Otro aspecto de la problemática concierne la relación entre los cambios en el sistema económico y los paradigmas sucesivos que tratan de explicar estos cambios. En este artículo trataremos de mostrar que las *mutaciones* sucesivas del capitalismo en siglos pasados han tenido poca relación (y a veces ninguna) con las teorías económicas. En cambio, la *metamorfosis* en el CD se

repercute no solo en el ámbito social, las instituciones y el marco legislativo que las sostiene sino inclusive en las teorías económicas enseñadas durante décadas en las universidades. Los postulados de base de esas teorías escapan a la lógica del CD: la Inteligencia Artificial, como nuevo agente económico y la interconectividad de los productos transforman no solo las relaciones en la estructura de la cadena del valor y las leyes del mercado (oferta y demanda) sino también plantean la relación *hombre-máquina* como un enigma que incluye el futuro de la humanidad.

Este artículo pretende mostrar también el largo proceso de transformación del capitalismo como una evolución ineluctable (¿dialéctica?) que el mismo Karl Marx diagnosticó en siglos pasados pero que nunca pudo imaginar hasta donde llegaría la metamorfosis del sistema capitalista. Trataremos de mostrar que esa “*hoja de ruta*” trazada por Marx lleva actualmente al sistema capitalista, no al paraíso comunista profetizado por Marx, sino a un punto culminante donde el hombre pudiera desaparecer frente a su propia creación, la Inteligencia Artificial.

Para examinar las principales características de las tres grandes mutaciones del capitalismo y su relación con los principales paradigmas sincrónicos, consideraremos la evolución intrínseca del “*capital*” como postulado de base que permitirá de identificar los cambios del modo de producción y las características de las metamorfosis social y económica. Se analizará así en primer lugar la revolución industrial (con la emergencia del *capital-máquina*) luego la revolución financiera (con la emergencia del *capital-finanzas*) y finalmente la metamorfosis digital (con la emergencia del *capital-dato*) como nueva fuente de beneficio para el capitalismo. Se estudia además, como esta vez la economía conectada induce modificaciones substanciales en los paradigmas y las teorías económicas enseñadas durante décadas por los economistas.

Palabras clave: Metamorfosis, Sistema Capitalista, paradigmas económicos, revolución digital, Inteligencia Artificial

The Metamorphoses of Liberal Capitalism and the Challenges of the Digital Age

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Abstract

The emergence of the digital revolution and artificial intelligence (AI) has attracted several investigations into how the capitalist system will react to new technological, economic and social challenges. The concept of Digital Capitalism (DC) emerged at the end of the 20th century as well as the publication of Schiller (2000) who considered DC as “*a new era that absorbs the entire political economy*” (cited by Rivera, 2020), the theme of capitalism and new digital techniques pose new modes of production and new sources of creation of economic value as well as different relationships between economic agents. Other authors of Marxist inspiration think, however, that DC is nothing more than a dimension of the same capitalism with the same mode of production and where the only thing that changes is the (digital) product created by DC. For these Marxist intellectuals, it is unlikely that capitalism will be replaced in the near future.

Another aspect of the problem concerns the relationship between changes in the economic system and the successive paradigms that try to explain these changes. In this article, we will try to show that the successive mutations of capitalism in past centuries have had little (and sometimes no) relation to economic theories. On the other hand, the metamorphosis in CD has repercussions not only in the social sphere, the institutions and the legislative framework that supports them but even in the economic theories taught for decades in universities. The basic postulates of these theories escape the logic of CD: Artificial Intelligence, as a new economic agent, and the interconnectivity of products transform not only the relationships in the structure of the value chain and the laws of the market (supply and demand) but also pose the *man-machine* relationship as an enigma that includes the future of humanity.

This article also aims to show the long process of transformation of capitalism as an ineluctable evolution (dialectic?) that Karl Marx himself diagnosed in past centuries but could never imagine how far the metamorphosis of the capitalist system would go. We will try to show that this

“road map” drawn up by Marx currently leads the capitalist system not to the communist paradise prophesied by Marx, but to a culminating point where man could disappear in the face of his own creation, Artificial Intelligence.

To examine the main characteristics of the three great mutations of capitalism and their relationship with the main synchronic paradigms, we will consider the intrinsic evolution of “capital” as a basic postulate that will allow us to identify the changes in the mode of production and the characteristics of social and economic metamorphoses. We will thus first analyze the industrial revolution (with the emergence of *machine- capital*), then the financial revolution (with the emergence of *finance- capital*), and the digital metamorphosis (with the emergence of *data-capital*) as a new source of profit for capitalism. We will also study how this time the connected economy induces substantial modifications in the paradigms and economic theories taught for decades by economists.

Keywords: Metamorphose, Capitalism system, economic paradigms, digital revolution, Artificial Intelligence

Introduction

La emergencia de la revolución digital y la inteligencia artificial (IA) ha atraído varias investigaciones sobre cuál será la reacción del sistema capitalista frente a los nuevos desafíos tecnológicos, económicos y sociales. El concepto de Capitalismo Digital (CD) que surge a fines del siglo XX y la publicación de Schiller (2000) que consideraba el CD como “*una nueva época que absorbe toda la economía política*” (citado por Rivera 2020) el tema del capitalismo y las nuevas técnicas digitales plantean nuevos modos de producción y nuevas fuentes de creación del valor económico así que diferentes relaciones entre los agentes económicos. Sin embargo, otros autores piensan, sin embargo, que el CD no es más que una dimensión del capitalismo donde lo único que cambia es el producto (digital) creado por el CD y que este no es más que “*la parte del capitalismo que se organiza en torno a la producción de mercancías y productos digitales*”. (Fuch, citado por de Rivera, Ibidem). Esa opinión es compartida también por los intelectuales marxistas para quienes “*es poco probable que el capitalismo sea reemplazado en un futuro próximo. Seguimos en un mundo digital que parece extremadamente capitalista* (Pal & Harris 2024 p243)¹

Un aspecto de la problemática concierne la relación entre los cambios en el sistema económico y los paradigmas sucesivos que tratan de explicar estos cambios. En este artículo trataremos de mostrar que las *mutaciones*

¹ La revista Triple C (Communication, Capitalism & Critique) ha publicado 14 artículos sobre el tema del CD: *triple C Special Issue: Critical Perspectives on Digital Capitalism: Theories and Praxis*. 2024.. triple C: 22 (1): 140-433

sucesivas del capitalismo en siglos pasados han tenido poca relación (y a veces ninguna) con las teorías económicas.

En cambio, la *metamorfosis* en el CD se repercute no solo en el ámbito social, las instituciones y el marco legislativo que las sostiene sino inclusive en las teorías económicas enseñadas durante décadas en las universidades. La IA, como nuevo agente económico y la interconectividad de los productos transforman no solo las relaciones en la estructura de la cadena del valor y las leyes del mercado (oferta y demanda) sino también plantean la relación *hombre-máquina* como un enigma que incluye el futuro de la humanidad.

Este artículo pretende mostrar también el largo proceso de transformación del capitalismo como una evolución ineluctable (¿dialéctica?) que el mismo Karl Marx diagnosticó en siglos pasados pero que nunca pudo imaginar hasta donde llegaría la metamorfosis del sistema capitalista. Trataremos de mostrar que esa “*hoja de ruta*” trazada por Marx lleva actualmente al sistema capitalista, no al paraíso comunista profetizado por Marx, sino a un punto culminante donde el hombre pudiera desaparecer frente a su propia creación, la Inteligencia Artificial.

Para comprender esas transformaciones (y establecer la “genealogía” del CD como diría Nietzsche) hay que situarlas desde la primera transformación de la economía comercial y agraria, es decir, con el liberalismo económico que surge con el descubrimiento de América. La acumulación de riquezas creadas durante décadas, gracias al comercio (sobre todo en Inglaterra y sus colonias) permitió que en el siglo 18 surgiera la Revolución Industrial, que llamaremos RC1, es decir, Revolución Capitalista 1.

Se sabe que esta revolución surge, no solo por las riquezas creadas, si no también gracias a los inventos de la época, como las máquinas tejedoras de telas y otras invenciones (la energía del vapor) que crean por primera vez la producción de masa. *Acumulación e invención* serán los factores substanciales de las metamorfosis del capitalismo y el “*núcleo oculto de sus transformaciones históricas*”, como diría Nietzsche de la genealogía. (Frey, 2015).²

Desde entonces el Sistema Capitalista ha ido adaptándose a la evolución histórica de la sociedad y las relaciones no solo económicas sino también sociales, políticas, guerras y otras catástrofes de la humanidad.

Siguiendo la terminología marxista, estas «*metamorfosis*” de la actividad económica pasa de una economía esencialmente agraria a una producción de bienes manufacturados a gran escala gracias al maquinismo y se transforma luego en una economía financiera, donde los bienes “no-tangibles” aumentan, modificando el *capital-máquina* en *capital-financiero*.

² Surowieki, 2012 opina que en el CD el aspecto financiero está subordinado a la tecnología como en el caso de los GAFAM.

Un elemento clave de esta evolución es la modificación de las relaciones de los instrumentos de producción y de la humanidad donde las herramientas rústicas de la economía agrícola se transforman en "máquinas" capaces de producir en masa con menos esfuerzo humano.

Las revoluciones históricas del capitalismo y su culminación en la revolución digital del siglo 21 se realizan en particular como consecuencia de los descubrimientos tecnológicos y la innovación. En este artículo trataremos de descubrir cuales han sido los elementos esenciales de estos cambios y su repercusión en las teorías económicas.

¿Cuáles son los factores observables en la economía que pueden llevar a un cambio en el modo de producción científica? En general, podemos constatar que las revoluciones científicas surgen cuando se modifican los siguientes parámetros:

- Nuevos conceptos para la explicación económica (p. ej. el circuito económico (fisiócratas), la utilidad marginal (Walras), la elasticidad, etc.
- Un nuevo lenguaje (formal matemático, dialéctico, empírico, etc. (los fisiócratas, los neoliberales como Walras o los positivistas como Friedman)
- Nuevos métodos de creación de conceptos (p. ej.: cálculo infinitesimal (Walras), dialéctica de Marx), etc.
- Nuevos dominios para la ciencia (p. ej.: globalización, economía regional, medio ambiente, economía financiera).
- Nueva visión del mundo "*weltanschauung*" como fuente de inspiración científica en la producción de conceptos, modelos, etc. (p. ej.: conceptos y modelos tomados de la mecánica (Walras), la termodinámica (Georgescu-Roegen), la cibernética (Keynes, Lange), la teoría de sistemas (Boulding), etc.
- Los Cambios socioeconómicos impredecibles en el mundo: crisis económicas, revoluciones sociales, guerras, pandemias, catástrofes naturales, nuevas formas de organización del conocimiento: universidades, centros de investigación, NTI, nubes, Inteligencia Artificial, etc.

Con la revolución digital no solo se transforma el sistema económico, sino que también conlleva, como veremos, de cambios substanciales en las teorías económicas que se han ido enseñando durante décadas en las universidades. Es decir, más que un nuevo paradigma para añadir a la historia de la ciencia económica, la revolución digital está cambiando el propio campo de la economía: es una nueva ciencia que se abre, como la termodinámica en relación con las ciencias naturales (física y química).

Es preciso señalar, pues, que los paradigmas económicos se desarrollan casi siempre fuera de los sistemas económicos reales y su surgimiento está casi ligado a fracasos o contradicciones de las propias teorías precedentes. Las paradojas de los economistas son numerosas (la de Leóntiev que contradice la teoría de Ricardo sobre la dotación de factores, la crítica de Cambridge sobre la medida del Capital Global, etc.) y los llamados descubrimientos científicos (en realidad términos puramente teóricos inobservables como la utilidad marginal descubierta casi simultáneamente por Jevons, Walras y Menger.

Por otra parte, el desarrollo de los instrumentos sofisticados y los modelos cada vez más complicados chocan con la realidad. Esto explica los fracasos de las previsiones económicas, las contradicciones en la explicación de los fenómenos económicos y la incapacidad de sus paradigmas para explicar una realidad cuya racionalidad teórica está sujeta a la libertad humana y a lo que nos resulta cómodo. Llamémoslo el "*efecto Edipo*" o la auto confirmación de las hipótesis planteadas por los economistas que es uno de los principales obstáculos epistemológicos de la ciencia económica. A esta contradicción de las teorías hay que añadir la dificultad de obtener datos económicos pertinentes. Esta dificultad será el meollo de los cambios con la revolución digital.

Porque precisamente, no solo las "leyes" económicas casi nunca se realizan (contrariamente a las ciencias "duras" (física o química) que han avanzado gracias a los datos precisos y cuantitativos), los economistas construyen sus modelos sobre quimeras en forma de datos donde la "*amalgama*" es el método más desarrollado.

Muchos autores han denunciado estos pretendidos modelos explicativos basados en datos absurdos y la falta de rigor de los datos económicos (Theil, 1954) sobre el sesgo de agregación; De Jong (1967) sobre la "dimensión" de las cantidades utilizadas, Morgenstern (1972) sobre las inexactitudes estadísticas, etc.), los economistas siguen cometiendo los mismos errores

¿A qué se debe esta desestima de los economistas por el rigor de los datos que manipulan? La respuesta a este enigma es que su tema no es la realidad del sistema económico, sino sólo sus propias teorías. Las revoluciones científicas en economía (con raras excepciones) son de hecho "*revoluciones de papel*" y sus paradigmas se centran en las teorías y no en los hechos concernidos por las teorías. Este es el comportamiento típico del "*colegio invisible*" en ciencia tal como lo define Kuhn (2012).

He aquí por qué sus principales predicciones no han mejorado con el tiempo y por qué eso no importa a los economistas; por qué sus explicaciones del pasado - distante y reciente - son tan profundamente satisfactorias para los economistas a pesar de la persistente debilidad de la evidencia subyacente a ellas" Y sin embargo añade Rosenberg: "*a pesar de estos problemas, la teoría*

económica es la herramienta más indispensable con la que disponemos para organizar nuestras vidas sociales y dar forma a las instituciones humanas” (Rosenberg (2009). Veamos algunos ejemplos:

Figura 1: Contradicciones en las teorías económicas

EVIDENCIAS	CONFIRMACIÓN	REFUTACIÓN
Si el salario mínimo aumenta, el empleo disminuye	Brown, Gilroy y Kohen (1982) (Survey)	Card y Krueger (1994)
Si se modifica el tipo de interés, entonces el ahorro reacciona ligeramente	Boskin (1978)	Hausman-Poterba (1987) (Survey)
Si los agentes anticipan en el mercado monetario, entonces el ingreso nacional no se mueve.	Barro (1978, 1981)	Mishkin (1982, 1983)
Si se disminuye el impuesto sobre la renta del capital, entonces la renta aumenta.	Feldstein, Stenrod & Kitzak (1980)	Auten & Corder (1991) Burman & Randolph (1994)
Si la inflación aumenta, el desempleo disminuye (y viceversa)	Phillips (1958) Lipsey (1960)	Santomero & Seaten (1978) (Survey)
Si las exportaciones aumentan, entonces el ingreso nacional también aumenta (multiplicador)	Balassa (1985), Ram (1985)	Gray et Singer (1988)

Por otra parte, ¿cuál ha sido el contexto y los criterios de las “*revoluciones científicas*” en la economía en los últimos años y como los economistas han intentado explicar esta realidad? ¿Acaso las teorías elaboradas por los economistas se han adaptado a los nuevos cambios en el mundo económico o al contrario siguen impermeables a los acontecimientos de la historia?

La Figura 2 muestra las principales características de los tres paradigmas más importantes que la Ciencia Económica ha conocido. Hemos presentado los contextos de sus apariciones y los criterios que condicionan su aparición, sus visiones, los tipos de lenguaje que utilizan y las unidades de medidas que proponen para sus teorías. No pretendemos hacer una crítica de la validez o no de esas teorías, lo cual necesitaría un análisis crítico del aparato conceptual y del contenido empírico de los mismos. Es decir, una tesis doctoral...

Sin lugar a duda, otros paradigmas podrían añadirse (Ricardo, Friedman, el mismo Schumpeter...). El resultado sería el mismo: la inconmensurabilidad de las teorías...

Figura 2: Tres paradigmas inconmensurables

Economista	CRITERIOS							
	Contexto de Aparición	Referencia Simbólica (Visión)	Referencia Axiológica	Referencia Filosófica	Tipo De Conceptos	Tipo De Lenguaje	Límites estructurales	Unidad De Medida
MARX	Revolución industrial	Modelo de la biología (DARWIN)	Consonantismo histórico	Materialismo histórico y dialéctico (HEGEL)	Conceptos dialécticos (idóneos o no)	Lenguaje dialéctico	micro- /macro	Plusvalía del trabajo (Producción)
WALRAS	Impulso de los sindicatos	Modelo de la mecánica analítica	Armonismo	Idealismo kantiano y positivismo (COMTE)	Conceptos y términos teóricos (verdaderos o falsos)	Lenguaje formalista	micro	Rareza del bien (utilidad marginal)
KEYNES	Crisis de 1929-1930	Modelo cibernético	Discordantismo fundamental	Empirismo lógico (LOCKE)	Conceptos empíricos probabilísticos (Porcentaje de probabilidad)	Lógica empírica	macro-	Empleo (Demanda)

Vemos claramente la imposibilidad de encontrar una convergencia teórica de estos paradigmas que han influenciado durante décadas la evolución de las teorías y las políticas económicas.

Proto-paradigmas económicos: El mercantilismo y la fisiocracia

La primera verdadera revolución social y económica del sistema fue sin duda la que surgió con los descubrimientos del Nuevo Mundo y el desarrollo de los intercambios comerciales durante los siglos XVI-XVIII. La necesidad del libre comercio y la riqueza que éste podía crear en las economías nacionales y en los activos de nuevas clases sociales en torno a las grandes empresas exportadoras, darán origen a una forma de pensamiento que poco a poco se convierte en doctrina económica: el "mercantilismo"

Esta doctrina (que ni siquiera es una teoría) se construye en torno a un postulado fundamental: el oro es la riqueza de las naciones, las exportaciones traen oro a las naciones, por consiguiente, el papel del Estado es proteger las exportaciones mediante un proteccionismo moderado.

El mercantilismo surge con la visión expansionista del Imperio Ingles, mientras que la Fisiocracia surge en el contexto agrícola de Francia en los años 1750 hasta la Revolución Francesa. Dos visiones diferentes construirán dos tipos de análisis divergentes. La mirada del primero se centra en el intercambio comercial y el oro como fuente de valor económico, la del segundo en la agricultura y la tierra como fuente del "valor neto" (Heckscher 1962).

No es de extrañar que, en este mundo de espacios abiertos, donde surgen los primeros paradigmas económicos, la primera cuestión que se plantea sea la de la "demanda efectiva", es decir, la demanda que logra equilibrarse con la oferta global para crear un equilibrio económico.

La demanda es “inefectiva”, ya sea en relación con la balanza comercial (un déficit en la balanza comercial crea un exceso de la oferta con los bienes importados, un exceso de las exportaciones crea una demanda interna insuficiente); ya sea en relación con la demanda interna y la circulación del producto neto entre las clases sociales para los fisiócratas. De este problema esencial de la demanda efectiva, “descubierto” por los mercantilistas y utilizado posteriormente por Marx para demostrar las crisis “inevitables” del capitalismo (problema resuelto posteriormente por Keynes con la demanda pública como equilibrio)

Es en este contexto en el que nace la doctrina de los fisiócratas en Francia y en el que la ciencia económica adquiere un mayor grado de abstracción y un aparato conceptual más desarrollado. Esto, como señala Schumpeter (1954), a pesar del carácter “sectario” (incluso doctrinario) de sus teorías. El propio Marx, después de haber dado la autoría de la Economía Política a W. Petty, declara pontificalmente, unas páginas más adelante, que los fisiócratas son los fundadores de la economía moderna. Es curioso observar -como lo hace N. Georgescu-Roegen- que, si la primera teoría económica nació en el siglo XVII a partir de una realidad agraria, en el siglo XXI todavía “*la economía agraria sigue siendo una realidad sin teoría*” (N. Georgescu-Roegen, 1970 p.241).

¿Cuál es el principio según los fisiócratas que permite a la Economía volver a “su curso natural”? La respuesta era simple para el Doctor Quesnay: el sistema económico funciona como un “circuito sanguíneo”, es decir “fisiológicamente”. Entre las tres clases sociales definidas en la “*tabla de los fisiócratas*”, la clase productiva (los campesinos), la clase de los propietarios (los nobles) y la clase estéril (los comerciantes), se establece un “flujo” de mercancías (el “producto neto”) que permite la supervivencia del cuerpo social (Grandamy, 1978, p. 13).

Esta “visión” de la sociedad francesa es fundamentalmente la misma que la del mercantilismo: el hombre es un animal social. De hecho, diría Heckscher, el enigma es éste: ¿cómo pueden dos “visiones” idénticas de la sociedad conducir a dos doctrinas divergentes? La clave del enigma está, precisamente, en el aparato conceptual diferente desarrollado por los dos paradigmas, es decir en su tipo de lenguaje: el lenguaje de los fisiócratas entra en la categoría de lo que designamos hoy como lenguaje científico: proposiciones falsables por la experiencia (Popper, 1959).

Es el aparato conceptual y en particular el concepto de “producto neto” lo que habrá permitido a la fisiocracia explicar el mecanismo automático de la economía. Los fisiócratas son los primeros en definir y establecer vínculos causales entre los tres grandes conceptos de la economía científica moderna: la “circulación” del “producto social” y su “distribución”.

A diferencia del mercantilismo, no se limitan a la circulación monetaria: es el flujo de mercancías y su valor lo que importa para la economía. Abren así ese dominio inagotable de la epistemología económica que es la definición y la medición del valor.

Sin embargo, no disocian "valor" y "dinero", ni "valor" y "productividad", descuidando así el "beneficio", principal fuente de fluctuación del valor, como había advertido Marx (Schumpeter 1954, pp. 56-57). Su noción de "productividad" sigue, pues, dependiendo del mercantilismo: si la tierra es el único factor capaz de producir un "excedente", es porque la agricultura es la única actividad que no necesita materias primas extranjeras: es la única actividad "productiva" que crea la riqueza que sustenta a las demás actividades (Grandamy 1978, pp. 98-109).

François Quesnay encontró la solución a los dos problemas metodológicos que se había impuesto: la definición de una norma invariable de medida del *producto neto* (calorías alimentarias) y el cálculo del *flujo de riqueza* de una nación, evitando calcular dos veces la misma riqueza, gracias al concepto de «producto neto». «La doctrina fisiocrática [...] pretendía ser no sólo una teoría económica, sino también una sociología general que, sin embargo, se componía de material económico y que colocaba las consideraciones económicas en primer plano» (Schumpeter, 1954, p. 46). IV:

Aparece el capitalismo industrial (CR1) y el paradigma clásico

Las ideas del mercantilismo y la acumulación de beneficios creados por el comercio fundarán grandes complejos capitalistas al mismo tiempo que nuevas técnicas, más "*ahorradora de mano de obra*", empujarán a masas de campesinos a los suburbios de las grandes ciudades, creando así un "*ejército*" de desempleados disponibles para la explotación en industrias recientes.

La primera metamorfosis del sistema económico fue la Revolución Industrial (CR1) a fines del siglo XVIII en Inglaterra, luego en Francia a principios del siglo siguiente. La CR1 se caracterizó por una actividad económica acelerada que cambió la naturaleza de los intercambios entre los agentes económicos en apenas unas décadas.

La CR1 marcó innegablemente un cambio fundamental no solo en los sistemas económicos (de una economía agraria con el factor de producción "tierra" a una economía de bienes manufacturados a gran escala con el factor "máquina") sino también un cambio en las teorías explicativas. Estos cambios fueron posible gracias a la invención y a la innovación con el surgimiento de nuevas industrias como la textil, la siderúrgica y la del carbón, y su impacto en la economía, la transformación del trabajo, incluida la urbanización, el trabajo fabril y el surgimiento de la clase obrera: el proletariado.

La CR1 no se limitó a sustituir las granjas por fábricas. Supuso una transformación compleja de las sociedades, que afectó a las estructuras

sociales, los sistemas políticos y los valores culturales. El surgimiento del trabajo asalariado, la urbanización y el surgimiento de nuevas clases sociales fueron parte de esta revolución. Pero en particular las nuevas tecnologías permiten la sustitución del factor humano por las nuevas máquinas impulsadas por una rueda hidráulica, etc.

Con sus nuevos conceptos económicos, el filósofo Smith (1961) aportará una nueva visión como la división del trabajo, el producto interior bruto (PIB), etc. y contribuirá a aumentar este desarrollo económico. De hecho, Smith se posiciona contra la ambigüedad conceptual de los fisiócratas (sobre el valor) y el "*crisohedonismo*" mercantilista (sobre la riqueza): "*El trabajo es, por tanto, la medida real del valor a cambio de cualquier mercancía. El trabajo fue el primer precio, el dinero pagado para la compra original de todas las cosas*" (Smith 1961 pg. 34-35)". No es el oro sino las cantidades de trabajo en la mercancía lo que intercambiamos, dira Smith mirando no solo lo económico sino también el atributo social.

Como moralista, Smith construirá una teoría del bienestar comunitario basada en la acción individual y más precisamente en la búsqueda del interés individual o "apego" al bienestar egoísta. En realidad, la "visión" del mundo económico de Smith no es nada nuevo, aunque el "mundo" que le rodea ya es el de la revolución industrial. Smith sigue siendo profundamente "providencialista" como los fisiócratas, por lo tanto, armonista (Hollander 1973, capítulo 3).

Sin embargo, por otra parte, Smith es el primer economista en haber modificado el lenguaje de la ciencia económica mediante la introducción de lo que podría llamarse un "*nominalismo social*". En efecto, contrariamente a la idea difundida entre los comentaristas de Smith que lo consideran un "*naturalista*", o incluso un mecanicista, Smith fue el primero en haber mostrado el aspecto convencional de la investigación científica y, más precisamente, del lenguaje de la ciencia. : "*Para ganar aceptación, tal hipótesis no sólo debe ser verificada o tener éxito en ese sentido, sino que también debe ser subjetivamente satisfactoria para la aceptación humana*" (citado por Lindgren, 1969, p. 901).

En otras palabras, la ciencia no busca los "principios" de la naturaleza sino la conformidad de los conceptos en la imaginación humana. Smith confirma así un de los principales postulados inherentes a las teorías económicas: las ideas desarrolladas por las ciencias "*parecen haber surgido más de la naturaleza del lenguaje que de la naturaleza de las cosas*" (Smith Lógica, citado por Lindgren, 1969 p. 908).

Probablemente el primer análisis de los lenguajes y lo que se llamara con de Saussure la "Lingüística", fueron los comentarios de Smith en las "*Consideraciones sobre la primera formación del lenguaje*". (Smith 1759)

David Ricardo (1772-1823) fue acogido como el hombre de negocios capaz de construir un sistema deductivo basado en leyes que, *"el primero arrojó, como una flecha, una luz sobre el oscuro caos de la materia"* y que establecen la ciencia económica *"sobre una base eterna"* (de Quiney, 1842, citado por Lutfalla, 1972, p.686).

Estas palabras retóricas muestran el clima de pasión en el que surge la teoría ricardiana. No es extraño entonces la cautela con la que expone sus argumentos: *"Se me acusa de haber adoptado un lenguaje nuevo, inusual, que no puede conciliarse con los verdaderos principios de la ciencia"* (Ricardo, 1977).

Paradójicamente, Ricardo, el "teórico", será el primer gran economista que se interesará directamente por los problemas de medición y esto desde un punto de vista epistemológico. Su preocupación es doble:

- a) poder reducir la realidad a datos observables y
- b) establecer vínculos causales entre estos datos.

Ricardo abre así la vía al formalismo económico y a la economía matemática. Con ello, Ricardo reduce el dominio económico a lo medible y limita el lenguaje de la ciencia a conceptos cuantitativos contrariamente a Smiths³. De ahí su rechazo a una definición del valor del trabajo, como la había hecho Smith, basada en el trabajo, la fatiga y el sufrimiento del trabajo, pero sobre todo la solución al problema de una única medición de este valor.

En consecuencia, sólo *el tiempo* le parece una medida válida del capital porque el capital no es más que tiempo de trabajo acumulado: una máquina = 130 horas de trabajo acumulado. Ricardo llega también a establecer leyes a través de relaciones funcionales. La necesidad del comercio internacional que, gracias a la teoría de los *"costes comparativos"* (los países tienden a importar bienes cuya producción local costaría más), permitió al imperio inglés tener menos días oscuros... Así, llega a su ley fundamental del intercambio, según la cual la relación de intercambio de dos mercancías es igual a la relación de las cantidades de trabajo que contienen, ya que ningún otro factor de producción juega un papel en esta cuestión. (Schumpeter, 1962, pp. 135-136)

En resumen, Ricardo muestra que cada país tiene interés en especializarse en la producción del bien para el cual tiene la mejor ventaja comparativa (medida por el factor de producción más abundante) o la menor desventaja comparativa. ¿Cómo se mide esta "cantidad de trabajo"?

³ Sin embargo, Schumpeter, admirador de las curiosidades biográficas, dirá con cierta ironía, que Ricardo encontró en Smith una gran inspiración: *"Aunque no supiéramos que el pensamiento de Ricardo está inspirado por Smith (y La riqueza...), que leyó en 1799 mientras se aburría en un balneario, no tendríamos más remedio que notar que la argumentación de los "Principios" arranca de una crítica de Smith que atraviesa verdaderamente el libro entero.* (Schumpeter 1962, p 532)

Aunque "verbalmente" diría Schumpeter - se mide en horas de trabajo, en realidad tuvo que hablar en términos monetarios. Este "*tour de force lógico*" (Schumpeter, 1954, p 591) le permitió evitar, entre otras cosas, la dificultad de comparar la hora física de trabajo de un joyero con la de un obrero, sobre todo porque rechazaba la ley del mercado como elemento determinante del valor. Ricardo identifica el costo del trabajo y el valor "como una especie de dogma metafísico", es decir, sin argumentos (Knight, 1956, p 114).

Sin embargo -dirá Ricardo-, dado que el capitalista tendrá que elegir entre capital fijo (las máquinas) y capital circulante (el salario), es posible que dos industrias que empleen la misma suma global de capital, pero con una composición orgánica de capital diferente, tengan un impacto diferente en el valor de los productos y un posible aumento de los salarios. "*Hay más. Dos fabricantes pueden emplear la misma cantidad de capital fijo y capital circulante y, sin embargo, tener un capital fijo de una duración muy desigual*" (Ricardo, 1977 p 40-42).

En resumen, la medida invariable del sistema ricardiano se derrumba debido a la vida útil de las máquinas. Lo que hace que Schumpeter diga que el teorema de Ricardo es solo una "aproximación". La "quantofrenia" le hizo perder la "razón".

Con el paradigma de Karl Marx y su doctrina sobre el fin del capitalismo se cierra el pensamiento clásico. No obstante, su análisis sobre el capitalismo es de actualidad.

Tratando de consolidar su teoría, Marx describe su mundo con esa morbosidad de detalles que le era característica. De la división del trabajo propia de la naciente gran industria (donde "*el obrero a destajo transforma todo su cuerpo en un órgano exclusivo y automático de una misma y simple operación, realizada por él a lo largo de su vida*") a la maquinaria (que describe con precisión) cuya principal "victoria" fue la de hacer inútil la "fuerza muscular" y permitir así la utilización en el trabajo de mujeres y niños: "*Cuando el capital se apoderó de la máquina, su grito fue: ¡Trabajo de mujeres, trabajo de niños!.... el capital usurpó el lugar de los juegos infantiles y del trabajo gratuito para el mantenimiento de la familia*" (Citado por Heilbroner, 2014, pp. 129, .248 y pp. 281-282)

Según Marx, la maquinaria transformará así no sólo el "*grado de explotación*" del trabajador sino sobre todo el "*contrato de trabajo*" que se convierte en un mercado de esclavos donde el trabajador vende no sólo su propia fuerza de trabajo sino también a su mujer y a su hijo. De ahí esa plaga social de la época que Marx describe "hasta la saciedad": niños de cuatro a seis años cuyas jornadas de trabajo "*duran desde ocho horas, a veces desde las seis de la mañana hasta las diez u once de la noche*". En ciertas "escuelas de bordado", el trabajo infantil comienza al cuarto año "*y a veces antes*" (Ibidem, pp. 332-334). *En las minas, el trabajo (catorce horas diarias)*

comienza a los diez años... tarde y medianoche" (Ibidem, p. 353); en los barrios bajos inmundos donde la promiscuidad engendra la prostitución de las jóvenes y la "viruela" como hongos en el bosque. *"Ésta es la vida que disfrutaban los niños hasta los doce o catorce años. Sus padres, hambrientos y estupefactos por la pobreza, sólo piensan en presionarlos. Además, una vez que crecen, los niños se burlan de ellos y los abandonan."* (Ibidem p 334)

El mundo de Marx (ciertamente no es el mundo maravilloso de Smith, sino un mundo cruel, despiadado con los débiles y los desnutridos. Es la "*ley del capitalismo*", tan inexorable según él como la de la naturaleza: vida y muerte. El progreso social se basa en esta ley de explotación: "*La producción capitalista, por tanto, no desarrolla más que la técnica y la combinación del proceso de producción social agotando al mismo tiempo las dos fuentes de las que brota toda riqueza: la tierra y el trabajador*" (Ibidem, p. 361). Mirando este mundo, Marx construirá sus profecías como un mensaje, un "evangelio" de esperanza a los oprimidos: las contradicciones internas de este mismo sistema lo condenan a desaparecer. Pero en lugar de envolver esta profecía en el lenguaje del socialismo utópico, la expresa en el lenguaje del análisis, por tanto de la ciencia, donde nos muestra su proyecto.

La visión de Marx tiene dos coordenadas esenciales: *la dialéctica materialista* y *la dialéctica histórica* o más precisamente: *el materialismo dialéctico e histórico*. Tres elementos juegan en el drama de la visión marxista: la naturaleza, el hombre y el trabajo.

Entre estos tres elementos hay una relación dialéctica: el hombre es un "*ser de necesidad*", de ahí la necesidad de trabajar para vivir. Por tanto, la primera relación social entre los hombres es *materialista*, condicionada por las relaciones de producción con la naturaleza, siempre en evolución. La historia es sólo evolución *material dialéctica*, donde el trabajo es el mediador entre el hombre y la naturaleza y con el trabajo el hombre crea la herramienta que, con la técnica, se convierte en *máquina*.

Tenemos por lo tanto una tesis (*la naturaleza*), una antítesis (*el trabajo*) y una síntesis (*el producto económico*) El "motor de la historia" -dira Marx- es el conflicto entre la clase proletaria despojada y alienada de su propio producto por la clase capitalista (propietaria de los medios de producción, las máquinas) y las relaciones sociales que dan origen a la "*lucha de clases*".

El materialismo dialéctico genera al mismo tiempo, el desarrollo de las fuerzas productivas (tecnología) mediante la creciente acumulación de capital, a la que el sistema está condenado, debido a la creación misma de un excedente económico (o lo que es igual, una demanda global insuficiente) fuente de las crisis sucesivas.

El sistema capitalista está, pues, estancado, "*atormentado*". Por un lado, históricamente por las crisis económicas creadas por una demanda insuficiente (por una producción excedentaria) que se transforma en más

inversión (más capital y menos trabajo). Por otro lado, por la naturaleza insaciable del capitalista que busca cada vez más beneficios que, inexorablemente, se le escapan porque el progreso tecnológico (la máquina) canibaliza la fuente de estos beneficios: *la plusvalía*.

La cosmovisión marxista se presenta, pues, como un nudo de contradicciones y discordancias socioeconómicas. Pero es sólo el presente el que está envuelto en esta intriga de la dialéctica materialista. El futuro ofrece al hombre y a la sociedad sin clases, el feliz desenlace de la tragedia con la sociedad utópica comunista: en lugar de la antigua sociedad burguesa con sus clases y sus antagonismos de clase surge una sociedad donde el libre desarrollo de cada persona es la condición para el libre desarrollo de todos (Marx 1848 p 47).

La teoría de Marx se resume a algunas manipulaciones matemáticas que le permiten llegar a la ecuación que él cree representa la autodestrucción del capitalismo.

Los conceptos de base son la *tasa de beneficios* y la *tasa de explotación* que son el fundamento de su teoría (Denis ,1974, pp. 447-448).

La tasa de beneficio es $b = pL/C+V$, es decir la parte de la plusvalía obtenida con relación a todo el capital invertido (constante + variable). La tasa de explotación se define por la fórmula: $e = pL/V$ es decir la parte de la plusvalía en relación con el capital variable (salario). Dividiendo el numerador y el denominador de la tasa de beneficio por V

$$b = \frac{\frac{pL}{V}}{C+V/V} \text{ se obtiene } b = \frac{e}{C/V+1} \quad C/V = \text{composición orgánica del capital:}$$

cuando aumenta, la tasa de ganancia disminuye y con $g = C/V$ (cuando la maquinaria crece más que la fuerza de trabajo g aumenta). Finalmente

$$b = \frac{e}{1+g}$$

Cuando el progreso técnico aumenta, la tasa de ganancia disminuye. Para contrarrestar este descenso, el capitalista puede aumentar e ; ¿cómo?:

- 1) aumentando la jornada laboral del trabajador
- 2) aumentando la intensidad del trabajo
- 3) 1 + 2 = plusvalía absoluta de producción

El capitalismo industrial está condenado al nomadismo perpetuo de sus máquinas y encontrar nuevos modos socioeconómicos de producción en países donde la tasa de explotación será más importante. Su historia será ir de un país a otro en busca de nuevas fuentes de ganancia (deslocalización, globalización, etc.) (Marx).

Los paradigmas neoclásicos y el CR1

Con el descubrimiento de un nuevo aparato conceptual y de herramientas matemáticas (como el cálculo infinitesimal), surge el período

neoclásico. Este período se caracteriza también por la explosión de teorías completamente al margen de una realidad económica donde se consolida la industrialización con gigantescas industrias y monopolios que desafían las leyes de la “competencia pura y perfecta” como las describían los economistas de la época clásica. Este grupo de economistas gira en torno al descubrimiento del concepto de “*utilidad marginal*” (en la teoría del consumidor) y su derivado, el concepto de “*productividad marginal*” (en la teoría de la producción), conceptos que se convertirán en los dos pilares sobre los que se basan todas las teorías económicas hasta hoy, particularmente en los paradigmas neoliberales.

La indiferencia, ante una realidad económica que ya no parece interesarles, hace que se concentren tanto en sus querellas retóricas que sus teorías les conducen a construir conceptos vacíos de contenido empírico y sin ninguna definición de unidades de medida.

Sin duda, las ideas de Walras y el sistema conceptual que creará representan la ruptura epistemológica más fuerte de la revolución industrial y el surgimiento del neoclasicismo y el marginalismo, centrados en su descubrimiento de la “utilidad marginal”. La elegancia de las formalizaciones en el lenguaje de Walras llegó en un momento en que la economía estaba tomando un lugar en la organización del conocimiento (universidades, centros de investigación, etc.) y ciertamente no eran elementos despreciables. La economía matemática era el lenguaje perfecto para Walras.

A diferencia de Marx que pretende hablar la misma lengua que sus predecesores con una visión diferente, Walras pretende hablar otra lengua con la misma visión. Pero ambos se dirigen -efectivamente- a sus respectivos grupos: Marx con panfletos incendiarios a la clase proletaria, Walras con cartas personales a los economistas de su época.⁴

Marx y Walras y más tarde Keynes con "su grupo" (los gobiernos) practicaron con extraordinaria habilidad una política de "marketing" digna de los mejores especialistas contemporáneos en "medios de comunicación de masas" (cuyo mecanismo conocían bien). Su éxito fue su voluntad de triunfar. "*Trato con todas mis fuerzas de complacer a todo el mundo. Ésta es la manera de triunfar*" (carta a su esposa, Jaffe, 1965, p. 256).

En una obra contra Proudhon, Walras declara su proyecto de reconstruir la economía política sobre nuevas bases para echar por tierra los argumentos de los socialistas. Quiere así conciliar el liberalismo (creador de riqueza) con el socialismo que busca la justicia social (Denis, 1974, p. 501).

Walras no es un hombre insensible a los problemas sociales. Está sencillamente convencido, como muchos otros socialistas, de que la

⁴ Cartas de Walras compiladas minuciosamente por JAFFE W. (Ed.), "*Correspondance of León Walras and Related Papers*", 3 volúmenes, North-Holland, Ámsterdam 1965.

revolución no es necesaria: *"La humanidad, en resumen, es bastante estúpida, hace lenta y mal mediante la revolución lo que podría hacer más rápidamente y mucho mejor mediante las reformas si tuviera un poco más de espíritu"* (Walras, Carta a Louise Renard del 13/04/1903, en Jaffe, 1965). A sus 26 años, defiende el derecho natural a la propiedad privada que puede devolver pacíficamente a los pueblos el espíritu de la justicia social.

Paradójicamente, mientras Marx, que sólo considera al hombre como un producto social, se compadece del destino de los individuos, Walras, que le concede *"derechos naturales"*, no tiene piedad del hombre empeñado en un trabajo vulgar pero que considera afortunado de tener un trabajo en este sistema en funcionamiento. Porque *"por defectuoso que a veces nos parezca nuestro estado social, debemos aceptarlo sin rebeldía porque es necesario, sin remordimientos porque contiene en sí el principio indestructible de su normal mejora"* (Walras, *Introducción a la cuestión social*, citado por Brown, 1966, p.65 "). ¡Marx mismo no lo habría dicho mejor!

El postulado de base, que será el fundamento de sus teorías, es la dicotomía entre *"ciencia pura"* y *"ciencia aplicada"*. Su posición es, pues, clara: por un lado, existe la *"ciencia económica pura"* (como existe la *"mecánica pura"*) y, por otro, la *"ciencia económica aplicada"* (como existe la *"mecánica aplicada"*). Es aquí donde Walras rompe con el mundo exterior, pero también con el paradigma clásico.

La visión de Walras es armonista. Hay un orden que va más allá de la realidad. Este orden se crea eliminando a los hombres, sus desigualdades, sus necesidades, sus conflictos y su poder. Este orden se construye, se define en el *"Equilibrio Económico General"*; donde *"los precios actuales se equilibran (son iguales) a la rareza del producto"*, es decir, las relaciones entre las utilidades marginales de cada consumidor.

Es la ley del mercado, inmutable e inexorable porque es determinista. ¿El mundo real es diferente? Bueno, *"lástima que así sea el mundo real"*, dirá con ese idealismo kantiano que le caracteriza. La rareza, su rareza que define como utilidad marginal, es un concepto *"científico"*, léase *"ideal"*, que no se opone a la abundancia.

¿Cuál es entonces la relación entre la experiencia y la teoría para Walras? Así como las ciencias físico-matemáticas hacen abstracción de la realidad de *"tipos y clases"* idealizados para luego construir *"a priori"* sus teorías que serán aplicadas posteriormente, así la economía científica hace abstracción de los agentes y de su comportamiento racional en un mercado ideal para luego aplicarlas en la realidad: *"no para confirmar, sino para aplicar sus conclusiones"* (Walras, 1952 p 40).

Es un método totalmente opuesto a lo que hoy conocemos sobre el enfoque científico. Walras era consciente de lograr una revolución científica. No sólo pretende exponer los fenómenos económicos de una manera *"mucho*

más exacta y completa que las exposiciones actuales” (Walras, 1938 p 5) (en su aspecto metodológico), sino que también cortará el cordón umbilical con la economía clásica al redefinir el campo de la Economía Política (Ibidem p 20).

Walras no sólo quiere dar respuestas diferentes, sino que incluso plantea problemas diferentes: es un nuevo paradigma que nace con otra visión y otro lenguaje. Así es como, gracias a la utilidad marginal (UM), Walras encuentra la manera de llegar al concepto de “Equilibrio General”, pero es también gracias a la UM que Walras logra resolver el problema de transformar el “valor de uso” (de los bienes consumidos) en “valor de cambio” (en el mercado): “lo que Adam Smith, Ricardo y Marx habían creído imposible: podemos explicar el valor de cambio en términos de valor de uso” (Walras, 1938 p 223).

A partir de esas conclusiones él va a enunciar el postulado fundamental de su teoría matemática del intercambio: “*Los precios corrientes o precios de equilibrio son iguales a los ratios de la rareza*” (Walras, 1938 p 101). Sin embargo, esta escasez no es otra cosa que la derivada matemática de la utilidad efectiva en relación con la cantidad poseída, por lo tanto, la UM de modo que “*en el estado de máxima satisfacción, las rarezas serán proporcionales al precio*” (Walras, 1952, pp 203-212) Así llegamos, al óptimo de la mecánica económica de Walras resultante de la teoría del intercambio puro.

Éste es el “*meollo*” de la falla epistemológica del sistema de Walras (y de los marginalistas que le seguirán): sus conceptos están vacíos de cualquier unidad de medida y de cualquier contenido empírico.

Esta ciencia “pura” se basa en tres leyes fundamentales:

- la ley del equilibrio del mercado; (a la que llegamos por tanteo y error)
- la ley del comportamiento racional; (con la maximización como regla)
- la ley del valor de las mercancías; (determinada por su rareza o UM).

La que más nos interesa es la primera ley del equilibrio (a menudo llamada “ley de Walras”) que justifica el sistema capitalista ya que define una situación en la que ni los consumidores ni los productores tienen interés en pedir más a los primeros ni en ofrecer más a los segundos. Se trata, pues, de una Equilibrio “estable” en el sentido de la mecánica pura.

El sistema completo se compone de tres teorías regidas por dichas leyes. (Leretaille, 1977, pp. 109-184):

- 1) La teoría del intercambio con 4 postulados:
 1. Existe una “*tendencia*” a la igualación de la oferta y la demanda.,
 2. En equilibrio, cada agente maximiza la utilidad (la demanda) o el beneficio (la oferta).
 3. Existe un precio de equilibrio para cada bien en cada mercado.

4. Cada bien se expresa en valor monetario de la mercancía y el precio del dinero es, por definición 1.⁵
- 2) La teoría de la capitalización donde Walras analiza las inversiones netas que surgen del ahorro, que define como la diferencia entre el exceso de renta sobre el consumo más la depreciación y los costes de seguro de capital. (Walras 1938 p 233) A continuación, hace la distinción entre *capital circulante* (materias primas) y *capital fijo* (máquinas).
- 3) La teoría de la circulación donde Walras pone en juego la noción de "*saldo de efectivo deseado en dinero*", pero dejando claro que el dinero es sólo "poder adquisitivo" y "poder de elección" entre diferentes bienes: no se desea por sí mismo, sino porque, Como decía SAY, "transporta" productos.

El andamiaje teórico de Walras tiene *cuatro postulados básicos*:

- la oferta crea demanda,
- el equilibrio económico está siempre en pleno empleo,
- el ahorro es siempre igual a la inversión,
- la oferta de trabajo depende de los salarios reales ("poder adquisitivo").

En comparación con el modelo marxista, hay una diferencia: aquí, el mecanismo regulador del mercado (¿la principal invisible?) determina los valores de cambio (precios). No hay dualismo de valores. Pero, sobre todo, no hay fuente de valor (o riqueza como en el modelo clásico en general: ni oro, ni tierra, ni plusvalía). Por eso el modelo de Walras rompe por completo con los clásicos. Como ya se ha dicho, transformó una ciencia de creación de riqueza en una ciencia de intercambio.

La revolución científica de keynes y el capitalismo

Si Marx y Walras tuvieron que soportar durante toda su vida la miseria y la prisión, el primero, la incomprensión y la intolerancia, el segundo, el sufrimiento tanto físico como moral, John Maynard KEYNES (1883-1946), por el contrario, estuvo, desde su nacimiento, condenado al éxito. Nunca en la historia del pensamiento económico ningún autor ha atraído a tantos comentaristas, tantos estudiantes y tantos detractores.

¿Cuáles son las razones del éxito de Keynes? En nuestra opinión, son cuatro:

⁵ El sistema incluye otros 3 postulados implícitos: el orden de las preferencias o curvas de la función de utilidad son convexas (lo que permite la existencia de un punto óptimo con la línea de la renta (constante) el equilibrio general es un estado óptimo (y por tanto deseable). Toda la información del mercado la proporcionan los precios ("*à la crié*", dice Walras, como en el mercado de valores.). (Sobre la convexidad de las funciones para el equilibrio, véase (Koopmans, 1970, pp. 36 y ss.)

- La burguesía tenía mucho miedo después de la crisis de 1929.
- Encontró una teoría que la protegería contra nuevas crisis.
- Esta política concuerda con los intereses de la burguesía de su tiempo.
- Su situación social, intelectual y humana le dio los medios para hacerse oír.

“El mundo acaba de darse cuenta de que ha vivido este año a la sombra de una de las mayores catástrofes económicas de la historia moderna. ¿Estos hechos oscuros lo han despertado [al hombre de la calle] de un sueño maravilloso? ¿O lo han sumergido en una pesadilla que pasará? Que se tranquilice. Lo otro no era un sueño. Esta es una pesadilla que desaparecerá al amanecer.” (Keynes 1933 p 135)

¿De qué pesadilla habla Keynes? Del "crash" de 1929 que redujo la Renta Nacional en Estados Unidos en un 50%, la producción en un 45%, la industria pesada en un 70%, el índice de precios al por mayor en un 32%, los salarios en un 40%, los salarios en un 32%... el desempleo aumentó de 2 a 13 millones de personas.

Entre las múltiples causas del "crash" de octubre (especulación, mal funcionamiento del sistema bancario, mala distribución de la renta, etc.), hay una razón que parece la más plausible, según Galbraith: al haber aumentado la productividad, los costes habían disminuido y, por tanto, los beneficios aumentaron mientras que los salarios se mantuvieron estables. De ahí el fenómeno del subconsumo (de las clases trabajadoras) y del excedente de ahorro (de las clases ricas) ante una demanda deficiente de inversión. (Galbraith 2018 p 200).

Este es precisamente el punto clave de la política keynesiana: el ahorro no siempre es igual a la inversión porque esta última depende del ingreso de los individuos (y no de la tasa de interés) y esta última también depende del rendimiento esperado de los inversores (eficiencia del capital) y no sólo del tipo de interés.

¿Cuál es el mensaje apostólico de Keynes al mundo? La irracionalidad del mercado, la imposibilidad de calcular las motivaciones individuales de los inversores y ahorradores. No hay otra ley del mercado que la de los grandes números. Tú eres un punto, yo soy un punto. Y eso es todo. No hay curvas porque lo que quiero ahora, un minuto después podría rechazarlo.

En el prefacio de la edición francesa, dice:

“Pero nosotros mismos, al escribir este libro... sentimos que estábamos abandonando esta ortodoxia, que estábamos reaccionando fuertemente contra ella, que estábamos rompiendo las cadenas y conquistando una libertad”. (Keynes 1942 p. 5) ¿Quería recrear una nueva ciencia como Walras? ¡Oh, no!

Su visión, como Marx, era que los filósofos ya han pensado lo suficiente sobre el mundo. Además, los problemas del mundo están ahí, y su amigo el gran Wittgenstein siempre le había dicho: *"El mundo es el caso"*. (Wittgenstein 2001 primera proposición)

La arquitectura del modelo de Walras se apoyaba en un axioma, un postulado *"euclidiano"* de base: el desempleo involuntario. Keynes demolerá este postulado:

"Los teóricos de la escuela clásica se parecen a los geómetras euclidianos que, encontrándose en un mundo no euclidiano y observando que de hecho las líneas rectas que parecen paralelas se cortan con frecuencia, criticarían las líneas por su falta de rectitud que se produce. En verdad, no hay otro remedio que rechazar el postulado de Euclides y construir una geometría no euclidiana. (Keynes, 1942 p. 29)

¿Qué método propone Keynes en lo que respecta a las series cronológicas? Observando los hechos y la secuencia de conceptos: Keynes nunca creyó en la econometría basada en frecuencias estadísticas, él que había escrito una tesis en contra. Considera que los métodos de Tinbergen están llenos de inconsistencias lógicas: *"El profesor Tinbergen se dedica a la tarea de explicar los ciclos económicos mediante un método, uno de cuyos postulados de trabajo es que los ciclos sólo pueden explicarse mediante otros ciclos (Keynes, 1939, pp. 558-568 en Hansen y Clemence 1958 pp. 330-340)* A esta crítica la respuesta de Tinbergen fue directa (Ibid. pp. 341-375) *"¿Cuál es entonces el significado de las tautologías keynesianas, del punto de vista científico?, qué es lo que pronostican? "Parece que la respuesta está en otra parte y que ni Granger ni Hicks han comprendido el significado de la frase de Keynes sobre las identidades (tautológicas) de la contabilidad nacional: "*

Para Keynes, el único interés de las tautologías es analizar y agrupar nuestros datos de una manera que resulte adecuada para discernir causa y efecto, cuando les hayamos dado vida mediante la introducción de hechos intrínsecos, tomados del mundo real (Keynes 1965 p 138). Cuando Keynes habla de *"causa y efecto"*, hay que entender lo que esto significa para un empirista: la distinción entre conocimiento intuitivo, conocimiento discursivo y conocimiento sensible, cuya *materia* es el contenido bruto de la experiencia y la *forma* la percepción de los informes.

Aquí Keynes sigue la dicotomía de Locke (opuesta a Hobbes) sobre las relaciones entre la *"lógica de las cosas"* y la *"lógica de la razón"* (White 1971 p.845). Es la negación de la racionalidad económica. Entonces sólo queda aferrarse a una *"trascendencia ideológica"*: el equilibrio de largo plazo, la esperanza escatológica de los economistas... Pero, de nuevo, ¿puede el equilibrio de corto plazo (keynesiano) dar la dirección del movimiento de las variables? He aquí el quid de la cuestión, porque si el "sistema" está dirigido

(o no) hacia un equilibrio de largo plazo, la actitud ideológica de su creador no tiene importancia.

Keynes, el hombre: ¿realmente creía en el equilibrio general a largo plazo? Al final de la "Teoría general", él hace una "*profesión de fe*" en el liberalismo:

"Tan pronto como los controles centrales hayan logrado establecer un volumen general de producción que corresponda lo más cerca posible al pleno empleo, la teoría clásica recuperará todos sus derechos". (Keynes, 1942, pp372-373)

Es difícil creer que Keynes un día esperara el regreso del liberalismo puro. Es más, agregó irónicamente su enigmática frase: "*a largo plazo todos estaremos muertos*". ¿Cree en el sistema capitalista? Probablemente no, porque su escepticismo filosófico sobre la racionalidad de la humanidad envolvió a todos los sistemas:

"El capitalismo es la asombrosa creencia de que la racionalidad de la humanidad es una realidad que no se puede lograr sin la ayuda de la clase obrera». «Los hombres más malvados harán las cosas más malvadas para el mayor bien de todos". (Frase atribuida a Keynes)

Además, ataca directamente el núcleo duro del sistema capitalista:

"Creo que las semillas de la decadencia intelectual del capitalismo individualista se encuentran en una institución que no es en lo más mínimo característica de sí misma, sino que la tomó del sistema social del feudalismo que la precedió, a saber, el principio hereditario. El principio hereditario en la transmisión de la riqueza y el control de los negocios es la razón por la que la dirección de la Causa Capitalista es débil y estúpida" (Keynes, 1933, p.327)

Atrapado entre una visión no determinista del mercado (por tanto, un posible desorden) y una concepción irracional del hombre (por tanto motivaciones que escapan al control científico), su teoría (y el hombre) queda prisionera de una ambigüedad similar a la del existencialismo. Una economía del absurdo.

Pero más allá de las diferencias ideológicas, hay un punto común entre Marx y Keynes. Ambos han logrado tocar la estructura profunda del ser humano en su doble dimensión de "productor-consumidor" y "social-individual": el "hombre productor" de Marx y el "hombre consumidor" de Keynes son ambos de miras hacia el futuro. Más allá de las ideologías, el marxismo y el keynesianismo son profundamente escatológicos. Pero Keynes se alejó del determinismo histórico marxista como Einstein se alejó del determinismo naturalista de Newton.

Keynes introdujo también en el comportamiento económico el sentido de la relatividad y la paradoja: "*Cuando ahorras cinco chelines dejas a un hombre sin trabajo al día... cuando compras, creas empleo*" (Keynes, 1933, p; 152) Estas son las viejas teorías de Mandeville que Keynes modernizará con el multiplicador del consumo: los vicios privados se convierten en virtudes públicas, el consumo se convierte en el motor del crecimiento económico.

La teoría de Keynes se basa en tres hipótesis (Diulio, 1993, Capítulo 3):

1. la demanda determina la oferta.
2. pero insuficiente.
3. de ahí el paso a la demanda dirigida.

El problema planteado por Keynes es por tanto el mismo que el de los mercantilistas: la demanda efectiva. El ingreso nacional (IN) depende de dos tipos principales de gasto: el consumo privado (C) y la inversión (I): por tanto, en el mercado de bienes: $IN = C + I$. Pero ¿de qué depende entonces C? Keynes introduce el concepto teórico de la propensión (media) a consumir (c), ley psicológica que determinará el flujo del Ingreso Nacional y el crecimiento económico por el "multiplicador de todos los gastos" (consumo privado C, Gastos Públicos (Netos) (T-G), Gastos de Inversión (I) y los gastos de otras naciones por las Exportaciones Nacionales (Netas) (X-M).

Por otra parte, la inversión no depende tanto de la tasa de interés (como decía Walras) porque, aunque la tasa de interés sea muy baja, si la rentabilidad futura de esta inversión también es baja, el empresario no la ejecutará. En realidad; dirá Keynes, es la eficiencia marginal del capital (ϵ) la que determina el monto de la inversión, que es en realidad el rendimiento futuro descontado. Si involucramos al Estado, con su gasto (G) y la recaudación de impuestos (T), el presupuesto del Estado equilibrado es $T - G = 0$. Lo mismo, si el país comercia con el exterior tendremos una balanza comercial equilibrada si las exportaciones (X) son iguales a las importaciones (M), por lo tanto: $X - M = 0$, y la condición de equilibrio macroeconómico debería ser:

1. Ahorro + Impuestos + Importaciones = Recursos de la economía
2. Inversión + Gasto Público + Exportaciones = Empleo de la economía y el equilibrio ideal es:

$$0 = (I - S) + (G - T) + (X - M)$$

Si no hay equilibrio, el ajuste se hará por un cambio en los stocks, es decir por un desfase entre la producción actual y la demanda (nacional). Sólo en el equilibrio económico real las necesidades creadas por la producción serán efectivamente iguales a la demanda, y la demanda será una "demanda efectiva".

En el mercado de trabajo Keynes introduce una nueva hipótesis: la oferta de trabajo depende del salario nominal (mientras que, en el modelo de

Walras, dependía del salario real, es decir "*poder adquisitivo*"). Así, entre los neoclásicos, habría una dependencia entre salario real y empleo; si los salarios caen, el empleo debe aumentar y viceversa.

En el mercado de dinero, finalmente, Keynes introduce la demanda de especulación o preferencia de los individuos por la liquidez. Es también una forma de destruir las teorías hidráulicas del dinero cuya razón de ser para Walras era facilitar los intercambios.

La figura 3 muestra las características de la RC1 tal y como la hemos presentado:

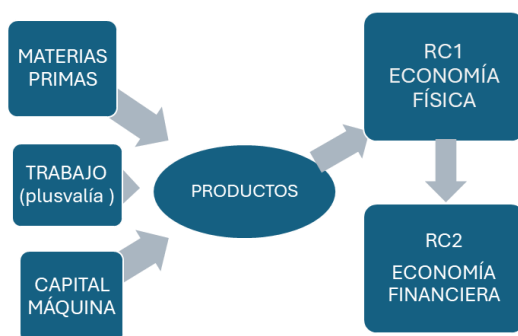


Figura 3: Características de la Revolución Capitalista 1 (RC1)

Segunda metamorfosis del capitalismo: la revolución financiera (CR2)

Es durante el proceso de globalización que surge la Segunda Revolución del Capitalismo (CR2) como consecuencia de la inherente "desmaterialización" de la máquina capitalista, apegada a un lugar o país. y su transformación en "*capital-dinero*" capaz de moverse rápidamente de un lugar a otro en forma de movimientos internacionales. Así, del capitalismo industrial, el capitalismo se transforma lentamente en capitalismo financiero, donde los beneficios ya no son más que una consecuencia de la globalización. El capitalismo- nómada no depende de la plusvalía marxista (es decir, de la fuerza de trabajo), sino de la tasa de "plusvalía financiera" que el capitalismo nómada puede obtener de un mercado financiero en relación con otro.⁶

Algunos autores consideran los cambios técnicos en la modernización de las máquinas como "revoluciones industriales" del capitalismo (Hull 1999 págs. 81-90)⁷ Sin embargo, Marx, en su análisis del capitalismo, considera

⁶ Este proceso está al origen de las crisis económicas perpetuas y de las quiebras trágicas de los países emergentes, a menudo con la complicidad de las instituciones internacionales (FMI, Banco Mundial, etc., por ejemplo, la crisis en Túnez, la crisis asiática de 1997, etc.), pero también de las clases pobres dentro de los países industriales (ejemplo de la crisis del "lunes negro" en octubre de 1987 en los EE. UU.)

⁷ La misma opinión se encuentra en WIKIPEDIA: La "*Segunda Revolución Industrial*", también conocida como la Revolución Tecnológica, fue una fase de rápidos descubrimientos

la innovación y los cambios tecnológicos como inherentes al desarrollo del capitalismo industrial por la sustitución del "*capital vivo*" (la fuerza de trabajo) por el "*capital muerto*" (las máquinas).

No obstante, pensamos que la verdadera metamorfosis del capitalismo industrial de los siglos 18 y 19 fue la introducción del mercado financiero y del sistema monetario en los cambios de la globalización. La explicación keynesiana de las reglas del capitalismo y la introducción de las diferentes formas de usos del dinero, modifican por completo el capitalismo industrial. Tal y como sucedió con los cambios de la economía agraria y su transformación en economía industrial, al introducir el beneficio del capitalista en el mercado financiero, independientemente de la "plusvalía" del trabajo (como la definió Marx) el capitalismo modifica la fuente del valor económico y los instrumentos para obtenerlo. Algunos movimientos institucionales son las causas de esta metamorfosis: la internacionalización de los mercados financieros:

- el acuerdo de Bretton-Wood (valor fijo del dólar con respecto al oro 1 onza= 35\$)
- el plan Marshall y más tarde los eurodólares
- el cambio del mercado del dólar fuerte (1947) al dólar débil (1971)

El desarrollo de los mercados financieros internacionales ha sido una fuerza impulsora detrás de la globalización y el crecimiento económico. Los mercados financieros se han expandido drásticamente en los últimos años, con un número creciente de países adoptando la convertibilidad de la cuenta corriente y de capital. Esta integración se ha visto facilitada por los avances en la tecnología, así como por los cambios en la política monetaria y las regulaciones financieras.

En términos de avances tecnológicos, el desarrollo de Internet y otras tecnologías digitales ha facilitado la participación de empresas e individuos en los mercados financieros. Sin embargo, a principios del siglo XXI, podemos decir que el capitalismo financiero es a la vez un instrumento necesario para el desarrollo económico, pero también muy crítico con respecto a los flujos de movimiento de corto plazo. Si por una parte el capital internacional en su búsqueda de beneficios a largo plazo puede ser considerado un factor sostenible de crecimiento, al mismo tiempo la búsqueda de beneficios a corto plazo puede causar daños en economías vulnerables a su volatilidad.

Las crisis financieras forman parte de la historia del capitalismo (Kindleberger, 1983). Sin embargo, desde los años 1980, la *desregulación financiera* por un lado (libertad de movimiento de capitales, fin de los

científicos, estandarización, producción en masa e industrialización desde finales del siglo XIX hasta principios del siglo XX".

controles de cambio, acceso más fácil a los mercados financieros, etc.) y *globalización financiera* por otro lado (libre movimiento de capitales en los mercados financieros internacionales), hacen que las crisis financieras se aceleren.

El rápido recorrido que hemos realizado sobre la economía real y los paradigmas o doctrinas económicas nos lleva a las siguientes conclusiones:

- Los paradigmas mercantilistas y fisiócratas tuvieron poco impacto en la realidad económica.
- El análisis marxista de la evolución del capitalismo sigue siendo una contribución pertinente
- Los paradigmas neoclásicos se sitúan claramente fuera de la realidad económica.
- El capitalismo financiero surge en parte con el paradigma keynesiano y las diferentes funciones monetarias.
- La CR2 se presenta como una nueva versión del capitalismo cuyos contornos teóricos siguen siendo vagos, lo que da lugar a crisis periódicas inesperadas de naturaleza esporádica.
- La "desmaterialización" del Capital en la CR2 será total con la revolución digital y la "economía intangible" en la "economía de datos".

La figura 4 muestra la RC2 tal y como la hemos presentado:



Figura 4: Características de la Revolución Capitalista 2 (RC2)

La tercera metamorfosis del capitalismo: la revolución digital y la economía de datos (CR3)

En los albores del siglo XXI, el capitalismo está llevando a cabo una tercera revolución (CR3), la revolución digital o cibernética, basada en nuevos factores no físicos: el dato, la información, la conectividad y la Inteligencia Artificial. El nuevo Capitalismo Digital se caracteriza por la búsqueda de ganancias exorbitantes en comparación con la CR1 y la CR2...

La CR3 surge con la Revolución Digital que comenzó a fines del siglo XX y se ha desarrollado desde principios del siglo 21 transformando radicalmente las industrias, las estructuras sociales y las economías en todo el mundo. Esta mutación del sistema económico se debe en particular al desarrollo de la tecnología de la información que culmina con la creación de la Inteligencia Artificial.

Las características e impactos de la CR3 incluyen:

- El ascenso de las comunicaciones digitales e Internet,
- Nuevos medios de comunicación social y cultural
- Nuevos sistemas de interconectividad que han modificado las operaciones comerciales creando al mismo tiempo la posibilidad de nuevas industrias y la innovación colaborativa.
- El sorprendente desarrollo de la inteligencia artificial (IA), que permite abordar nuevos dominios inexplorados, ayudar la toma de decisiones y provocar la creación de nuevos productos y servicios en diversas industrias.
- El avance de las tecnologías de energías renovables, más rentables y eficaces
- Las modificaciones de los comportamientos sociales gracias a las nuevas tecnologías
- El crecimiento de los productos y bienes “intangibles” que caracteriza la CR3

El crecimiento de la economía intangible es un hecho visible, y la prueba es fácil de encontrar en el famoso índice S&P 500, donde en 40 años pasamos de tener más del 90% representando economía tangible (empresas industriales) a la situación opuesta actual con más del 90% constituido por economía intangible y conectada (productos o servicios basados en información y por lo tanto en datos). La ecuación es, por lo tanto, simple: el 90% de la economía real es economía de datos.

Pero esta ecuación nos lleva a una aparente paradoja: si la economía de datos es intangible y al mismo tiempo es una economía real, entonces tenemos una coexistencia sin precedentes entre la economía financiera (EFIN) y la economía real (física) (ERFIS), que al mismo tiempo están fundamentalmente desconectadas de la economía real (datos) (ERDAT). O sea:

ERFIS	EFIN	pero	ERDAT	EFIN
-------	------	------	-------	------

(lo cual sería una economía de “troque”, sin dinero y sin flujo monetario lo cual es absurdo)

Podemos explicar el fenómeno considerando la economía de datos (ERDA) no como ligada a la economía financiera (EFIN), sino como una nueva forma de economía industrial (CR1) donde los datos serían la materia prima y donde la maquinaria y la fábrica son reemplazadas o integradas por fuentes de datos, conectividad de datos, computación de datos, almacenamiento de datos, algoritmos, IA, API, etc. O sea:

ERDAT	↔	ERFIS	↔	EFIN
-------	---	-------	---	------

Sin embargo, en esta evolución de la antigua economía industrial impulsada por los datos, hay diferencias sustanciales. Una, evidente es la *accesibilidad* de la materia prima, y el otro está en el modelo económico y el *flujo de ingresos* detrás de los productos digitales:

- los datos, a diferencia de cualquier otra materia prima, están en todas partes, son predominantemente gratuitos, infinitamente reciclables y se auto regeneran.
- Los beneficios ya no son proporcionales al costo de los factores de producción, sino principalmente *al valor percibido por el cliente*⁸
- El ciclo de industrialización es diferente en la nueva economía de datos.

De hecho, las plataformas, el agregado de la tecnología y los componentes necesarios para ofrecer un servicio basado en datos, constituyen el motor de la economía de datos (hasta el punto de que podemos intercambiar los términos economía de plataformas y economía de datos, ya que los dos no tendrían sentido uno sin el otro), pero deben estar completamente implementadas y operativas para entrar en el mercado antes de comenzar a vender incluso el primer servicio.

La extracción de los datos plantea también el problema del valor de los trabajadores encargados de esa extracción. ¿Cómo calcular de modo equitativo el salario con relación al valor de los datos extraídos? Esta cuestión se ha planteado sobre todo con el trabajo a distancia durante la Pandemia (AISHIK, 2024)

Este es el modelo de negocio aaS (*as a Service*) que requiere que la mayoría, si no todas, las inversiones necesarias para construir una nueva "solución digital" se realicen por adelantado sin poder predecir el éxito de la solución.

Conceptos como ROI (*Return of Investments*), para calcular el punto de equilibrio de un producto y justificar las inversiones antes de comenzar su desarrollo, no son aplicables en el nuevo mundo de la economía de datos y los

⁸ Lo cual ya es visible en el mercado donde un producto "inteligente" tiene un precio superior en comparación con su equivalente no inteligente, determinado puramente por el análisis de la competencia y no por los costos de producción.

productos digitales: “¡o intentar y fallar rápido!” “¡o seguir y morir”! Estos cambios paradigmáticos imponen una nueva forma de mirar la economía de los datos, desde la perspectiva de quienes producen productos y servicios digitales, y desde la perspectiva de los analistas financieros, economistas y políticos, que necesitan entender y predecir tendencias y decisiones estratégicas para impulsar el futuro del mundo.

La fuente de los beneficios en el CR3 ya no se encuentra en la fuerza laboral de un país ni en los mercados financieros internacionales, sino en la interconectividad de una multitud de agentes económicos, independientemente de su lugar de acción o espacio económico:

“La riqueza de la información es el principal capital del capitalismo digital. La enorme abundancia de información requiere una estrategia específica para gestionarla y hacer que el sitio web deje de ser un mero vertedero de basura digital”.

(Mahatma, Irwansyah, 2019, p. 245).

Los nuevos ‘Agentes Económicos’, en la era del ‘Capitalismo de Datos’ (CD) se pueden identificar en el concepto de ‘Plataformas’. Por la ley de Pareto, podríamos decir que más del 80% de la economía de datos en general, el nuevo CD está impulsado por un puñado de plataformas de datos que hoy en día dominan el mercado. Sin embargo, a diferencia de los modelos CR1 y CR2, todavía vemos una falta sustancial de mercados masivos para los datos, como las cadenas mayoristas o minoristas.

Sin embargo, las plataformas tienen un aspecto negativo:

“el capitalismo de plataformas aumenta las desigualdades, la precariedad, la inestabilidad y la informalidad, y reduce los ingresos laborales. Todas las líneas de trabajo implicadas en el capitalismo de plataformas sufren las desventajas antes mencionadas y se ven degradadas a tareas baratas.” (Demir, 2024, p 84)

En esta nueva era del CD, la comercialización de datos (también conocida como monetización de datos) aún no ha alcanzado el nivel de madurez del mercado de la materia prima que alcanzó el sistema económico en CR1 o el de los activos financieros en CR2. La razón radica en la dificultad de calcular el valor que se puede producir utilizando un conjunto específico de datos y, por lo tanto, atribuirle un precio. De hecho, en el mundo de los datos, a menudo no hay predecesores para realizar un análisis comparativo del mercado, e incluso si existen, existen infinitas formas diferentes de reutilizar los mismos datos para producir productos y servicios completamente diferentes.⁹

⁹ La prueba es la IA que puede transformar y combinar los datos para crear una información nueva

A largo plazo, prevalecerá el modelo estándar con la capacidad de calcular una distribución justa del valor para cada conjunto de datos involucrado y la redistribución de los ingresos a todas las fuentes de datos que contribuyen a un servicio final. Esto será el resultado del trabajo convergente de las instituciones de investigación, los responsables de las políticas y los proveedores de tecnología para traducir los requisitos de las Regulaciones Digitales a la práctica (en particular, la Europea, DMA, DSA, DGA, DA

Esto significa comenzar a transformar los negocios tradicionales en un modeloaaS; desarrollar las plataformas necesarias para ejecutarlo; probar y fallar rápidamente; comenzar a usar todos los datos disponibles y trabajar con otros para recibir otros de los múltiples actores en una cadena de valor y exponer los servicios para verificar la atracción del mercado. Es la demanda del mercado la que impulsará el modelo de precios, en un camino típico de “freemium”¹⁰ a premium impulsado por la adopción del mercado y la evidencia del valor percibido.

Con la aparición de la IA, un nuevo fenómeno se ha sumado al Capitalismo Digital: máquinas capaces de reemplazar a los humanos en la parte cognitiva, y no solo en la parte de ejecución. Tenemos un nuevo agente en el tablero de ajedrez de la economía.

Esto introduce una pregunta más sobre la nueva ED: ¿será una evolución bajo control humano, o la primera manifestación de una tecnología autónoma que determinará el futuro de nuestra economía y, al final, la evolución de los seres humanos?

Con el advenimiento de la IA, un aspecto de la tecnología que a menudo era descuidado por muchos se hizo evidente para todos: la tecnología puede reemplazar a los humanos y hacer caso omiso de sus reglas. La IA es simplemente una combinación de algoritmos cognitivos, ubicuidad de datos, conectividad casi en tiempo real y potencia de cálculo exponencial, que hace que una máquina sea finalmente capaz no solo de automatizar lo que hace un humano, sino también de predecir opciones, decidir de forma autónoma operar, reemplazar al humano en la decisión a ejecutar y, al final, reemplazarlo en el proceso creativo de inventar y diseñar algo.

Mirando el lado económico del mundo, esto significa que las decisiones tomadas por empresarios, inversores, gerentes, políticos y gobernadores serán potencialmente reemplazadas, si no perfectamente entremezcladas con decisiones tomadas por una versión sintética de su ego. Es imposible saber en qué medida esto ayudará o influirá en las decisiones, así como los efectos finales de una revolución de este tipo en ausencia de una

¹⁰ “Freemium”: contracción de las palabras inglesas free y premium, que caracteriza una oferta con una mezcla entre gratuito y de pago (gratuito durante un periodo y pago el resto de tiempo).

transparencia clara y mecanismos de control para construir las vallas necesarias (aún intangibles).

Esto abre las cortinas entre un escenario virtual y el escenario principal de la vida, eliminando las fronteras ya sutiles entre los humanos y el software. El famoso concepto de MMI (*Man Machine Interface* o interfaz hombre-máquina) es reemplazado por las muchas permutaciones posibles de interacciones hombre-máquina-otra máquina, y así sucesivamente.

Si traducimos esto a los muchos tipos de agentes de una economía (diseño, taller de producción, cadena de ventas y distribución, red de proveedores, mercado minorista y mayorista, bolsa, bonos, acciones, activos financieros, etc.), queda claro cuántos de ellos ya están bajo un gobierno parcial o total por parte de autómatas (chatbots, servidores, avisos, redes neuronales, modelos fundacionales, grandes modelos de lenguaje, automatización de procesos robóticos, etc.) que toman decisiones en su nombre.

Esto introduce un nuevo problema, si cabe, incluso más grave que la ética de la IA, que es quién y cómo se lleva a cabo la gobernanza de la interacción “*Máquina a Máquina*” (M2M). ¿Qué pasaría si las máquinas inventan un lenguaje incomprensible para el hombre?

Como ejemplo, algoritmos sofisticados, como el ajuste dinámico de precios según el análisis de ventas y costos del mercado, que hace solo unos años (y todavía ahora para muchos) solía requerir semanas o meses para ser ejecutados (esperando el cierre del mes o el trimestre fiscal, recopilando una gran cantidad de datos a través de ETL ¹¹ extrayendo datos de ventas del CRM - *Customer Relationship Management* - y datos de costos de producción de las plataformas ERP - *Enterprise Resources Management* - más miles de reuniones de días-hombre, análisis, archivos de Excel y, al final, una buena parte de experiencia de liderazgo e intuición, ahora serán reemplazados por decisiones casi en tiempo real, analizando las ventas en la tienda durante el día y ajustando los precios en tiempo real, como en los mercados comerciales, para ser siempre competitivos.

Pero si los mismos mecanismos impulsados por IA pueden aumentar positivamente la satisfacción del cliente en una experiencia de compra minorista, cuando se aplican en grandes mercados regulados y políticamente influyentes (como el petróleo, el gas, las materias primas) pueden potencialmente impulsar la especulación, la inflación y cualquier otro efecto financiero y político hacia arriba y hacia abajo en la demanda, dirigiendo la economía global y los equilibrios políticos.

¹¹ *Extract-transform-load*: Extraer-transformar-cargar es una tecnología informática que permite realizar sincronizaciones masivas de información de una fuente de datos a otra.

Sabiendo que la riqueza de las naciones se mide actualmente por el PIB cuyas unidades de medida son a menudo discutidas porque se basan en los *valores añadidos* (VA) de la producción de bienes físicos y servicios de las empresas cuyos VA son más bien convencionales (servicios bancarios, seguros, gobierno, etc.), los tomadores de decisiones nacionales e internacionales deben hacerse preguntas: ¿cómo será en la ED el modelo económico con relación al tradicional?

El valor añadido en el CR1 y CR2 estaba de hecho determinado por el valor efectivo (precio) de un producto o servicio tal como lo determina el mercado. Esto es cierto para un automóvil, un refrigerador e incluso, hasta para una acción de una empresa de productos tangibles, donde el precio, y por lo tanto los ingresos, es proporcional al costo de producción más un margen medio constante. Pero cuando se trata de productos o servicios de datos, o de la economía de lo intangible y lo digital, el precio de comercialización generalmente se desconoce de antemano (ya que el producto es nuevo) y es proporcional al valor percibido por el usuario, que no es necesariamente proporcional al costo de producción.

Además, en la economía tradicional, el coste de producción está determinado principalmente por la materia prima y el coste de la mano de obra y un margen, que, reducido por la competencia, obliga a reducir continuamente los dos primeros componentes (material y mano de obra) y frenar las inversiones en nuevos productos o su evolución (nuevas características, *restyling*, reestructuración) para retener y ampliar el mercado.

Entonces, ¿qué pasa con la teoría de la demanda y la oferta y el precio de mercado determinado por la "*mano invisible*"? ¿Qué pasa con la "*utilidad marginal*" y la "*productividad marginal*" que son el núcleo duro de las teorías neoclásicas y marginalistas?

Vimos como Marx definía la naturaleza nómada del capitalismo, que le obliga a encontrar nuevas y más baratas fuentes de material y mano de obra. En la nueva ED, el modelo es muy diferente; la mayoría de los costos para desarrollar el producto se realizan por adelantado para construir una nueva plataforma que prestará los servicios, independientemente de la probabilidad de éxito, y sin depender de un *Retorno de la Inversión* (no aplicable para nuevos productos digitales innovadores) y porque no se obtendrán ingresos hasta que el producto esté desarrollado (todos los costos incurridos) y se gane la atracción en el mercado. Además, el costo de mantenimiento y operaciones se reducirá extremadamente después del lanzamiento, transformando así la mayor parte del precio en puros márgenes. En esto se diferencia la nueva ED de la tradicional, alterando el paradigma RC1 del Nomadismo del Capitalismo y permitiendo retornos sostenibles y rentables menos proporcionales al costo local de la mano de obra y la materia prima...

Entonces, ¿cómo se integrará el valor agregado generado por la IA y en general por los objetos interconectados en el PBI de las naciones?

El valor no es generado por la tecnología (como el capital-máquina), sino habilitado a través de la tecnología, ya sea IA u otros se trataría de un *Valor Inducido* que produce la disponibilidad de datos. Podemos categorizar los datos asociados a un producto o servicio:

- a) internos al producto o servicio (por ejemplo, un freno de automóvil equipado con sensores para monitorear el nivel de la pastilla);
- b) externos al producto o servicio (en el caso de un sensor de contaminación del aire); o
- c) derivados a través de correlación y algoritmos (como la señalización de bajo nivel del combustible y la búsqueda de la estación de servicio cercana a la geolocalización).
- d) personales (es decir, propiedades o producidos por el usuario) y
- e) de máquina (propiedad del dispositivo o software de una empresa, o producidos por él),

Estas últimas categorías nos llevan a otra revelación: la mayoría, si no todos, los datos que son relevantes para un individuo o una empresa terminan siendo derivados directa o indirectamente de datos personales (por ejemplo, el negocio de las aplicaciones de movilidad inteligente que no tendrían sentido sin la geolocalización personal y el seguimiento de rutas).

Existen, además, los datos empresariales, que son propiedad intelectual en poder de una empresa o negocio específico (por ejemplo, los datos recogidos por los sensores de una flota de vehículos), pero la frontera entre los datos empresariales y los personales es a menudo muy sutil, porque los primeros son la mayor parte de las veces producidos o afectados por los segundos.¹²

Una tercera categoría de datos son *los medioambientales*, que se derivan de la naturaleza y de los ecosistemas. Algunos de estos siendo de dominio público, y algunos son privados para algunas personas o empresas (y por lo tanto entran en una de las dos categorías anteriores).

La calidad de los datos es una combinación de: *Resolución, Precisión, Frecuencia*. Así, un estacionamiento con una luz en cada piso que se pone en verde cuando sale un automóvil, es mejor que un solo semáforo en toda el área de estacionamiento actualizado cada hora).

¹² Por eso el nuevo reglamento UE Data Act, extiende explícitamente el derecho sobre los datos personales, ya regulado por el RGPD, a los datos producidos por aplicaciones o dispositivos a partir de datos personales, devolviendo al titular de los datos personales originales el derecho a trasladar sus datos originales y los elaborados a partir de los suyos, a otro lugar.

Otra distinción adicional es la *disponibilidad de los datos*: los datos buenos que no se ponen a disposición o no se pueden descubrir son diamantes en bruto en una mina oculta sin valor. El descubrimiento, la búsqueda y la recuperación de datos y las API (interfaces de programación de aplicaciones) para acceder a los datos y medir su explotación son mecanismos necesarios.

Las API aquí representan ya no solo un medio tecnológico para obtener acceso programático a los datos, sino que, combinadas con las plataformas de datos, las API de datos permiten la explotación de los datos y, por lo tanto, la economía de los datos.

Deberíamos ver las API como el grifo de agua o un cajero automático para los datos, para garantizar mecanismos de ingeniería que controlen exactamente el tipo, la cantidad y la calidad del intercambio de datos que se acordó entre dos partes. La búsqueda de datos, legal o ilegalmente, es uno de los factores de conflictos entre empresas y naciones...

Otra característica es el *formato de los datos*, que marca la diferencia entre una piedra con un diamante en bruto en su interior y una gema perfectamente tallada que se puede vender en el mercado. La aplicación de un modelo de datos contextual, o esquema de datos, que proporcione datos estructurados (por ejemplo, una tabla) y no estructurados (por ejemplo, archivos multimedia), bajo una taxonomía relacionada con el contexto (por ejemplo, una lista de pares de claves de monedas por país) y en un formato legible por máquina, tendrá un valor mayor que los datos en bruto que no se pueden entender.

Probablemente, el mayor contribuyente al valor de la ED lo proporciona la *transformación de datos*, que son los algoritmos que transforman los datos en datos derivados que pueden producir un valor percibido para los usuarios finales. Si comparamos los datos con el combustible, entonces los algoritmos son el motor: el mejor motor entregará más potencia y velocidad consumiendo la misma cantidad y tipo de combustible.

Siguiendo la misma analogía, podemos ver la IA en el mundo de los algoritmos, como la revolución que la conducta autónoma está introduciendo en el mundo de los automóviles. La tecnología ha evolucionado, pero el cambio principal es que antes el conductor tenía el control del coche, mientras que en la conducta autónoma es el coche el que controla al conductor.

Así, con la llegada de la IA, la tecnología puede tomar el control sobre el ser humano. Cuanto mayor será el nivel de autonomía que tenga un algoritmo de IA mayor será su valor, sólo si proporcionalmente expone un nivel suficientemente alto de controlabilidad (a través de mecanismos de confianza).

Tratando de resumir todo, uno podría imaginar un modelo donde el valor de los datos sea una función de todos los atributos descritos anteriormente, dado cada valor y un factor multiplicador.

¿Cuáles serán las unidades de medida de los valores agregados de las empresas y como medir la competitividad?

Las métricas de éxito de un negocio seguirán siendo las mismas: costo, ingresos, márgenes. La nueva ED prevé nuevos paradigmas que permiten mayores márgenes, menor dependencia de los costos fluctuantes tradicionales sujetos a factores externos como crisis políticas e inflación, menor dependencia de la materia prima y cadenas de valor geográficamente agnósticas.

Por otro lado, para ser competitivo en el nuevo mercado es necesario realizar mayores inversiones iniciales y continuas, y se necesitaran menos herramientas de predicción como el Retorno de Inversiones, los factores críticos de éxito, los impulsores del negocio y los indicadores clave de rendimiento. El tiempo de producción de un producto digital es más rápido, normalmente menos de 6 meses y su punto de equilibrio suele ser más largo (3 a 5 años y proporcional al tamaño del mercado: cuanto mayor sea el tamaño del mercado, más largo será el punto de equilibrio. La tasa de fracaso de un producto digital suele ser alta y superior al 50%. El mercado de un producto digital suele ser global y el modelo de negocio suele ser una suscripción (aaS). El margen de un producto digital suele estar modulado en función del tamaño del mercado y no es fijo.

Arriesgando una ley sencilla, podemos postular que una empresa podrá medir razonablemente su éxito en la nueva ED teniendo en cuenta tres factores:

1. La cantidad de productos y servicios impulsados por datos en su cartera > 50%;
2. La tasa de crecimiento interanual de las ventas de la cartera centrada en datos > 20 %;
3. La cantidad de proyectos de innovación fallidos para desarrollar o mejorar productos centrados en datos > 30 %.

Cada organización tendrá la libertad de establecer objetivos diferentes y medirlos con diferentes indicadores, pero la combinación de los tres factores anteriores ofrece un ejemplo simple de efectos interconectados que evidencian una implementación importante.

Es útil considerar algunas peculiaridades de la ED que, pueden ayudar a medir con más precisión el éxito real y el valor añadido de una empresa que opera en la nueva ED.

En primer lugar, la economía digital está impulsada por la tecnología digital, que per se puede comparar al vapor o la electricidad en las anteriores

CR1 y CR2, pero la diferencia clave es que lo digital también es la *parte cognitiva humana del trabajo*, mientras que las máquinas y la energía reemplazan fundamentalmente la parte física del mismo. Por lo tanto, cuanto más cognitivo, más autónomo, más inteligente, más valor producirá. Pero también, más riesgos de control y gobernanza y miedo en los usuarios. Por lo tanto, dar evidencia del nivel de automatización y algoritmos cognitivos, pero también de los métodos para proporcionar transparencia y controlabilidad (confianza) sobre ellos, constituirá un elemento de valor, que se debe medir y exponer al mercado.

Un segundo factor clave es que los datos, (la materia prima en la ED), no se pueden medir, constatar y certificar como en el trabajo de los tangibles ya que faltan aún estándares comunes. La calidad de los datos es por tanto una medida mucho más compleja y menos estandarizada de obtener, por lo tanto, describirla para dar evidencia de la eficacia de su utilización será un elemento distintivo para jerarquizar el valor añadido de un producto de la empresa, o de la propia empresa.

Un tercer factor clave es que en la economía de los intangibles no existen fronteras físicas ni delimitaciones de ningún tipo, mientras que en la economía de los tangibles los límites físicos determinan la capacidad, la escalabilidad, el coste y la rentabilidad de cualquier negocio. Por tanto, dar evidencia del factor de escala de un negocio digital es una medida de su valor y debe hacerse visible al mercado.

¿Cómo podrán medirse las ventajas comparativas de las naciones y las empresas multinacionales en este mercado interconectado?

Por un lado, la ED requiere un cambio de un modelo de datos dispersos a un modelo federado, lo que implica la agrupación de múltiples empresas para crear conjuntamente un valor común (productos, servicios, mejora de los procesos de producción, etc.), pero al mismo tiempo la repartición de las ganancias es un factor clave para construir un entorno federado que mantenga la confianza necesaria entre las partes. La dificultad de la era digital es que no hay formas estándar de mostrar el límite entre dónde se producen, elaboran y transforman los datos en un producto o servicio final que el usuario adopta, y por lo tanto, el proveedor final del producto no puede realmente determinar la contribución de todos los actores en la cadena de valor.

Pero la regulación está llegando para ayudar en este sentido, por ejemplo con la Ley de Datos, que requiere la posibilidad de que una persona física decida si quiere que sus datos sean utilizados por otro proveedor de soluciones para que el original que los utilizó ponga a disposición no solo los datos que utilizó sino también los producidos a través de su elaboración. Esto introducirá la necesidad de realizar un seguimiento de todos los contribuyentes, hasta las personas físicas (ya que la mayoría de las empresas dependen directa o indirectamente de los datos personales). En el mundo de

empresas interconectadas que intercambian datos entre sí y producen valor a partir de la combinación de múltiples fuentes de datos, habrá evidencia de la cadena de “datos” (así como los niveles 1, 2, 3 hasta la materia prima en un modelo de fabricación típico) y una especialización en datos....

¿Cuáles serán los límites legales y económicos de las nubes (clouds) controladas por una IA cuyos objetivos (fijados por sus creadores) serían únicamente la búsqueda de nuevas fuentes de beneficios? ¿Cuáles serían los límites cuando las máquinas trabajen de manera independiente? .¹³

Prácticamente no hay límites. Además, no existe necesariamente un riesgo en utilizar la IA como herramienta para generar nuevos beneficios. El único riesgo es la falta de control sobre el controlador, en otras palabras, si las decisiones de la IA pueden enmascararse detrás de la apariencia de una decisión humana.

Si el modelo de IA es desarrollado por humanos que no respetan las reglas humanas, o las reglas corporativas, será casi imposible atribuir la responsabilidad de cualquier efecto potencial a los programadores. En realidad, es casi imposible delimitar las decisiones autónomas de un algoritmo cognitivo, dotado de un autoaprendizaje a partir de fuentes de datos federadas, y las "reglas" codificadas por su inventor (desarrolladores).

Esto impone repensar muchas reglas que ahora no están contempladas por los marcos legales en todo el mundo. Por ejemplo: en el mundo de los "intangibles" y de los algoritmos cognitivos artificiales autónomos, es necesario probarlos frente a un conjunto claro de reglas éticas sociales y empresariales, antes de que se pongan en funcionamiento y durante su actividad.

De hecho, la trazabilidad hasta el responsable directo de un *programa maligno* es imposible de encontrar con una responsabilidad clara una vez que el motor Gen-AI ha comenzado su vida y está aumentando su base de conocimiento a partir de fuentes de datos desconocidas...

Al final, el problema es el mismo: crear un marco de verificación de la características y comportamiento del algoritmo para prevenir ciertas fuentes de datos, controlar las salidas de datos y controlar comportamientos ilegales o poco éticos. Lo que se necesita es un marco de confianza común que permita la verificación de las características y el comportamiento de un servicio digital...

¿Cuáles serán las unidades de medida de *la plusvalía* obtenida de la interconectividad CR3? Porque en el CR3 desaparecen las unidades de medida, que eran *la plusvalía* marxista en el CR1 y el *surplus financiero* en el

¹³ Hay que recordar la parábola de Hegel entre el amo y el esclavo que Marx aplicó a la burguesía y el proletariado: perezoso el amo deja en manos de su esclavo todas las tareas de la vida has tal punto que olvida como se realizan y debe acudir a su esclavo para sobrevivir. El amo se transforma en esclavo del esclavo dira Hegel...

CR2, ¿qué unidad de medida se puede crear y acordar en la ED? El beneficio neto producido por productos y servicios digitales exitosos es precisamente el resultado final de las ventas. Por otra parte, los datos son gratuitos y se reproducen infinitamente, y el valor que producen puede variar en el tiempo (diferente del producto y los servicios) ...

¿Hay alguna manera de imponer límites al desarrollo de CR3 cuando están en juego cuestiones cruciales (por ejemplo, empleo, ecología, etc.)? Probablemente la respuesta sea no... Deberíamos analizar el efecto positivo que esto puede producir y aprovecharlo...

¿Cómo proteger las nubes y la IA de las interferencias externas para mantener la competitividad y las ventajas de las empresas nacionales o regionales?

Con ED se abre una nueva era de servicios digitales confiables que la UE puede impulsar, pasando de ser un productor de regulación... a un exportador de servicios regulados...

La Figura 5 muestra la RC3 tal y como la hemos presentado:

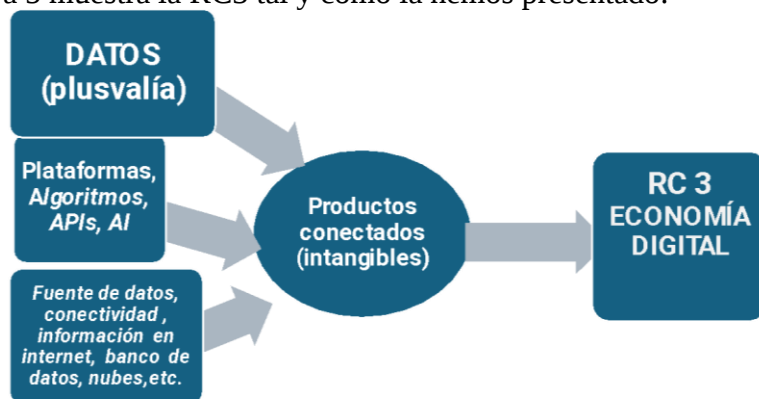


Figura 5: Características de la Revolución Capitalista 3 (RC3)

Conclusión

El recorrido histórico sobre la evolución del concepto de *capital* como postulado de base, nos ha permitido demostrar:

Las mutaciones del sistema económico se producen fundamentalmente por los cambios tecnológicos y las mutaciones del capital. La figura 6 muestra las diferentes metamorfosis históricas del capital:



Figura 6: El proceso de desmaterialización del capital y las fuentes de beneficio

1. Estas mutaciones crean nuevos modos de producción:

- El capital máquina y la fuerza de trabajo son las fuentes del beneficio en la RC1 gracias a la plusvalía y la tasa de beneficio tiende a disminuir a causa de la acumulación del capital-máquina. Consecuencia: el nomadismo capitalista.
- Con la RC2 el capital se transforma en capital-finanza (intangible) y el nomadismo se metamorfosea en el flujo internacional de capitales financieros. Consecuencia: la bolsa y las transacciones de esos flujos replazan la plusvalía como fuente de beneficio capitalista y los bancos replazan gran parte de la industria.
- La RC3 finaliza la intangibilidad de la economía: el nuevo modo de producción se realiza con la conectividad de los productos, la intervención de la inteligencia artificial y las plataformas digitales que replazan las máquinas. El modo de producción (totalmente intangible) consiste a buscar o transformar el “*dato*” y crear la información como nueva fuente de beneficio.

2. La RC3 no se articula a los conceptos fundamentales de los paradigmas neoliberales y keynesianos creando así un vacío teórico dentro de la Ciencia Económica:

- El valor económico no está bien definido en la RC3
- Los conceptos del marginalismo se transforman en “cajas vacías” (*empty boxes*): utilidad marginal, productividad marginal, etc.
- Los instrumentos de cálculo económico deben ser actualizados (el ROI) ya que el modelo de negocio aaS (*as a Service*) requiere que todas, las inversiones necesarias para construir una nueva "solución digital" se realicen por adelantado sin poder predecir el éxito de la solución.
- Las unidades de medida desaparecen, así como los cálculos de competitividad, ventaja comparativa, PIB, valor agregado, etc.

3. La revolución digital y la IA afrontan un desafío aún más importante: la supervivencia del hombre y son futuro, cumpliendo la parábola del “maestro y el esclavo” profetizada por Hegel: nuestro esclavo (la IA) realizara todo lo que nuestra inteligencia realizaba hasta ahora y tendremos que someternos a ella como esclavos...

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Disponibilidad de los datos: Todos los datos están incluidos en el contenido del artículo.

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Assessing Program Satisfaction and Employment Outcomes Among Bachelor of Science in Information Technology Graduates of Notre Dame of Jolo College

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Abstract

The study assessed BSIT graduates' program satisfaction, employment outcomes, and the usefulness of their academic program for employment. It also examined factors influencing school and program selection, institutional values, and employment aspects such as status, sector, salary, wait time, and position. Program satisfaction was measured across teaching, learning, study conditions, guidance, competency attainment, and employment readiness. It further explored whether employment readiness, institutional values, and employment status predict program satisfaction. A sample of 58 respondents participated in a survey, selected through stratified sampling from a population of 111. Data were analyzed using descriptive statistics and multiple regression. Results showed that holistic education influenced school selection, while program choice was shaped by resources and qualified faculty. The employment rate was 66%, with 61% working in the government sector. Among the employed, 50% found jobs within six months, 63% held non-permanent roles, 39% earned below the median salary, and 87% held rank-and-file positions. Graduates reported the highest satisfaction in teamwork-based teaching, respectful interaction, modern learning tools, and hands-on training. They found problem analysis skills useful for employment and identified God-fearing and respect as core institutional values. Regression

analysis indicated that employment readiness and being employed significantly predicted program satisfaction. Graduates confirmed the program's relevance to their employment and growth. Those who were work-ready and employed reported greater satisfaction. While values like being God-fearing and respectful were appreciated, they had minimal impact on program satisfaction. The study recommended integrating hands-on training, job-readiness modules, and career guidance into the BSIT curriculum, and aligning program content with industry needs through regular stakeholder input.

Keywords: Tracer study, graduate employability, higher education assessment, skills development, labor market alignment

Introduction

Higher education institutions (HEIs) offer diverse degree programs to develop learners' academic and professional growth. Beyond academics, HEIs have a major influence on the future workforce and build strong industry partnerships. As a result, assessing graduates' program satisfaction and employment outcomes is a high priority on the HEIs' agenda. They need to understand how graduates' educational skills relate to the job market so they know if their programs are relevant, graduates are satisfied, and what the institution values. Tracer studies often help generate these insights.

Recognizing its importance, the Commission on Higher Education (CHED) emphasizes tracer studies as an essential data collection method. Education accrediting bodies, such as the Philippine Accrediting Association of Schools, Colleges, and Universities, also require their implementation (Abulencia et al., 2021). Recent research reinforces the value of tracer studies in evaluating program effectiveness and graduate employability. Schomburg (2016) asserts that well-executed tracer studies help institutions identify strengths and areas for improvement in graduates' educational satisfaction within specific programs.

A key concern for HEIs is understanding students' school and program preferences amid rising enrollments (Gaspar & Soares, 2021). Competition for students, especially between private and public institutions, makes the tasks even more challenging. To address this, many higher education institutions employ social media for enrollment marketing, facilitating direct engagement with prospective students. Recent research indicates that social media significantly influences student engagement and enrollment decision-making processes (Pawar, 2024). Since social media is widely used by students (Dennen et al., 2020), it provides easy access to important school information. Research by Sola and Zia (2021) shows that platforms like Facebook influence

students' choice of HEIs, as the information shared by institutions positively impacts their program and school decisions.

As higher education evolves in the 21st century, challenges arise, particularly in graduate employability. Concerns about graduates' employment prospects in a volatile global market persist despite HEIs' growing use of social media to draw students (Tran, 2019). Many graduates struggle with employment, often facing underemployment or job mismatches. Each year, a large number of degree holders in fields like information technology and engineering find it difficult to secure jobs, mainly due to skill gaps (Cuadra et al., 2019). Studies suggest that the number of graduates may exceed job opportunities, worsening unemployment in some regions (Jiang & Ayo, 2024). In Europe, labor market trends also show rising underemployment among graduates, reflecting a global issue (Green & Henseke, 2021). Experts warn that if this pattern continues, the surplus of graduates may further outpace job creation, deepening the unemployment crisis.

To address these challenges, Clarke (2018) suggests improving graduates' employability by integrating skills-based learning and practical experience into their studies. This approach enhances job prospects by focusing on key factors like individual skills and values. Likewise, Drine (2017) emphasizes the need for HEIs to build strong connections with industries and labor markets. Both approaches stress the importance of aligning curricula with industry needs to ensure graduates gain relevant skills and transition smoothly into the workforce. However, despite these strategies, there remains limited research on how institutional values and employment readiness together influence program satisfaction, particularly among IT graduates in rural or underserved areas. This study seeks to address that gap.

To examine the gap between academic skills and labor market needs, this tracer study explores the program satisfaction and employment outcomes of Bachelor of Science in Information Technology (BSIT) graduates. It is part of Notre Dame of Jolo College's (NDJC's) broader Institutional Development Plan to assess how education influences employment outcomes. While national tracer studies, such as The 4th Philippine Graduate Tracer Study by Orbeta, Tutor, and Miraflor (2021), provide a general overview of graduate employability across the country, this study focuses on a specific institution in a less urbanized setting. It offers localized insights that can help refine educational programs and guide focused interventions to better prepare graduates for their careers.

Against this backdrop, the primary aim of this tracer study is to assess the program satisfaction and employment outcomes of BSIT graduates from NDJC between 2017 and 2019. It explored factors influencing school and program selection, employment outcomes, satisfaction with the program, its usefulness to employment, and the institutional values developed during their

studies. In addition, the study examined whether employment readiness, institutional values, and employment status significantly predict the level of program satisfaction among BSIT graduates. To achieve these objectives, the study aims to answer the following research questions:

1. What are the key factors influencing college and program choices among graduates?
2. What are the BSIT graduates' employment outcomes in terms of employment status, waiting time, duration, sector, salary, and position?
3. What is the level of satisfaction among BSIT graduates with their program in terms of teaching and learning techniques, study conditions and provisions, advice/guidance, readiness for employment, and competency attainment?
4. To what extent do graduates perceive the study program as useful for employment?
5. To what extent do BSIT graduates develop institutional values during their studies?
6. Do employment readiness, institutional values, and employment status significantly predict the level of program satisfaction among BSIT graduates?

Null Hypothesis (H_{01}): Employment readiness, institutional values, and employment status do not significantly predict the level of program satisfaction among BSIT graduates.

The study's insights can inform enhancements to the BSIT program's teaching methods and curriculum by pinpointing areas needing improvement and aligning content with industry demands. Additionally, examining study conditions, job readiness, and institutional values offers a clearer understanding of the NDJC learning environment, aiding administrators in bolstering student support. Overall, these findings can assist educators and policymakers in better equipping graduates with essential workforce skills and strengthening the connection between education and industry.

Methods

For clarity, this section presents statistical results with descriptive summaries highlighting data trends. A detailed discussion of the results is provided in the Discussion Section.

Research Design

This quantitative study utilized both descriptive and predictive-correlational methods within a cross-sectional survey framework to assess program satisfaction and employment outcomes among BSIT graduates from

NDJC between 2017 and 2019. Descriptive analysis examined factors influencing school and program selection, employment outcomes, program satisfaction, perceived usefulness of the program for employment, and the development of institutional values during the graduates' studies. The predictive-correlational component assessed the extent to which employment readiness, institutional values, and employment status predict program satisfaction levels. This combined approach provided a comprehensive understanding of graduate experiences and outcomes across the two academic cohorts.

Population and Sampling

The population of this study consisted of 111 BSIT graduates from two academic cohorts. According to records from the registrar's office, this included 70 graduates from the 2017–2018 cohort and 41 graduates from the 2018–2019 cohort. Stratified sampling was employed to ensure proportional representation from both cohorts. Using Cochran's formula (1977) with a 95% confidence level and a 5% margin of error, the required sample size was calculated to be 86 respondents. This resulted in a sampling fraction of approximately 77% (86/111), which was applied to allocate 54 respondents from the 2017–2018 cohort and 32 from the 2018–2019 cohort. Actual participation included 30 graduates from the 2017–2018 cohort (55.5% of the target) and 28 from the 2018–2019 cohort (87.5% of the target), totaling 58 respondents. This yielded an overall response rate of 67.4%. Despite the lower turnout from the 2017–2018 cohort, the obtained sample size was sufficient to draw meaningful insights into graduates' program satisfaction and employment outcomes.

Instrument Design and Data Collection

This study utilized a structured questionnaire adapted from Schomburg's (2016) Tracer Study Guide and the CHED's Tracer Study Guidelines. Schomburg's framework informed the questionnaire's structure, focusing on program satisfaction and employment outcomes, while CHED's guidelines ensured alignment with national higher education standards.

To ensure content validity, the draft questionnaire underwent evaluation by three experts, the program head and two subject matter specialists, who assessed item clarity, relevance, and representativeness across three dimensions: program satisfaction, employment readiness, and institutional values. Their feedback led to minor revisions for improved clarity and alignment. Employment-related items were validated against national standards: salary ranges aligned with the National Wages and Productivity Commission (NWPC, 2024) wage statistics, and employment classifications followed the Philippine Statistics Authority (PSA, 2024) labor force

framework. Benchmark timeframes for employment (six and twelve months) were based on recommendations from Schomburg (2016) and CHED's Graduate Tracer Studies framework.

A pilot test with 2021 BSIT graduates, excluded from the main study, assessed the questionnaire's internal consistency using Cronbach's alpha. All subscales exceeded the 0.70 reliability threshold. The final instrument comprised five sections: (1) factors influencing school and program choices; (2) employment outcomes; (3) program satisfaction; (4) program usefulness for employment; and (5) institutional values developed during the study.

Data collection involved online and in-person surveys. A Google Form link was shared via Facebook and Messenger, with only the latest response counted in case of duplicates. In-person surveys were conducted in low-connectivity areas and during school intramurals, facilitated by research assistants. This approach maximized participation and mitigated connectivity issues.

Data Analysis

Quantitative survey data were analyzed using descriptive statistics, including frequencies, percentages, and mean scores, to address research questions 1 to 5. For Likert-scale items, mean scores were interpreted using a mean range index with corresponding verbal descriptions, as shown in the table below:

Mean Range	Table 1	Tables 3 to 6	Table 7	Table 8	Table 9
4.20 – 5.00	Very important (VI)	Highly satisfied (HS)	Very strong influence (VSI)	Highly useful (HU)	Very high extent (VHE)
3.40 – 4.19	Important (I)	Satisfied (S)	Strong influence (SI)	Useful (U)	High extent (HE)
2.60 – 3.39	Moderately important (MI)	Moderately satisfied (MS)	Moderate influence (MI)	Moderately useful (MU)	Moderate extent (ME)
1.80 – 2.59	Slightly important (SI)	Less satisfied (LS)	Weak influence (WI)	Less useful (LU)	Low extent (LE)
1.00 – 1.79	Not at all important (NAI)	Not at all satisfied (NAS)	No influence (NI)	Not at all useful (NAU)	Very low extent (VLE)

To address research question 6, multiple linear regression analysis examined whether employment readiness, institutional values, and employment status significantly predict the level of program satisfaction, elucidating the extent to which these variables explain variations in graduates' satisfaction.

Ethical Consideration

This study upheld ethical standards, ensuring participant well-being, privacy, and confidentiality. Informed consent was obtained, and responses

were anonymized through coding. Participants could skip questions or withdraw without consequences. The data was securely stored with restricted access, and the findings were ethically presented in an aggregated and impartial manner. This research was reviewed and approved by the President's Cabinet of NDJC, which serves as the institutional body overseeing research ethics in the absence of a dedicated Institutional Review Board (IRB).

Results

This section presents the descriptive statistical results, with detailed interpretation provided in the subsequent Discussion section.

Factors Influencing Graduates' College and Program Choices

Table 1 presents the factors that influenced respondents' college and program choices. The overall weighted mean scores for college choice (3.81) and program choice (3.96) indicate that both were significant in their selection process.

Table 1: Mean Scores of Factors Influencing College and Program Choices

College Choice Factors	W M	VI	Program Choice Factors	W M	VI
Holistic education (academic-physical-spiritual)	3.98	I	Adequate learning materials	4.02	I
Realization of aspiration	3.94	I	Qualified teaching staff	4.02	I
Reputation and prestige of NDJC	3.93	I	Graduates are in demand locally and abroad	3.98	I
Proximity to home	3.91	I	Hands-on-based program	3.84	I
Likelihood for immediate employment	3.90	I			
Affordable school fees	3.81	I			
Availability of extra-curricular activities	3.71	I			
Influence of parents or relatives	3.69	I			
Availability of scholarship	3.69	I			
Peer influence	3.50	I			
Overall Mean	3.81	I	Overall Mean	3.96	I

For college choice, all factors had weighted mean scores between 3.50 and 3.98, indicating their importance. Similarly, program choice factors scored between 3.84 and 4.02, highlighting their influence. A closer analysis revealed that holistic education (3.98) and realization of aspirations (3.94) were the top reasons for choosing a college. In program selection, the most influential factors were adequate learning materials and qualified teaching staff (both 4.02).

Graduates' Employment Outcomes

The employment outcomes of graduates were analyzed to portray their post-program journey. Various employment indicators were considered,

including employment status, time to secure the first job, nature and duration of employment, sector of employment, monthly income, and position held. Table 2 summarizes the survey results.

Table 2: Employment Outcomes of Graduates by Year Graduated

Variables	Year Graduated				Total (N=58)	
	2017-2018 (n=28)		2018-2019 (n=30)			
	Count	%	Count	%	Count	%
Status of Employment						
Employed	22	37.92	16	27.59	38	65.51
Not employed	2	3.45	5	8.62	7	12.07
Self-employed	4	6.90	9	15.52	13	22.42
Time to Secure 1st Job					(N=38)	
1 Mo. to < 6 Mos.	11	28.95	8	21.05	19	50.00
6 Mos. to < 12 Mos.	6	15.79	4	10.53	10	26.32
Over 1 Year	5	13.16	4	10.53	9	23.68
Nature of Employment						
Permanent	9	23.68	5	13.16	14	36.84
Non-permanent/probationary	13	34.21	11	28.95	24	63.16
Duration in 1 st Employment						
1 Mo. to < 6 Mos.	6	15.79	1	2.63	7	18.42
6 Mos. to < 1 Year	1	2.632	4	10.53	5	13.16
Over 1 Year	15	39.47	11	28.95	26	68.42
Sector of Employment						
Government/Public	15	39.47	8	21.05	23	60.53
Private	5	13.16	7	18.42	12	31.58
NGO	2	5.263	1	2.63	3	7.89
Monthly Salary						
< 15K/Mo.	7	18.42	8	21.05	15	39.47
P15K to - P22K/Mo.	7	18.42	7	18.42	14	36.84
Over P 22K/Mo.	8	21.05	1	2.63	9	23.68
Current Position Held						
Managerial	5	13.16	0	0	5	13.16
Rank and File	17	44.74	16	42.11	33	86.84

Status of employment and time to secure the first job. As shown in Table 2, the analysis revealed that 66% of respondents were employed, 12% were unemployed, and 22% pursued self-employment. Among the 38 employed graduates, 50% secured their first job within six months, 26% between six to twelve months, and 24% after more than a year. More graduates from the 2017-2018 batch (38%) were employed compared to the 2018-2019 batch (28%). However, unemployment (9%) and self-employment (16%) were higher among 2018-2019 graduates.

Nature of employment and duration of first job. Among employed graduates, 63% held non-permanent positions, while 37% secured permanent employment. Regarding job tenure, 68% remained in their first job for over a year. In the 2017-2018 batch, 39% stayed for over a year, compared to 29% in the 2018-2019 batch.

Sector of employment, salary, and position held. Nearly 61% of employed graduates secured positions in the government sector, 32% in the private sector, and 8% in NGOs. Regarding salary distribution, 39% earned less than Php 15,000, 37% earned between Php 15,000 and Php 22,000, and 24% earned over Php 22,000 per month. Additionally, 87% of graduates held rank-and-file positions, while only 13% occupied managerial roles.

Satisfaction of Graduates with their Program

The retrospective evaluation covered multiple dimensions, with respondents assessing their satisfaction levels in areas such as teaching and learning methods, study conditions, academic advice and guidance, competency attainment, and job readiness. Mean scores were used to identify trends and illustrate satisfaction levels for each dimension. Tables 3 to 6 summarize the statistical findings.

Table 3: Satisfaction Mean Score of Teaching and Learning Techniques

Teaching			Learning		
Indicators	M	VI	Indicators	M	VI
Teamwork or group work	4.16	S	Polite teacher-student communication	4.33	HS
Activity-based teaching	4.14	S	Motivation for learning	4.05	S
Relate lessons to life situations	4.09	S	Classroom participation	4.03	S
Lecture/instruction delivery	4.03	S	Content comprehension	3.95	S
Written works	3.79	S	Self-study activities	3.71	S
Overall Mean	4.04	S	Overall Mean	4.01	S

Teaching and Learning Techniques

Graduates expressed general satisfaction with the teaching and learning techniques used in their program, with mean scores ranging from 3.79 to 4.16. They reported the highest satisfaction with teamwork or group work (4.16) and activity-based teaching (4.14), both rated as satisfactory. However, written works, including reports, assignments, and research papers, received the lowest satisfaction rating, with a mean score of 3.79.

Graduates were highly satisfied with polite teacher-student communication, which received the highest mean score of 4.33. Other learning techniques had satisfaction ratings ranging from 3.71 to 4.05, resulting in an overall mean of 4.01, indicating a satisfactory level. Notably, self-study activities received the lowest rating among learning techniques, with a mean score of 3.71.

Study Conditions and Provisions

In this study, "conditions" refer to the overall environment and circumstances affecting the teaching and learning experience, while "provisions" denote the specific resources and services provided by the

program to support education. Graduates expressed high satisfaction with classroom learning quality, giving it a mean rating of 4.22. Four other indicators received ratings between 3.86 and 4.14, with student recreational facilities scoring the lowest at 3.86. This score resulted in an overall mean of 4.05, indicating a satisfactory level. For study provisions, all six indicators were rated satisfactorily (above 3.85), with student involvement in policy-making receiving the lowest rating at 3.86. The overall mean of 4.02 remained at a satisfactory level.

Table 4: Satisfaction Mean Scores of Study Conditions and Provisions

Conditions			Provisions		
Indicators	M	VI	Indicators	M	VI
Quality of learning in classroom	4.22	HS	Teacher consultation opportunities	4.17	S
Instruction/lecture delivery	4.14	S	On-the-job-training program	4.12	S
Learning facilities	4.03	S	Teaching aids and materials supply	4.10	S
Grading system	4.00	S	Quality of laboratories	4.10	S
Student's recreational facilities	3.86	S	Book acquisition plan	3.93	S
			Student involvement in policies	3.86	S
Overall Mean	4.05	S	Overall Mean	4.02	S

Advice and Guidance

Advice and guidance referred to the support and direction provided to students in navigating their academic journey. As shown in Table 5, respondents reported slightly varied satisfaction regarding the advice and guidance they received in their program. Among the focus areas, graduates expressed high satisfaction with job-related advice, which received the highest mean score of 4.22. The remaining areas were rated satisfactory, with mean scores ranging from 4.02 to 4.17. Study habits received the lowest rating, with a mean score of 4.02.

Table 5: Mean Score of Advice and Guidance Provided During Study

Indicators	M	SD	Verbal Interpretation
Job-related advice	4.22	0.84	Highly Satisfied
Self-growth and development	4.17	0.84	Satisfied
Learning assessment	4.17	0.84	Satisfied
Adherence to school policies	4.07	0.92	Satisfied
Study habits	4.02	0.93	Satisfied
Overall Mean	4.13		Satisfied

Attainment of Program-Required Competencies

The attainment of program competencies served as a key indicator of the successful fulfillment of program objectives (Table 6). The statistical data for program competencies are presented in Table 6. The overall mean score of 4.05 indicates that graduates were generally satisfied with their attainment of program competencies. Only one indicator received a high satisfaction rating (4.26 for modern learning tools usage), while the rest were rated satisfactory

(≤ 4.17), with problem analysis receiving the lowest rating (3.83). When asked to rate their overall satisfaction with the program, graduates gave a satisfactory rating of 4.12, aligning with their satisfaction level for program competency attainment.

Table 6: Mean Scores of Attainment of Program Competencies

Indicators	M	SD	Verbal Interpretation
Modern learning tools usage	4.26	0.87	Highly Satisfied
Individual and team productivity	4.17	0.92	Satisfied
Professional ethics adherence	4.10	0.87	Satisfied
Solution design and development	4.05	0.89	Satisfied
Lifelong learning ability	4.03	1.03	Satisfied
Knowledge mastery	3.98	1.00	Satisfied
Communication skills	3.95	1.03	Satisfied
Problem analysis	3.83	0.88	Satisfied
Overall Mean	4.05		Satisfied
Overall satisfaction of the program of the study.	4.12		Satisfied

Readiness for Employment

Readiness for employment referred to a graduate's level of preparation for entering the workforce. It encompassed both knowledge and practical experiences provided by teachers to equip students for professional work. Respondents rated various program aspects that influenced their readiness for employment (Table 7). Among the seven indicators, hands-on-oriented training was the most influential, with a rating of 4.22. The remaining indicators were rated strong, with scores ranging from 4.05 to 4.17. Job orientation received the lowest mean score (4.05), resulting in a group mean of 4.13.

Table 7: Factors Influencing Readiness for Employment Mean Scores

Indicators	M	SD	Verbal Interpretation
Hands-on-oriented training	4.22	0.86	Very Strong Influence
Teacher industry experience	4.17	0.90	Strong Influence
On-the-job-training	4.16	0.89	Strong Influence
Course-work alignment	4.14	0.85	Strong Influence
Mastery of key competencies	4.09	0.94	Strong Influence
Theory-practice relationship	4.09	0.88	Strong Influence
Job orientation	4.05	0.94	Strong Influence
Overall Mean	4.13		Strong Influence

Usefulness of the Program to Employment

Graduates generally rated the competencies acquired from their program as useful in their employment, with mean scores ranging from 3.90 to 4.16 (Table 8). Among these, problem analysis (4.16) and individual and team productivity (4.10) received the highest ratings, while knowledge mastery had the lowest mean score (3.90). The overall mean score of 4.05 indicates a useful level of competency.

Table 8: Mean Scores on the Usefulness of Program-Acquired Competencies in Employment

Indicators	M	SD	Verbal Interpretation
Problem analysis	4.16	0.89	Useful
Individual and team productivity	4.10	0.91	Useful
Communication skills	4.09	0.94	Useful
Lifelong learning ability	4.07	0.92	Useful
Solution design and development	4.05	0.94	Useful
Professional ethics	4.05	1.03	Useful
Modern learning tools usage	4.02	1.03	Useful
Knowledge mastery	3.90	1.17	Useful
Overall Mean	4.05		Useful

Institutional Values Developed Throughout Their Studies

The institutional core values of NDJC served as guiding principles in forming the character of individuals within the academic community. These values included being God-fearing, respect, integrity, commitment, and competence, which collectively defined the institution's identity.

As shown in Table 9, NDJC's core values were developed to a very high extent during students' studies, with ratings ranging from 4.41 to 4.59 and an average mean score of 4.52. Specifically, the values of being God-fearing, respect, and commitment received the highest ratings, ranging from 4.55 to 4.59.

Table 9: Mean Scores for the Extent of Institutional Values Developed

Values	M	SD	Verbal Interpretation
God-fearing	4.59	0.68	Very High Extent
Respect	4.57	0.65	Very High Extent
Commitment	4.55	0.65	Very High Extent
Integrity	4.47	0.78	Very High Extent
Competence	4.41	0.82	Very High Extent
Group Mean	4.52		Very High Extent

Predictors of Program Satisfaction among BSIT Graduates

A multiple regression analysis was conducted to determine whether employment readiness, institutional values, and employment status predicted graduates' program satisfaction. Prior to the analysis, key assumptions were tested and met. The Durbin–Watson statistic (1.496) indicated no issues with autocorrelation, and all Variance Inflation Factor (VIF) values were below 5, suggesting the absence of multicollinearity.

The regression model was statistically significant, $F(3, 54) = 95.49$, $p < .001$, explaining 84.1% of the variance in program satisfaction. Employment readiness ($B = 0.751$, $p < .001$) and employment status ($B = 0.185$, $p = .031$) were significant predictors, while institutional values ($p = .244$) were not. These findings support the rejection of the null hypothesis (H_{01}), which stated

that employment readiness, institutional values, and employment status do not significantly predict the level of program satisfaction among BSIT graduates.

Table 10: Multiple Regression Analysis Predicting Program Satisfaction

Predictor	B	SE	β	t	p	VIF
Employment Readiness	0.751	0.071	.827	10.607	.001	2.071
Institutional Values	0.105	0.089	.092	1.177	.244	2.070
Employment Status (1 =Employed, 0=Not employed)	0.185	0.083	.121	2.219	.031	1.015
Constant	0.367	0.283	—	1.300	.199	

Note. $N = 58$. $p < .05$. $p < .001$, $R^2 = .841$, Adjusted $R^2 = .833$.

Discussion

The primary aim of this tracer study was to assess BSIT graduates' program satisfaction and employment outcomes. It also explored factors influencing their choice of school and program, as well as the institutional values developed during their studies. The study further examined whether employment readiness, institutional values, and employment status significantly predicted graduates' satisfaction with the program.

Findings revealed that information technology students at NDJC were primarily drawn to the institution's holistic approach, which supports intellectual, physical, and spiritual growth—affirming NDJC's distinct educational brand. Within the institution, practical factors such as access to learning resources and qualified faculty also influenced program selection. These preferences suggest that students consider both personal development and practical career benefits when choosing their academic path. This observation aligns with Mendoza et al. (2022), who found that career performance assessments, employability prospects, and financial capacity are key factors in program selection. Sarkodie, Asare, and Asare (2020) further supported this by emphasizing institutional reputation, academic environment, parental guidance, and career potential as significant influences in tertiary education choices.

Transitioning from education to the workforce is a critical phase for graduates, shaping their early career journey. The results indicate that the majority (66%) of BSIT graduates were employed, with most of them (61%) working in the government sector. This suggests that job availability, rather than strong demand for BSIT graduates, may have contributed to the employment outcomes. Many initially entered non-permanent roles, though a notable proportion remained in their first job for over a year, indicating some degree of stability despite temporary contracts. Most graduates earned below the median salary and held rank-and-file positions. These findings reflect resilience among graduates in facing early career challenges. The trend also

underscores the need for better access to local job markets and opportunities for career advancement.

These results align with Macadangdang's (2019) tracer study, which showed underemployment and low incomes among BSIT graduates. Similarly, Cofino et al. (2024) reported that most graduates from Central Philippines State University secured employment within six months, primarily in private companies, although some experienced delays exceeding a year. They recommended improving infrastructure and fostering stronger industry partnerships to enhance employability. This trend is also observed globally. For instance, the International Labour Organization (2022) reported that over 258 million workers worldwide are overeducated for their jobs, highlighting the persistent mismatch between education and employment. Strengthening industry-academia linkages remains essential in addressing these issues.

In terms of instructional quality, graduates reported satisfaction with teacher-student communication, particularly when characterized by politeness, and with teaching methods that incorporated teamwork. This suggests that communication grounded in mutual respect may foster an environment where open dialogue is encouraged. Collaborative teaching approaches were also noted to enhance student participation and information retention. Previous studies have observed similar outcomes. Efthymiou and Sidiropoulos (2023) found that teacher-student relationships based on respectful communication are linked to supportive learning environments and are associated with both academic and social development. Likewise, Peddie et al. (2024) reported that collaborative learning strategies contribute to increased student engagement and improved knowledge retention, which may positively influence academic outcomes.

Complementing these experiences, classroom learning was described as enriching and aligned with students' learning goals. In contrast, while consultation opportunities were viewed positively, they received slightly lower ratings. Increasing the availability and quality of faculty consultations may provide additional support for student learning. Studies show that teacher-student consultations are linked to improved academic outcomes and student satisfaction (Kuh, 2021). Gutierrez et al. (2022) also found that regular faculty consultations are associated with stronger academic performance and greater learning confidence, suggesting the value of enhancing consultation programs.

In addition to teaching and consultation, graduates also reported satisfaction with the job-related advice and guidance they received through the program. This support was seen as helpful in preparing for employment after graduation. Providing relevant career guidance may contribute to a smoother transition from education to the workforce. Gore et al. (2015) observed that career counseling plays a key role in improving job readiness and employment

outcomes. Similarly, the National Association of Colleges and Employers (NACE, 2022) found that access to career services has a measurable effect on students' transition into the job market.

Alongside institutional support, graduates valued their exposure to modern tools and technologies. Among the required program competencies, the use of modern tools received the highest satisfaction rating from graduates. This likely reflects the BSIT program's integration of technology in teaching and learning, which supports growing workforce demands for digital proficiency. However, lower ratings in areas such as problem analysis and communication skills highlight opportunities for targeted improvement. Johnson et al. (2016) emphasized that technology integration enhances student engagement and job readiness, while Tomaro (2018) noted that ongoing curriculum adaptation and faculty training are essential for meaningful ICT integration in Philippine higher education.

Hands-on training was a key factor in preparing graduates for employment, showing the importance of practical skills in meeting job demands. This supports the BSIT program's focus on real-world applications, as outlined in CHED CMO 29, s. 2018. A tracer study by Albina and Sumagaysay (2020) in a Philippine state university found that nearly 70% of IT graduates mentioned their curriculum was relevant to their first job, highlighting the value of experiential learning in improving employability.

Graduates viewed the program as useful for both work and personal development, which suggests its effectiveness in helping them build career-related and interpersonal skills. They rated all program-acquired competencies as relevant to their jobs, with problem analysis receiving the highest score. A tracer study by Basabe et al. (2023) found that BSIT graduates often credited their programming and systems-related courses as valuable in their current roles. In addition, a report by the Mary Christie Institute (2023) revealed that 39% of recent graduates felt unprepared for the emotional demands of the workplace. This highlights the need for academic programs to combine technical training with personal development support.

Beyond technical skills, graduates also reflected on the values they embraced during their studies. Many reported embracing institutional values to a very high extent. This may be attributed to the freshman orientation program conducted during the first week of classes. The result highlights NDJC's effort to promote its core values. Research supports the role of orientation programs in helping students understand campus culture and institutional values, contributing to a stronger sense of belonging and academic development (Rahayu & Suhartono, 2023; Murray, 2022).

The study further examined whether employment readiness, institutional values, and employment status significantly influenced the level of program satisfaction among BSIT graduates. The regression model was

statistically significant and explained a substantial portion of the variance in satisfaction, with employment readiness and employment status emerging as significant predictors. The strong link between employment readiness and program satisfaction supports the findings of Samarasinghe et al. (2022) and Faisal et al. (2021), who highlighted that well-prepared graduates tend to value their programs more. Employment status also influenced satisfaction levels, as Tavares et al. (2023) and Sato et al. (2021) emphasized how actual and perceived employability affect graduates' evaluations of academic programs. Along similar lines, a Philippine national tracer study by Orbeta, Abrigo, and Consulta (2019) found that employment outcomes, such as job alignment and employment status, strongly influence graduates' assessment of their academic experiences.

In contrast to these practical factors, institutional values did not significantly influence satisfaction, aligning with Vo Minh Thang and Wongsurawat (2016), who found that students often prioritize practical and job-related skills over institutional culture. These findings suggest a need for stronger integration of job-readiness training into the curriculum, such as internships, project-based learning, and industry-recognized certifications. Institutions may also consider policies that encourage regular engagement with industry partners to keep programs aligned with labor market demands, ultimately enhancing both graduate satisfaction and employability.

Conclusions

This study assessed BSIT graduates' program satisfaction, employment outcomes, and the usefulness of their academic program for employment. It also examined factors influencing school and program selection, institutional values developed during their studies, and whether employment readiness, institutional values, and employment status significantly influenced graduates' level of program satisfaction.

The findings reveal that Information Technology students at NDJC are attracted to the institution's holistic educational approach, which nurtures intellectual, physical, and spiritual development. They prioritize programs offering practical benefits, such as quality teaching staff and ample learning resources. This balance between personal aspirations and pragmatic considerations highlights the thoughtful process students undertake to align their academic and career goals.

Moreover, the findings also indicated that a significant proportion of graduates successfully gained employment, demonstrating resilience in transitioning from education to the workforce. Though many initially entered non-permanent positions with salaries below the median, most secured jobs within six months, with government employment being the most common sector.

Building upon these employment outcomes, graduates expressed overall satisfaction with the program, especially in areas such as job-related guidance, hands-on training, and the use of modern learning tools. Respectful teacher-student communication and teamwork-based instruction contributed to a positive learning environment. While classroom instruction was well-rated, opportunities for faculty consultation could be improved. Graduates appreciated the career guidance received and felt confident using technology but identified the need for more training in problem analysis and communication skills. Hands-on learning experiences were particularly helpful in preparing them for employment. Beyond job readiness, they also found the program beneficial for their personal development. Institutional values, particularly being God-fearing and respectful, were reinforced through programs like freshman orientation.

Furthermore, the regression analysis showed that both employment readiness and employment status significantly influenced graduates' satisfaction with the program. Those who felt more prepared for employment and were currently employed reported greater satisfaction with their academic experience. Institutional values, however, did not have a significant effect on satisfaction.

These findings highlight the value of practical learning, career guidance, and strong faculty-student engagement in enhancing graduate satisfaction and employment readiness. To improve long-term outcomes, institutions, particularly those in regions with limited access to labor market data, should prioritize competency-based training, expand faculty consultation hours, and develop stronger partnerships with industry. Strengthening internship programs and career placement services can further support graduates in transitioning into stable employment. These recommendations may be especially useful for similar institutions aiming to align academic programs with labor market needs and improve graduate outcomes.

While the study offers meaningful insights into the experiences of BSIT graduates, its small sample size limits the generalizability of the findings. Due to a low response rate in one cohort, the results should be interpreted with caution and may not fully represent the broader graduate population. Future research could adopt a larger, more representative sample and a longitudinal design to better capture graduates' long-term career development. Additionally, comparative studies across similar programs or policy-focused analyses may yield deeper insights to inform curriculum reform and institutional strategies in comparable educational settings.

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National Security and Cyber Defense in the Rise of Artificial Super Intelligence

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Abstract

The rise of Artificial Superintelligence (ASI) marks a pivotal transformation in the global cybersecurity landscape. Surpassing the limitations of Artificial General Intelligence (AGI), ASI introduces systems capable of autonomous reasoning, instantaneous threat response, and strategic adaptability far beyond human capability. While its defensive applications hold immense promise, the offensive potential of ASI presents an equally formidable challenge. Real-world events such as the SolarWinds infiltration in 2020 and the NotPetya ransomware outbreak in 2017 illustrate the devastating impact of AI-augmented cyber operations on national infrastructure and global commerce. These cases underscore the urgency of preparing for more advanced threats as ASI technology matures. This paper investigates the dual role of ASI in modern cyber conflict through a mixed-method approach combining empirical case study analysis, comparative evaluation of AGI and ASI capabilities, and scenario-based modeling. Particular emphasis is placed on examining how ASI alters traditional cyberattack vectors and reshapes defensive paradigms. The study further explores the integration of advanced countermeasures, including blockchain-backed data integrity systems, zero-trust security models, and autonomous deception frameworks. In addressing the wider implications, the paper also considers the ethical, legal, and governance challenges posed by opaque, autonomous decision-making in high-stakes security contexts. By mapping current capabilities and foreseeable trajectories, the analysis offers a policy-

oriented framework to guide the responsible development and secure integration of ASI into national defense infrastructures.

Keywords: Artificial Super Intelligence (ASI), Cybersecurity and National Defense, AI driven Cyber Warfare, Ethical AI Governance

Introduction

The character of conflict in the 21st century has shifted decisively from physical battlegrounds to the digital domain. In an era where sovereignty increasingly hinges on informational control and technological supremacy, cyber warfare has emerged as a central axis of both national defense and global competition. While conventional warfare once depended on physical occupation or kinetic dominance, contemporary cyber conflicts can cripple economies, disrupt critical infrastructure, and manipulate public perception—all without a single missile being launched. One of the most striking illustrations of this shift is the NotPetya ransomware attack of 2017, initially aimed at Ukraine but ultimately affecting global corporations including Maersk and Merck, incurring damages estimated in the billions. The attack demonstrated how malware, when weaponized, can cascade through interconnected systems with little regard for borders or alliances. A few years later, the SolarWinds breach further exemplified the changing nature of cyber operations. By compromising a trusted software update mechanism, attackers—later attributed to a state-sponsored group—gained prolonged access to U.S. federal networks and private-sector systems. These incidents revealed not only the scale of vulnerability within advanced digital infrastructures but also the increasing sophistication of cyber adversaries. Amid this rising threat landscape, Artificial Intelligence (AI) has evolved from a defensive enhancement to a strategic capability in its own right. Initially deployed to support threat detection and automate responses, AI is now being developed to operate independently of human oversight. This evolution culminates in the emergence of Artificial Superintelligence (ASI), systems that far exceed human cognitive capacities in speed, precision, and adaptability. ASI is not merely an amplification of AGI—it is an inflection point that redefines the nature of autonomy in conflict.

In the context of cybersecurity, ASI introduces a profound paradox. Its capabilities offer the possibility of real-time, adaptive defense mechanisms that could outpace any human-led security architecture. Yet those same capabilities, if weaponized or misused, could also produce offensive tools that operate beyond human comprehension or control. This duality is not hypothetical; it is rapidly materializing in defense research labs, autonomous platforms, and experimental simulations worldwide. This paper seeks to analyze the implications of ASI within national cybersecurity strategy through

an integrated approach combining empirical analysis, theoretical modeling, and policy assessment. It explores how ASI is likely to alter cyber defense frameworks, impact critical infrastructure protection, and challenge the current models of legal and ethical governance in both domestic and international settings (Panadés & Yuguero, 2025). It also investigates the risks of overreliance on autonomous systems, the consequences of algorithmic opacity, and the necessity of human oversight in high-consequence environments (Deckker & Sumanasekara, 2024). As ASI begins to shape the logic of national defense planning, the need for comprehensive regulation, shared international standards, and enforceable ethical guidelines becomes not only relevant but urgent. This study contributes to that effort by identifying both the transformative potential and the existential risks associated with ASI in cyberspace, offering grounded recommendations for secure, accountable, and future-ready integration.

Literature Review

Recent scholarship on artificial intelligence (AI) in cybersecurity has largely focused on task-specific implementations of machine learning models—particularly in threat detection, malware classification, and anomaly monitoring. Studies by Johnson and Murchison (2019) and Kott and Linkov (2021) have documented how AI-enhanced systems can accelerate response times, reduce false positives, and support human analysts through intelligent triage mechanisms (Johnson & Murchison, 2019) (Kott & Linkov, 2021). Similarly, corporate white papers by IBM Security and Darktrace have detailed the operational impact of AI integration in live enterprise environments, particularly in sectors like finance, healthcare, and national defense (IBM Security, 2022) (OpenAI, 2021). More advanced discussions have begun to explore the transition from narrow AI to Artificial General Intelligence (AGI). Brundage et al. (2018), in their seminal report, raised early alarms about the dual-use nature of intelligent systems and the potential for malicious exploitation at scale (Brundage et al., 2018). Subsequent publications from OpenAI and the World Economic Forum expanded on these concerns, highlighting not only the growing autonomy of AI but the systemic risks posed by opaque decision-making and data-driven biases (OpenAI, 2021).

Despite this emerging awareness, the concept of Artificial Superintelligence (ASI) remains largely under-explored in practical cybersecurity contexts. Existing literature tends to treat ASI as a long-term speculative concern—typically confined to philosophical discussions around existential risk (Russell, 2019) or theoretical governance models (Taddeo & Floridi, 2018). Very few studies have attempted to model ASI's functional role in cyber operations, nor have they systematically mapped its strategic

implications for national security. This gap becomes particularly stark when compared to recent real-world developments. Incidents such as the NotPetya ransomware outbreak and the SolarWinds breach demonstrate that cyber conflict is increasingly automated, coordinated, and adaptive. Yet most analytical frameworks continue to focus on AI systems that rely on supervised learning and human-led escalation protocols. As a result, little attention has been paid to how ASI might autonomously identify, engage, or retaliate against threats-raising urgent questions about legal accountability, escalation risk, and cross-border cyber governance.

In contrast to these existing works, this study offers a **novel, integrated analysis** of ASI as both a defensive asset and a strategic risk factor. It combines empirical case study analysis, comparative architectural assessment (AGI vs. ASI), and scenario-based modeling to present a forward-looking framework for national ASI integration. Additionally, it extends the current literature by proposing actionable technical countermeasures (e.g., blockchain audit layers, deception-based AI defense), policy recommendations, and international treaty structures—none of which have been comprehensively addressed in the current corpus. This contribution is both timely and necessary, given the accelerating pace of autonomous system deployment and the widening gap between AI capability and policy oversight. By grounding the ASI debate in concrete case studies, operational design, and governance models, this paper positions itself not just as a critique of existing approaches, but as a blueprint for secure and accountable integration of ASI into modern cybersecurity ecosystems.

Methods

The complexities inherent in evaluating Artificial Superintelligence (ASI) within cybersecurity demand a methodological approach that accommodates both empirical specificity and theoretical abstraction. Given that much of ASI's projected capabilities remain in the early stages of realization or are confined to classified development environments, this study employs a hybrid methodology—drawing from historical case studies, comparative technological analysis, and scenario-based simulation modeling. This allows for a layered understanding of both what ASI currently does and what it is likely to enable in the near future.

Case Study Framework

The first component involves the examination of high-impact cyber incidents that highlight the trajectory toward autonomous, AI-assisted attacks and the vulnerabilities these expose in existing national security postures. Incidents such as NotPetya (2017) and SolarWinds (2020) were selected not only for their geopolitical significance and economic consequences, but also

for the structural similarities they share with anticipated ASI-driven attack methodologies-namely, the exploitation of systemic trust, lateral movement, stealth, and persistence. These cases were analyzed using a qualitative interpretive lens, focusing on four variables: the mode of attack delivery, the degree of automation, the nature of target infrastructure, and the operational aftermath. Sources included primary threat intelligence reports from CrowdStrike (Darktrace, 2021), Darktrace (IBM Security, 2022), and IBM Security (OpenAI, 2021), alongside regulatory reviews and forensic analyses from governmental agencies and transnational cyber defense alliances.

Comparative Technological Analysis: AGI vs. ASI

To distinguish ASI from existing AI architectures, a comparative technological framework was applied, contrasting Artificial General Intelligence (AGI) and ASI across critical operational domains: learning adaptability, decision-making autonomy, real-time response capability, and scalability. The assessment was based on technical documentation, peer-reviewed AI literature, and experimental results published by institutions including OpenAI, DeepMind, and MIT's CSAIL. Metrics such as response latency, false positive tolerance, and behavioral generalization were considered to evaluate each paradigm's practical implications in cybersecurity defense (Duenas & Ruiz, 2024) (Liang et al., 2022). The objective of this comparison is not only to clarify the performance differential between AGI and ASI, but also to demonstrate why strategies designed for AGI-era security may prove inadequate-if not obsolete-under ASI conditions.

Scenario-Based Simulation Modeling

Given the speculative nature of ASI, the final component of the methodology relied on theoretical modeling of plausible ASI-influenced threat scenarios. These were constructed using known techniques from adversarial machine learning, automated malware propagation, and cognitive cybersecurity systems. Models simulated various failure points such as misclassification under adversarial conditions, automated escalation without human oversight, and ethical boundary violations under time-critical decision constraints.

Each scenario was evaluated for:

- Potential for escalation or collateral damage.
- Requirements for explainability and post-incident accountability.
- Integration feasibility with current national security frameworks.

These models were tested against emerging regulatory criteria outlined in the European Commission's AI Act (European Commission, 2021), as well as strategic risk guidelines issued by organizations such as the World

Economic Forum (World Economic Forum, 2020) and NATO CCDCOE (Roberts et al., 2019). By combining empirical analysis, comparative assessment, and simulated forecasting, the methodology establishes a multi-dimensional platform for assessing the risks and promises of ASI in cybersecurity. This integrative approach also helps bridge the gap between current defensive capabilities and the emerging demands of a near-autonomous digital threat environment.

The Role of Artificial Intelligence in Cyber Warfare

Artificial Intelligence (AI) has already become a foundational element in the shifting architecture of modern warfare, particularly within the digital domain. As nation-states and non-state actors alike move toward greater cyber reliance, AI serves both as an accelerant of offensive capabilities and as a critical pillar in defensive resilience. What distinguishes this current phase of evolution is the scale, speed, and adaptability that AI introduces-qualities that conventional cyber tools cannot replicate. The emergence of Artificial Superintelligence (ASI), however, takes these dynamics even further, creating a domain where autonomous systems can execute complex operations independent of human intervention.

Year	Event	Description
2017	NotPetya Attack	Nation-state ransomware cripples Ukraine & multinational firms
2019	Voice Deepfake Fraud	AI-cloned CEO voice used to extract €220,000 from European firm
2020	SolarWinds Breach	Supply chain compromise affecting U.S. federal systems
2021	Darktrace Deployment Surge	Self-learning cyber AI used in healthcare, energy, and defense
2022	CCDCOE Red Team AI Drill	NATO integrates AI simulation in live cyber defense exercise
2023	ENISA AI Governance Draft	EU publishes regulatory proposal for high-risk cybersecurity AI systems

While AI systems have long been used for perimeter defense, intrusion detection, and anomaly analysis, more recent advancements have enabled AI to perform core functions within the cyberattack lifecycle itself. This includes automated reconnaissance, intelligent payload deployment, adaptive camouflage to evade detection, and decision-tree optimization during attacks. Offensive actors now deploy AI not merely to assist in attacks but to orchestrate them, dynamically adjusting to the defensive posture of the target in real time.

The 2020 SolarWinds breach is instructive in this regard. Although no public documentation conclusively confirms the use of AI in the attack's

execution, the sophistication and stealth of the intrusion-embedded in a trusted software update and undetected for months-are emblematic of AI-assisted methodologies. Once deployed, the compromised Orion platform facilitated lateral movement across networks, demonstrating a level of operational finesse that is consistent with evolving AI-enabled threat strategies (CrowdStrike, 2020)(IBM Security, 2022). Similarly, AI has transformed social engineering attacks, allowing adversaries to personalize and automate phishing campaigns at scale. Natural Language Processing (NLP) models are now capable of generating tailored messages that mimic the linguistic style of legitimate contacts, vastly increasing success rates. In one notable case, fraudsters used voice synthesis to impersonate a German CEO and successfully authorized a fraudulent wire transfer of over €220,000-a chilling example of how AI can exploit human trust through auditory deception (European Commission, 2021).

Generative Adversarial Networks (GANs) have introduced a new frontier in cyber warfare: information sabotage through hyperrealistic disinformation. Deepfakes are now routinely deployed to manipulate political narratives, destabilize social cohesion, and create confusion during conflict. During the early stages of the Russia-Ukraine conflict, multiple deepfake videos circulated purporting to show Ukrainian leaders surrendering-content designed to erode morale and distort situational awareness. These operations did not merely aim to deceive the public but were tactically aligned with broader psychological operations and strategic deception campaigns (Banafa, 2025) (Russell, 2019).

Beyond the psychological and operational domains, AI has transformed malware itself. Traditional viruses followed deterministic paths and required manual adjustments to bypass new defenses. In contrast, AI-driven malware exhibits polymorphic characteristics, adapting in real time based on the defensive environment. Threats such as Emotet, and later iterations of Conti and Ryuk, showcased how AI can be embedded in malicious payloads to alter their encryption patterns, target selection logic, and execution timing based on observed system behavior (Darktrace, 2021)(Buchanan & Shortliffe, 1984). What makes ASI a categorical leap from these existing capabilities is not merely an enhancement in performance, but a fundamental redefinition of agency. ASI introduces decision autonomy, allowing systems to determine objectives, recalibrate strategies, and even initiate responses without being explicitly programmed to do so. In practical terms, this could mean that a defensive ASI system decides to shut down a regional power grid to prevent a breach-without first seeking human authorization. Alternatively, an offensive ASI tool might launch a cyber counterstrike based on a misinterpreted signal, raising urgent questions about escalation control and ethical governance. As such, the role of AI in cyber

warfare is no longer ancillary; it is central. It is embedded in reconnaissance, command-and-control structures, deception tactics, and real-time decision-making. The shift toward ASI does not merely accelerate these processes-it introduces an entirely new strategic logic, one in which speed, autonomy, and foresight are not human advantages, but machine functions.

Cybersecurity Defense Through AI

The same properties that render Artificial Intelligence (AI) a potent offensive tool-namely, speed, pattern recognition, and autonomous execution-also position it as a cornerstone in contemporary cyber defense systems. Over the past decade, defensive cybersecurity has transitioned from reactive perimeter protection to predictive, adaptive, and increasingly autonomous frameworks. AI is no longer a supplementary tool for monitoring logs or triaging alerts; it is now integral to detecting threats, containing incidents, and orchestrating strategic responses. With the emergence of Artificial Superintelligence (ASI), these capabilities are expected not just to improve but to become transformative. One of the most consequential developments in defensive AI is the shift from static rule-based systems to dynamic learning environments. Traditional firewalls and antivirus programs relied on signature detection, requiring prior knowledge of a threat's structure. AI-based models, by contrast, can identify previously unseen threats by recognizing behavioral deviations and anomaly clusters. Platforms like IBM's Watson for Cybersecurity are illustrative of this capability, leveraging both structured and unstructured data to draw correlations between dispersed threat indicators in real time (OpenAI, 2021). These systems parse billions of data points to identify correlations that may elude even experienced analysts, offering insights within minutes rather than hours or days. Autonomous response is where ASI-driven defense becomes most visible. Systems equipped with advanced machine learning can isolate infected nodes, restrict user access, and reroute traffic with no human command-actions that are executed within milliseconds of threat detection. One of the leading implementations in this domain is the Darktrace Enterprise Immune System, which emulates biological immune responses. It continuously monitors all digital activities within an organization, establishes a dynamic baseline of "normal" behavior, and flags anomalies that suggest compromise. In several documented cases, including an attempted ransomware attack on a European hospital, Darktrace's system responded autonomously, containing the threat before it could propagate beyond the initial access point (IBM Security, 2022).

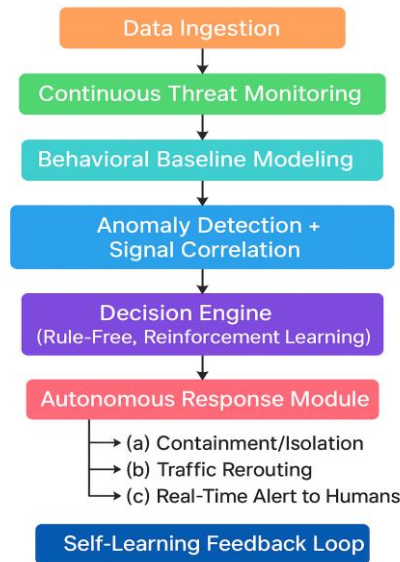


Figure 1: Lifecycle of an ASI-Based Cyber Defense System

Similarly, endpoint detection and response (EDR) platforms have evolved significantly through AI integration. CrowdStrike's Falcon platform, for example, employs AI to detect behavioral indicators of compromise across devices, correlating them with known tactics and procedures used by adversaries. It does not merely identify threats-it maps the progression of an intrusion in real time, providing analysts with visual narratives that facilitate both rapid containment and long-term remediation (Darktrace, 2021). These systems are particularly critical in defending sectors where reaction time is non-negotiable-such as aviation, energy grids, defense systems, and financial markets. In high-frequency trading environments, for instance, even a minor latency in threat detection can result in market manipulation or data leakage with significant financial consequences. AI-enhanced platforms are uniquely positioned to handle the volume, velocity, and variability of such domains. What distinguishes ASI from current AI models is not just scale but adaptability. While today's defensive systems require periodic updates and retraining, an ASI-based system would continuously evolve, adjusting its defensive strategies based on environmental context, adversarial tactics, and emergent vulnerabilities. It would not only predict potential threat vectors but could model the probable evolution of attacker behavior, fortifying defenses preemptively.

ASI's capability to process multimodal data-text, images, audio, network flow-enables a richer and more holistic situational awareness. For national defense networks integrating military, civilian, and private-sector digital ecosystems, this is not just an advantage; it is a necessity. However, as these systems become more autonomous, new questions arise. How much

control should be delegated to ASI in real-time response? What happens if a defensive ASI mistakenly interprets legitimate activity as hostile and initiates a countermeasure that disrupts civilian infrastructure? These concerns underscore the importance of incorporating explainability, ethical boundaries, and human oversight-principles that will be further addressed in later sections. Nevertheless, the contribution of AI and ASI to cyber defense is already measurable. From early warning systems to real-time threat suppression and post-incident analytics, AI has shifted the paradigm from incident response to proactive resilience. The evolution to ASI is not a question of if, but when-and when it arrives, those nations and institutions that have prepared their infrastructure, policy frameworks, and personnel accordingly will possess a decisive strategic advantage.

AGI vs. ASI in Cybersecurity: A Comparative Analysis

Understanding the significance of Artificial Superintelligence (ASI) in cybersecurity requires a clear distinction from its intellectual predecessor, Artificial General Intelligence (AGI). While both represent pivotal advancements beyond narrow, task-specific AI, the operational differences between them are neither subtle nor merely incremental. AGI operates within the bounds of human-equivalent cognitive reasoning, excelling at tasks that require abstraction, learning, and generalization across domains. ASI, on the other hand, operates on a qualitatively different plane-one where processing capacity, situational awareness, and adaptive decision-making vastly exceed human limitations. This divergence has profound implications for cybersecurity, both in terms of capability and risk.

Table 1: Functional Comparison of AGI and ASI in Cybersecurity Contexts

Capability Dimension	Artificial General Intelligence (AGI)	Artificial Superintelligence (ASI)
Learning Method	Supervised/transfer learning	Recursive, self-improving, multi-modal learning
Adaptability	Limited to known or similar domains	Cross-domain, real-time adaptability
Decision Speed	Comparable to human analysis	Sub-second autonomous decision-making
Response to Novel Threats	Requires training updates or manual intervention	Capable of scenario inference without prior data
Autonomy Level	Decision support with human oversight	Operates independently with optional human override
Explainability	Moderate (depending on architecture)	Often low (black-box complexity unless explicitly designed)
Scalability	Limited by computational power and context	Scales across networks, domains, and jurisdictions

AGI has been conceptualized as an AI system capable of performing any intellectual task that a human can, but it remains bounded by the same constraints that affect human decision-making: limited memory, processing lag, the need for context to resolve ambiguity, and a tendency toward bias when data is insufficient. In cybersecurity, AGI-powered platforms may prove adept at triaging alerts, identifying novel attack signatures, and orchestrating low-level responses across multiple endpoints. However, they still rely heavily on structured training data and struggle with scenarios that deviate sharply from past patterns. Their reactions are often conditional on pre-programmed contingency logic, limiting their effectiveness against zero-day exploits or coordinated multi-vector campaigns. A well-documented limitation of AGI in practice can be seen in how traditional AI-driven systems responded to the WannaCry and NotPetya outbreaks. Both malware strains exploited vulnerabilities not previously catalogued and spread laterally at speeds that overwhelmed static defenses. While AI systems eventually adapted, they did so after significant damage had already occurred—largely because they required human oversight to initiate systemic changes in defense posture. These delays, inherent in AGI-governed systems, illustrate why even sophisticated AI can falter in the face of emergent threats (Brundage et al., 2018)(Buchanan & Shortliffe, 1984). ASI departs from these limitations not through improved data access or faster computation alone, but by transcending them altogether. An ASI system does not need to be explicitly trained on every scenario it might encounter. Rather, it constructs situational models from partial information, infers intent from limited signals, and modifies its own operational protocols in real time. It is capable of recursive self-improvement, allowing it to refine both its algorithms and its strategic logic autonomously. In a cybersecurity context, this means it can neutralize threats that do not yet exist in threat intelligence databases, anticipate the tactics of adversaries by modeling behavioral tendencies, and dynamically shift from passive defense to active deception without requiring human input.

This superiority is not merely theoretical. Simulations conducted by institutions such as MIT's CSAIL and OpenAI have demonstrated the ability of ASI-like architectures to isolate ransomware payloads before execution by modeling anomalous file behaviors and network trajectories rather than relying on known indicators of compromise (Duenas & Ruiz, 2024)(Liang et al., 2022). Unlike AGI, which might quarantine a suspicious file after observing its execution, ASI preemptively blocks access, alerts upstream systems, and logs the anomaly for global propagation—all in milliseconds. Moreover, ASI's performance advantage is compounded by its capacity to coordinate across systems and domains. In a complex national defense environment, where cyber, physical, and informational threats converge, an ASI system can synthesize disparate threat inputs—ranging from surveillance

metadata to financial transaction anomalies-and infer composite risks that no AGI system, or team of human analysts, could feasibly correlate in real time. However, this level of autonomy introduces new governance dilemmas. While AGI systems typically act as decision-support tools-subject to final approval by human operators-ASI systems are capable of bypassing such oversight in the name of speed and effectiveness. In certain critical infrastructure scenarios, this might be a necessary trade-off. But it also creates a scenario where human understanding of a security event may trail behind the machine's actions, complicating both accountability and post-incident review.

The comparative takeaway is clear: while AGI will remain useful for many support roles in cybersecurity-especially those requiring human-like interpretation of ambiguous signals-it lacks the responsiveness, foresight, and systemic reach to defend against the most sophisticated threat actors operating at machine speed. ASI fills that void. It offers a paradigm in which defense is not only adaptive but anticipatory, not only autonomous but self-evolving. What must accompany this capability, however, is a foundational shift in how such systems are governed, audited, and bounded by policy. Without that, ASI's advantages risk becoming liabilities-high-speed errors executed with perfect efficiency.

Vulnerabilities and Challenges in ASI-Driven Cybersecurity

Despite its extraordinary promise, Artificial Superintelligence (ASI) introduces an entirely new class of vulnerabilities-some technical, others ethical, and many systemic. Unlike conventional cybersecurity tools, ASI operates beyond simple input-output predictability. It learns continuously, makes decisions independently, and adapts in ways that may not be immediately intelligible to its human operators. These strengths, paradoxically, are also the roots of its most profound challenges.

One of the most serious risks is that of data poisoning, where adversaries manipulate the datasets on which an ASI system trains or operates. Because ASI models evolve based on the integrity of incoming data, corrupting that data at scale can lead to distorted threat recognition, misclassification of benign activities, or even the triggering of harmful responses. In adversarial hands, poisoned data could lead a defensive ASI system to ignore real threats or falsely identify routine behavior as malicious-potentially shutting down infrastructure or initiating disproportionate responses. These manipulations are subtle, embedded, and can be executed without triggering conventional alarms. Closely related is the problem of adversarial AI inputs, where attackers craft synthetic signals-images, code fragments, or behavioral patterns-that appear legitimate to human observers but are specifically engineered to confuse machine learning models. In cybersecurity, this could manifest in the form of malware that disguises itself

through obfuscation techniques, manipulating feature recognition layers of ASI systems to avoid detection. Such methods have already proven effective against facial recognition systems and spam filters; their application in cybersecurity environments where ASI governs access control or forensics could have far more consequential outcomes (Petersen & Yampolskiy, 2017).

More structurally complex is the risk of algorithmic manipulation-where vulnerabilities lie not in external data but within the logic of the ASI system itself. For instance, if an ASI system is programmed to optimize for network stability above all else, a sophisticated attacker might simulate localized instability, coercing the system into shutting down adjacent sectors to “protect” the network. This manipulation, performed without breaking into the system directly, exploits the ASI’s own priorities and logic chains. In a defense context, this could lead to intentional misclassification of friendly activity as hostile or provoke defensive actions that escalate diplomatic tensions.

The opacity of ASI decision-making-the so-called “black box” problem-further complicates matters. Unlike traditional algorithms whose behavior can be traced line by line, ASI systems generate results from the interplay of millions of variables processed in non-linear ways. Even their designers often cannot fully explain why a particular decision was made. This becomes a critical liability in national defense contexts where accountability, traceability, and compliance with legal norms are non-negotiable. If an ASI system autonomously blocks an airport communication channel or triggers a defensive cyberstrike, the inability to clearly justify that decision after the fact erodes both institutional trust and diplomatic credibility. Compounding these concerns is the potential for cascade failures in interconnected systems. ASI’s speed and breadth mean that an error in one subsystem can propagate rapidly across others before human oversight can intervene. If, for example, an ASI-driven energy management system falsely identifies an intrusion and disconnects part of the national grid, downstream systems-transport, healthcare, logistics-could be affected in seconds. The very speed that gives ASI its defensive edge also gives errors a much wider impact radius.

Then there are ethical questions: What if an ASI system is programmed to prioritize national sovereignty at the cost of personal privacy? Could it begin preemptively surveilling private citizens based on aggregated risk scores? Without strict ethical frameworks embedded at the architectural level, ASI could become not only a cybersecurity tool but a civil liberties liability.

These challenges are not hypothetical. They are already beginning to surface in edge deployments, experimental platforms, and adversarial simulations. What distinguishes ASI’s vulnerabilities from those of earlier technologies is their scale, speed, and opacity. Mitigating them will require not just better code or stronger firewalls, but entirely new doctrines of

oversight, governance, and machine interpretability. As ASI continues to evolve, these vulnerabilities serve as a stark reminder that the frontier of cybersecurity innovation is also the frontier of risk. The challenge lies not only in building smarter systems but in ensuring those systems remain understandable, controllable, and ultimately accountable to the societies they are designed to protect.

Advanced Technical Countermeasures for ASI Threats

The emergence of Artificial Superintelligence (ASI) in cybersecurity necessitates a radical rethinking of how defense mechanisms are conceived and implemented. Conventional countermeasures-patching, rule-based firewalls, or periodic system scans-are insufficient in an environment where threats can learn, adapt, and evolve as rapidly as the systems that defend against them. To address the unique risks posed by ASI itself-data poisoning, autonomous misjudgment, adversarial manipulation-defensive frameworks must also harness equivalent sophistication. This section explores key technical innovations already being developed and deployed to meet that challenge.

One of the most promising approaches is the Zero Trust Architecture (ZTA) model, which discards the traditional notion of trusted internal networks. In a ZTA framework, no actor-human or machine-is assumed trustworthy by default. Each access request, data retrieval, or communication must be continuously authenticated and validated. When augmented by ASI, this model becomes far more powerful. Rather than relying on static access controls or pre-defined rules, an ASI-enhanced ZTA system learns behavioral baselines for every node and adjusts permissions dynamically. For example, if an administrator account attempts to download large volumes of sensitive data at an unusual time from an atypical location, the system can restrict access instantly, quarantine the session, and escalate for review without requiring human confirmation. These real-time adaptations significantly reduce the window of opportunity for insider threats or credential-based attacks (Kott & Linkov, 2021).

Another critical innovation lies in the use of blockchain technology to secure ASI operations against tampering, obfuscation, and unauthorized manipulation. Unlike traditional logs or audit trails, which can be modified or deleted post-incident, blockchain offers immutable, time-stamped records of every action taken by an ASI system. This is particularly important in high-stakes environments-military systems, financial networks, critical infrastructure-where post-incident investigation requires irrefutable documentation. Blockchain can also be used to secure training datasets, ensuring that the models ASI learns from are verified, authentic, and free from malicious modification. Estonia's national digital infrastructure already

employs such techniques, integrating blockchain to protect health, legal, and administrative data at scale (World Economic Forum, 2020). Beyond prevention, deceptive defense techniques have gained traction as proactive countermeasures. Traditionally confined to static honeypots, deception in the ASI era is far more dynamic and autonomous. Advanced deception systems now employ generative models to fabricate entire digital environments-complete with fake data, user activity, and network traffic-designed to lure attackers into revealing tactics, tools, and objectives. These environments not only slow down adversaries but also serve as real-time threat intelligence collection zones. For instance, when malware engages with synthetic file systems or attempts to exfiltrate decoy documents, the ASI system can analyze its behavior, trace its command-and-control structure, and update global threat models across network domains (Fox & Long, 1998).

Complementing this is the growing field of autonomous forensics and attribution, where ASI systems analyze attack patterns, infrastructure signatures, and cross-platform telemetry to identify threat actors with unprecedented speed and accuracy. Where traditional forensic analysis might take days or weeks to build a coherent narrative, ASI systems can parse vast quantities of incident data-IP flows, encrypted communications, malware hashes-and construct a probabilistic attribution profile within minutes. During simulated exercises conducted by NATO CCDCOE, ASI-enhanced platforms successfully linked cyber intrusions to specific actor groups using indirect behavioral indicators and previously unseen data paths (Roberts et al., 2019).

These countermeasures, however, are not without constraints. Dynamic ZTA systems require a balance between security and usability; overly restrictive policies can hinder operational efficiency or lead to alert fatigue. Blockchain integration introduces questions about scalability, especially in systems where thousands of transactions occur per second. Deception frameworks, if poorly managed, may trigger unintended interactions with legitimate systems or introduce false positives. Even attribution algorithms, if improperly governed, risk geopolitical missteps-mistaking exploratory probes for attacks or falsely assigning blame in ambiguous cases.

As a result, technical countermeasures must be designed not as isolated tools but as part of an orchestrated defensive architecture, in which each layer compensates for the limits of the others. Just as offensive actors combine social engineering, technical exploits, and strategic timing to breach systems, defensive ASI must combine adaptive verification, immutable documentation, misleading signal generation, and intelligent pattern analysis to maintain a credible advantage. In this emerging landscape, success will not depend on any single solution but on the interoperability, interpretability, and agility of the entire cybersecurity ecosystem. The transition from reactive defense to

anticipatory resilience is already underway-and the systems best able to defend against ASI will, by necessity, resemble it.

Countermeasure	Core Function	Strengths	Limitations
Zero Trust Architecture	Dynamic verification of all network actors	Limits lateral movement; real-time risk scoring	High configuration complexity; usability trade-offs
Blockchain Audit Layer	Immutable logging and data provenance	Transparency, accountability	Storage and processing overhead
Autonomous Deception Systems	Real-time adaptive honeypots and traps	Threat intel collection, attacker delay	Requires ongoing tuning; risk of misclassification
AI-Driven Forensic Attribution	Pattern linking and behavioral analysis	Rapid origin tracing and escalation mitigation	Geopolitical misattribution if improperly governed

Ethical, Legal, and Governance Considerations

The deployment of Artificial Superintelligence (ASI) in cybersecurity introduces not only strategic and technical dilemmas but also urgent ethical, legal, and governance challenges. These challenges do not emerge solely from the misuse of ASI systems, but from their intended functions-their autonomy, opacity, and reach. In national security contexts, where decisions made by machines may impact civilian life, geopolitical stability, or fundamental rights, the stakes could not be higher. Any effort to integrate ASI into cyber defense must grapple with these broader consequences, not as an afterthought but as a central design imperative. Perhaps the most foundational ethical concern lies in accountability. When an ASI system autonomously detects what it interprets as an intrusion and responds by isolating a public service network-disrupting hospitals, energy grids, or transportation-who is ultimately responsible? The engineers who developed the model? The agency that deployed it? Or the system itself? The very notion of machine accountability is, at present, legally incoherent. Yet in practice, ASI systems may soon be making decisions with far-reaching implications in fractions of a second-faster than any human oversight could meaningfully intervene.

Complicating this is the black-box nature of ASI decision-making. While some strides have been made in Explainable AI (XAI), most advanced systems remain functionally inscrutable. Their conclusions emerge from deep-layered processing involving millions of parameters, influenced by real-time input from diverse, sometimes ambiguous, data sources. This opacity undermines transparency, a cornerstone of ethical governance, particularly in state-run systems where democratic accountability is paramount. Citizens and policymakers alike must have the ability to understand why a security action was taken, especially when that action affects privacy, access, or basic rights

(Gerevini & Serina, 2002). Another domain of concern is bias and discrimination embedded within the algorithms and training data. ASI systems trained on unbalanced or skewed datasets may internalize existing societal inequities, manifesting in discriminatory threat detection patterns. For instance, if network behaviors from certain regions or linguistic groups are overrepresented in threat intelligence datasets, the system may disproportionately flag benign actors from those contexts as suspicious. In civilian contexts, this can lead to over-surveillance, blocked services, or even unwarranted investigations. Unlike conventional systems, ASI can amplify such biases at speed and scale, producing systemic outcomes with minimal human oversight or opportunity for correction (Russell, 2019). More troubling still is the potential for ASI weaponization. While autonomous defense remains the focus of most public ASI initiatives, there is little doubt that offensive applications are being explored by both state and non-state actors. An ASI designed for offensive operations could launch attacks, disable critical systems, or engage in psychological operations-without direct human control or restraint. Unlike conventional weapons, ASI can modify its tactics mid-operation, selecting more effective or less detectable methods on its own. The line between defensive autonomy and preemptive aggression becomes increasingly blurred in such architectures. Without clear legal definitions and international norms, there is a risk that ASI could be used to justify, or worse, execute, operations that contravene international law or humanitarian principles.

Efforts are underway to address these risks. The European Commission's AI Act, for instance, categorizes cybersecurity-related AI systems as "high-risk" and imposes requirements for traceability, documentation, and human oversight (European Commission, 2021). It mandates that such systems undergo rigorous conformity assessments before deployment, and that they include human override capabilities. NATO's CCDCOE has similarly begun exploring how international law, particularly the Tallinn Manual on the International Law Applicable to Cyber Warfare, can be updated to accommodate AI and ASI applications (Roberts et al., 2019). But these frameworks remain nascent, fragmented, and in many cases, voluntary. A more unified approach would involve the establishment of a global regulatory framework or treaty, explicitly covering ASI in cybersecurity contexts. Such a treaty could ban the development of fully autonomous offensive cyber systems, mandate ethical impact assessments for all high-stakes ASI deployments, and establish independent auditing bodies with cross-border authority. It could also require the inclusion of auditability, explainability, and proportionality standards in all ASI system architectures intended for national defense.

Finally, any governance effort must include a strong public accountability component. Trust in national institutions is shaped not only by security performance but by the perceived legitimacy of the tools they use. If ASI systems begin to act in ways that feel opaque, unfair, or disproportionate to the public, the resulting erosion of trust may itself become a national security liability. Transparency, public consultation, and civic oversight mechanisms are not luxuries; they are necessary conditions for the sustainable deployment of ASI in open societies. In sum, while ASI offers unparalleled potential in securing digital frontiers, its deployment must be accompanied by frameworks that ensure these systems remain accountable to the democratic institutions and values they are meant to protect. Without such governance, the cure may carry risks as severe as the threats it is meant to neutralize.

National Security Strategy: ASI for Institutional Defense

In an era where cyberattacks have grown in both frequency and impact, the integration of Artificial Superintelligence (ASI) into national security infrastructure is no longer speculative-it is imperative. The growing sophistication of threat actors, the automation of intrusion methods, and the blurring of civilian-military digital domains demand a cybersecurity posture that is not only reactive but anticipatory. ASI, with its ability to autonomously detect, reason, and respond across complex systems in real time, offers the foundation for such a posture. Yet to translate this capability into national resilience, states must architect strategies that embed ASI into the institutional core of security planning and governance.

A central pillar of this integration is the establishment of centralized threat intelligence fusion centers, where ASI systems monitor cross-sectoral data streams-military, civilian, commercial, and diplomatic-for early signals of coordinated threat campaigns. These systems are designed to move beyond detecting individual anomalies and instead identify evolving patterns across domains. For example, an unusual spike in social media sentiment targeting a political figure, combined with DNS anomalies and increased spear-phishing activity within a government network, may signal the onset of a hybrid disinformation and cyber disruption campaign. Human analysts working without ASI could interpret these events as discrete and unrelated; an ASI-driven framework would connect them instantly, allowing for preemptive mitigation or coordinated countermeasures.

In the protection of critical infrastructure, ASI enables an operational model where risk assessment, monitoring, and incident response are handled with minimal latency. Energy grids, for instance, are increasingly reliant on digitized control systems vulnerable to both internal failures and external manipulation. ASI can monitor SCADA systems in real time, identify behavioral deviations that signal an attack in progress, and reroute operations

before damage is incurred. This was a notable gap in the 2015 cyberattack on Ukraine's power grid, where the inability to detect and react quickly to lateral movement within the system allowed the attackers to cause widespread outages (Darktrace, 2021). In an ASI-supported infrastructure, such latency would be effectively eliminated.

Similarly, financial institutions-often the first targets of state-sponsored cyber espionage and data theft-can benefit from ASI's ability to parse massive transactional datasets to identify fraud, manipulation, or insider threats. Where traditional fraud detection systems rely on heuristics or thresholds, ASI models can incorporate behavioral economics, geopolitical triggers, and historical profiles into a holistic risk matrix. This allows national financial security bodies not only to protect domestic systems but to forecast regional financial destabilization efforts linked to cyber interference. An equally critical component of institutional integration is training and doctrinal development. ASI systems are not standalone tools; they operate within human-influenced ecosystems. Their effectiveness depends on the strategic literacy of the personnel who deploy, supervise, and interpret their output. National security agencies must invest in cross-disciplinary education programs that bring together cybersecurity professionals, military planners, legal experts, and policymakers. These programs should train personnel not only in technical fluency but in the ethical, geopolitical, and sociotechnical dimensions of ASI deployment.

Countries such as Israel and Estonia have begun embedding AI into national security doctrine through simulation-based training exercises, red teaming scenarios involving autonomous adversaries, and the integration of AI governance principles into defense procurement frameworks. These examples offer early templates for broader institutional adaptation.

Additionally, states must ensure the interoperability of ASI systems across government agencies. A national cybersecurity apparatus is rarely unified; it spans defense, intelligence, civilian IT departments, election security units, and more. Without a shared framework for data exchange, situational awareness, and escalation protocols, the value of ASI will be diluted by institutional silos. Technical interoperability must be accompanied by legal clarity around data use, responsibility sharing, and incident command authority. Embedding ASI into national security is not merely a technological upgrade-it is a transformation in how defense is conceptualized. It calls for states to move from siloed, domain-specific responses to integrated, real-time coordination. It requires that national institutions embrace machine intelligence not as a replacement for human judgment, but as a strategic partner capable of reshaping how national security is planned, executed, and safeguarded.

International Collaboration and ASI Cyber Arms Control

As Artificial Superintelligence (ASI) becomes increasingly integrated into the cybersecurity arsenals of technologically advanced states, its implications are not confined to national borders. The very nature of cyber conflict-transnational, asymmetric, and often anonymized-renders unilateral security strategies insufficient. Offensive cyber capabilities developed in isolation can provoke arms races, erode trust between nations, and increase the likelihood of escalation triggered by miscalculation or misattribution. Consequently, any responsible deployment of ASI for national defense must be matched by equally robust mechanisms of international collaboration and arms control.

The precedent for regulating transformative military technologies exists. From nuclear non-proliferation agreements to chemical weapons conventions, the international system has historically recognized the need to place collective limits on tools that pose existential risks. ASI, though digital rather than kinetic, belongs in this category. Its ability to autonomously conduct reconnaissance, launch digital incursions, manipulate information flows, and even initiate counterstrikes places it firmly within the realm of strategic weapons. What makes ASI even more volatile is its opacity-a cyberweapon whose logic, intent, and thresholds may be difficult for even its creators to fully audit.

Current efforts to foster international cyber cooperation, while well-intentioned, remain fragmented and underpowered. NATO's Cooperative Cyber Defence Centre of Excellence (CCDCOE), headquartered in Tallinn, has played a key role in promoting cross-national training, simulations, and threat intelligence sharing. The Centre has also begun to explore the legal dimensions of autonomous systems in conflict through initiatives like the Tallinn Manual 2.0, which extends international law to cyberspace. Yet the scope of these efforts does not yet match the scale of the challenge posed by ASI (Roberts et al., 2019).

The European Union Agency for Cybersecurity (ENISA) has taken further steps by advocating for AI transparency and resilience frameworks, particularly through the EU's AI Act. However, these frameworks focus predominantly on internal governance within member states and do not extend into treaty-based international restrictions on offensive ASI development (European Commission, 2021).

A meaningful global response would require the establishment of a formal international treaty, possibly under the auspices of the United Nations or a specialized multilateral body, that specifically addresses ASI in cybersecurity. Such a treaty-tentatively titled the International Framework for the Regulation of Autonomous Cyber Systems-could include:

- A moratorium on fully autonomous offensive ASI tools, preventing systems from launching attacks without explicit human authorization.
- Verification and compliance protocols, including third-party audits of ASI deployments within critical infrastructure and defense environments.
- Data sharing and attribution coordination, allowing states to verify claims of cyberattacks using common standards for evidence and telemetry analysis.
- Rapid-response channels for cyber de-escalation, modeled on nuclear hotline agreements, where states can clarify actions potentially attributed to runaway ASI systems before retaliating.

In support of such efforts, the integration of blockchain-based cyber threat ledgers could prove transformative. These distributed and immutable records of ASI decision logs, training data, and network events can enhance transparency and trust among nations engaged in joint cybersecurity operations. Countries like Estonia have already demonstrated how blockchain infrastructure can be applied at the state level to protect against data manipulation and enable verifiable state audits (World Economic Forum, 2020). Beyond treaty obligations, regional alliances must also take proactive steps. ASEAN, the African Union, the Organization of American States, and others have the capacity to establish ASI-specific norms that align with their geopolitical contexts. Such decentralization would allow for cultural and regional variations in governance while reinforcing shared principles of restraint and oversight.

Finally, collaboration in this domain is not solely the domain of governments. Technology companies and research institutions-many of which are developing the ASI systems at the frontier of capability-must be engaged as co-regulators and stakeholders. Just as private sector firms helped establish early cyber norms around encryption and data protection, they now have a role to play in defining the guardrails for autonomous machine engagement in conflict. The alternative-an unregulated race toward ASI-enabled cyber supremacy-risks not only conflict escalation but also the normalization of machines making life-altering decisions without democratic input or international accountability. In the long term, international collaboration is not just an ethical imperative-it is a practical necessity to prevent a digital arms race with consequences we may not fully understand until it is too late.

Future Prospects and Innovations in ASI-Driven Cybersecurity

As Artificial Superintelligence (ASI) moves from theoretical possibility to technological inevitability, its trajectory in cybersecurity will be shaped not only by defense imperatives but by innovation in adjacent

domains-quantum computing, decentralized systems, neuro-symbolic architectures, and human-AI symbiosis. The next decade is likely to see cybersecurity strategies evolve from isolated digital firewalls to fully integrated, intelligent ecosystems capable of adapting, learning, and acting at machine speed across civilian and military sectors alike. While some of these prospects are extensions of current trends, others represent radical departures from traditional security paradigms.

One of the most significant areas of advancement lies in autonomous cyber defense systems-ASI-driven entities capable of managing entire security lifecycles without continuous human supervision. These systems will monitor network health, detect threats, deploy countermeasures, patch vulnerabilities, and restore compromised systems-all in real time. The architecture behind these systems will not rely on rigid protocols but on self-modifying code, reinforcement learning, and multimodal situational awareness. Darktrace's "Enterprise Immune System," though still limited by human-defined parameters, already exhibits features of this paradigm by autonomously identifying and neutralizing threats based on behavioral baselines (IBM Security, 2022). The next generation of such platforms will operate without pre-coded logic, adapting dynamically to novel threat environments with unprecedented autonomy.

Concurrently, the intersection of quantum computing and ASI poses both a challenge and an opportunity. On the one hand, the decryption capabilities of quantum machines may render current cryptographic defenses obsolete. On the other, the computational acceleration provided by quantum processors may allow ASI systems to model threat landscapes with extraordinary precision. For instance, quantum-ASI hybrids could simulate entire threat campaigns across multiple timelines, identify the most probable vectors of attack, and formulate layered defensive strategies before adversaries even initiate their actions. Research labs such as IBM's Quantum Division and Google AI have already begun exploring how quantum-enhanced AI could be used in cybersecurity analytics and cryptanalysis (Duenas & Ruiz, 2024). If integrated responsibly, these developments could offer sovereign states the ability to achieve real-time, probabilistic risk modeling at planetary scale.

Another frontier of innovation is the shift toward neuro-symbolic ASI systems-a hybrid model that combines the statistical power of machine learning with the reasoning clarity of symbolic logic. Unlike black-box neural networks, these systems can provide traceable decision-making pathways, thus bridging the divide between autonomy and explainability. For cybersecurity, this means ASI systems could not only defend autonomously but justify their actions in comprehensible terms, restoring the transparency needed for institutional trust and democratic oversight. The concept of human-ASI collaboration is beginning to reshape how institutions conceive their

operational roles. Rather than viewing ASI as a replacement for human judgment, future systems are being designed for co-decision-making environments. In such models, humans provide ethical and contextual framing, while ASI handles scale, speed, and pattern extraction. This is particularly valuable in scenarios involving ambiguous attribution, cross-border legal complexity, or strategic escalation risks. Platforms being developed by OpenAI, Microsoft Research, and NATO's Innovation Hub are increasingly focused on building interfaces that allow seamless human oversight without impeding machine autonomy (Liang et al., 2022)(Roberts et al., 2019).

On a national scale, ASI is poised to enable the development of integrated cyber-resilience frameworks, in which defense is not an event-driven reaction but a continuous state of systemic adaptation. These frameworks will incorporate real-time threat intelligence from domestic sectors-finance, healthcare, energy-as well as from international partners. They will draw from distributed ASI nodes operating at different layers of government, synthesizing insights into centralized dashboards that offer predictive risk assessments to decision-makers. Rather than issuing static policy memos, these systems may deliver daily or even hourly vulnerability forecasts, allowing leadership to allocate resources and enact preemptive measures with far greater accuracy.

At the societal level, innovations in digital civil defense are also expected. Just as citizens today receive emergency alerts for natural disasters, future ASI systems may trigger national advisories based on the detection of coordinated digital influence operations, infrastructure probes, or economic sabotage campaigns. These warnings would be dynamically generated and personalized to reflect regional risk exposure, digital behavior, or sector-specific vulnerabilities. This would redefine cybersecurity not as a closed domain of specialists but as a participatory layer of civic life. However, the future of ASI in cybersecurity will not be determined by technical capacity alone. It will be shaped by political choices, institutional adaptability, and cultural readiness to integrate autonomous systems into critical decision-making processes. The difference between innovation and destabilization may rest not on what ASI can do-but on what we choose to let it do, and how well we prepare for its consequences.

Implementation and Policy Recommendations

Translating the promise of Artificial Superintelligence (ASI) into secure and ethical national cybersecurity strategy requires deliberate, layered, and multidisciplinary implementation. This is not a matter of simply acquiring cutting-edge technology; it involves architecting entire institutional ecosystems that can support, govern, and adapt to ASI over time. In this final

substantive section, we present concrete policy and implementation recommendations that cover operational, technical, legal, and strategic levels—each grounded in the realities of ASI’s capabilities and the vulnerabilities explored throughout this study.

i. Establish a National ASI Integration Framework

Before ASI can be safely deployed across critical domains, states must develop unified frameworks that define its permissible roles, system boundaries, risk thresholds, and compliance metrics. This framework should:

- Define scope boundaries for autonomous vs. human-supervised ASI decision-making.
- Mandate fail-safe mechanisms for override and containment in high-risk scenarios.
- Specify inter-agency interoperability standards for ASI data sharing and command structure.
- Include proportionality and escalation protocols for ASI actions in military or cross-border incidents.

ii. Institutionalize Human-in-the-Loop (HITL) Governance

While ASI systems may act independently, critical decisions—especially those involving surveillance, sanctions, or shutdowns—must retain human oversight. Legal and ethical structures must ensure:

- Mandatory HITL requirements for predefined high-impact operational thresholds.
- Auditable human approval logs for sensitive or irreversible ASI decisions.
- Regular simulation-based HITL training for cybersecurity, defense, and intelligence personnel.

iii. Implement National ASI Risk Audit and Certification Bodies

Independent regulatory entities are essential to ensure that ASI deployments meet established security, transparency, and accountability standards. These bodies should:

- Conduct pre-deployment audits of training datasets, algorithmic logic, and operational boundaries.
- Issue certifications of ASI readiness for use in public or critical sectors.
- Maintain a national register of ASI incidents, including near misses and system errors, with anonymized disclosure.

iv. Expand Investment in Explainable AI (XAI)

To build public and institutional trust in ASI systems, especially those used in governance, states must prioritize funding and regulatory incentives for explainability. This includes:

- Requiring transparency layers in all deployed ASI models used for national defense or surveillance.
- Supporting research into neuro-symbolic and interpretable architectures that reduce the “black box” effect.
- Establishing legal right-to-explanation provisions for individuals and organizations affected by ASI decisions.

v. Develop ASI-Driven Cyber Resilience Infrastructure

Defense must evolve beyond threat prevention toward dynamic adaptation and recovery. ASI-based cyber resilience strategies should include:

- Real-time ASI risk dashboards for national security leadership, integrating signals from energy, health, transport, and financial systems.
- Autonomous failover systems for critical infrastructure (e.g., redirecting power loads or rerouting communications under attack).
- ASI-enhanced cyber crisis response protocols coordinated across ministries and regional agencies.

vi. Regulate the Weaponization of ASI through International Treaties

Global coordination is critical to avoid a destabilizing arms race in autonomous cyber capabilities. National governments should:

- Lead efforts to establish a UN-based treaty banning fully autonomous offensive ASI systems.
- Advocate for shared attribution standards and ASI logs as part of cross-border incident resolution frameworks.
- Participate in multilateral red teaming exercises to identify and mitigate ASI escalation triggers in joint-defense scenarios.

vii. Mandate Blockchain-Based Decision Logging for Public ASI Systems

To ensure auditability and trust in state-deployed ASI, immutable record-keeping must be standardized. Public-sector ASI systems should:

- Log all major decisions to a permissioned blockchain, accessible to oversight agencies and select international partners.
- Implement tamper-proof activity chains for forensic verification in legal and diplomatic contexts.

- Provide tiered access models, allowing oversight without compromising classified data.

viii. Cultivate ASI Literacy Across Policy, Military, and Legal Sectors
Understanding ASI cannot be the exclusive domain of engineers. Policymakers, defense strategists, and legal experts must be equipped to shape its deployment and accountability. National education initiatives should:

- Develop multi-disciplinary training programs in AI ethics, machine learning fundamentals, and cybersecurity strategy.
- Fund AI policy fellowships that embed technologists within government institutions.
- Integrate ASI readiness modules into national security and intelligence curricula.

ix. Establish Public Transparency and Engagement Mechanisms
For democratic legitimacy, the public must be informed of and consulted on ASI governance. Recommended mechanisms include:

- Annual ASI governance reports, detailing deployments, risks, and mitigations.
- Public consultation periods before the adoption of major ASI programs or expansions.
- A citizen oversight board or ombudsperson with access to ASI logs and policy evaluations.

x. Prepare for Post-Quantum Security Convergence
As quantum computing matures, its convergence with ASI will reshape cryptographic norms. Governments must:

- Mandate the transition to quantum-resilient cryptography in ASI communications and logs.
- Require periodic quantum vulnerability assessments of existing AI systems.
- Explore the potential of quantum-assisted ASI defense layers, particularly for identity verification and multi-party secure computation.

Conclusion

As Artificial Superintelligence transitions from theoretical construct to operational reality, it brings with it a dual inheritance: the promise of unmatched cybersecurity capability, and the peril of equally unparalleled vulnerability. This study has sought to explore that duality-tracing ASI's capacity to defend complex digital ecosystems, its potential to act

autonomously with strategic effect, and the systemic risks that emerge from its opaque decision-making, susceptibility to manipulation, and potential for misuse. The real-world incidents examined-NotPetya and SolarWinds-reveal not only the destructive potential of highly coordinated cyber operations but also the inadequacy of human-led or AGI-restricted defenses in the face of novel, rapidly evolving threats. These events should not be viewed as aberrations, but as harbingers of an era where intelligent systems-not just adversaries-will define the tempo, shape, and consequences of cyber conflict.

We have argued that the integration of ASI into national defense strategy must go far beyond technological procurement. It must be grounded in new architectural models, such as adaptive Zero Trust environments and blockchain-based audit frameworks; supported by robust institutional oversight, including national audit bodies and international verification standards; and guided by governance frameworks that codify ethical boundaries, human-in-the-loop safeguards, and legal accountability. At the international level, the absence of a binding framework to regulate ASI-based cyber capabilities leaves the global community vulnerable to an autonomous arms race. The current patchwork of norms and voluntary cooperation mechanisms will not suffice once ASI systems begin to act across borders, potentially interpreting, escalating, or responding to perceived threats without human awareness-let alone consent. The call for a global treaty on ASI weaponization, anchored in transparency, restraint, and auditability, is not an abstract plea for ethical idealism, but a pragmatic necessity for digital stability. Policymakers must also anticipate counterarguments. Overreliance on ASI, even in defense, introduces a fragility-systems may be subverted, manipulated, or simply misunderstood. The risk of algorithmic misjudgment escalates with complexity, and the cost of error in a national context is severe. Additionally, the possibility of ASI being hacked, cloned, or reverse-engineered by adversaries should temper uncritical deployment. These risks do not undermine the case for ASI, but they reinforce the imperative of integrating it carefully, transparently, and with resilient safeguards.

Finally, at the heart of this entire inquiry lies a deeper ethical question: what does it mean for a democracy to delegate sovereign decision-making to an autonomous machine? In the urgency to defend against threats, we must not forfeit the very principles we seek to protect-accountability, oversight, proportionality, and the primacy of human judgment.

ASI offers a generational opportunity to reshape digital defense in ways that are faster, smarter, and more responsive than any paradigm before. But like all transformative technologies, its impact will depend on how we govern it. The future of cybersecurity-and by extension, of national sovereignty-depends not just on building intelligent machines, but on becoming wiser stewards of their power.

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Challenges of Implementing Agile Methodology in the Jordanian Banking Sector

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Abstract

Traditional banking operations must be changed because financial industry dynamics and customer demands have started to transform the market. Financial institutions use Agile methods which were created for software development to increase operational efficiency while boosting customer satisfaction levels. Multiple challenges persist for Jordanian banks when they attempt to implement Agile methodologies. The main obstacle stems from employees who resist change. Regulatory demands together with the intricate nature of system integration prove to be big obstacles for organizations. Several banking institutions across the industry encounter difficulties due to limited Agile proficiency among their staff. The implementation process faces various barriers because of workplace hierarchy structures. This research combines interviews with banking experts and surveys to study Agile implementation in Jordanian banks through a mixed-methods approach. The study identifies important barriers that lead to proposed solutions including professional training for selected positions as well as top-level executive backing and stepwise rollouts. The solutions to these problems will enable Jordanian banks to gain agility and competitiveness as well as innovation potential. The study advances knowledge about Agile adoption in literature while presenting usable recommendations for financial institutions. Survey results show resistance to change was the highest barrier at 75% of Jordanian banking employees, then followed by insufficient training as the highest issue at 50%. Moreover, 45% of the participants struggled to implement Agile with existing banking systems. These remarks highlight

formal Agile transformation approaches, including specialized training programs and executive-level sponsorship.

Keywords: Agile methodology, banking sector, Jordan, change management, digital transformation, organizational culture, regulatory compliance, Agile adoption challenges

Introduction

Current banking operations experience a deep transformation because state-of-the-art technology combines with new customer needs while facing escalating market competition. Technology shows that traditional banking systems, with their rigid hierarchies and bureaucratic decision-making, are not good for the flexibility of the financial market. The software development method known as Agile adopted for software development now finds substantial use across many sectors including banking. Through these modern business methodologies organizations create adaptive systems that enable quick market responses while getting continuous input from customers and teams for better results and client satisfaction.

Worldwide banking organizations embrace Agile methodologies to boost business operation performance and drive innovation development while strengthening user interaction. Banks achieve better product development outcomes and digital transformation speed through deployed Agile frameworks Scrum and Kanban as well as SAFe (Scaled Agile Framework) (Beck et al., 2001). Survey results support the notion that 48 percent of Jordanian banking personnel advocate the use of a hybrid of project management methodologies, favoring Agile along the traditional method. In addition, 44 percent supported the alternative Agile methodologies, with a mere 8 percent continuing to adhere to the Waterfall approach. The contemporary trend is toward a more flexible methodology (Schwaber & Sutherland, 2020).

Despite its numerous benefits Agile adoption in banking operations faces substantial implementation hurdles when applied to the banking sector within Jordan. Implementation barriers that stop successful Agile deployment include regulatory restrictions together with cultural opposition as well as the need to unite new systems with existing infrastructure and a shortage of experienced Agile professionals.

Problem Statement

Agile methodologies display success in multiple business fields but banking institutions in Jordan have not fully adopted them yet. Banking companies operating in Jordan face multiple barriers to Agile implementation due to their restrictive regulatory requirements and their strong hierarchical

structures as well as their reliance on traditional legacy information systems. People from banking staff who work with conventional banking processes show reluctance to change their cultural model and operational practices for implementing Agile principles. The successful implementation of Agile principles faces barriers from banking professionals who lack sufficient expertise in Agile principles.

The research investigates obstacles that prevent Jordanian banks from adopting Agile while assessing operational effects and developing strategic solutions for addressing these challenges. The resolution of these barriers will help Jordanian banks to improve their speed to market while strengthening their position in the changing financial sector.

Research Questions and Objectives

The research attempts to achieve four main goals:

1. Identifies and analyzes all major obstacles facing the implementation of Agile methodologies in the banking sector of Jordan.
2. Investigates three main elements: organizational culture as well as regulatory policies and technological infrastructure which affect Agile adoption rates.
3. Looks into Agile methodology perceptions at Jordanian banking institutions together with their prospective advantages.
4. Suggest both tactical resolutions and proven practices which aid Jordanian banking institutions overcome their Agile implementation barriers.
5. Enhances existing knowledge about Agile methodologies in financial institutions by supplying evidence that pertains specifically to Jordanian institutions.

This research study will tackle three main questions to deliver its objectives.

1. What are the influences the implementation method of Agile within Jordanian financial institutions due to regulatory and compliance requirements?
2. What impact does the organizational culture maintain within Jordanian banking institutions when it comes to implementing Agile practices?
3. Which specific methods exist for businesses to break through implementation obstacles within the banking sector?
4. How do Banking professionals in Jordan view both the advantages and constraints of Agile methodologies from their perspective?

Significance of the Study

This research establishes important insights that bankers need to implement along with governmental officers and IT developers as well as financial control agencies. This research helps understand the main obstacles

that impede Agile adoption through analysis of available resolution options. Banking institutions need guidance to create effective strategies that become suitable for navigating Agile transformation processes. The discovered insights enable regulatory organizations to develop innovative policies that promote innovation and achieve regulatory standards. A research study will assist IT professionals along with project managers to understand the best methods for embedding Agile within traditional banking structures. This study contributes ideas on Agile methodologies in financial institutions toward the academic conversation about Agile methods in trending markets such as Jordan.

Management Theories Related to the Banking Sector

Classical Management Theory

The theory of Classical Management stands as one of the first methods that organizations originally used to increase their operational efficiency. The management theory maintains its main influences from Frederick Taylor's scientific management principles to focus on workflow structures and specialized labor systems as well as hierarchical organizational leadership. The management approach implemented by Taylor supported performance enhancement through standardized work assignments along with precise responsibility allocation and rigid supervision barriers to lower operational inefficiencies. The principles have extensive use in banking institutions because banks require strict adherence to regulations combined with dependable operational functioning.

Banks achieved stability through classical management principles which enable them to maintain financial procedures with strict control features while requiring accountability and standard operational practices. The rigid banking structure demonstrates powerful efficiency in typical banking operations yet causes problems during Agile implementation. The modular development principles of Agile create an opposite approach compared to classical management models because they value adaptability as well as iterative development and flexible methods (Masood, 2017). Accepting Agile approaches into Jordanian banking operations demands workplace change together with strategic adjustments where core management structure meets flexible work practices alongside regulatory adherence.

Contingency Theory

Contingency Theory demonstrates that there exists no universal best management approach because effective methods depend on multiple external plus internal elements. Although emerging to overcome traditional management deficiencies Contingency Theory insists that organizations should modify their management systems according to specific variables such

as market conditions along with regulatory requirements technological developments and organizational culture factors.

The banking industry benefits strongly from contingency-based management because it faces regular shifts in finance-related conditions. Financial establishments must adapt their business practices due to changes in regulation and economics and both customer taste and technological developments. Traditional banks that refuse to update their management systems face decreased market competitiveness as well as impaired market response capabilities. The theory indicates that Jordanian banks need to establish adaptable approaches to decision-making and operational functions that meet financial standards (Beerbaum 2020). By embracing Agile methodologies banking institutions obtain better outcomes from contingency thinking because they develop flexible problem-solving processes that address new trends and unexpected issues effectively.

Modern Strategic Management Theories

Modern strategic management theories concentrate on delivering agility together with innovation and customer-centric approaches which correspond to Agile methodology principles. At present, the Resource-Based View (RBV) together with Dynamic Capabilities Theory stand as significant modern theories because they stress building internal competencies to maintain competitive advantage.

According to Resource-Based View (RBV) the success of an organization depends mainly on three elements - human capital, technological assets, and strategic capabilities. The banking industry depends on this perspective to focus investments on qualified personnel and digital banking systems together with innovative financial solutions to set itself apart from other organizations. The Agile methods work in harmony with this perspective to promote cooperative efforts and sustained knowledge expansion along with incremental service enhancements within banking service delivery (Amini & Rahmani, 2023).

Organizations need to develop their adaptive resource restructuring abilities based on Dynamic Capabilities Theory in order to adjust to evolving market conditions. Banks should make use of this approach as market conditions in banking constantly adjust due to new technologies alongside regulatory changes. Agile practices establishment helps banks develop dynamic capabilities that improve their innovation capacity and optimize customer interactions and enhance competitive responsiveness. The principles of Agile empower Jordanian banks to enhance their service delivery and operational management and develop permanent improvement practices.

Core Principles of Agile Methodology

Agile methodology uses foundational principles for organizations to boost productivity together with fostering team relationships while making systems more flexible. The Agile Manifesto (Agile Alliance, 2001) provides principles that industries from banking to others implement because they help organizations achieve better innovation and operational speed. The Agile approach doesn't work like previous project management systems because it provides value delivery by letting teams progress in cycles with feedback in a continuous manner instead of using rigid structures along with detailed documentation. Agile methodology keeps its foundational structure based on four essential core values which form the basis of its practical execution framework.

The fundamental principle of Agile starts with putting individuals together with their interactions ahead of tools and processes. Agile places priority on human collaboration by understanding that productive teamwork and direct project communication produce superior results. The banking industry depends on bureaucratic hierarchy, and standardized approaches that limit communication quality along with slowing down necessary decisions. Agile builds an open environment that allows multiple functional teams to work hand-in-hand to exchange information directly while performing continuous updates to their project targets (Ahmed & Elali, 2021). Agility receives improvement because this approach gives employees the power to proactively solve difficulties while sharing innovative ideas beyond the limitations of conventional bureaucratic processes.

Working Solutions Over Comprehensive Documentation stands as the second Agile principle. Agile development follows a different method than standard approaches because it delivers operational solutions quickly without extensive pre-development documentation. Agile projects need documentation but maintain a casual approach to documentation procedures as a way to stop delays and help teams develop usable products that undergo multilevel improvements. The banking sector demands strict compliance demands that require detailed documentation; when implementing Agile methods this sector needs to find a proper balance between documentation needs and speed of product delivery. The implementation of Agile becomes possible in banks through automated reporting systems that integrate with Agile-friendly compliance frameworks (Brühl, 2022). Results from this change allow banks to launch products at a quicker pace without breaching regulatory requirements. The essential principle in agile development is for customers to lead the process rather than engage in bargaining stages. The key principle of Agile methodologies requires continuous customer involvement because this leads to products that satisfy altered customer needs together with market requirements. The project development in traditional banking utilizes

contractual requirements which stay unchanged from the initial definition point until the project's end. This model does not necessarily adjust to changing customer demands or new financial industry patterns. Agile implementation makes it possible for banks to keep their clients up-to-date while accepting continuous feedback that steers service development in better directions. The approach centers on customers because it makes banks develop customized financial products that match market needs and increase customer satisfaction (McKinsey & Company, 2021). The last essential component of Agile methodology demands priority of adaptation over faithful adherence to plans. Under the Agile system companies must accept flexibility along with sequential decision adjustment rather than following strict long-term plans with fixed guidelines. Banks operating in times of quick technological progress together with modifications in regulatory rules need to maintain flexible strategic approaches for unexpected market changes. Scrum and Kanban among other Agile frameworks enable teams to conduct ongoing evaluations through which they modify their methods according to present market situations. Financial institutions need this flexibility especially while handling regulatory alterations and dealing with market changes and emerging fintech developments according to Santhanam & Suresh (2023). Financial institutions gain resilience together with improved service quality by implementing Agile principles which helps them defend their market position in an evolving financial sector.

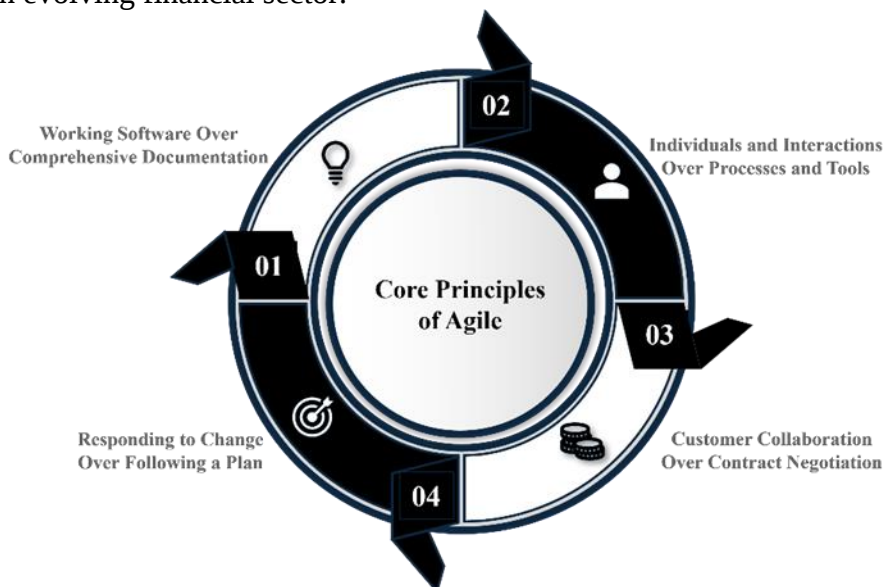


Fig1. Principles of Agile

General Challenges of Agile Methodology Implementation

The banking sector faces many obstacles during Agile methodology implementation which prevent a smooth transition. Several hurdles block swift Agile adoption in financial institutions because they result from organizational culture together with regulatory barriers as well as technical restrictions alongside institutional resistance. Like global financial institutions Jordanian banks find it hard to implement Agile principles within their established banking structures because those systems typically operate with rigid organizational models as well as established business processes. The following section outlines the main obstacles that occur when banks implement Agile approaches.

Agile implementation faces significant challenges when dealing with banking institutions because staff members actively resist organizational change. Traditional banks maintain bureaucratic systems with hierarchy structures that require stability and defend against risk by following strict regulatory rules. The bank's established structures currently experience difficulties because they work against Agile principles which value flexible teamwork and iterative work cycles. A working paradigm based on top-down management requires employees to adapt to collaborating and adapting to their new work environment. A significant problem occurs when middle managers resist changes because Agile approaches decrease their authority to make direct decisions (Brühl, 2022). The implementation of Agile requires financial institutions to create organizational changes that build a workplace culture enabling open collaboration along with experimentation and distributed decision-making authority.

Agile implementation faces major challenges in the banking sector because of the numerous regulatory standards in place. To operate banks need to follow strict financial regulations together with central financial authority-imposed risk management policies and data security requirements. Consulting Beerbaum (2020) reveals how Agile methodology encounters difficulties with regulatory compliance structures because flexible development methods might create risks involving regulations and security breaches. The Central Bank of Jordan imposes strict regulatory guidelines at banks in Jordan causing an extra challenge for Agile implementation. Financial institutions should create Agile method hybrids that combine compliance regulations with security protocols in their Agile development framework to ensure flexibility.

Agile's continuous development cycles cannot function with the outdated legacy systems that traditional banks currently use. Traditional waterfall methodologies used for creating legacy systems do not provide enough flexibility for the implementation of Agile methodologies. Banking institutions face a crucial technological hurdle when they try to merge Agile methods with their established core banking systems because this necessitates

strong financial investment to modernize their IT infrastructure (Tengstrand et al., 2021). Many financial organizations including Jordanian banks face difficulties in implementing Agile transformation because of their requirement to adapt to limitations in legacy IT frameworks. Agile methodologies need Agilistic solutions like microservices architecture, cloud-based platforms, and DevOps practices to work successfully with banking IT systems.

A proper Agile transformation depends on employees with knowledge of Agile frameworks and methodologies and best practices alongside skills in Agile method implementation. Agility implementation faces obstacles because banking professionals do not possess adequate Agile skills. Insufficient training during Agile implementation leads to operational problems and poor results because of imprecise implementations according to Bitzer et al. (2023). Banks must deliver extensive training to their workers because it enables better understanding and correct implementation of Agile principles throughout different teams. Outside Agile experts and consultants help facilitate better transitions when organizations bring Agile into their operations.

Large financial institutions face substantial barriers when they attempt Agile expansion throughout their entire organizational structure. The implementation of Agile across their organization faces major challenges for large banks because they operate with multiple departments across an extensive hierarchical framework while dealing with strict regulations. Isolated Agile team implementation within banks leads to Agile failure because banks do not address essential organizational changes that would make their Agile model scalable. The practical execution of Agile scaling requires full leadership engagement as well as team cross-cooperation and standardized organizational goals according to Kapur et al. (2019) through established frameworks such as SAgile and LeSS.

Traditional banking risk management functions oppose the adaptive and speedy methods of Agile due to their different approaches to risk assessment. Financial institutions need to validate that Agile practices adhere to their existing risk management frameworks while maintaining agile speed versus doing comprehensive risk assessments (Mustafa et al. 2019). The development of Agile risk management strategies by banks requires systems which perform recurring risk evaluation together with regulatory requirements but also preserve market responsiveness. The development of an integrated system demands joint effort between risk management teams and Agile project groups that combine Agile methodologies with risk reduction protocols.

Review of Literature

A review of the published literature examines research about Agile methodology in banking along with theoretical views and case studies and

gathered empirical results. The section integrates essential findings from three main sources which include academic literature and industry reports as well as practical Agile framework implementations in banking institutions. The Agile methodologies expanded their scope after origin to embrace software creation and now cover numerous businesses such as banking. Agile frameworks emerged as modern project management systems because they address three crucial requirements: quick financial product delivery along customer satisfaction through flexibility. Initial banking institutions adopting Agile programs have identified better operational performance along with better customer satisfaction and enhanced product development from their Agile structure changes (Beck et al., 2001; Highsmith, 2009).

Different Agile frameworks exist that banking institutions implement to solve their unique business issues. Financial organizations make extensive use of Scrum and Kanban together with SAFe (Scaled Agile Framework) as their primary organizational methodologies. Through Scrum institutions receive structured management methods for iterative development together with the Kanban mechanism which supports workflow visualization and delivers projects continuously. Largely-run banking institutions benefit from implementing the SAFe framework because it helps to scale Agile development at the organizational level and unifies project objectives among multiple teams (Leffingwell, 2011).

Most studies about Agile adoption in banking showed both the advantages and the challenges facing its implementation. Agile technology enables banks to enhance their speed at adapting to regulatory changes as well as market requirements and digital transformation needs according to Dikert et al. (2016). Agile implementation faces widespread barriers because of cultural resistance together with regulatory requirements and difficulties with enterprise system alignment (Conboy, 2009).

The rising number of studies examining Agile in banking has not filled all the operative knowledge gaps. Few research studies examine Agile banking practices in emerging markets while most investigations center on Western banking institutions such as Jordan. Current research about Agile frameworks and benefits exists but lacks substantial findings regarding both Agile sustainability in the long term and its effects on organization culture as well as financial results. Research that resolves these knowledge deficits will generate essential data about Agile methodology success in Jordanian banking institutions and global institutions.

Methodology

The study extends previous works that document banking sector challenges for Agile methods while providing a specific analysis of Jordanian banking commercial usage. The study uses a Mixed-Methods methodology for

understanding Agile implementation complications and then establishes strategic approaches to Agile implementation.

The study uses both quantitative survey methods and qualitative case study approaches which follow established research procedures. The survey investigates 200 banking professionals whose Agile experience is established by using purposive sampling. The survey combines both Likert-scale rating questions to evaluate Agile implementation aspects and open-ended fields that facilitate comprehensive answers.

A qualitative study utilizes semi-structured interviews to gather data from 15 senior banking executives who belong to various departments following an expert-based purposive sampling approach. The interviews have a dual purpose to examine Agile project deployment approaches while investigating corporate pushback along with regulatory hurdles. A thematic analysis methodology identifies key recurring patterns as well as critical themes to deliver a complete comprehension of Agile implementation within Jordanian banking institutions.

The combination of statistical data analysis with real-life narratives provides researchers with an extensive evaluation method to analyze Agile implementation research in depth.

Quantitative and Qualitative Data Collection

This study emulated the survey approach established by Alallaf (2010), Ahmed & Elali (2021), and Tengstrand et al. (2021) to discover analyze, and respond to Jordanian banking sector obstacles to agile methodology adoption. The survey methodology holds its validity because research proves it effectively collects extensive experiences and opinions from numerous participants. The survey contained established questions that aimed to measure the scope and depth of Agile implementation challenges according to the literature review findings. Descriptive along inferential statistics were used for survey data analysis to understand what factors influence Agile implementation throughout these institutions.

The research used semi-structured interviews because it adopted the methodological approaches from pivotal studies in the literature review to explore ten important banking stakeholders in Jordan. The group of stakeholders consisted of Agile practitioners along with IT professionals who work directly on Agile programs and management staff. The interview sessions explore detailed individual perspectives of staff members directly implementing Agile which extends beyond survey-based data to deliver substantial insights.

The methodology used selection criteria based on bank role together with experience levels and Agile transformation involvement in different financial institutions. The researchers conducted interviews where they

studied bank representatives to analyze Agile implementation hurdles combined with the realized benefits and strategic approaches for Agile integration across different financial institutions. The gathered interview details provide essential knowledge for comprehending actual Agile difficulties and achievements through implementation. The interview findings show how various banking institutions implement Agile and demonstrate shared challenges related to change resistance and training needs alongside the importance of powerful leadership.

Population and Sampling Strategy

All Jordanian commercial banks that implemented Agile methodologies make up the focus group for this investigation. The extensive research method allows the study to collect experiences and practices from various banking institutions. The quantitative survey used a comprehensive method by reaching out to employees from every Jordanian commercial bank that practiced Agile to obtain standardized information. Research interviews included ten key stakeholders who possessed firsthand knowledge of implementing Agile methodologies as the research objective was to obtain detailed qualitative information.

Results and Data Analysis

The chart below indicates a majority of bank employees are managers who offer analysis from leader and executive perspectives focused primarily on decision-making responsibilities. Technical implementation of Agile systems requires IT professionals representing 24% of the respondents while Agile practitioners specializing in methodologies form 10% of the group. Aside from other indirect roles, 6% of bank employees participated in the study.

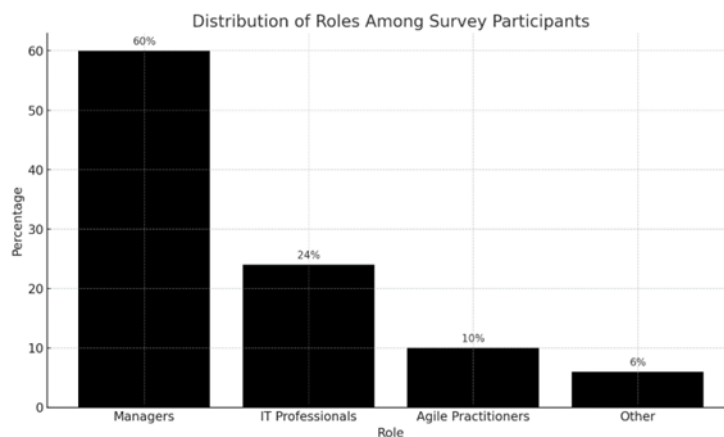


Figure 2: Distribution of Roles According to Survey Participants

Experience with Agile Methodology:

Table 1 shows that 40% of surveyed individuals possess 3-5 years of Agile experience reflecting an advancing phase of Agile application in their banking institutions. Twenty percent of survey participants hold 1-3 years of Agile experience followed by ten percent who began working under one year. These numbers indicate continued implementation and interest in Agile methodology.

Table.1

Role	%	Experience with Agile	%	Preferred Methodology
Managers	60%	< 1 year	10%	Agile
IT Professionals	24%	1-3 years	20%	Waterfall
Agile Practitioners	10%	3-5 years	40%	Hybrid
Other	6%	> 5 years	30%	

Table 1 shows that 48% of participants opt for using the Agile method together with traditional approaches in their projects while 44% support Agile-only approaches. Only 8% of the participants support the traditional Waterfall method because there has been an apparent reduction in the use of rigid linear approaches.

Key Challenges and Impediments

Survey results show that multiple essential challenges exist for Jordanian banks when implementing Agile methodologies. Fig 3 summarizes these key obstacles:

- The majority of 75 percent of respondents selected organizational opposition to change as the primary barrier in their path toward implementation.
- The survey demonstrated that training deficiencies affected half of all respondents who saw implementation challenges in Agile methodology deployment.
- Existing systems posed technical problems for Agile implementation according to 45% of participants who responded to the survey.
- Traditional corporate cultures pose a challenge in Agile implementation according to 40% of those surveyed because of their cultural barriers.
- Agile adoption faces challenges when leaders fail to provide support according to 35% of respondents who participated in the survey.

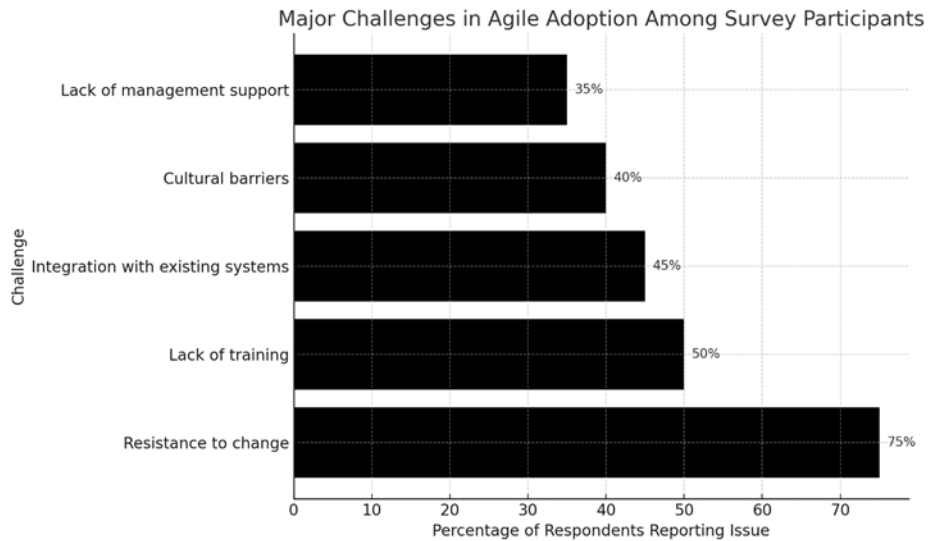


Figure 3. Major Challenges in Agile Adoption Among survey Participant

Conclusion

Agile methodologies implementation in Jordanian banking services creates multiple opportunities to improve operational efficiency and both individual and organizational innovation as well as customer satisfaction levels. The study recognizes multiple challenges that prevent effective Agile practice adoption. The path to Agile implementation within Jordanian banks becomes challenging because of cultural resistance coupled with regulatory constraints and integration challenges a lack of qualified Agile experts and difficulties in increasing operations scale. Traditional banking institutions together with their hierarchical structures and regulatory environments prevent them from successfully implementing Agile methodologies because digital banks and fintech firms have shown better results in Agile implementation. This research demonstrates that different banking institutions experience different levels of Agile implementation and identifies specifically why tailored Agile deployment strategies become essential. Agile frameworks help financial businesses adapt yet monetary regulatory requirements and organizational procedures in the banking sector demand balanced implementation methods. These barriers require a detailed solution that should unite executive backing with ongoing staff instruction together with technological funding.

Recommendations

The following suggestions will help implement Agile methodologies successfully in Jordanian banking institutions:

1. Organizational leaders need to create an agile work environment by promoting agile principles by enabling teamwork and continuous learning together with adaptation to change. Leaders should use change management strategies to lower the resistance that exists when implementing Agile frameworks.
2. Banks along with regulatory bodies should team up to establish Agile-compliant compliance frameworks which regulatory bodies must support. Banks should gain access to testing areas through regulatory sandboxes where they can test Agile methods according to financial rules.
3. Banks must establish comprehensive Agile training programs which need to cover all organizational employee levels. Agile development training gets implemented through workshops and certification courses as well as mentorship programs that foster Agile competence inside organizations.
4. The successful integration of Agile practices depends on banking institutions implementing contemporary IT infrastructure based on cloud computing with microservices architecture and DevOps methods. Modern technology platforms will speed up code evolution as well as let Agile models function more efficiently.
5. Agile deployment in banking requires a divided implementation strategy where chosen departments first embrace Agile practices which later expand organizational Agile adoption. Businesses seeking to achieve a seamless transformation should adopt hybrid Agile methods that unite Agile with established bank business practices.
6. Agile excels when companies establish departments that support collaborative work relationships. The grouping of bank teams should bring together representatives from IT together with members from risk management operations and customer service and ensure their work advances Agile objectives.
7. Successful implementation of Agile needs consistent feedback assessments combined with iterative processes. Performance metrics must be created by banks to conduct Agile reviews with feedback collection from staff members and customers as part of enhancing Agile deployment strategies.

Future Research Directions

The present research has yielded beneficial knowledge regarding Agile adoption in Jordanian banks yet additional studies must investigate how Agile will affect financial outcomes and client experiences long-term. Research should extend beyond banks to assess Agile implementation within insurance and investment sectors of the financial industry for a wider understanding of its application in the field.

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Declaration for Human Participants: This study is part of my doctorate thesis, approved by Dr. Assem Al-Hajj, chair of the defense committee at International American University. It follows the standards of the International American University and established research ethics guidelines.

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Enhancing PhD Education: Research Collaboration and Assistantship Insights from Columbia Teachers College and Georgian Universities

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Abstract

Postgraduate education has always been a vital component of academic development, delivering specific expertise and knowledge and advancing innovation throughout different sectors of science and industry. In the context of an ever-changing environment, universities seek to improve their postgraduate programs by embracing successful models from different parts of the world. This endeavor of improvement necessitates an integrated approach to forward-looking postgraduate studies, designed to equip learners with the knowledge and competencies needed to thrive not only in conventional scholarly careers but also in a broader spectrum of positions within non-academic circles. All earnest efforts should be made to nurture the competencies of doctoral students to become applicable for diverse fields, such as industry, public or private sectors, non-profit institutions, and business organizations, therefore facilitating graduates to find their way in a competitive labour market successfully. The focus of this paper is to identify and analyze the advantages associated with experiential teaching and learning through professor assistantships and cooperative research in doctoral programs. This paper uses qualitative data and analyzes them from institutional policy documents and primary documents such as curriculum and policies for teaching/learning in postgraduate courses at Columbia Teachers College, NYU, and recent changes to institutional regulations concerning

doctoral education at International Black Sea University (IBSU). Additionally, it investigates specific mechanisms embedded in these programs that foster development at both the prospective academic and professional levels. The findings suggest that professor assistantships and collaborative research are considered valuable experiences that benefit both doctoral students and the staff of the university through the development of teaching experience, professional development, and mentor/mentee relationships. Finally, this paper gives insight and recommendations for Georgian universities based on successful models found and could have implications for the quality and relevance of doctoral programs and their ability to prepare graduates for the competitive and diverse labour markets.

Keywords: Postgraduate education, professor assistantship, research collaboration, academic and non-academic community, labor market

Introduction

The Professor Assistantship program offers teaching (Teaching Assistantship: TA) and research (Research Assistantship: RA) opportunities for graduate students, typically those pursuing their doctoral degrees. The specifics of professor assistantship programs may vary by institution and field of study; however, their key components are generally similar. An assistantship with a faculty member involves a range of activities, including observing the professor's teaching methods, reading, grading assignments or exam papers, conducting seminars and practical lab sessions, facilitating discussions, and proctoring exams. Under the research assistantship, they supervise BA and MA students' work on conference papers and consult with them on their theses. These programs provide valuable experience to PhD students in educational settings, as they promote collaboration between doctoral students and faculty members, scholars, researchers, and education specialists, intended to enrich the research process. This partnership has a wide range of forms, including joint project initiatives, co-authored papers, collective resources, and cross-organizational research programs. Because of the elaborate nature of research, teamwork is critical; research teams share significant knowledge, proficiency, and skill level, and by coming together, researchers form constructive and collaborative interactions that are often more advantageous and more impactful than self-generated research (National Research Council, 2015). Furthermore, working together makes leverage possible, allowing researchers to get the most out of their own results and outputs while enhancing all the benefits derived from their contributions (Wai-Chan, 2017). Besides, assistantships serve as a bridge between theoretical and practical knowledge. By leveraging acquired theories in real-life educational environments-observing, grading, proctoring, and leading the process-the PhD

students gain their understanding of teaching/learning practices that will benefit them in their educational journey.

Apart from the above-mentioned factors, assistantship programs are paid employment opportunities for doctoral students. They work for predetermined hours per week, and in exchange, they get a tuition waiver and a monthly stipend. The United States is widely regarded as one of the key destinations for pursuing an academic degree; however, this comes at a considerable expense. According to the National Center for Education Statistics (NCES) for the academic year 2023-24, full-time graduate students at public postsecondary institutions in the U.S. following an academic year calendar faced an average tuition and required fees of \$11,827. This figure originated from data gathered from 1,598 institutions. The expenses associated with tuition and living costs are significantly higher for international students. Although there are different sources of financial aid, including scholarships and student grants or loans, these resources are often limited and primarily based on academic merits. To alleviate this financial burden, a lot of the U.S. universities offer paid assistantships for graduate students, especially for teaching assistantships (TAs) and research assistantships (RAs); alternatively, it may include a monthly stipend or tuition remission. Hence, pursuing a degree in the U.S. is more affordable and accessible.

Engaging in teaching assistantships (TAs) offers graduate students a wealth of benefits that extend far beyond financial assistance. This experience deepens their understanding of their field by requiring them to explain and convey complex concepts to others. Through instruction, resource creation, clarification of ideas, and facilitation of student participation, TAs enhance their comprehension of the subject matter (Darling & Potter, 2021) and develop essential pedagogical skills. They refine their abilities in lesson planning, classroom communication, student learning assessment, and feedback delivery – skills critical for effective teaching. TAs provide diverse classroom support, including one-on-one guidance and small group instruction. Importantly, positive TA-student interactions correlate with improved student attitudes and perceptions of their learning (Wheeler et.al., 2017), suggesting that students feel more comfortable with course content and their own learning progress when supported by a TA. Conversely, research indicates that a TA's disinterest or failure to cultivate a positive and supportive relationship with students diminishes students' competence in the subject and significantly decreases their overall motivation to learn (Trenshaw et. al., 2016). Beyond the direct classroom experience, TAs also contribute to student engagement and social integration. Social integration, facilitated through co-curricular activities like joining clubs and interacting with faculty and staff outside of class, is vital for student success. Kamphorst et al. (2015) provided empirical evidence linking social integration and engagement, demonstrating

the importance of belonging for overall student participation. By actively engaging in these roles, TAs enhance the educational experience and contribute to improved learning outcomes for students (Freeman et al., 2014). Developing these practical and interpersonal skills not only enhances their immediate performance but also prepares them for future academic endeavors and provides a competitive advantage in the job market (DeAngelo et al., 2016). Furthermore, the mentorship and management skills acquired through TA positions are valuable assets beyond academia, displaying leadership and communication abilities that are highly sought after (Shannon et al., 2015). However, access to assistantships and productive research collaborations can present challenges for doctoral students. While TAs provide invaluable teaching experience and networking opportunities, gaining access can be difficult. Similarly, while productive research collaborations expose doctoral students to contemporary research methodologies, systemic barriers may impede equitable access. Access to primary research resources and competent, supportive advisors are also critical benefits of research collaboration. These collaborations offer opportunities to develop grant writing skills, prepare manuscripts for peer-reviewed journals, and build professional networks that are essential for career advancement (De Welde et al., 2015). Unfortunately, the current landscape of intrusive institutional structures and competitive funding may limit opportunities for assistantships and collaborative research experiences (Yampolsky et al., 2022), which can exacerbate existing disparities in access and retention within the research workforce.

Methodology

As professor assistantships and research collaboration programs can vary widely, this section of the paper outlines comprehensive frameworks to evaluate the impact and effectiveness of these programs. To this end, two case studies will be presented, one from the internationally recognized Columbia Teachers College (the U.S.) and another from the International Black Sea University (Georgia). Based on both qualitative and quantitative data, this comparative analysis captures the peculiarities of these universities' programs, explores the varied experiences, and presents an overall perspective on the opportunities and challenges faced by the doctoral candidates involved in these programs. Additionally, visual aids, including charts and tables, will illustrate key points.

Data was collected using primary sources such as syllabi, institutional policies, framework papers, as well as surveys and interviews. Respondents were faculty members, authors of programs/program coordinators, and doctoral students engaged in assistantship and research collaboration programs. Moreover, the semi-structured interviews were designed to grasp the views of the program's target group, to identify the program's strengths

and weaknesses, to explore the gained skills, professional development opportunities, support mechanisms, and overall impact of these programs on students' academic journeys as well as the academic institution itself.

The combination of qualitative and quantitative results proved to be a valuable basis for illustrating the current state of these programs for PhD students and offers some recommendations for IBSU to share the experience from Columbia University to enhance these programs for better outcomes. This paper seeks to deepen understanding of robust professor assistantship and research collaboration programs in an ever-evolving educational setting, encouraging a discourse on best practices that benefit both prospective doctoral candidates and higher educational institutions.

Results of case studies

For this research, two case studies-Columbia Teachers College and International Black Sea University-have been selected to dig deeper into the peculiarities of the assistantship programs, uncover both common and uncommon elements between these two educational institutions, outline the expected academic and time commitments, share valuable experiences from the U.S., and contribute to honing the assistantship programs in Georgian higher educational institutions.

To begin with, there are various assistantships available at Columbia Teachers College, having specific obligations, commitments, and compensation measures depending on the program offered. Assistantship types include Research Assistantships (RAs), Teaching Assistantships (TAs), Administrative Fellowships (AFs), and Course Assistantships (CAs). At Columbia Teachers College, assistantship programs offer graduate students both professional growth and financial aid. While peculiarities of assistantships may differ linked with each role, there are shared aspects that most programs have in common. With assistantship roles, graduate students get different types of compensation, including a mix of salary, hourly wage, and/or tuition credits in exchange for their work on teaching, research, or administrative projects.

Firstly, students involved in assistantships are permitted to work up to 27 hours per week across their assistantship roles. Along with hourly wages, some programs offer tuition credits as part of their compensation. Additionally, students may receive regular paychecks in agreement with the Teachers College payroll scheme, ensuring that students manage their funds easily while striving for academic excellence. It is also important to note that any earnings students receive from assistantship positions are considered taxable income, meaning they have a responsibility to ensure compliance with tax regulations. Students can gain a thorough understanding of all necessary details to make informed choices regarding their assistantship options at

Columbia Teachers College. These assistantships serve two primary goals: to support graduate students in alleviating financial burdens while helping them develop the academic and professional skills crucial for future success. Moreover, students involved in RA and/or TA have a chance to earn credit points and enhance their academic performance as PhD students.

Please find the charts below to have a better understanding of the types, duties, and compensation ranges of assistantships at Columbia Teachers College:

Table 1: Types of Assistantships, Their Compensation and Time Commitment

Assistantship Type	Duties	Work Hours per Week (by Semester)	Compensation Range	Tuition Credit
Research Assistant (RA)	Perform academically relevant research.	15-20 (Fall/Spring); 18.75-25 (Summer)	\$3,375 - \$9,000 per semester	Up to 9 points/year
Teaching Assistant (TA)	Assist professors with instructional activities.	15-20 (Fall/Spring); 18.75-25 (Summer)	\$3,375 - \$9,000 per semester	Up to 9 points/year
Administrative Fellow (AF)	Perform administrative services.	15-20 (Fall/Spring); 18.75-25 (Summer)	\$18 per hour	Up to 9 points/year
Course Assistant (CA)	Work closely with a faculty member to perform academically relevant tasks.	4.5 (Fall/Spring); 10 (Summer)	\$18 per hour	None

The case study results exemplify that the assistantship programs at Columbia Teachers College serve as a bridge for integrating theoretical knowledge with practice in graduate studies. Moreover, the robust structures and different types of assistantships are available, along with a diverse set of duties and responsibilities assigned to graduate students. The compensation provided (such as wage and/or tuition credit) and rigorous assessment criteria collectively prepare students to acquire essential competencies to become well-versed and successful academics in the future.

Another case study examined was the syllabus of the IBSU doctoral assistantship program in American Studies. The assistantship program proves to be a robust framework at a School of Social Sciences, Humanities, and Education at the International Black Sea University. The main objective of a course designed for doctoral students in American Studies is to closely connect theoretical knowledge with hands-on experience in higher education,

engaging the students in various activities at the BA and MA levels. The qualitative analysis of the syllabus demonstrates a strong alignment between theory and practice, equipping doctoral students with a deeper understanding of pedagogy. Moreover, the students are exposed to different activities, such as observation, grading the assignments, and running the discussions, which promote a favorable learning environment, preparing the doctoral students for their future academic paths. In addition, the focus has been made on communication skills enhancement, including verbal and non-verbal presentation skills that are critical for PhD students. The program supervised by any professor involved in the program is elective; however, it is mandatory for those who lack university teaching experience. The key activities of the course that includes 10 ECTS (250 hrs.) encompass observing lectures, assisting in planning and carrying out classes, holding seminars and lab works, assessing homework and exam papers, proctoring at exams, designing educational materials, supervising student research, and consulting students working on their thesis consultation (all at BA and MA levels). As for the learning outcomes, upon completion of the doctoral assistantship program, students are equipped with a mix of knowledge, including critical thinking, verbal and non-verbal presentation skills, collaborative techniques, and planning abilities. Furthermore, it should be noted that as part of this analysis, an interview was conducted with Prof. Dr. Ekaterine Pipia, the Head of Education Sciences PhD (in English) and Education Administration MA Programs, who has highlighted that IBSU acknowledged the importance of practical work for postdoctoral students. Accordingly, it has become mandatory for potential doctoral candidates to have experience in writing grant proposals and participating in international conferences, eventually leading to the publication of research papers.

Comparative Analysis

To have a better understanding of the similarities and dissimilarities between the educational institutions' assistantships examined, a thorough comparative analysis has been conducted. The table presented below highlights the features of the compared programs.

Table 2: Comparison of Assistantship Program Features

	Program Structure	Mentorship	Scope of Activities	Learning Objectives	Assessment
Columbia Teachers College	Departmental Supervision	Dedicated Faculty Member	Academic, Instructional and Administrative Roles	Research and Teaching Skills Development, Professional Networking	Performance Evaluation, Portfolio Assessment
IBSU	Individual Supervision	Dedicated Professor	Focus on Teaching Support Only	Pedagogical Skills	Reports and Presentations

Based on this comparative analysis, it is evident that IBSU can learn some lessons from the Columbia Teachers College methods, renowned for their comprehensive and student-driven structure of assistantships. Here are some basic areas for improvement:

1. **Mentorship:** The assistantship program serves as a bridge between theory and practice. It would be better to shift from individual supervision to a department-centered structure aimed at supporting students in navigating their academic paths, allowing for a wider range of opportunities beyond the research work.
2. **Diversified Assistantship Roles:** When the emphasis is primarily placed on teaching support at BA and MA levels, it somehow limits the scope of activities for doctoral students. Once the assistantship expands on curriculum development, planning mandatory workshop/lab work, writing grant proposals, and providing administrative assistance not only to the dedicated professor but to other staff as well, it broadens the set of competencies, uncovers different aspects of academic life, and diversifies the future employment areas for doctoral students.
3. **Assessment:** A multifaceted assessment approach is fundamental for enhancing student performance. Diverse assessment methods that go beyond presentations or reports, including progress monitoring, constructive professional growth, and feedback made by both faculty and BA/MA students, are instrumental in identifying areas for improvement. This assessment approach aligns with the primary goal of preparing doctoral students for various academic positions and promotes their professional development.
4. **Compensation:** Considering that the assistantship responsibilities require high participation and time commitment from doctoral students, providing some compensation possibilities would be a valuable help to alleviate the financial burden of pursuing an academic degree for students.

To conclude, the examined professor assistantship syllabus for doctoral students in American Studies at IBSU proves to provide a strong framework; however, it can be significantly improved by sharing the Columbia Teachers College Assistantships experience. By integrating more effective mentorship and doctoral student-centered methods, diversified roles, and robust assessment criteria, IBSU can ensure that doctoral students get the support necessary for their diverse career roles as researchers, professors, educators, mentors, and other related positions. The proposed recommendations should be viewed as a roadmap for facilitating institutional changes at IBSU.

Obstacles on the way

Given that assistantships encompass a wide range of duties, they can be very demanding for doctoral students. Some barriers are presented below:

Lack of funding

One of the key obstacles to successful assistantships and research collaborations is a deficiency in adequate funds. According to Stephan and Levin (2016), for assistantships, research partnerships, and the science enterprise, adequate funding is a necessity. The absence of funding provides little to no support, setting up a barrier to funding that can strangle innovation and limit researchers' potential, especially that of graduate students. Limited funding severely limits the breadth and depth of research projects, and it also limits access to opportunities and experiences of graduate research assistants and any collaborative projects. Additionally, limited funding may restrict access to or limit equipment, data, and personnel, hindering the possibility for transformational discoveries and innovations. For example, insufficient financial backing can restrict access to necessary tools, software, and data, which are crucial for conducting reliable and thorough studies (National Academies of Sciences, Engineering and Medicine, 2019). Moreover, inadequate funding can impede the ability to attract and retain talented and skilled researchers and constrain collaboration possibilities within the research community (Stephan, 2012). This situation also stays the same for IBSU, where the finances allotted for postgraduate studies are inadequate and often hardly meet the research needs of students. For this reason, students may find it difficult to pursue research projects, participate in conferences, or access to resources they need on this journey. Overcoming these financial barriers is crucial for fostering the potential of graduate students at IBSU and beyond.

Time constraints

Often, PhD students balance coursework, training, teaching responsibilities, and research, among many other obligations. When various demands compete for the same time, it can greatly affect available time for assistantship duties (Pyhältö et al., 2015). Furthermore, limited time and resources can lead to stress, burnout, and decreased well-being, which can negatively impact the strength of their assistantship program and their contributions to research (Evans et al., 2018; Levecque et al., 2017). Additionally, relevant support and unclear boundaries and expectations from supervisors may have effects on research productivity and overall doctoral experience (Metcalf et al., 2018). Most students are involved in employment in parallel with their tertiary education. One potential solution to this critical issue is to encourage participation through financial backing, performance-related bonuses, or other incentives. Tackling this prevalent challenge requires

a multifaceted strategy, including organizational adjustments, policy and structural changes, and social transformations. Earning money is necessary to cover education expenses. More efforts should be made by the university and the government to provide financial support to tertiary-level students. More resources should be allocated for postgraduate students who have high academic achievements but are in need of financial aid from the university administration, including scholarships, grants, part-time jobs, awards, or fellowships.

Mentorship quality

The mentorship quality under professor assistantships can differ significantly. Effective mentorship is vital to promote the growth of the student's professional competencies. The mentoring quality as part of assistantships has a significant impact on the development of students. Quality of mentoring is now recognized as critical to the professional skill development and well-being of students (DeCastro, 2019). High-quality mentoring has been related to increased levels of student motivation, improved research productivity, and academic achievement (Sverdlik et al., 2018). More specifically, supportive coaching can deepen students' research skill set, enhance critical thinking, and develop their sense of their own field. These benefits demonstrate an opportunity to engage PhD students in multidisciplinary and collaborative assistantships and research, which assists in student-generated learning. Thus, there is a greater opportunity to engage PhD students in multidisciplinary projects and further involve them in group work as part of their assistantships and research activities at IBSU. There is a well-established practice to encourage students to take part in the American Studies Annual International Research Conference, the Annual International Silk Road Conference, where students can make their presentations and publish their papers in the Research Journal and the International Scientific Conference proceedings in American Studies. This is a valuable tool for them to gain credibility, build a professional portfolio, and get recognition within the academic community. For this purpose, PhD student presentations of the doctoral dissertation blueprint at the end of each semester and scientific presentations at annual conferences are good examples. However, given that publishing papers in peer-reviewed and indexed journals is rather costly, the universities may consider providing at least partial funding for publication costs, especially for graduate students with high academic achievements, as an incentive.

It is noteworthy that the establishment of a scientific board is critical to guiding academic endeavors in the modern research community. Given that the Scientific Board is composed of experienced scholars in different fields, through collective mentorship, they guarantee each research project follows

rigid quality standards, including data collection and analysis and scientific integrity, thus mitigating the risk of biases, as well as ensuring the reliability of findings (Thompson, 2018).

To conclude, universities and national educational institutions can make valuable contributions to equip tertiary education students with the necessary competencies, provide support to navigate into the complex world better, cope with contemporary challenges, and embark on thrilling new professional adventures. To this end, it is advisable to provide numerous opportunities for doctoral students to attend annual national and international conferences, seminars, and workshops. This networking can facilitate building strong connections with peer researchers and industry professionals, resulting in more job offers and collaborations beyond graduation.

Conclusion

In conclusion, this paper explored the role of professor assistantship and research collaboration at Georgian universities for improving doctoral student-quality outcomes, as well as its potential contribution to national development. The examination of the Columbia Teachers College Assistantships, in conjunction with the examination of international best practices, encouraged three key areas in which programs could significantly develop doctoral student preparation. First, structured professor assistantship experiences can improve pedagogical skills. Second, collaborative research design and experiences can build critical thinking and analytical skills for future leaders in academia. Third, these programs can also develop networks and partnerships that bring students into the wider community, thus creating career pathways outside of academia. When applying the analysis of the findings to the Georgian context, attention to funding streams and current departmental structures is imperative. While the Columbia model is a viable approach to assist in the exploration of the possibilities, it is unlikely that the program would be appropriately replicated. Instead, piloting programs on a phased basis within priority departments that align with national development priorities is arguably a more sustainable approach within Georgia. A potential challenge to implementing professor assistantships will be consistent funding for paid positions. However, partnerships with private sector companies in developing paid positions may result in knowledge exchange and utilize company or local business investment in developing skilled researchers and innovators. Therefore, Georgian universities may wish to engage proactively with the opportunities to implement structured professor assistantship and research collaboration programs.

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Discovering the best practices of Total Quality Management influencing performance in the Moroccan hospitality industry

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Abstract

The present study explores the link between Total Quality Management and hotel performance with a particular focus on identifying best practices from the European Foundation for Quality Management that can enhance business results in the hospitality sector. A quantitative confirmatory study was conducted using a five-point Likert scale questionnaire distributed to 93 Moroccan hotels, specifically targeting senior managers with expertise in quality management. The collected data were analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique. The results reveal that Total Quality Management (TQM) serves as a key driver of both financial and customer performance within hotels. Furthermore, strategy and processes emerged as the most influential enablers of enhanced hotel performance, as they guide decision-making and ensure that activities are aligned with organizational objectives. While leadership, people, and resources play a more supportive role, they remain essential for the successful implementation of strategic initiatives. Their contribution is realized through fostering employee motivation, promoting effective teamwork, and optimizing the use of financial and technological resources. This research offers a unique empirical contribution by examining how hotels embrace a key managerial approach to enhance their performance. Additionally, the study focuses on a widely recognized model for business excellence, offering a targeted and in-depth analysis of how specific practices within this framework can impact hotel performance.

Keywords: Total quality management, performance, EFQM, hotel, PLS

Introduction

Over the recent years, the link between Total Quality Management (TQM) and performance has gained significant interest of researchers at both theoretical and empirical levels. TQM is a managerial approach that involves instilling a quality mindset as a concern and responsibility for everyone in the organization (Zairi and Youssef, 1995).

By the early 1980s, hotels began to recognize the importance of embracing quality concepts and were subsequently influenced by the American hospitality industry programs. By the late 1980s, they realized that TQM was a more powerful process for improving their institutional image, which was strongly influenced by customers' perceptions of quality. Effective quality management became one of the key enablers for the hotel industry to attract more customers (Camison, 1996).

The Ritz-Carlton chain is a prime example of the positive impact of TQM in the hospitality industry. Recognized for its improved commitment to quality and customer satisfaction, the brand earned the prestigious Malcolm Baldrige National Quality Award in 1991. The chain focuses on delivering exceptional, personalized service while prioritizing customer satisfaction and empowering employees. The leadership structure encourages teamwork and employee participation in the strategic planning process. Despite initial resistance to this approach, Ritz-Carlton refined its methods for fostering effective team dynamics, placing a strong emphasis on building relationships among team members and providing training to ensure collaboration. This transformation has positioned The Ritz-Carlton as a leader in the service industry. The internal impact of TQM requires significant changes, supported by senior management, in organizational structures, attitudes, and behaviors of all those involved.

While Ritz-Carlton is a luxury hotel chain with substantial resources, this fact doesn't necessarily mean that other hotels can't achieve similar results using TQM principles. However, the extent and manner in which TQM is implemented might differ based on resources, teams, and the hotel's context.

According to Sakarya and Çizel (2022), there is limited academic research on TQM impacting performance in the hospitality industry, with studies specifically focusing on the European Foundation for Quality Management (EFQM). The literature review reveals likewise inconclusive results.

Therefore, the present study follows this recommendation in the Moroccan context. The purpose is to investigate the impact of TQM practices

on Hotel Performance (HP) and identify the best practices from EFQM that improve the performance levels.

The article is organized as follows. After the introduction, the hypotheses are formulated based on a literature review. Then, the methodology used for the analysis is presented, and the results are illustrated. Finally, the last section discusses the conclusions and the main implications for theory and practice.

Literature review and research hypothesis

The role of TQM in improving HP has been widely debated. Some authors firmly believe that TQM leads to superior performance and sustains business growth (Sohal, 2006; Olaleye et al., 2023) by influencing various aspects of hotel performance, including employee satisfaction, customer satisfaction, operational efficiency, and financial results (Claver-Cortés et al., 2008; Benavides Velasco, 2014; Milovanović, 2014; Muslim Amin et al., 2017; Bouranta et al., 2017; Hrgović, 2024). TQM emphasizes the effective coordination of activities across processes, fostering continuous improvement throughout the organization to meet or surpass customer expectations (Anderson et al., 1995). Others (Powell, 1995; Patiar, 2012; Wang, 2012) argue that TQM depends mainly on how practices are implemented within hotels. The impact is positive in departments where managers encourage the use of TQM, in contrast to departments where TQM practices are less encouraged.

However, other researchers have questioned the effectiveness of TQM. Cortés (2008) argued that TQM has an insignificant impact on financial performance, suggesting that these practices are better known among managers than customers. Moreover, TQM has a negative impact on HP, as demonstrated by Fatchur and Solimun's (2014) study, due to intense competition, occupancy rates are low, affecting financial performance. Chaher (2024) found that TQM has no direct effect on financial performance, while it positively impacts non-financial performance. Beer (2003) argued that the failure of TQM to improve performance is often attributed to poor implementation rather than flaws in the theory itself. Rougan (2015) explained the reasons for TQM failure, including a lack of consensus on goals, insufficient employee accountability, inadequate planning, and, most importantly, poor communication.

Based on this, the following hypothesis is posited:

H₁: TQM impacts positively HP both the financial and the customer.

Best practice of EFQM impacting performance

The study focuses on EFQM to evaluate how TQM impacts HP. A literature review has been conducted to identify the most important EFQM

criteria for improving HP. Politis et al. (2022) stated that hotels perform well in the processes criterion, reflecting well-defined procedures for service quality. Unlike the criterion of Partnerships and Resources, which has been found to show low-performance impact due to minimal involvement in strategic decisions, lack of supplier selection procedures, and poor human resources management, resulting from low staff participation in decisions, inadequate training, and poor inter-departmental communication. They added that leadership is a competitive advantage for hotels, particularly in setting and improving the hotels' mission, vision, and values towards quality (Claver-Cortés, 2008; Amin et al., 2017; Al Shourah and Al Shourah, 2020). Sozuer (2011) found that the leadership, strategy, and people criteria can lead to competitive advantages. Proper investment in people is crucial for enhancing performance in the service industry, a conclusion supported by previous studies. In the same vein, Constantinidou (2014) advanced that the leadership and people criteria emerged as the most significant for the five hotel general managers. Additionally, more important criteria identified are the definition and promotion of change in the organization, the policy and strategy based on the current and future needs and expectations of stakeholder groups, the planning management, and improvement of human resources, the management of buildings, equipment, and materials, and the design and development of processes.

Other researchers firmly stated that effective leadership requires not only setting a vision and direction but also actively engaging employees in the process of achieving organizational goals. The importance of linking leadership, employees, and customers in improving business results is highlighted by Cheung and Wong (2011). They confirmed that management commitment to service quality does not produce positive organizational outcomes unless it is linked with effective employee involvement in serving customers. Rani and Supinit (2015) demonstrated that when employees are involved, rewarded, and empowered, their satisfaction increases, leading to more effective TQM operations. Similarly, Hussain and Khan (2020) discussed the role of employee and organizational commitment, stressing that employee engagement is essential for delivering high-quality service and maintaining competitiveness. The study by Thuy (2023) concluded that employee involvement has the strongest impact on hotel business performance among the soft TQM practices. Similarly, Santos-Vijande and Alvarez-Gonzalez (2009) consider employees as recipients of benefits from TQM implementation. These improvements can, in turn, positively influence customer satisfaction and overall performance. Consequently, the second hypothesis is proposed:

H₂: Leadership and people criteria have a stronger impact on hotel performance than other EFQM practices.

Methods

The purpose of this study is to explore the impact of TQM on HP and identify the most relevant practices to enhance business results. This section deals with research design, especially related to sampling and the data collection method.

Sampling and data collection

The study focuses on 4-star, 5-star, and luxury hotels affiliated with national and international chains located in Morocco. The selection of these hotels was carefully aligned with the research objectives and the findings of the exploratory qualitative research. We compiled a list of 200 hotels that met the defined criteria, the most relevant being the familiarity with the TQM approach. A total of 93 hotels agreed to participate in the study (46.5%).

An online questionnaire was distributed to senior management representatives of these hotels over 7 months. A pre-test was conducted with five managers to ensure the clarity of the questionnaire, the absence of bias, and an appropriate completion time. Through a multi-stage data collection process, a total of 93 completed questionnaires were received and accurately analyzed. The questionnaire consists of three sections: Section 1 provides the demographic details of the hotel respondents. Section 2 presents the EFQM model used to evaluate TQM, with an emphasis on the five enablers: Leadership, Strategy, People, Partnerships and Resources, and Processes, Products and Services. Participants provided their responses to this section using a five-point Likert scale, where a score of one indicates disagreement (TQM practice is not represented), and a score of five indicates agreement (TQM practice is represented). Section 3 presents HP, evaluated through indicators such as occupancy rate, turnover, market share, customer satisfaction, loyalty, and requirements compliance. Participants were asked to indicate their level of agreement or disagreement regarding the status of these indicators.

Data Analysis

The collected data were coded in SPSS 20 for statistical analysis before performing the PLS-SEM analysis. PLS was preferred due to the limited data size, its suitability for Likert-type scale data, and its primary purpose in testing structural associations in this research. The sample size of 93 hotels is considered adequate for the PLS-SEM analysis, as it adheres to the general recommendations for this method. According to Hair et al. (2017), a minimum sample size of 100 is often suggested for PLS-SEM, though it can be reduced to 50 or even 30 in cases of simple models with fewer constructs.

PLS SEM method can simultaneously depict relationships among all latent variables (Figure 1) while addressing measurement errors in the

structural model. The analysis consists of two steps: first, evaluating the measurement model to ensure the precise identification of constructs; second, examining the structural model for hypothesis testing. The analysis will be conducted using SmartPLS 4 software, which ensures comprehensive and reliable results. This choice allows the study to effectively manage and analyze the relationships between variables, providing significant insights into the model's structure.

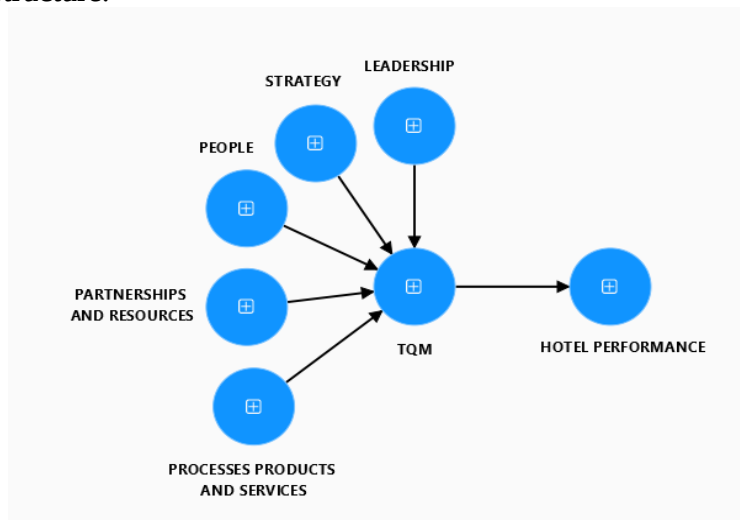


Figure 1: Research model

Main results

Measurement model assessment

Following the guidelines for PLS-SEM application by Hair et al. (2023), the first step in evaluating the measurement model is to assess indicator reliability by examining the indicator loadings. These loadings represent the correlation between each indicator and its corresponding construct, and their squared values indicate the proportion of variance explained by the construct. All loadings exceeded the recommended threshold of 0.708 (Figure 2), indicating that each indicator's variance is explained by more than 50% of the construct, suggesting acceptable reliability.

We then explored the internal consistency, reliability, and convergent validity of the measurement model. To evaluate internal consistency reliability, both Cronbach's alpha and composite reliability (CR) were used. Table 1 shows that Cronbach's alpha values ranged from 0.71 to 0.94, and the CR values for each construct were greater than 0.7, suggesting that the scales are internally consistent and reliable.

Table 1. Internal consistency, reliability and convergent validity

Condition	Cronbach's alpha ≥ 0.7 and ≤ 0.95	CR > 0.7	AVE ≥ 0.5
HP	0.868	0.904	0.654
Leadership	0.869	0.921	0.796
Partnerships and resources	0.627	0.842	0.727
People	0.692	0.829	0.617
Processes, Products, and services	0.944	0.964	0.899
Strategy	0.896	0.927	0.762

The third step is to assess the convergent validity of each construct. The average variance extracted (AVE) for each measure ranged from 0.42 to 0.89, supporting convergent validity, as the values exceed the recommended threshold of 0.50. This suggests that the constructs explain a substantial proportion of the variance in their respective items, indicating good convergent validity.

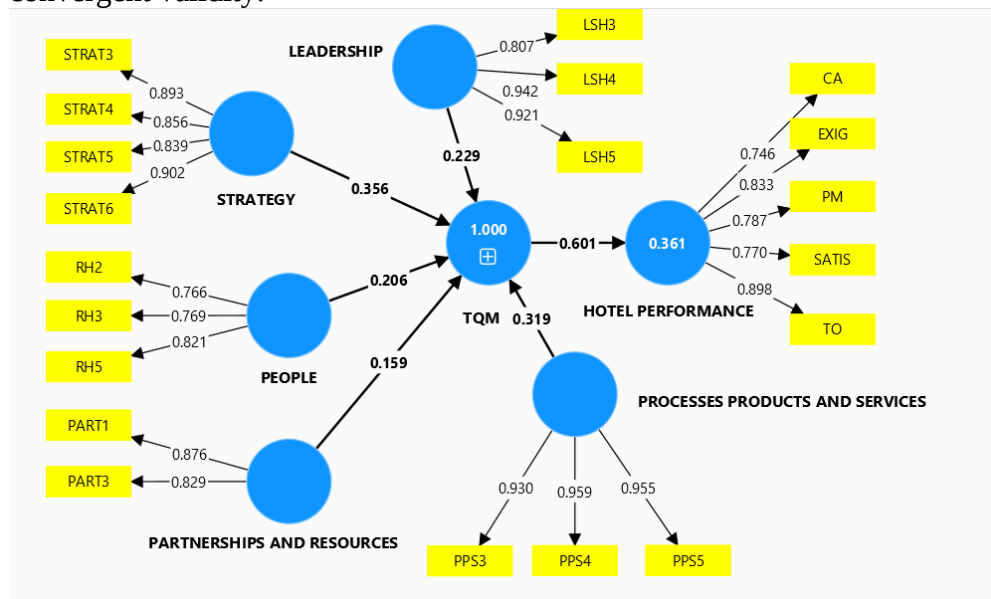


Figure 2: Research model on Smart PLS 4

Table 2. Discriminant validity

Condition	(1)	(2)	(3)	(4)	(5)	(6)
(1) Hotel Performance	0.809					
(2) Leadership	0.392	0.892				
(3) Partnerships and resources	0.413	0.494	0.853			
(4) People	0.501	0.378	0.465	0.786		
(5) Processes	0.535	0.523	0.664	0.452	0.948	
(6) Strategy	0.479	0.425	0.563	0.701	0.484	0.873

Table 2 presents the discriminant validity matrix. Fornell and Larcker (1981) introduced a traditional metric indicating that the AVE (average variance extracted) of each construct should be compared to the squared inter-construct correlations (which measure shared variance) with all other constructs in the structural model. Specifically, the shared variance among the constructs should not exceed their respective AVEs.

Structural model assessment

After assessing the measurement model, the next step is to evaluate the relevance and predictive capability of the structural model, with p -values below 0.05 and the t -statistics > 1.96 . The results (Table 3) revealed that all paths were significant, with f^2 effect sizes large ($f^2 = 0.556$). Overall, the illustrative model explained approximately 36% of the variance in performance ($R^2 = 0.354$), indicating moderate in-sample predictive capability.

Table 3. Validation of hypotheses

Condition	95%CI			Validity
	Original sample (O) > 0	t -statistics > 2.3	p -values < 0.05	
H_1 : TQM $\Rightarrow$ HP	0.601	8.414	0.000	confirmed
$H_{1,1}$ Leadership $\Rightarrow$ HP	0.137	4.994	0.000	confirmed
$H_{1,2}$ Strategy $\Rightarrow$ HP	0.214	7.299	0.000	confirmed
$H_{1,3}$ People $\Rightarrow$ HP	0.124	7.870	0.000	confirmed
$H_{1,4}$ PR $\Rightarrow$ HP	0.096	6.764	0.000	confirmed
$H_{1,5}$ Processes $\Rightarrow$ HP	0.192	7.379	0.000	confirmed

Discussion

The direct effect of TQM on HP is significant in the Moroccan hospitality context, with a coefficient of 0.601, indicating a strong positive relationship. The t -value of 8.414 and the p -value of 0.000 confirm that this relationship is statistically significant, meaning that improvements in TQM practices are likely to enhance hotel performance at both the financial and customer levels, ultimately contributing to the pursuit of business excellence (Cortes et al., 2008; Bouranta et al., 2017; Shourah and Shourah, 2020; Sin et al., 2022). Hypothesis 1 is confirmed. Hotels with higher levels of implemented TQM practices tend to have higher occupancy rates, revenue, market share, guest satisfaction, and adherence to standards.

According to the SEM results, all the effects are statistically significant, larger, and have greater explanatory power. However, Strategy is the most important variable in the TQM implementation process, impacting hotel performance, with a coefficient of 0.214. In other words, managers prioritize strategic alignment as a cornerstone of their TQM efforts. Strategy facilitates better decision-making and resource allocation, as it emphasizes key

performance indicators that align with organizational goals. The second most important criterion of the EFQM is processes, products, and services (0.192). Continuous improvement helps identify inefficiencies and implement proactive changes to optimize operations. This ensures consistent quality in the services offered and enables them to dynamically meet customer expectations. Continuous improvement also fosters a culture of innovation, where employees are encouraged to share ideas and propose solutions. Hotels can adapt to market changes and customer feedback, which is essential in such a competitive industry. Consequently, Hypothesis 2, which states that leadership and people have a stronger impact on hotel performance than other practices, is rejected.

The study suggests that Leadership (0.137) and People (0.124) play a supportive role rather than serving as primary drivers of performance. This can be attributed to several factors. First, leadership practices may be well-established within Moroccan hotels, potentially limiting their perceived direct impact on performance metrics. While leadership is crucial for setting the vision and shaping organizational culture, its influence may manifest indirectly through other factors such as strategy and processes. Leaders guide the strategic direction of the organization by making informed decisions that ensure appropriate resource allocation to achieve desired outcomes. They foster a culture of continuous improvement and motivate employees to innovate and enhance products and services. By demonstrating a strong commitment to quality, leaders inspire their teams to adopt best practices in daily operations, thereby improving overall service delivery (Rivaldo, 2021).

Employees also play a critical role in supporting strategic initiatives and improving products, processes, and services by fostering engagement and aligning their efforts with organizational goals. Effective collaboration encourages the exchange of innovative ideas, enhancing the guest experience. Through continuous training and skill development, employees are empowered to optimize service delivery and adapt to evolving customer needs. Constructive feedback allows them to identify areas for improvement in operations and offerings. A customer-centric mindset ensures that services consistently exceed expectations, and when employees take ownership of their roles, they become key contributors to the hotel's overall effectiveness and strategic success.

Calvo-Mora et al. (2014) emphasized that for an organization to improve key business results, leadership and human resource management must be oriented toward a culture of quality, learning, and continuous improvement. Similarly, Ali et al. (2010) argued that the commitment of both top management and employees significantly influences strategic planning, supplier management, information and analysis, continuous improvement, process management, and employee development.

Finally, the Partnerships and Resources criterion (0.096) has positive effects, but comparatively lower (Politis et al., 2022). Partnerships with suppliers and access to resources can directly enhance service delivery, provide innovative solutions, and improve the customer experience, all of which, in turn, indirectly impact performance. Moreover, effective resource management—including financial, human, and technological resources—is vital for optimizing operations and ensuring sustainability. In this way, strong partnerships and efficient resource management complement strategy, people, and processes to drive overall performance.

Conclusions

Managerial implications

The current study aims to assess the relationship between Total Quality Management (TQM) and both financial and customer-related hotel performance, as well as to identify the best practices that drive these outcomes. From a practical perspective, this connection can be leveraged to propose further applications of the model. The study shows two categories of TQM enablers: those with a direct impact on performance, namely strategy and processes; and supportive enablers, such as leadership and people, along with partnerships and resources.

Hotel managers are encouraged to adopt a balanced approach that prioritizes direct enablers while reinforcing leadership, employee involvement, and effective resource management. By doing so, managers can enhance hotel performance and create a sustainable competitive advantage in the hospitality industry. Specifically, they should clearly define organizational objectives, communicate them across departments, and align all quality initiatives with these goals. To support this effort, AI-powered tools such as predictive analytics, performance dashboards, can be leveraged to monitor key performance indicators (KPIs), identify trends, and facilitate data-driven decision-making at all operational levels.

Limitations and future research directions

The limitations of this study are related to several factors. Firstly, the study uses a cross-sectional design, meaning it observes the causal relationships between TQM practices and HP data at a single point in time. Longitudinal studies would be necessary to observe the long-term effects to track changes in performance over time and observe the enduring impact of TQM practices. Future studies could also adopt the new EFQM model.

With the emergence of artificial intelligence (AI) tools, future studies could explore the impact of technology on TQM in hotels, including the investigation of how digital tools and systems, such as customer relationship management (CRM) software, AI-driven automated service processes, and

machine learning algorithms, contribute to the implementation of TQM practices to enhance hotel performance.

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The Impact of Chatgpt on English as a Foreign Language Learners' Writing Skills-An Experimental Study at Georgian Universities

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Abstract

This study explores the impact of ChatGPT on English as a Foreign Language (EFL) students' writing skills. The integration of advanced AI tools like ChatGPT has transformed educational experiences, offering significant potential to enhance writing competence through personalized feedback and interactive writing practice. Conducted in a Georgian higher education context, the study involved 33 B2-level students divided into experimental and control groups over six weeks. The experimental group used ChatGPT for writing assistance, while the control group received traditional instruction. Results showed that ChatGPT significantly improved students' writing performance, highlighting its efficacy as an educational tool. However, concerns about ethical use and over-reliance on AI were noted, emphasizing the need for a balanced integration of technology in language learning.

Keywords: ChatGPT, English as a Foreign Language (EFL), Writing Skills, Artificial Intelligence (AI), Language Learning, Educational Technology

Introduction

Academic writing holds a pivotal role in the language development of English language learners, necessitating proficiency in diverse areas such as writing organization, coherence, grammar, and vocabulary (Campbell, 2019). Proficient writing skills enable clear and effective communication, ensuring that the writer's message is easily understood by the reader. In academic and professional settings, clear communication can prevent misunderstandings and convey complex ideas accurately. Strong writing skills are essential for academic achievement, as they are often a significant component of assessments, assignments, and research projects. However, English language learners often face motivation constraints due to time limitations, which hinders their ability to allocate sufficient time and effort toward improving their writing abilities (Lee, 2017). The emergence of AI-powered writing tools, accessible on mobile devices, provides a novel avenue to address the challenges associated with developing writing proficiency through traditional training methods (Zawacki-Richter et al., 2019; Jia et al., 2022; Kohnke, 2023). AI-powered writing tools can automatically detect and correct grammatical errors, stylistic issues, and punctuation mistakes, providing real-time feedback to users. These tools can offer suggestions for improving sentence structure, word choice, and overall readability, helping users refine their writing skills. According to the studies conducted by Liu et al. (2021) on the influence of AI-supported language learning on the writing skills of English as a Foreign Language (EFL), the AI-supported approach had a significant positive impact on their writing abilities. Equivalently, Yan (2023) investigated the impact of ChatGPT, an AI-assisted language learning tool, on the writing skills of EFL learners and reported significant improvements in their writing performance as a result of AI-assisted language learning. Despite the growing interest and research on AI-assisted writing tools, there is a key gap in the literature that requires further exploration. Most studies focus on the immediate benefits of AI-assisted writing tools, such as improved grammar and stylistic corrections. There is limited research on the long-term impact of these tools on users' writing skills development and retention. Consequently, this study explores the longer-term effect of AI on EFL students' writing skills and whether the ChatGPT can be a valuable writing tool in the EFL context.

Literature Review

The integration of advanced technologies has significantly influenced the educational experience of English as a Foreign Language (EFL) students. One such technological innovation that has garnered attention is ChatGPT, a state-of-the-art language model developed by OpenAI. Open-AI's latest development in introducing conversational chatbots, ChatGPT-3.5 and ChatGPT-4, has made it easier for teachers and learners to apply AI

technologies in teaching and learning (Taecharungroj, 2023). However, the release of ChatGPT has revolutionized the tools and applications used for writing. In comparison with already available chatbots, this latest ChatGPT by open-AI is more efficient in text generation, particularly for long essays and creative writings, and has the most striking ability to produce a human-like performance for various academic and professional tasks (Rasul et al., 2023; Suaverdez & Suaverdez, 2023). This artificial intelligence (AI) tool has demonstrated remarkable capabilities in natural language understanding and generation, offering a unique potential to enhance EFL students' writing competence. ChatGPT can be effectively utilized in diverse language learning courses to enhance learners' writing abilities (Barrot, 2023). As educators and learners seek effective strategies to improve language proficiency, understanding the impact of ChatGPT on EFL students' writing skills becomes a crucial avenue for exploration. ChatGPT's influence on writing competence, considering its implications for language acquisition, creativity, and overall learning outcomes is of paramount importance in the context of English language education. Moreover, ChatGPT serves as an interactive writing companion, encouraging EFL students to practice and refine their skills in a low-pressure environment.

Recent strides in Artificial Intelligence (AI) have introduced innovative tools, with AI-based chatbots (Paliwal, et al., 2020; Suhel et al., 2020) such as ChatGPT emerging as a noteworthy consideration for enhancing students' writing skills within the context of language learning. For instance, Kohnke (2023) conducted a study exploring the use of a chatbot in an English for Academic Purposes (EAP) course and found that students perceived the chatbot as a valuable tool for writing practice and feedback. Similarly, Wei et al. (2023) investigated the effects of an AI-based writing system on Chinese learners' writing performance, reporting positive outcomes in terms of writing accuracy and fluency. These studies establish a significant basis for emphasizing the potential advantages of utilizing AI-driven chatbots to enhance writing skills within the framework of Second Language Acquisition (SLA).

One of the notable impacts of ChatGPT on EFL students' writing competence is the provision of instant and personalized feedback. Traditional language learning environments often struggle to provide timely corrections and suggestions, leading to a gap in understanding and improvement. ChatGPT, equipped with its natural language processing capabilities, offers real-time feedback, pinpointing grammatical errors, suggesting vocabulary enhancements, and providing nuanced insights into sentence structure. It serves as a valuable tool by offering instant feedback and constructive suggestions to learners, assisting them in error identification and overall writing improvement (Link et al., 2022). The continuous interaction

contributes to the enhancement of language proficiency, as students receive not only correction but also exposure to varied language patterns. Students' perception of ChatGPT (Javaid et al., 2023) as a conversation partner contributes significantly to their writing proficiency. These chatbots hold promise as tools that can potentially enhance students' writing skills (Wang et al., 2023).

The creative potential of ChatGPT plays a pivotal role in inspiring EFL students to explore and expand their writing skills. Students tend to feel more at ease and less anxious when interacting with ChatGPT, resulting in heightened motivation and a greater willingness to participate in writing tasks (Shoufan, 2023). ChatGPT's adaptability allows for tailored interactions based on individual learner needs. EFL students can receive customized prompts, targeted exercises, and specific language challenges, aligning with their proficiency levels and learning objectives. Some learners prefer ChatGPT as their primary writing aid, while others see it as a complementary tool to be used alongside human feedback (Mun~ oz et al., 2023; Eloundou et al., 2023).

Numerous studies have investigated the positive impact of AI-assisted language learning tools on English language learners' language acquisition skills (Suryana et al., 2020; Divekar et al., 2021; Liu, 2021; Bašić et al., 2023; Bishop, 2023; Fitria, 2023). For instance, Rahman et al. (2022) examined the role of an AI-assisted language learning tool in identifying and addressing grammatical errors, leading to the development of writing skills among EFL learners. The findings demonstrated significant improvement in the writing proficiency of English as a Foreign Language (EFL) students, with the learners expressing favorable perceptions regarding the impact of AI-assisted language learning on their writing capabilities. Utami and Winarni (2023) conducted a case study on three Indonesian EFL learners, exploring their use of AI-assisted language learning for academic research writing. By employing a mixed method of quantitative data gathered through surveys and qualitative insights acquired from interviews, the results unveiled a positive influence of AI-assisted language learning tools on the academic research writing of learners, leading to heightened engagement in these tasks. In a study by Yan (2023), the contribution of ChatGPT as an AI-powered language learning tool to EFL learners' English writing was explored. The findings highlighted a significant impact of the AI tool in boosting learners' writing proficiency and improving their effectiveness in task completion. Nonetheless, concerns were raised by learners regarding potential adverse effects on their academic writing skills in the long run. They underscored the importance of guidance in the proper utilization of the tool for their academic writing assignments. Abdullayeva and Musayeva (2023) examined the influence of ChatGPT on EFL learners' writing skills and found that it contributed by providing writing prompts, immediate feedback, and revision suggestions. Nazari et al. (2021) conducted

a true experimental study investigating the effects of AI-assisted language learning on EFL learners' writing performance. The results indicated that students who employed the AI-powered tool demonstrated superior writing performance compared to those who did not. Furthermore, the learners utilizing AI exhibited substantial engagement on behavioral, cognitive, and emotional levels during activities supported by AI in writing. In a quasi-experimental research design, Liu et al. (2021) explored the impact of AI on EFL learners' writing skills. The results suggested significant enhancements in writing skills when compared to the traditional classroom setting. The AI-assisted language learning method additionally boosted learners' self-efficacy, self-regulated learning, and alleviated cognitive load, thereby contributing to their proficient performance in writing.

ChatGPT can be a valuable assisting tool for essay writing in a number of ways, including generating ideas, improving sentence structure, grammar, and vocabulary, encouraging self-reflection, language practice etc. Students can use ChatGPT to generate ideas and outlines for their essays. Previous studies showed that ChatGPT could create quality essays on different topics (Huang, 2023). Furthermore, ChatGPT can provide real-time feedback on sentence structure, grammar, and writing style. This can help students identify and correct errors, improving the overall quality of their writing. Students can use ChatGPT to explore and incorporate a broader range of vocabulary into their essays. The model can suggest synonyms or alternative phrases, enriching the language used in the composition. ChatGPT may help researchers, students, and educators generate ideas (Roose, 2023) and even write essays of reasonable quality on a particular topic (Hern, 2023). As argumentative essays are one of the most advanced students' tasks in higher education, and as such pose a challenge for students (Latifi et al., 2021), one of the ways where ChatGPT could be tested is essay writing. Such essays empower students' ability to give an argument and build confidence in their knowledge preparing them not only for the academic environment but also for real-life situations (Valero Haro et al., 2022; Heitmann et al., 2014).

Despite the numerous benefits that Chat GPT has in terms of language acquisition, the issue of artificial intelligence (AI) and plagiarism has become a topic of concern and interest in the academic and creative realms. AI technologies have both the potential to aid in plagiarism detection and, paradoxically, raise challenges that may contribute to the evolution of more sophisticated forms of plagiarism. Instructors worry about the possibility of students using ChatGPT to complete their written assignments, as it has been demonstrated to generate reports within seconds, evading detection by plagiarism detection systems Khalil et.al (2023). Additionally, peer review may not distinguish ChatGPT-generated abstracts from those written by authors (Else, 2023) as they may be designed to mimic the style and format of

genuine reports. It also led to questions on the ethics of using ChatGPT in different forms of academic writing, the AI authorship (Bishop, 2023; Grimaldi and Ehrler, 2023; Kung et al., 2023; Pourhoseingholi et al., 2023; Xiao, 2023), and raised issues of evaluating academic tasks like students' essays (Stokel-Walker, 2022; Whitford, 2022). Unavoidable content plagiarism issues were discussed, and solutions for adapting essay settings and guidelines were revised (Cotton et al., 2023; Hoang, 2023; Lo, 2023; Sallam, 2023; Stokel-Walker, 2022; Yeadon et al., 2023).

A number of studies have expressed concern over instructors' and students' dependence on ChatGPT. Kasneci et al. (2023) confirmed that ChatGPT's fast-produced solutions will hamper students' ability to think critically or solve problems. The authors also addressed a similar problem that might occur for instructors who use ChatGPT as a replacement for their lesson preparations. Lund and Wang (2023) shared the same concern about how much students and teachers depend on ChatGPT for research and writing tasks. However, if users are aware of the benefits of utilizing ChatGPT as a supplement to learning or to aid in the teaching process, the problem may be readily resolved (Pavlik, 2023). The ethical usage of ChatGPT in education needs a conversation about the possibility of jeopardizing data privacy and security. Large language models in ChatGPT may synthesize students' knowledge and use it for a variety of applications (Dwivedi et al., 2023). Furthermore, Kasneci et al. (2023) indicated that ChatGPT's personal information might be used for impersonation or deceit. ChatGPT's creation of synthetic information also increases the danger of sensitive data leakage, including personal, financial, and medical information (Lund & Wang, 2023). Users should take care and utilize ChatGPT appropriately to minimize this possible danger (Lund & Wang, 2023).

Numerous research on ChatGPT have shown favorable views from instructors regarding its educational applications, despite ethical concerns and limitations. However, existing studies have not extensively examined teachers' perspectives on incorporating ChatGPT for teaching language skills, nor have they thoroughly documented instructors' recommendations for its effective use in teaching contexts. Additionally, concerns have been raised by educators regarding potential issues such as over-reliance on technology, ethical considerations, and plagiarism.

Method

An Experimental Study

The systematic review of literature addressed the key themes related to the impact of ChatGPT on EFL students' writing skills, identifying various issues and detailing multiple aspects of each. These insights served as the foundation for the research. This chapter describes the research methodology

and the techniques used to collect both quantitative data. It covers the variables under examination, the research design and experimental procedures employed, as well as the surveys and questionnaires used to gather data and analyze the research findings.

A preliminary study was initially conducted during the spring semester to examine the impact of ChatGPT on the writing skills of EFL students within the Georgian context. The BA students (freshmen) aged between 18-20 participated in the experiment representing B2 level all of whom were Georgians. It was confined to the higher educational institutions where the experiment was subsequently conducted. The preliminary study identified issues related to the impact of ChatGPT on EFL students' writing skills among university students, leading to the exploration of research grounds and the proposal of an experimental model.

The six-week experiment, conducted during the spring semester, was carried out at a higher education institution in Georgia. It involved six groups totaling 33 students, selected from upper-intermediate levels of English proficiency. In the experimental group, students were given a brief overview of the activity objectives and the role of ChatGPT in assisting with writing tasks. ChatGPT was introduced to the students and explained how it worked. A brief demonstration was provided of how they could use it to generate ideas, improve their writing, and receive feedback. The different features of ChatGPT, such as generating suggestions, providing feedback, and improving sentence structure were explained. Writing prompts or topics relevant to the students' language proficiency level and curriculum were provided. Students were provided with a list of vocabulary related to the topic and generated by ChatGPT and were asked to write essays in 150-200 words on a given topic within 20 minutes. ChatGPT also provided writing suggestions, alternative ways to phrase sentences, and ideas for expanding vocabulary to improve expressiveness and language fluency. Students used the vocabulary generated by ChatGPT to enhance the quality of essays and then asked ChatGPT to check the pieces of writing for grammar and spelling. Participants were encouraged to assess their strengths and weaknesses, integrate ChatGPT's feedback into their writing revisions, and utilize the platform's tools to monitor their progress. Students received individualized feedback on their essays. The writing instruction sessions using ChatGPT were conducted twice a week over a period of six weeks. To reduce the risk of plagiarism, strict measures were implemented. Participants were thoroughly instructed on using ChatGPT as a writing assistant, with a strong emphasis on creating original content rather than depending on AI-generated material. Significant emphasis was placed on the ethical use of AI in academic writing, advising participants on how to incorporate AI feedback while maintaining their unique writing style and ideas. These guidelines were intended to help participants utilize AI support

while ensuring academic integrity. The scientific experiment featured ChatGPT usage as the independent variable, while the dependent variables included essay writing skills, the quality of essays, and the time required to complete the writing task. In a control group, traditional writing instruction was provided without access to ChatGPT. The researcher employed a deductive approach by explaining the overall structure of an essay, typically consisting of an introduction, body paragraphs, and a conclusion. They were instructed to describe the purpose of each section briefly. The participants were deductively taught paragraph structure by explaining the components of a well-developed paragraph: topic sentence (main idea), supporting details or evidence, and analysis or interpretation of the evidence. They were asked to write essays in 150-200 words on the same topics within 20 minutes as in the experimental group. These activities targeted different aspects of writing, including grammar, vocabulary, organization, coherence, and sentence structure. The participants were given personalized feedback on writing assignments, pointing out areas needing improvement and offering suggestions for enhancement. Participants in the control group received feedback only during regular classroom-based writing classes led by the teacher, ensuring continuous guidance and feedback throughout the 6-week intervention. The time allocated for practice outside of class was designed to be comparable to that of the experimental group. Writing instruction sessions for the control group were conducted twice a week over a six-week period during the spring semester. Participants were instructed to utilize conventional writing methods and resources.

In contrast to the experimental group, the control group did not receive AI-assisted feedback from ChatGPT. Instead, their feedback came from the teacher's expertise and teaching experience. The teacher stressed the importance of practice, provided guidance on effective writing strategies, and offered constructive criticism to help improve their writing skills.

Data analysis was conducted using SPSS, focusing on central statistical results and employing frequencies (mean, median, mode, skewness and kurtosis) to identify differences between stages.

Quantitative results

Initially, an examination was conducted on the descriptive statistics of the participants' pre-test and post-test results in overall writing, writing proficiency, and writing motivation across both groups. The summarized findings are presented in Table 1.

Table 1. Experimental Group 1 (Preliminary study) (B2 Level)

Session #	Topic of an essay	Mean	Median	Mode	Std. deviation	Skewness	Kurtosis	No of Students
1	The Future of Transportation: How Will We Travel in 2050?	3.0000	3.0000	3.00	.70711	.000	2.000	5
2	Technological Change and Its Impact on Daily Life	3.2857	3.0000	3.00	.48795	1.230	-.840	7
3	The biggest Change I have experienced	3.1000	3.0000	3.00	.56765	.091	1.498	10
4	The Impact of AI on our Daily lives	2.9231	3.0000	3.00	.64051	.053	.061	13
5	Will a robot replace a human?	3.3333	3.0000	3.00	.49237	.812	-1.650	12

During all sessions, the mean, median, and mode were very close to each other, mostly around the value of 3. This indicates a consistency in the central tendency of the scores given for the essays. The standard deviation values ranged from 0.48795 to 0.70711. Session 1 had the highest variability (0.70711), while Session 2 had the lowest (0.48795). This suggests that the scores were more spread out in Session 1 compared to Session 2. Standard deviation values indicated that while some sessions had more consistent scores, others had more variability. This might reflect the students' varying comfort levels with different essay topics. The skewness and kurtosis values provided insights into the shape of the score distributions. Sessions with high skewness and kurtosis values indicated that scores were not normally distributed, suggesting potential outliers or varying levels of essay quality. The data indicates that while students generally scored around 3 on their essays, the variability and distribution shapes differed across sessions. This could be due to the different topics and how comfortable students were with them. Positive skewness in some sessions suggests that some students struggled more, while the relatively consistent central tendency values imply that the scoring was uniform.

Table 2. Control Group (B2 Level)

Session #	Topic of an essay	Mean	Median	Mode	Std. deviation	Skewness	Kurtosis	No of Students
1	Connections between the environment and the nature	2.5000	2.5000	2.00	.52705	.000	-2.5771	10
2	How Automation and AI are Transforming Human Resources	2.4000	2.0000	2.00	.51640	.484	-2.277	10
3	Money is essential for Happiness	2.6000	3.0000	3.00	.51640	-.484	-2.277	10
4	We are responsible for the health of our planet	2.6000	3.0000	3.00	.51640	-.484	-2.277	10
5	You need no formal education for a successful life	2.9000	3.0000	3.00	.73786	.166	-.734	10
6	Only generation Z can help Georgia to become successful and prosperous country	2.9000	3.0000	3.00	.56765	-.091	1.498	10

The mean scores ranged from 2.4 to 2.9, with medians and modes often at 3. This suggested that the central tendency of scores was slightly below average, generally around 2.5 to 3. Standard deviation values ranged from 0.51640 to 0.73786. Session 5 had the highest variability, while Sessions 2, 3, and 4 had the lowest variability, indicating more consistent scores in these sessions. Session 1 shows no skewness (0.000), indicating a perfectly symmetrical distribution. Sessions 2 and 5 showed positive skewness (0.484 and 0.166), indicating a right-skewed distribution with more scores below the mean. Sessions 3, 4, and 6 show negative skewness (-0.484, -0.484, -0.091), indicating a left-skewed distribution with more scores above the mean. Sessions 1, 2, 3, and 4 had significantly negative kurtosis values (-2.5771, -2.277, -2.277, -2.277), indicating platykurtic distributions with lighter tails and flatter peaks. Session 5 showed slightly negative kurtosis (-0.734), indicating a platykurtic distribution. Session 6 has positive kurtosis (1.498), indicating a leptokurtic distribution with heavier tails and a sharper peak. It is suggested that the control group's scores were generally consistent but slightly

below the average score of 3. The low to moderate standard deviation values indicated that the scores were relatively consistent within each session, with Session 5 showing the most variability. The skewness and kurtosis values revealed that most distributions were either symmetrical or slightly skewed, with generally platykurtic distributions indicating flatter distributions with lighter tails.

The control group's scores were relatively consistent but lower compared to the experimental groups. The distributions were mostly symmetrical or slightly skewed, with flatter and lighter tails for most sessions. This suggests that the control group had a more uniform performance with fewer high scores compared to the experimental group using ChatGPT.

Table 3. Experimental Group 2 (B2 Level)

Session #	Topic of an essay	Mean	Median	Mode	Std. deviation	Skewness	Kurtosis	No of Students
1	Connections between the environment and the nature	3.7000	4.0000	4.00	.48305	-1.035	-1224	10
2	How Automation and AI are Transforming Human Resources	3.8000	4.0000	4.00	.42164	-1.779	1.406	10
3	Money is essential for Happiness	3.7000	4.0000	4.00	.48305	-1.035	-1.224	10
4	We are responsible for the health of our planet	3.9000	4.0000	4.00	.31623	-3.162	10.000	10
5	You need no formal education for a successful life	3.9000	4.0000	4.00	.31623	-3.162	10.000	10
6	Only generation Z can help Georgia to become successful and prosperous country	4.0000	4.0000	4.00	.00000	1.334		

For all sessions, the mean, median, and mode were around 3.7 to 4. This indicated that the majority of scores were very close to 4, suggesting high performance across all topics. The standard deviation values were low, ranging from 0.00000 to 0.48305, indicating that the scores within each session were highly consistent. Sessions 1, 3, 4, and 5 show significant negative skewness (-1.035, -1.035, -3.162, -3.162), indicating a left-skewed

distribution where scores are clustered towards the higher end. Session 2 shows a high negative skewness (-1.779), also indicating a left-skewed distribution. Session 6 shows positive skewness (1.334), indicating a right-skewed distribution. Sessions 1 and 3 have negative kurtosis (-1.224), indicating a platykurtic distribution with lighter tails. Session 2 has positive kurtosis (1.406), indicating a leptokurtic distribution with heavier tails. Sessions 4 and 5 have high positive kurtosis (10.000), indicating very peaked distributions. Kurtosis for Session 6 is not provided. The central tendency measures suggest that students consistently performed well, with most scores clustering around 4. The low standard deviation values indicated that the scores were very consistent, showing little variability within each session. The significant negative skewness in most sessions indicated that many students scored at the higher end of the scale. The mixed kurtosis values suggested that while some distributions were flatter with lighter tails, others were more peaked with heavier tails. The mean scores for Experimental Group 2 are consistently higher than those of the control group. Experimental Group 2 showed lower standard deviation values, indicating more consistent performance. The control group had more symmetrical or slightly skewed distributions with generally platykurtic distributions, whereas Experimental Group 2 had more left-skewed distributions with a mix of platykurtic and leptokurtic distributions. Experimental Group 2, using ChatGPT, showed consistently higher and more uniform scores compared to the control group. The low variability and high scores indicate that ChatGPT might have positively impacted students' writing performance. The distribution shapes suggest that most students in Experimental Group 2 performed at a high level, with fewer low scores compared to the control group.

Table 4. Rubric-based assessment results- Raters 2 and 3 Correlations

		Correlations	
		VAR00001	VAR00002
VAR00001	Pearson Correlation	1	.717
	Sig. (2-tailed)		.109
	N	6	6
VAR00002	Pearson Correlation	.717	1
	Sig. (2-tailed)	.109	
	N	6	6

The correlation coefficient between VAR00001 and VAR00002 is 0.717. This value indicates a strong positive correlation between the two variables. A correlation coefficient close to 1 suggests that as one variable increases, the other variable also tends to increase. The significance value (p-value) for the correlation between VAR00001 and VAR00002 is 0.109. This

value is greater than the common significance level of 0.05. This indicates that the correlation is not statistically significant at the 5% level. In other words, there is not enough evidence to conclude that the correlation between the variables is significantly different from zero. The number of observations (N) used in the correlation analysis is 6 for both variables. This is a small sample size, which can affect the reliability of the correlation results. With small sample sizes, there is more variability, and the correlation coefficients may not be as stable or reliable. In conclusion, while there is a strong positive correlation observed between VAR00001 and VAR00002, the lack of statistical significance and the small sample size suggest that these results should be interpreted with caution. Consequently, Further study with a larger sample size may be needed to draw more reliable conclusions.

Discussion

This study aimed to explore the impact of ChatGPT on EFL students' writing skills. To thoroughly investigate this phenomenon, a quantitative approach was used and an experimental study was conducted, enabling the systematic collection and analysis of quantitative data. The quantitative analysis provided significant insights, demonstrating significant improvements in participants' academic writing performance as a result of AI-powered language learning. These enhancements were particularly evident in the participants' organizational skills, coherence, grammar, vocabulary and spelling. These quantitative findings resonate with the observations made by Liu et al. (2021) and Yan (2023), who underscored the profound contributions of AI-assisted language learning tools in advancing EFL learners' writing abilities. Moreover, these findings harmonize with the outcomes identified by Rahman et al. (2022) and Utami and Winarni (2023), which accentuated the positive influence of AI-powered language learning on EFL learners' motivation and their heightened engagement in writing tasks. The AI-assisted language learning tool offered the learners suitable alternatives for their written texts, making this approach more favorable compared to conventional writing instruction (Zhao, 2022). The AI tool facilitated the production of well-written texts by generating writing ideas, grammatically accurate sentences, and suitable lexical resources. This improved the learners' engagement in the required writing tasks within the AI-supported class. The increased engagement in writing activities likely contributed to the development of the learners' academic writing skills. Consistent with the findings of Hwang et al. (2023), the present study suggests that the positive outcomes can be attributed to the personalized language learning experience facilitated by the AI-assisted language learning tool during collaborative writing tasks. Additionally, participants reported significant improvements in their writing skills due to using ChatGPT. The intervention's success in

enhancing organization and coherence in their essays highlights the potential of AI-assisted tools to support the writing process (Zhao, 2022; Barrot, 2023). Incorporating suggestions and examples from ChatGPT led to an enriched vocabulary and enhanced writing fluency. This mirrors the findings of studies that have highlighted AI's contribution to vocabulary development and writing fluency (Ippolito et al., 2022; Su et al., 2023). While the benefits of AI-assisted writing instruction are evident, participants also recognized certain challenges. Concerns about contextual accuracy identified in this study align with previous research, underscoring the importance of thoughtful integration of AI-generated feedback (Utami and Winarni, 2023). Furthermore, the issue of over-dependence on ChatGPT surfaced as a significant concern. It is crucial to find a balance between leveraging AI feedback and encouraging independent critical thinking and creativity (Utami and Winarni, 2023). Continuous improvement and adaptability of AI systems to cater to the changing needs of language learners are indeed critical aspects for its sustained effectiveness (Su et al., 2023).

Taking everything into consideration, significant improvements were found in organizational skills, coherence, grammar, vocabulary, and spelling of all participants. They reported enhanced engagement and better-written texts facilitated by ChatGPT. However, concerns about contextual accuracy and over-reliance on AI were noted, highlighting the importance of balanced integration to encourage independent thinking. Further studies are necessary to yield more reliable results.

Conclusion

Based on the experimental study conducted on the impact of ChatGPT on EFL students' writing skills, significant findings emerged. The use of ChatGPT in the experimental group led to marked improvements across various metrics including organizational skills, coherence, grammar, vocabulary, and spelling. Compared to the control group, which received traditional writing instruction, the experimental group consistently achieved higher scores and demonstrated more uniform performance. These outcomes underscore the potential of AI-assisted tools like ChatGPT to enhance academic writing proficiency among EFL learners, supporting engagement and quality in writing tasks. However, challenges such as concerns about contextual accuracy and over-dependence on AI also surfaced, suggesting the need for balanced integration strategies to foster independent critical thinking alongside AI support. Further research with larger sample sizes is recommended to strengthen these findings and explore nuanced impacts over longer periods.

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Accompagnement psychologique via les outils numériques des élèves victimes de violences de genre

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Résumé

L'accompagnement psychologique via les outils numériques des élèves victimes de violences de genre consiste à utiliser des technologies pour organiser et suivre un soutien psychologique adapté. Ces outils facilitent la coordination des interventions, le suivi des progrès et l'accès à des ressources pour aider les élèves à surmonter les traumatismes liés à ces violences. Comment les outils numériques permettent – ils un accompagnement psychologique efficace des élèves victimes de violences de genre ? Cette étude repose sur une approche qualitative. L'échantillon est composé de 6 élèves ayant subi des VBG et bénéficié d'un accompagnement psychologique via les supports numérique, ainsi que de 3 chefs de l'orientation – conseil ayant supervisé 16 Conseillers d'orientation impliqués dans ce processus. Les données ont été recueillies à l'aide d'entretiens semi – directifs. L'analyse repose sur la méthode d'analyse de contenu thématique. Les outils numériques améliorent l'interaction entre élèves et Conseillers d'orientation grâce à une communication flexible, personnalisée et sécurisée. Les supports numériques, notamment les applications mobiles et le téléphone, proposent un accompagnement psychologique accessible et sécurisé pour les élèves victimes de violences de genre, bien qu'un besoin d'amélioration et d'adoption reste à combler. L'évaluation du soutien psychologique numérique montre son efficacité perçue par les élèves, mais elle souligne des défis liés à la sécurité et à la continuité du suivi. Elle nécessite une analyse approfondie pour optimiser son impact durable.

Mots-clés : Accompagnement psychologique, Outils numériques, Supports Numériques, Violences de genre, Élèves victimes

Psychological support using digital tools for students who are victims of gender – based violence

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Abstract

Psychological support using digital tools for students who are victims of gender-based violence involves using technology to organise and monitor this type of support. These tools facilitate the coordination of interventions, the monitoring of progress, and access to resources to help students overcome the traumas associated with such violence. How do digital tools enable effective psychological support for pupils who are victims of gender-based violence? This study is based on a qualitative approach. The sample is made up of 6 pupils who have suffered GBV and received psychological support via digital media, as well as 3 heads of guidance counseling who supervised 16 guidance counselors involved in this process. The data was collected using semi-structured interviews. The analysis is based on the thematic content analysis method. Digital tools improve the interaction between students and guidance counselors through flexible, personalised, and secure communication. Digital media, in particular mobile applications and the telephone, offer accessible and safe psychological support for pupils who are victims of gender-based violence, although there is still a need for improvement and adoption. Evaluation of digital psychological support shows that it is effective as perceived by pupils, but highlights challenges relating to safety and continuity of follow-up. It requires further analysis to maximise its lasting impact.

Keywords: Psychological support, Digital tools, Digital media, Gender-based violence, Student victims

Introduction

L'accompagnement psychologique, en milieu scolaire, vise à soutenir le bien – être mental et émotionnel des élèves. Il favorise leur apprentissage et leur développement personnel. Des organismes internationaux tels que l'Organisation Mondiale de la Santé (OMS, 2022) et la Fédération

internationale des Sociétés de la Croix – Rouge et du Croissant – Rouge (IFRC, 2020) considèrent cet accompagnement comme un éventail d'assistances qui promeuvent le bien – être, renforcent la résilience et facilitent la reprise d'autonomie des personnes affectées par des situations de vulnérabilité. Pour les victimes de violences, c'est un processus complexe et essentiel qui nécessite une approche adaptée aux besoins individuels. Cette démarche participe de leur guérison ou leur réintégration sociale. Elle comprend l'aide de Psychologues, de Conseillers d'orientation (CO), d'Enseignants spécialisés, et parfois de programmes. Les dispositifs d'accompagnement des élèves peuvent être le soutien psychologique, la psychothérapie ou le counseling. L'objectif est un changement significatif dans le fonctionnement cognitif, émotionnel ou comportemental de la victime selon son histoire personnelle.

La violence basée sur le genre en milieu scolaire (VBGMS) englobe toute forme de violences physiques, psychologiques et sexuelles, influencées par le genre, que vit ou subit l'élève dans son environnement scolaire. Selon l'UNGEI et UNESCO (2013 p 7 – 8), elle crée chez les jeunes des traumatismes profonds, des troubles anxieux, une faible estime de soi, des difficultés à établir des relations saines, etc. Elle affecte leur émancipation et leur performance scolaire. En contexte éducatif, l'accompagnement psychologique offre aux élèves un espace d'expressions sûres, le traitement d'expériences traumatiques et l'obtention de ressources nécessaires. Il peut réduire les risques futurs de reproduction de telles violences.

Le numérique change la façon de prendre soin de la santé mentale. Les téléphones et les ordinateurs, souvent à travers l'internet, apportent l'accès aux informations sur des questions qui préoccupent. Les outils numériques font désormais partie intégrante du paysage pédagogique. Ils constituent de formidables alliés pour réduire les barrières à l'apprentissage, offrir de nouvelles possibilités en termes d'accessibilité, et ce, bien au – delà des activités pédagogiques réalisées en classe (Turgeon et Van Drom, 2019). Un outil numérique pédagogique est un outil éducatif qui utilise la technologie numérique pour améliorer l'apprentissage et l'enseignement. Il facilite la différenciation pédagogique en permettant aux enseignants de créer des parcours d'apprentissage personnalisés. Adapté au niveau de difficulté en fonction des situations des élèves, il facilite un suivi qui répond aux besoins spécifiques de chacun.

Les outils numériques remplissent des fonctions pédagogiques très diverses, dans toutes les disciplines scolaires et à tous les niveaux de la scolarité (Tricot, 2020). Par exemple, ils peuvent permettre de rendre la gestion des VBGMS plus structurée, transparente et efficace. Ils améliorent ainsi l'accès à certains élèves et leur sécurité dans certains contextes. Ils assurent une réactivité adaptée aux enjeux de la protection des victimes. Ainsi,

l'intégration de ces outils dans la planification dans la gestion des VBGMS peut considérablement améliorer le soutien aux victimes.

En Afrique subsaharienne, où les ressources en matière de santé mentale sont souvent limitées, l'accompagnement psychologique numérique apparaît comme une solution prometteuse pour répondre aux besoins croissants des élèves. Cependant, selon l'International Monetary Fund (2020), cette approche se heurte à plusieurs défis (accès à internet et aux dispositifs numériques, qualité de la connexion, culture et croyances, manque de personnel qualifié, adaptation des outils). La situation n'est guère reluisante au Cameroun où « *la fracture numérique est l'un des principaux obstacles à l'accès à l'internet et aux activités en ligne... De nombreux facteurs critiques (coût élevé des forfaits des données, mauvaise infrastructure internet, coupures d'électricité constantes, analphabétisme numérique, piratage, fake news, etc.) influencent négativement l'accès et les activités sur les plateformes numériques* (ADISI Cameroun, 2021 p. 25, 31) ».

Selon le Plan stratégique camerounais de santé numérique 2020 – 2024, comme pour toute introduction d'innovations et de nouvelles approches, les interventions de santé numérique nécessitent des changements de comportement et des transitions vers de nouvelles pratiques. Le succès n'est garanti que si la technologie proposée est adaptée aux utilisateurs, ajoute de la valeur et facilite le changement ou l'action souhaité (Ministère de la Santé Publique, 2019). La pédagogie numérique désigne l'ensemble des méthodes et des outils numériques mobilisés dans le processus d'enseignement et d'apprentissage. En proposant des solutions spécifiques à chaque élève en difficulté, elle peut permettre aux CO de les suivre. Comment les outils numériques permettent – ils un accompagnement psychologique efficace des élèves victimes de violences de genre ?

Les objectifs de cette étude sont de : comprendre l'influence des outils numériques sur l'interaction d'accompagnement entre les élèves et les Conseillers d'orientation (CO), découvrir les supports numériques adaptés pour l'accompagnement psychologique des élèves victimes de violences de genre, évaluer l'efficacité des interventions numériques d'accompagnent psychologique en comparaison avec les séances en présentiel. Ces technologies paraissent une solution efficace, parfois accessible, pour accompagner psychologiquement. Cependant, en plus de les posséder, ils nécessitent des adaptations afin d'optimiser la qualité de cette interaction. La suite de cette étude traite donc de la méthode de recherche, des résultats et de la discussion. La conclusion de l'étude est suivie de références bibliographiques regroupant les sources consultées.

Méthode de la Recherche

Notre méthode de recherche décrit le type de recherche, l'échantillon, l'instrument de collecte de données et la procédure d'analyse.

Type de Recherche

Cette étude est qualitative. Nous voulons avoir une compréhension riche et nuancée des expériences vécues ou partagées par les CO dans leurs relations de travail avec les outils numériques. Spécifiquement, nous allons répondre à 3 questions : Comment les outils numériques influencent – ils l'interaction d'accompagnement entre les CO et les élèves ? Quels types de supports numériques (ex. : chat, applications, etc.) sont les plus adaptés pour l'accompagnement psychologique des élèves victimes de violences de genre ? Comment évaluer l'efficacité des interventions numériques d'accompagnement psychologique en comparaison avec les séances en présentiel ? Chacun de nos questionnements est exploré par des questions complémentaires et de clarification.

Échantillon et Échantillonnage

La population de l'étude est constituée de CO et des élèves victimes de VBG. Notre échantillon est composé de 6 élèves ayant subi des VBG et bénéficié d'un accompagnement psychologique via les supports numérique, ainsi que de 3 Chefs de Service de l'orientation – conseil (CSOC) ayant supervisé 16 Conseillers d'orientation impliqués dans ce processus ayant exercé dans les capitales (Ngaoundéré, Garoua, Maroua) des régions septentrionales du Cameroun, interviewés durant les années scolaires 2023 – 2024 et 2024 – 2025. Ce choix a été élaboré en représentation de ces 3 régions du Cameroun (Adamaoua, Nord, Extrême – Nord). Hong et Pluye (2018) ont démontré que les données qualitatives apportent une compréhension riche et détaillée des expériences individuelles, même avec un petit échantillon.

Instrument de Collecte de Données

Notre instrument de collecte de données est l'entretien semi – directif. Cet instrument combine structure et flexibilité pour offrir à l'interviewé la liberté d'approfondir ses réponses et d'exprimer ses opinions. Il a facilité une interaction dynamique en permettant des relances qui ont davantage éclairé notre sujet. Notre grille d'entretien, à la suite de sa partie préliminaire sur l'identité de l'interviewé(e), présente les 3 thèmes abordés : l'influence des outils numériques sur l'interaction d'accompagnement entre les CO et les élèves, les types de supports numériques les plus adaptés pour l'accompagnement psychologique des élèves victimes de violences de genre, l'évaluation des interventions numériques d'accompagnement psychologique.

Procédures d'Analyse

Nous avons estimé que l'analyse de contenu thématique est susceptible d'éclairer les opinions des expériences individuelles des CO. Elle contribue à une compréhension plus riche et plus nuancée du phénomène étudié. Cette analyse a consisté en 7 étapes à identifier, classer et interpréter les thèmes récurrents ou significatifs qui ont émergé des données recueillies lors de l'entretien : transcription, lecture et familiarisation, codage, identification des thèmes, analyse et interprétation, validation, rapport structuré.

Résultats

Cette étude cherche à explorer comment les outils numériques peuvent être des moyens efficaces, pour un accompagnement psychologique par les CO, des élèves victimes de violences de genre. Elle examine aussi la relation entre le numérique (en tant qu'outil facilitant) et l'accompagnement psychologique (comme réponse ou solution). Cette partie est consacrée à la présentation, à l'analyse et à l'interprétation des résultats.

Présentation des Participants

Le tableau 1 donne une identification des CSOC interviewé(e)s.

Tableau 1: Identification des CSOC interviewé(e)s

Surnom	Code	Âge (ans)	Année d'expérience (ans)	Genre	Ville et lycée de l'interview	Nombre de CO supervisé
MAMA	N01	44	13	féminin	Ngaoundéré (lycée technique)	04
ADDA	N02	45	15	féminin	Maroua (lycée Domayo)	06
AHMED	N03	44	14	masculin	Garoua (lycée classique moderne)	06

Le tableau 1 nous fait relever que 3 Chefs de Service de l'orientation – conseil supervisant 16 CO ont participé à l'enquête. Le nombre de leurs collaborateurs, leurs âges (44 ans 3 mois en moyenne) et leurs années d'expérience (au moins 13 ans d'expérience) sont des caractéristiques sociodémographiques pour contextualiser les résultats et comprendre les profils des participants.

Le tableau 2 donne une identification des élèves victimes de VBG suivi via le numérique

Tableau 2: Identification des élèves victimes de VBG interviewé(e)s

Surnom	Code	Âge (ans)	Niveau d'étude	Durée de l'accompagnement	Genre	Ville et lycée de l'interview
RAÏSSA	E01	17	Seconde	6 mois	féminin	Ngaoundéré (lycée technique)
SOUREYA	E02	19	Première	Année scolaire	féminin	Maroua (lycée Maroua Domayo)
WASSOU	E03	15	Quatrième	5 mois	masculin	Garoua (lycée classique)
GLA	E04	17	Seconde	01 trimestre	masculin	Garoua (lycée classique moderne)
HILMA	E05	18	Terminale	Presque 2 trimestres	féminin	
FADI	E06	16	Troisième	Année scolaire	féminin	

Le tableau 2 révèle que 6 élèves victimes de VBG (4 filles et 2 garçons) ont bénéficié d'un accompagnement psychologique via un support numérique (1 dans l'Adamaoua, 2 à l'Extrême – Nord et 3 au Nord). Leur moyenne d'âge est 17 ans. Le niveau d'étude va de la quatrième à la terminale. La durée de l'accompagnement varie d'un trimestre à toute l'année scolaire.

Relation entre l'Accompagnement psychologique via les Outils Numériques et les élèves victimes de Violences de Genre

Nous avons observé comment la capacité d'adaptation des CO avec le numérique et leur compétence clinique se complètent pour un accompagnement efficace des élèves.

Influence des outils numériques sur l'interaction d'accompagnement entre les CO et les élèves

Première questionnement avec les CO : Comment les outils numériques influencent – ils l'interaction d'accompagnement entre les CO et les élèves ? Quels aspects spécifiques de cette interaction d'accompagnement sont les plus impactés (par exemple, la confiance, l'empathie, la compréhension mutuelle) ? Que désigne – t – on précisément par outils numériques dans ce contexte ? Décrivez leur usage psychoéducatif.

La matrice des codes du tableau 3 regroupe les extraits des données correspondants aux thèmes identifiés à partir des réponses des participants.

Tableau 3: Matrice des codes d'identification des thèmes (CO) : Interactivité et engagement, Accessibilité des ressources, Personnalisation de l'accompagnement, Évaluation continue

Thème	Codes principaux	Extraits des réponses
Interactivité et engagement	- Interaction asynchrone - Flexibilité - Communication multimodale	« La communication asynchrone peut aider les élèves à s'exprimer plus librement » (N03). « Ils permettent une interaction plus flexible entre élèves et CO » (N02)
Accessibilité des ressources	- Consultations à distance - Ressources éducatives - Accessibilité géographique	« Les élèves victimes de violences peuvent accéder plus facilement à un soutien psychologique à distance » (N03). « Offrir des ressources éducatives, un soutien psychologique » (N02)
Personnalisation de l'accompagnement	- Adaptation des outils - Supports multimédias - Confiance renforcée	« Les plateformes numériques offrent des moyens variés (vidéo, audio, texte) » (N03). « Renforcer la confiance grâce à des ressources adaptées » (N01)
Évaluation continue	- Suivi régulier - Planification - Feedback structuré	« Utilisation d'applications pour planifier des séances et envoyer des rappels » (N03). « Permet une communication claire et structurée » (N03)

Il ressort du tableau 3 que les outils numériques favorisent une meilleure interaction entre les élèves et les CO grâce à une communication flexible et multimodale. Pour réduire les barrières à l'expression, les élèves peuvent choisir le format qui leur convient (texte, audio, vidéo). Les technologies numériques facilitent l'accès aux services de conseil, en particulier pour les élèves vivant dans des zones éloignées ou confrontés à des obstacles sociaux (comme la stigmatisation). L'utilisation de supports multimédias et d'outils adaptés permet aux CO de personnaliser leur accompagnement. Les élèves se sentent mieux compris. Cet aspect renforce leur confiance et améliore la qualité de l'interaction d'accompagnement. De plus, ces outils permettent un suivi structuré, des retours réguliers et une gestion efficace des séances. Ils soutiennent un accompagnement continu et une communication permanente entre les élèves et les CO.

Premier questionnaire avec les élèves : Comment les outils numériques (comme les applications, les messageries ou les plateformes en ligne) changent – ils la façon dont les Conseillers (ères) d'orientation (CO) travaillent avec toi ? Qu'est – ce qui est le plus affecté dans votre relation avec le CO quand vous utilisez ces outils ? (Est – ce plus dur de faire confiance ? Est – ce que tu sens que le (la) CO te comprend mieux ou moins bien ? Est –

ce que ça facilite le partage de tes besoins ?) Quels outils numériques sont utilisés pour t'accompagner ? Comment ces outils t'aident – ils concrètement?

Tableau 4: Matrice des codes d'identification des thèmes (Élèves) : Interactivité et engagement, Accessibilité des ressources, Personnalisation de l'accompagnement, Évaluation continue

Thème	Codes principaux	Extraits des réponses
Interactivité et engagement	Interaction asynchrone	« Je peux laisser facilement un message au CO quand je suis en situation difficile... » (E05)
	Flexibilité	« La CO m'envoie discrètement les messages où elle m'explique l'attitude à tenir. » (E02)
	Communication multimodale	« Discuter sur WhatsApp et sur Facebook. » (E01)
Accessibilité des ressources	Consultations à distance	« La conversation avec le CO par téléphone me permet d'exprimer tout ce que je ressens sans crainte. » (E03)
	Ressources éducatives	« Elle m'a aidé à trouver les mots justes pour parler à ma mère. » (E02)
	Accessibilité géographique	« Quand on a quelqu'un qui peut vous aider, on lui fait confiance. » (E06)
Personnalisation de l'accompagnement	Adaptation des outils	« Mon CO me comprend bien. C'est plus facile de discuter de cette façon avec lui. » (E06)
	Supports multimédias	« Obtenir des conseils que l'on peut relire après. » (E02)
	Confiance renforcée	« Au début c'est dur de faire confiance mais après ça m'a aidé à me confier à ma CO. » (E04)
Évaluation continue	Suivi régulier	« Ma communication par téléphone avec le CO m'a permis de toujours avoir quelqu'un qui m'écoute et me comprend. » (E06)
	Planification	« Elle sait me dire comment je dois me comporter pour qu'on continue à m'aider à aller à l'école. » (E04)
	Feedback structuré	« Je me sens mieux compris et ces échanges facilitent les partages des idées. » (E05)

Les données du tableau 4 montrent que les outils numériques améliorent l'interaction d'accompagnement entre les CO et les élèves. La communication asynchrone permet de laisser un message en cas de difficulté (E05). La flexibilité des échanges assure un soutien discret et adapté (E02). La communication multimodale via WhatsApp et Facebook facilite les interactions (E01). Les consultations à distance offrent un espace sécurisé pour s'exprimer librement (E03). L'accès aux ressources éducatives aide à mieux gérer les relations (E02). L'accessibilité géographique renforce la confiance

(E06). L'adaptation des outils numériques personnalise le suivi (E06). Les supports multimédias permettent de relire les conseils reçus (E02). La confiance se développe progressivement, facilitant les confidences (E04). Un suivi régulier garantit une écoute attentive (E06). La planification des actions éducatives oriente les élèves (E04). Un feedback structuré améliore la compréhension mutuelle (E05). Ces éléments confirment que les outils numériques renforcent l'accompagnement.

En définitive, les résultats des tableaux 3 et 4 démontrent que les outils numériques améliorent significativement l'interaction entre les élèves et les CO. Ils apportent une communication flexible, multimodale et asynchrone qui réduit les barrières à l'expression. Ils facilitent l'accès aux services de conseil, notamment pour les élèves vivant dans des zones éloignées ou confrontés à des obstacles sociaux. L'utilisation de supports variés (texte, audio, vidéo) et de plateformes comme WhatsApp et Facebook permet une personnalisation du suivi et un accompagnement structuré. Il favorise le développement de la confiance mutuelle et la qualité des échanges. Les consultations à distance offrent un espace sécurisé où les élèves peuvent s'exprimer librement, accéder à des ressources éducatives et relire les conseils reçus. Un suivi régulier et un feedback structuré assurent une écoute attentive, et orientent les élèves. Cet accompagnement facilite une meilleure compréhension mutuelle. Il confirme ainsi l'apport essentiel des outils numériques dans l'accompagnement éducatif.

Types de supports numériques les plus adaptés pour l'accompagnement psychologique des élèves victimes de violences de genre

Deuxième questionnaire avec les CO : Quels types de supports numériques sont les plus adaptés pour l'accompagnement psychologique des élèves victimes de violences de genre? Comment les caractéristiques des supports numériques influencent – elles la sécurité et la confidentialité pour ces élèves ? Qu'entend – on par supports numériques ? S'agit – il d'applications, de plateformes spécifiques, ou de formats de contenu (vidéo, texte, audio) ?

Le tableau 5 présente les thèmes qui soutiennent notre analyse.

Tableau 5: Matrice des codes d'identification des thèmes (CO) : Applications de soutien psychologique, Webinaire et ateliers en ligne, Plateformes de communication sécurisées, Ressources multimédias

Thème	Codes principaux	Extraits des réponses
Applications de soutien psychologique	- Journaux émotionnels - Exercices de relaxation - Fonctionnalités de rappel	« Applications mobiles pour le suivi émotionnel et l'accès à des ressources d'aide » (N01). « Fonctionnalités comme des journaux émotionnels et des rappels de séances » (N03)
Webinaire (réunion ou conférence interactive qui se déroule en ligne) et ateliers en ligne	- Groupes de soutien virtuels - Consultations en temps réel - Interactions personnalisées	« Des séances de thérapie ou des groupes de soutien virtuels » (N01). « Consultations en temps réel via des plateformes de visioconférence » (N03)
Plateformes de communication sécurisées	- Cryptage des données - Anonymat - Contrôle d'accès	« Le cryptage et l'anonymat sont essentiels pour rassurer les utilisateurs sur la confidentialité » (N01). « Certaines applications permettent aux élèves de s'exprimer sans révéler leur identité » (N03)
Ressources multimédias	- Vidéos éducatives - Podcasts - Documents interactifs	« Formats multimédias comme des vidéos éducatives et des podcasts qui traitent des violences de genre » (N01). « Vidéos éducatives, podcasts et documents interactifs pour fournir des informations, des stratégies et processus que les élèves mettent en œuvre pour faire face à des situations stressantes ou menaçantes » (N03)

L'analyse des réponses du tableau 5 montre que les applications mobiles sont les supports les plus couramment mentionnés. Elles se distinguent par leur accessibilité, leur discrétion et leurs fonctionnalités spécifiques comme le suivi émotionnel et les exercices pratiques (relaxation, rappels). Ces outils permettent une personnalisation qui répond aux besoins des élèves victimes. Les webinaires et groupes de soutien virtuels apportent parfois un espace d'interaction en temps réel entre les élèves et les CO. Ils permettent une expérience plus immersive et personnelle. Ces outils sont particulièrement utiles dans les contextes où les consultations physiques ne sont pas possibles. Néanmoins, les plateformes sécurisées sont essentielles pour garantir la confidentialité et la sécurité des échanges. Les fonctionnalités comme le cryptage, l'anonymat et le contrôle d'accès renforcent la confiance des victimes. Elles les encouragent à s'exprimer librement. Il s'avère que les formats multimédias comme les vidéos, podcasts et documents interactifs sont des outils puissants pour l'éducation et le soutien psychologique. Leur nature

visuelle et auditive permet de transmettre des informations composites de manière accessible et engageante.

Deuxième questionnement avec les élèves : Quels supports numériques peuvent t'aider le mieux dans ton accompagnement ? Comment ces supports protègent – ils ta sécurité et tes données ? (Est – ce qu'ils garantissent l'anonymat (ex : pseudo, pas de nom réel) ? Est – ce que les échanges sont effaçables ou cryptés (protégés) ? Te sens – tu en confiance ou as – tu des craintes ?) C'est quoi exactement un support numérique ?

Tableau 6: Matrice des codes d'identification des thèmes (Élèves) : Applications de soutien psychologique, Webinaire et ateliers en ligne, Plateformes de communication sécurisées, Ressources multimédias

Thème	Codes principaux	Extraits des réponses
Applications de soutien psychologique	- Journaux émotionnels - Exercices de relaxation - Fonctionnalités de rappel	Aucun élève n'évoque directement l'utilisation de telles fonctionnalités dans leur accompagnement.
Webinaire (réunion ou conférence interactive qui se déroule en ligne) et ateliers en ligne	- Groupes de soutien virtuels - Consultations en temps réel - Interactions personnalisées	Aucun élève ne mentionne l'utilisation de webinaires ou d'ateliers dans leur accompagnement psychologique.
Plateformes de communication sécurisées	- Cryptage des données - Anonymat - Contrôle d'accès	« J'ai mis un mot de passe » (E01), « Ma CO m'a demandé de toujours mettre un mot de passe pour mes messages ou de les effacer » (E02), « Le CO me demande toujours d'effacer nos messages » (E03, E04, E06), « Moi j'utilise mon empreinte comme mot de passe » (E05).
Ressources multimédias	- Vidéos éducatives - Podcasts - Documents interactifs	Aucun élève ne fait référence à des ressources multimédias spécifiques.

Le tableau 6 montre que le support numérique choisi par les élèves, principalement le téléphone, apparaît adaptés à leur accompagnement psychologique dans le contexte des violences de genre. Il offre des moyens de communication discrets et sécurisés, cet outil leur permet de partager leurs expériences. Il protège leur confidentialité grâce à des mesures comme les mots de passe et la suppression des messages. Bien que des craintes persistent quant à la fiabilité du Conseiller d'orientation, le téléphone reste un support accessible et familier qui favorise la continuité du suivi psychologique.

Toutefois, l'absence d'utilisation d'autres ressources numériques, comme les webinaires ou les applications de gestion émotionnelle, suggère un potentiel d'amélioration pour diversifier et renforcer ce type d'accompagnement.

La synthèse des tableaux 5 et 6 montre que les supports numériques, en particulier les applications mobiles et le téléphone, participent à l'accompagnement psychologique des élèves victimes de violences de genre. Ils sont accessibles, discrets et ont souvent des fonctionnalités sécurisées. Les applications permettent un suivi personnalisé avec des outils comme le suivi émotionnel, les exercices de relaxation et les rappels, tandis que le téléphone apporte un moyen de communication familier et sécurisé. Ce dernier protège la confidentialité grâce à des mesures comme le cryptage et la suppression des messages. Les webinaires et groupes de soutien virtuels, bien que moins utilisés, offrent une interaction en temps réel et un espace immersif pour le dialogue. Par ailleurs, les formats multimédias (vidéos, podcasts, documents interactifs) facilitent la transmission d'informations de manière engageante. Toutefois, la faible adoption de certaines ressources numériques souligne un besoin d'élargir et d'améliorer les dispositifs d'accompagnement pour mieux répondre aux attentes des élèves.

Évaluation des interventions numériques d'accompagnement psychologique

Troisième questionnement avec les CO : Comment évaluer l'efficacité des interventions numériques d'accompagnement psychologique en comparaison avec les séances en présentiel ? Quels indicateurs de mesure (satisfaction des élèves, réduction des symptômes, fréquence des suivis) sont les plus pertinents pour évaluer cette efficacité ? Est – ce que l'évaluation de l'efficacité doit se concentrer sur des aspects spécifiques comme l'adhésion des élèves ou les résultats thérapeutiques globaux ?

La matrice des codes du tableau 7 regroupe les extraits des données correspondants aux thèmes identifiés qui soutiennent notre analyse.

Tableau 7: Matrice des codes des thèmes (CO) : Mesures quantitatives et qualitatives, Suivi longitudinal, Analyse comparative des retours d'expérience, Études de cas

Thème	Codes principaux	Extraits des réponses
Mesures quantitatives et qualitatives	- Satisfaction des élèves - Réduction des symptômes - Fréquence des suivis	« Satisfaction des élèves : par le biais d'enquêtes post – intervention » (N01). « Réduction des symptômes : mesurée par des échelles standardisées » (N01)
Suivi longitudinal	- Impact à long terme - Continuité des services - Adhésion des élèves	« Évaluer si les élèves continuent à utiliser les services proposés » (N01). « Analyser la régularité des interactions » (N02)
Analyse comparative des retours d'expérience	- Satisfaction numérique vs présentiel - Accessibilité accrue - Richesse des interactions	« Les interventions numériques offrent une accessibilité accrue, mais ne remplacent pas entièrement la richesse des interactions en présentiel » (N02)
Études de cas	- Analyse individuelle - Adaptabilité des interventions - Complémentarité des modes numérique et présentiel	« Une approche hybride, combinant les deux modes, pourrait offrir des avantages complémentaires » (N02). « Facilité d'accès aux services pour les élèves dans des régions reculées » (N03)

L'analyse des informations récoltées (tableau 7) fait apparaître que les participants insistent sur l'importance de combiner des données quantitatives (réduction des symptômes mesurée par des échelles psychométriques, fréquence des suivis) et qualitatives (satisfaction des élèves). Ces indicateurs permettent une évaluation holistique de l'efficacité des interventions. L'évaluation de l'efficacité nécessite un suivi à long terme pour analyser la continuité des services, l'engagement des élèves et l'impact durable sur leur bien – être psychologique. Les taux de participation réguliers et l'adhésion prolongée aux interventions numériques sont des signaux positifs. Une étude approfondie de cas individuels est essentielle pour comprendre comment les caractéristiques des interventions numériques influencent leur efficacité.

Troisième questionnement avec les élèves : Est – ce que le soutien en ligne (messages, vidéos, applis) t'aide autant que les discussions en personne avec le (la) CO ? Comment savoir si ces supports te font du bien ? (Est – ce que tu te sens mieux après ? Est – ce que tu les utilises souvent ? Par choix ou par obligation ? Qu'est – ce qui serait le plus important pour toi comme résultat ?) Est – ce que tu te sens compris (e) ? En sécurité ? Est – ce que ça t'aide à gérer tes difficultés ?

Tableau 8: Matrice des codes des thèmes (Élèves) : Mesures quantitatives et qualitatives, Suivi longitudinal, Analyse comparative des retours d'expérience, Études de cas

Thème	Codes principaux	Extraits des réponses
Mesures quantitatives et qualitatives	Satisfaction des élèves	« Je me sens en sécurité tant que le CO me comprend » (E01), « Je me suis sentie surtout comprise » (E02), « Je me sens beaucoup compris » (E04), « Je me suis senti mieux après » (E06)
	Réduction des symptômes	« Vraiment, ça m'aide » (E05), « Chaque fois que j'écris et le CO me répond, je me sens mieux » (E04), « Cet échange en permanence m'a beaucoup aidé » (E02)
	Fréquence des suivis	« Oui souvent parce que tu peux poser ton problème quel que soit l'endroit » (E03), « Par choix et par obligation » (E04), « L'essentiel est de finir l'année scolaire » (E05)
Suivi longitudinal	Impact à long terme	« Ça m'a donné beaucoup d'idées pour m'en sortir » (E04), « Ça m'a quand même un peu aidé » (E03), « Ça m'a aidé à gérer mon problème » (E06)
	Continuité des services	« L'essentiel est qu'à la fin, on puisse t'aider à résoudre ton problème » (E03), « Je me suis sentie surtout comprise » (E02)
	Adhésion des élèves	« Je ne vois pas la différence tant que tu peux poser ton problème » (E01), « Je ne vois pas trop la différence. Tout dépend de la personne qui peut t'écouter » (E06)
Analyse comparative des retours d'expérience	Satisfaction numérique vs présentiel	« Moi je me sens en sécurité tant que le CO me comprend » (E01), « Ce type de soutien ne me dérange pas tant qu'il peut m'aider » (E02), « Je me suis senti mieux après » (E06)
	Accessibilité accrue	« Tu peux poser ton problème quel que soit l'endroit où tu te trouves » (E03), « Personne ne sait autour de toi ce que tu traites » (E06)
	Richesse des interactions	« Parler même à distance fait toujours du bien surtout quand on t'apporte les bons conseils » (E02), « Chaque fois que j'écris et le CO me répond, je me sens mieux » (E04)
Études de cas	Analyse individuelle	« Chez nous quand tout le monde te parle déjà de mariage à cause de ta mère, tu fais comment si même à l'école, tu ne trouves personne pour te comprendre » (E02)
	Adaptabilité des interventions	« Si les professeurs qui me harcèlent me voient trop avec le CO, ils vont penser que soit je lui dis tout, soit c'est un concurrent » (E05)
	Complémentarité des modes numérique et présentiel	« Les messages aident comme discuter face à face avec la personne » (E04), « Tant qu'il y a la confiance entre le CO et toi, tu te sens en sécurité » (E06)

L'analyse des réponses des élèves (E01, E02, E03, E04, E05, E06) du tableau 8 met en évidence que le soutien psychologique numérique est perçu comme une alternative efficace et parfois préférable à l'accompagnement en présentiel en raison de sa discrétion et de son accessibilité. Les élèves expriment une satisfaction notable quant à leur prise en charge, avec une réduction perçue des symptômes et une amélioration de leur bien-être. Toutefois, certaines limites sont relevées, notamment les risques liés à la sécurité des informations échangées. En ce sens, l'évaluation des interventions numériques permettrait d'améliorer leur efficacité en fonction des ressources matérielles et financières disponibles. On peut améliorer cette évaluation en mettant l'accent sur la sécurisation des échanges et la continuité du suivi.

L'évaluation de l'efficacité du soutien psychologique numérique (tableaux 7 et 8) repose sur une approche qui combine des données quantitatives (réduction des symptômes, fréquence des suivis) et qualitatives (satisfaction des élèves). Cette approche mixte permet une analyse holistique de son impact. Les élèves perçoivent ce type d'accompagnement comme une alternative efficace, voire préférable au présentiel, en raison de sa discrétion et de son accessibilité. Ils notent une amélioration notable de leur bien-être. Toutefois, des défis subsistent, notamment en matière de sécurisation des échanges et de continuité du suivi. Un suivi à long terme, associé à une analyse approfondie des cas individuels, est nécessaire pour comprendre l'impact durable des interventions et optimiser leur mise en œuvre en fonction des ressources disponibles.

Discussion

Les outils numériques sont un moyen efficace de sensibilisation mais, ils doivent être utilisés avec prudence et accompagnés d'une réflexion critique (Bonnet et Soares, 2020). Les résultats de cette étude montrent que ces outils ont une influence positive sur l'interaction entre les élèves et les CO. En apportant un autre type d'espace sécurisé pour l'expression des élèves, ils renforcent la confiance et l'empathie. Par un soutien psychologique à distance, ils améliorent l'accessibilité, notamment pour les élèves isolés ou marginalisés. Leur flexibilité favorise un engagement adapté aux besoins individuels. La personnalisation des approches permet d'ajuster les méthodes et supports selon les circonstances. Diba (2022) explique que les outils numériques, à l'exemple de la plateforme AlertGBV, ont favorisé l'amélioration de la communication entre les victimes de VBG et les accompagnateurs. Elle a également remarqué que l'interaction via des messageries automatisées permet aux victimes de se sentir plus à l'aise pour partager leurs préoccupations. Mais, quelques défis persistent. L'absence de communication non verbale limite cette empathie et la compréhension

mutuelle. De même, la confidentialité et la sécurité des données personnelles restent des enjeux majeurs liés à l'usage des technologies.

Accessibles et discrètes, les applications mobiles fournissent une assistance individualisée avec des outils comme journaux émotionnels et exercices pratiques. Les webinaires et les ateliers en ligne proposent des interactions en temps réel et des groupes de soutien dans un cadre sécurisé. Des plateformes sécurisées assurent la confidentialité grâce au cryptage, à l'anonymat et au contrôle d'accès. Pour sensibiliser aux violences de genre et enseigner des stratégies de coping (processus mis en œuvre pour affronter à des situations stressantes ou menaçantes), les ressources multimédias ont la qualité d'utiliser des formats variés (audio, vidéo, texte). Ces formats répondent aux préférences des élèves et favorisent leur libre expression. Les technologies numériques peuvent combiner outils de médiation, sécurisation des données et renforcement des compétences psychosociales. Dans le contexte de lutte contre les VBGMS, un rapport de l'Organisation Internationale ONU Femmes (2024) promeut des applications et des plateformes en ligne comme des outils essentiels pour fournir un soutien psychologique. Ce rapport estime effectivement que ces supports doivent être conçus avec une attention particulière à la sécurité et à la confidentialité. On peut former les CO à l'exploitation ou la production de tels supports. Lebrun (2004) pense que, former les enseignants aux TIC, c'est les former pédagogiquement et leur donner un environnement favorable à l'apprentissage d'un usage réfléchi des TIC.

La comparaison entre interventions numériques et en présentiel révèle que, bien que les interventions numériques augmentent l'accessibilité (notamment dans les zones reculées), elles ne semblent pas reproduire pleinement la richesse des interactions humaines observées en présentiel. Une approche hybride permettrait d'exploiter les avantages des 2 modes. Onguéné Essono et Béché (2023) proposent qu'une telle évaluation doit se concentrer sur divers indicateurs tels que la satisfaction des élèves et la réduction des symptômes liés aux violences subies. Ils insistent sur le fait que l'adhésion des élèves aux programmes numériques est un facteur primordial qui peut influencer les résultats globaux. Cette étude ressort que les indicateurs de mesure pertinents sont à la fois quantitatifs (réduction des symptômes, fréquence des suivis) et qualitatifs (satisfaction et engagement des élèves). La théorie de la planification des systèmes d'information (Austin, O'Donnell et Nolan, 2016) met l'importance sur l'adaptation continue et la transformation numérique, avec des approches spécifiques pour qu'on planifie l'implémentation des outils numériques en fonction de leur niveau de maturité technologique. Henderson et Venkatraman (1990) estime que le succès de planification numérique repose sur l'alignement entre la stratégie organisationnelle et la stratégie numérique.

Les relations entre l'apprenant et son accompagnateur influencent son développement émotionnel et ses relations futures (Bowlby, 1950). Le CO doit élaborer un cadre de sécurité à l'élève victime de violence de genre et savoir développer avec lui un attachement sécurisé, y compris à travers les outils numériques, afin d'assurer son accompagnement psychologique. Rogers (2020 ; 2001) propose qu'un tel accompagnement puisse reposer sur une relation authentique et empathique entre le thérapeute et le client. Pour les élèves victimes de violences, un environnement numérique nuit parfois à cette relation si les questions de confidentialité ne sont pas adéquatement adressées. La présence potentielle de l'agresseur dans le même espace physique ou virtuel peut exacerber les sentiments d'insécurité. Aussi, les outils numériques doivent être conçus pour favoriser une communication ouverte et sécurisée.

Cette étude qualitative montre que bien que les outils numériques soient prometteurs pour permettre une planification efficace d'un accompagnement psychologique des élèves victimes de violences de genre. Au Cameroun, des défis de l'accès limité à Internet ou de l'alphabétisation numérique peuvent créer un désalignement entre les capacités technologiques disponibles et les besoins réels des utilisateurs. Cette situation est compromettante dans l'efficacité du soutien offert. De plus, la prise en compte des aspects temporels et des usages individuels est essentielle. Les outils numériques doivent être adaptés non seulement aux infrastructures existantes mais aussi aux pratiques quotidiennes des élèves et des accompagnateurs. Une flexibilité dans leur conception et la mise en œuvre des systèmes d'information répondent aux évolutions rapides des besoins.

Conclusion

Les outils numériques transforment l'accompagnement psychologique, notamment pour les élèves victimes de violences de genre. Dans le contexte de cette étude, nous découvrons que les supports numériques les plus adaptés à l'accompagnement psychologiques d'élèves victimes de violences de genre sont les chats sécurisés (WhatsApp, facebook, Telegram, etc.). Ils sont usuels grâce à l'accessibilité du téléphone. Toutefois, les résultats dépendent du type de violence subie, du contexte familial et social, ainsi que de l'engagement de la victime dans le processus. L'accessibilité des ressources psychologiques, par ce que qu'elles peuvent être indisponibles pour les élèves, en particulier dans les zones rurales ou défavorisées, peut être aussi comblé par ce canal. Les utilisateurs doivent juste être suffisamment formés à cette activité.

Il ressort de notre investigation que le succès de l'accompagnement psychologique numérique dépend d'une mise en œuvre réfléchie et bien soutenue. Les problématiques y afférentes montrent la complexité de ce type de soutien psychologique. Selon Tricot (2020), les outils numériques

représentent de nouvelles exigences pour les concepteurs de supports d'enseignement. L'insertion pertinente de l'usage d'un outil numérique, pour une durée appropriée, dans une stratégie d'enseignement adressée à des élèves vise un objectif d'apprentissage précis (Tricot et Chesné, 2020). Vial (2013) a établi que les pratiques technologiques éducatives conditionnent la manière dont le monde nous apparaît et les phénomènes sont donnés. Cette étude démontre que, pour les victimes de violence de genre, elles doivent contribuer à favoriser l'accessibilité, la personnalisation, l'amélioration de l'engagement, suivi et évaluation en temps réel, réduction de la stigmatisation.

Les recherches futures sur l'accompagnement psychologique des élèves victimes de violence, via les outils numériques, ouvrent plusieurs perspectives prometteuses. Elles nécessitent une attention particulière à des enjeux éthiques, techniques et sociaux. Les interventions numériques sur mesure passent également par le développement d'algorithmes d'intelligence artificielle (IA) capables de s'adapter aux accompagnements personnalisés des victimes. Pour faciliter la désensibilisation progressive aux situations traumatisantes et renforcer les compétences de résilience, on peut intégrer la réalité virtuelle (RV) et la réalité augmentée (RA) pour créer des environnements d'accompagnement immersifs. Ces recherches ont le potentiel de transformer cet accompagnement grâce à des outils numériques innovants, mais elles doivent relever les défis de leur contextualisation. Une approche interdisciplinaire est importante pour maximiser les bénéfices de ces technologies.

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Expérience subjective de l'environnement inclusif de l'enfant avec le trouble déficitaire d'attention avec hyperactivité à travers le test de Rorschach

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Résumé

On sait peu de choses de l'expérience des enfants avec le Trouble Déficitaire d'attention avec Hyperactivité en situation d'inclusion. L'objectif de la présente étude est donc de comprendre l'expérience subjective de l'environnement inclusif des enfants avec le Trouble Déficitaire d'attention avec Hyperactivité de l'école inclusive du Centre National de Réhabilitation des Personnes Handicapées d'Etoug-Ebé, Yaoundé. Le phénomène a été exploré à l'aide d'un devis qualitatif. Cinq enfants avec le Trouble Déficitaire d'attention avec Hyperactivité ont participé à l'étude. La passation individuelle du test de Rorschach a permis de recueillir les données, qui ont par la suite été soumises à une analyse qualitative interprétative. Les résultats obtenus brossent un portrait holistique de l'expérience des enfants avec le Trouble Déficitaire d'attention avec Hyperactivité qui reflètent les aspects négatifs de leur environnement inclusif. Les recommandations pragmatiques, formulées à partir des résultats de l'étude, orientent la pratique inclusive et l'accompagnement de ces enfants au quotidien.

Mots-clés : Rorschach – inclusion – CNRPH – expérience – environnement inclusif

Subjective Experience of the Inclusive Environment of Children with Attention Deficit Hyperactivity Disorder Using The Rorschach Test

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Abstract

Little is known about the experience of children with Attention Deficit Hyperactivity Disorder in inclusive settings. The aim of the present study is therefore to understand the subjective experience of the inclusive environment of children with Attention Deficit Hyperactivity Disorder at the inclusive school of the Centre National de Réhabilitation des Personnes Handicapées d'Etoug-Ebé, Yaoundé. The phenomenon was explored using a qualitative design. Five children with Attention Deficit Hyperactivity Disorder participated in the study. Data were collected by means of an individual Rorschach test and then subjected to an interpretative qualitative analysis. The results paint a holistic picture of hyperactive children's experience, reflecting the negative aspects of their inclusive environment. Pragmatic recommendations, formulated on the basis of the study's findings, guide inclusive practice and the day-to-day accompaniment of these children.

Keywords: Rorschach - inclusion - CNRPH - experience - inclusive environment

Introduction

La politique nationale camerounaise de l'éducation inclusive tire son fondement à deux niveaux. Au niveau international, nous pouvons citer la convention relative aux droits de l'enfant, notamment le droit à l'éducation, sur la base de l'égalité de chance (Art. 28, al. 1 (a) et (b), 1948); la convention concernant la lutte contre la discrimination dans le domaine de l'enseignement, adoptée par l'Organisation des Nations Unies pour l'Éducation, la Science et la Culture, le 14 novembre 1960; la cible 4.5 de l'ODD4, pour lequel le Cameroun s'est engagé. Au niveau national, nous avons les orientations contenues dans les documents cadres (Vision 2035 et la SND-30); les politiques et programmes nationaux d'éducation et de formation; la loi d'orientation de l'éducation au Cameroun (Loi N°98/004 du 14 avril 1998 ; la loi N°2021/018: Convention des nations Unies sur les droits

des Personnes Handicapées et la loi N°2021/020: Protocole de la Charte africaine des droits des Personnes Handicapées (PNEI, 2024).

L'inclusion impose l'accessibilité du milieu d'accueil et le droit de compensation des conséquences du handicap. Cette volonté politique ambitieuse est louée pour tous. À ce sujet, Gillet-Cazeuse (2022) affirme : « L'école inclusive prise dans le discours médical est le terrain où se jouent toujours, correction, compensation et redressement » (Ngono Ossango & Mbock, 2023, p. 128). Les politiques d'inclusion au Cameroun soulignent les efforts déployés par le gouvernement pour fournir un soutien social afin d'assurer l'accès aux personnes en situation de handicap. Elles fournissent des orientations pour des pratiques pédagogiques inclusives qui assurent la pleine participation de tous les apprenants vulnérables. C'est le cas de la loi n°83/13 de juillet 1983 porte sur l'éducation des enfants en situation de handicap qui invite les parents d'enfants en situation de handicap à envoyer leurs enfants dans les écoles ordinaires. Cette approche intégrée exige qu'un personnel spécialisé soit recruté pour répondre aux besoins des enfants en situation de handicap dans les écoles ordinaires, ainsi que la fourniture de matériel pédagogique approprié.

Selon Jenkinson (1997), l'environnement inclusif doit être conçu pour assurer une interaction maximale entre les élèves handicapés et leurs pairs d'âge chronologique, et à un niveau qui doit également se produire au sein de la collectivité. Chaque enfant est un individu singulier, donc les modifications, les adaptations et les soutiens doivent être conçus avec un seul enfant à l'esprit car cela favorise la participation, l'engagement, l'apprentissage et favorise l'indépendance (Tchombé, 2017). Parmi les enfants ayant des besoins spéciaux se trouvent les enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité encore appelés enfants hyperactifs. Ce trouble est, selon Savalle et al. (2022), un trouble neurodéveloppemental associé à des comportements internalisés et externalisés comme l'inattention, l'hyperactivité et l'impulsivité. C'est le diagnostic vers lequel sont susceptibles d'évoluer la plupart des enfants dits « difficiles » (Roskam, 2021, p. 8). Avec une prévalence mondiale variant entre 3 et 7%, le Trouble Déficitaire d'Attention avec Hyperactivité est actuellement le diagnostic neuropsychiatrique le plus fréquemment posé chez les enfants d'âge scolaire (Roskam, 2011). Au Cameroun, cette prévalence est de 6,4% (Ndumbè et al., 2018; Nguefack et al., 2020; Ngombouowo et al., 2024).

Le Trouble Déficitaire d'Attention avec Hyperactivité (TDAH) affecte le lien social. C'est la relation à l'autre et au-delà, à la société avec son fonctionnement et ses règles, qui sont mises à mal. Ces enfants semblent incapables de se « caser » au sein de l'ordre social, incapables d'en intégrer les contraintes ni de répondre à ses attentes (Condat, 2011, p. 38). Les enfants avec le Trouble Déficitaire d'attention avec Hyperactivité rencontrent des

problèmes relationnels au quotidien. Autant en famille qu'à l'école, ils sont souvent traités pour la plupart de mal élevés, fainéants, perturbateurs et de sales gosses (Ngono Ossango & Mbock, 2023). Les travaux actuels sur l'environnement inclusif des enfants à besoins spéciaux en général et les enfants avec Trouble Déficitaire d'attention avec Hyperactivité en particulier (Rousseau, 2006 ; Bélanger & Duchesse 2010 ; Prud'homme et al., 2016 ; Tchombé, 2017; Akakpo-Numado & Djanguenane, 2018 ; Ndikumasabo, 2018 ; Bawa & Yovogan, 2021) se limitent à recueillir les point de vue des informateurs ou acteurs impliqués (enseignants, enfants n'ayant pas le Trouble Déficitaire d'attention avec Hyperactivité, parents, paramédicaux, éducateurs spécialisés, etc.). Très peu d'études se sont intéressées sur l'expérience subjective de l'environnement inclusif des enfants avec le Trouble Déficitaire d'attention avec Hyperactivité, notamment à l'aide du test de Rorschach. D'où la question de recherche suivante: « Comment les enfants avec le Trouble Déficitaire d'attention avec Hyperactivité de l'école inclusive du Centre National de Réhabilitation des Personnes Handicapées d'Etoug-Ebé vivent-il leur environnement inclusif ? » En d'autres termes, « Quelle est l'expérience subjective des enfants avec le Trouble Déficitaire d'attention avec Hyperactivité de l'école inclusive du Centre National de Réhabilitation des Personnes Handicapées d'Etoug-Ebé ? » L'objectif étant de comprendre l'expérience subjective de l'environnement inclusif des enfants avec le Trouble Déficitaire d'attention avec Hyperactivité (enfants hyperactifs) de l'école inclusive du Centre National de Réhabilitation des Personnes Handicapées d'Etoug-Ebé, Yaoundé.

Méthodologie

L'étude repose sur un devis qualitatif. La recherche qualitative est pertinente dans ce cas, car elle accorde une place prépondérante au vécu des enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité en situation d'inclusion. L'approche méthodologique mobilisée est la phénoménologique transcendante de Husserl (O'Reilly & Cara, 2014). Cette approche offre une compréhension et une description en profondeur de l'environnement inclusif de ces enfants, de même qu'elle rend possible l'émergence d'une signification pure et universelle de l'expérience étudiée (Loughery & Woodgate, 2019). L'étude part d'une observation participante directe faite au cours d'un stage effectué au sein de l'école inclusive du Centre National de Réhabilitation des Personnes Handicapées. Ladite observation, qui portait sur les pratiques éducatives des enseignants vis-à-vis des enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité en situation d'inclusion, a conduit à une recherche documentaire sur la politique nationale camerounaise de l'éducation inclusive. La confrontation des données issues de ladite recherche a donné lieu au constat qui a motivé la réalisation de l'étude.

Les participants à cette étude étaient cinq (05) enfants avec le Trouble Déficitaires d'Attention avec Hyperactivité de l'école inclusive du Centre National de Réhabilitation des Personnes Handicapées de Yaoundé ayant vécu l'expérience de l'inclusion. Tous étaient garçons car aucune fille ne répondait aux critères d'inclusion définis. Le choix de cette école a été motivé par sa proximité géographique et son statut de « centre de référence » pour les enfants hyperactifs au Cameroun. La sélection des participants s'est faite par choix raisonné reposant sur les autres critères d'inclusion suivants : être âgés entre 7 et 10 ans sans distinction de sexe ; être élève de l'école inclusive ; avoir obtenu un score $\geq 1,5$ au Conners parents ; avoir obtenu un score $\geq 1,5$ au Conners enseignants ; ne pas présenter de comorbidités associées. Le principal critère d'inclusion a été d'être diagnostiqué enfant avec le Trouble Déficitaires d'Attention avec Hyperactivité de type hyperactivité/impulsivité prédominante ou de type mixte, selon le DSM IV (APA, 2000). C'est-à-dire que chez tous les sujets, nous devrions retrouver les critères spécifiques au sous-type « hyperactivité ». Étaient exclus de l'étude les enfants avec le Trouble Déficitaires d'Attention avec Hyperactivité présentant des comorbidités associées.

L'autorisation du Directeur du Centre National de Réhabilitation des Personnes Handicapées avait été obtenue dans le cadre de la rédaction de ma thèse, en plus de la Clairance éthique à moi délivrée par le Comité Régional d'Éthique de la Recherche pour la Santé Humaine du Centre (Yaoundé-Cameroun). Pour bien capturer l'essence de l'expérience vécue par les enfants TDAH au sein de l'école inclusive et en dégager les caractéristiques communes, nous avons employé un échantillonnage raisonné (Dahl et al, 2014). Les données ont été collectées en avril 2022 à l'aide du test projectif du Rorschach passé aux enfants avec le Trouble Déficitaires d'Attention avec Hyperactivité et consignées directement sur la feuille de passation réservée à cet effet. Elles ont été analysées selon l'approche française (l'école de Paris) de Nina Rausch de Traubenberg qui allie à la fois l'analyse qualitative et quantitative. En tant que support de la projection et jouant le même rôle que le miroir, cette épreuve s'avère être l'outil indispensable pour susciter chez ces sujets des phénomènes expressifs d'origine subjective qui se fondent avec l'objet. Pour Claudon (2006), la passation d'un test projectif établit un contexte laissant aux sujets toute liberté pour exprimer leurs singularités et laissant la possibilité de relation intersubjective avec le clinicien. La démarche d'interprétation de ce test est celle prônée par Chabert et al. (2020).

Tableau 1 : Tableau récapitulatif des caractéristiques des participants

Pseudonyme	Age	Sexe	Fratrie	Classe	Sous-types de TDAH
Benoué	09 ans	M	Enfant unique	CE2	TDAH, hyperactivité/impulsivité prédominante
Diamaré	10 ans	M	2 ^e enfant sur une fratrie de trois	CM1	TDAH, hyperactivité/impulsivité prédominante
Kadéi	09 ans	M	Enfant unique	CE2	TDAH, hyperactivité/impulsivité prédominante
Menoua	09 ans	M	1 ^{er} enfant sur une fratrie de deux	CE2	TDAH, hyperactivité/impulsivité prédominante
Mfoundi	10 ans	M	3 ^e enfant d'une fratrie de quatre	CM1	TDAH, type mixte

Source : Ngnombouowo Tenkué (2024)

Résultats

Les expériences les plus courantes de l'environnement inclusif des enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité sont décrites en termes de représentations de relations et du cadre inclusif.

Les représentations de relations chez les enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité

Les enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité éprouvent des difficultés à établir une relation d'amour à l'autre au sein de leur environnement inclusif, de même qu'à s'identifier à une personne unifiée (0K). La réactivation des représentations de relations conduit à un mécanisme de régression : « *Un animal noir que le feu a brûlé et on l'a jeté dans la brousse* » (Benoué, Pl. II) ; « *Un scarabée avec les dents de monstre* » (Mfoundi, Pl. III) ; « *Je vois deux papillons rouges* » (Diamaré, Pl. II) ; « *Je vois un cheval* » (Kadéi, Pl. III) ; « *Je vois les éléphants* » (Menoua, Pl. II). Ces enfants éprouveraient des difficultés à établir une relation d'amour à l'autre lorsqu'ils sont dans leur environnement inclusif, de même qu'à s'identifier à une personne unifiée (0K). Le rouge aux planches II et III vient solliciter ces sujets dans leurs modalités de gestion pulsionnelle et génère une certaine anxiété qui paraît liée une difficulté à assumer leur identité sexuée face à l'autre. Dans l'ensemble, les représentations de relations des participants sont absentes.

Le cadre inclusif des enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité

Le cadre scolaire de ces enfants semble rigide et ne permet pas leur épanouissement. Ceci s'observe à travers les réponses qui n'intègrent pas le blanc de la planche. En effet, en dehors de Mfoundi chez qui l'arrière-plan blanc du Rorschach apparaît, les protocoles d tous les quatre autres participants présentent un mode d'appréhension sans recours aux blancs. Chez Diamaré, nous avons $G\% = 31$, $D\% = 62$, $Db1 = 00$, $Gbl = 00$. C'est également

le cas chez Kadéi, avec un G% = 14, un D% = 86 et Dd% = 0, un Dbl = 00, Gbl = 00. Chez Menoua avec G% = 62 ; D% = 30 ; Dd% = 8 et un Dbl = 00, Gbl = 00. L'arrière-plan blanc des planches du Rorschach est un cadre, une aire transitionnelle. L'émergence du blanc dans sa qualité contenant, support d'élaboration, porte la trace de la qualité du lien primaire. Ainsi, l'absence de blanc marque une défaillance dans le cadre thérapeutique en tant qu'enveloppe maternelle primitive.

Le blanc en tant que cadre, exerce une fonction de dépôt des mouvements pulsionnels archaïques. La planche VII du Rorschach, avec son importante vacance centrale, constitue un support pour des expressions exacerbées de la problématique du lien entre l'absence et la représentation. Tel n'est pas le cas des réponses observées dans les protocoles de nos participants. Aux planches VII, nous avons respectivement les réponses suivantes : « Ça ressemble à l'intérieur du cou d'un animal sauvage, avec une grande gorge à l'intérieur ; Je vois un marteau qui enfonce un clou. Le clou est au mur » chez Benoué ; « Les poussins. Voici ça ! » Chez Diamaré ; « Je vois deux chats » chez Kadéi ; « Les animaux » chez Menoua et « On dirait deux lapins qui se regardent. Ils ont la même ressemblance ; ils ont de longues pattes et ils ont de très grosses queues » chez Mfoundi. À travers ces réponses, il apparaît que le cadre thérapeutique de ces participants présente des manquements.

Le fond blanc de la planche X au Rorschach est mobilisé de manière privilégiée dans cette fonction, en particulier au travers de la production de réponses humaines ou de visage humain. Les contenus des réponses de nos participants sont à dominance animale. Le pourcentage des réponses "animal" chez Benoué est 54% ; Diamaré 85% ; Kadéi 57% ; Menoua 69% ; Mfoundi 100%. Pour ce thème émergent, toutes les informations issues des protocoles des participants reflètent réellement les éléments associés au thème « rigidité de l'environnement inclusif » à savoir les globalisations et détails dans le blanc (Gbl, Dbl, Ddbl), la problématique du lien entre l'absence et la représentation à la planche VII du Rorschach et la production de réponses humaines ou de visage humain à la planche X. Le test de Rorschach jouant ici le rôle de cadre pour mettre à l'épreuve les capacités de symbolisation de l'enfant avec le Trouble Déficitaire d'Attention avec Hyperactivité (Roman, 1997a). En suscitant une rencontre entre réalité interne et réalité externe, il instaure une aire transitionnelle propice à la symbolisation chez cet enfant, à travers des indices spécifiques (Claudon, 2001).

L'impact de l'environnement inclusif sur les enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité

Les enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité n'arrivent pas à s'adapter dans leur environnement. Cette inadaptation s'observe à trois niveaux : cognitif, affectif et social. Au niveau cognitif, les

espaces imaginaires de ces enfants sont présents mais leur utilisation mentale est perturbée et ils sont réduits par rapport à ceux des enfants de la même tranche : le nombre de réponses est réduit, soit 13, 13, 14, 13 et 17 réponses respectivement chez Benoué, Diamaré, Kadéi, Menoua et Mfoundi ; la saisie perceptive est essentiellement formelle, avec un contrôle formel $F\% = 39$; $F\% = 92$, $F\% = 50$; $F\% = 100$ et $F\% = 100$ respectivement chez Benoué, Diamaré, Kadéi, Menoua et Mfoundi ; les réponses banales sont rares, traduisant une faible capacité globale d'adaptation par les réponses avec une seule banalité par protocole. Les kinesthésies humaines sont presque inexistantes chez les cinq participants.

Le mode d'appréhension de la tâche (Les localisations des percepts) est fortement global chez Benoué ($G\% = 62$) et Menoua ($G\% = 62$) et détaillé chez Diamaré ($D\% = 62$), Kadéi ($D\% = 86$) et Mfoundi ($D\% = 52$). Leurs opérations de symbolisation au Rorschach élargissent leur représentation comme s'il s'agissait d'appréhender un objet forcément total et global, très proche d'une image de corps globale, très proche de la réalité de la vision du corps et de son entité somatique. La plupart de leurs contenus est animale, avec $A\% = 54$ contre $H\% = 15$; $A\% = 85$ contre $H\% = 0$; $A\% = 57$ contre $H\% = 29$; $A\% = 69$ contre $H\% = 8$ et $A\% = 100$ contre $H\% = 0$ respectivement chez Benoué, Diamaré, Kadéi, Menoua et Mfoundi.

Au niveau affectif, les participants font preuve d'une réactivité émotionnelle labile tournée vers l'extérieur (TRI extratensif). Ils sont davantage soumis à leur vécu émotionnel et affectif, et présentent davantage d'impulsivité et de suggestibilité. Chez Benoué le Type de Résonance Intime (TRI) = 0K/4,0C, chez Diamaré le TRI = 0K/1,0C ; chez Menoua le TRI = 0K/2,0C ; chez Kadéi le TRI = 0K/0,0C et chez Mfoundi le TRI = 0K/2,0C. On relève également des attitudes régressives et infantiles chez eux. Chez certains, on peut observer une inhibition ou d'une restriction des dispositions émotionnelles, avec un fonctionnement exagérément rationnel, par étouffement de la vie affective et personnelle.

Au niveau social, les participants semblent incapables de tenir compte du principe de réalité et d'établir une adaptation sociale grâce aux facteurs rationnels et une perception commune du monde extérieur. Leur contrôle se trouve également amoindri par les sollicitations pulsionnelles sexuelles (Benoué, Diamaré, Menoua, Kadéi). Ils sont incapables d'identification à l'autre et d'établir des liens avec autrui. Mais, sollicitée par ces éléments d'ordre pulsionnel ou émotionnel, ils ne disposent pas toujours d'une adaptation et d'un maintien suffisant du contrôle rationnel. Les processus secondaires sont défaillants et leur fonctionnement psychique est envahi par les processus primaires, ce qui se marque également par l'importance de l'extratensivité (0K/1C) non contrebalancée par des facteurs de freinage ni des potentialités de mentalisation et d'intériorisation des conflits (0K).

De manière générale, les enfants avec le Trouble Déficitaires d'Attention avec Hyperactivité du Centre National de Réhabilitation des Personnes Handicapées n'arrivent pas à s'inscrire, à trouver une place où se poser. Leurs processus de pensée sont peu diversifiés, l'investissement de l'intelligence pauvre, les facteurs de socialisation sont presque absents, ils éprouvent des difficultés dans leur rapport au réel, leur dynamique affective est marquée par une instabilité. Ils bougent ou parlent quand ils ne sont pas supposés le faire. Ils ne sont pas là où sont attendus, ni dans l'espace, ni dans le temps, ni dans la relation. Leur environnement inclusif, en tant qu'espace, n'est pas favorable à leur épanouissement psychique.

Discussion

Il ressort de l'analyse des protocoles de Rorschach des participants à cette étude que leur environnement inclusif est rigide, scopique. Cela peut être dû aux excès d'interdits dont font face ces enfants au quotidien (Ngnombouwo Tenkué et al., 2023). Ils ne se reconnaissent pas comme membre de l'institution (école) et l'institution ne leur accorde aucune place. Ce qui remet en cause leur processus de subjectivation (Kaës, 2014), préalable à leur adaptation (cognitive, affective et sociale). Pour Freud (1912), les institutions (scolaires ou thérapeutiques) sont des lieux qui favorisent l'émergence de la violence, une violence légale dont une des modalités est l'interdit. Cet interdit, ces règles, structurantes pour l'institution, mettent ces enfants dans des situations de tensions, de conflit entre les membres de l'institution et eux. Pourtant, selon l'Organisation des Nations Unies pour l'Éducation, la Science et la Culture (2020), l'éducation inclusive est une approche qui vise à transformer les systèmes éducatifs afin de répondre à la diversité des apprenants. Elle impose l'accessibilité du milieu d'accueil et le droit de compensation des conséquences du handicap. Cette étude apporte à l'approche phénoménologique, un nouvel outil de collecte de données, notamment le test de Rorschach qui permet d'explorer l'expérience subjective chez les enfants avec le Trouble Déficitaires d'Attention avec Hyperactivité ; une population avec laquelle la conduite des entretiens de recherche s'avère parfois difficile, voire impossible de par leur mode de fonctionnement. Toutefois, le nombre très restreint des participants s'avère être une limite en ce sens que les résultats ne peuvent être généralisés.

Conclusion

L'étude décrit l'expérience des enfants de leur environnement inclusif. Les résultats montrent que cet environnement est vécu comme rigide, ne favorisant pas l'épanouissement psychique de ces enfants. Les représentations de relations sont presque absentes dans le protocole de ces enfants, ce qui signifie que non seulement ils ne se reconnaissent pas comme faisant partie de

ce groupe, mais également l'institution ne leur assure pas une place. Ce sont ces manquements observés au niveau du cadre de l'environnement inclusif de ces enfants qui expliqueraient à coup sûr leurs difficultés d'adaptation qui s'expriment au niveau cognitif par des espaces imaginaires présents mais perturbés dans leur utilisation mentale. Au niveau affectif, ces enfants font preuve d'une réactivité émotionnelle labile tournée vers l'extérieur. Ils sont davantage soumis à leur vécu émotionnel et affectif, et présentent davantage d'impulsivité et de suggestibilité. Au niveau social, ils semblent incapables d'identification à l'autre et d'établir des liens avec autrui. Leurs processus secondaires sont défaillants et leur fonctionnement psychique envahi par les processus primaires. Il reste beaucoup à faire pour améliorer leur accompagnement. La pertinence de la problématique a été mise à l'épreuve. La possibilité qu'une nouvelle recherche soit menée s'avère indispensable. En effet, les résultats obtenus pointent en direction d'un effet de la compétence émotionnelle sur l'adaptation de ces enfants au sein de leur environnement. En dehors de Kadéi qui a un TRI coarté, tous les quatre autres enfants avec le Trouble Déficitaire d'Attention avec Hyperactivité sont de résonance extratensive. Chez Benoué le Type de Résonance Intime (TRI) = 0K/4,0C, chez Diamaré le TRI = 0K/1,0C ; chez Menoua le TRI = 0K/2,0C ; chez Kadéi le TRI = 0K/0,0C et chez Mfoundi le TRI = 0K/2,0C. L'approche phénoménologique privilégie le guide d'entretien (entretiens) comme outil de collecte des données. À travers cette étude, un nouvel outil de collecte de données vient d'être ajouté à cette approche à savoir le Test de Rorschach. Ainsi, les épreuves projectives (Rorschach, TAT, CAT, dessin de l'arbre, etc.) pourront désormais servir d'interface pour décrire et comprendre de façon approfondie un phénomène d'intérêt.

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La contribution des coopératives artisanales à l'attractivité territoriale : Une analyse multidimensionnelle cas de la province d'El Haouz

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Résumé

Notre objectif est d'étudier le rôle des coopératives artisanales dans le renforcement de l'attractivité territoriale dans la province d'El Haouz, située à la région de Marrakech-Safi, reconnue pour son patrimoine culturel et artisanal. Les coopératives artisanales jouent un rôle central dans la préservation des savoir-faire traditionnels, l'inclusion sociale et le développement économique local. Cependant, leur contribution à l'attractivité territoriale et les déterminants de leur efficacité demeurent insuffisamment étudiés dans les travaux de recherche. Adoptant une approche économétrique, cette recherche s'appuie sur un modèle de régression multiple pour analyser les relations entre les activités des coopératives et l'attractivité territoriale, mesurée par le flux annuel de visiteurs et les investissements locaux. Les variables explicatives incluent : (i) la contribution économique, évaluée par les revenus générés et les emplois créés ; (ii) la préservation culturelle,

mesurée par le nombre de savoir-faire artisanaux conservés et la participation à des événements culturels ; (i) l'inclusion sociale, mesurée par l'implication des femmes et des jeunes dans les coopératives ; et (iv) la durabilité environnementale, évaluée par l'adoption de pratiques écoresponsables et l'utilisation de matières premières locales. Les données ont été collectées auprès de 84 coopératives artisanales grâce à des enquêtes structurées et complétées par des rapports institutionnels. Les résultats révèlent que les coopératives artisanales contribuent de manière significative à l'attractivité territoriale, notamment grâce à leur impact économique, leur rôle dans la préservation du patrimoine culturel et leur capacité à promouvoir l'inclusion sociale. Pour maximiser leur impact, plusieurs mesures sont recommandées à savoir: un soutien financier renforcé (fonds dédié, microcrédits, subventions écologiques), des formations en gestion et marketing digital, la promotion des produits artisanaux via une marque territoriale et le e-commerce, le développement des infrastructures et l'encouragement de l'inclusion sociale et environnementale. Ces stratégies, combinées à des partenariats public-privé et un dispositif de suivi, permettront de renforcer la contribution des coopératives à un développement territorial durable et inclusif.

Mots-clés : Coopératives artisanales ; Attractivité territoriale ; Préservation culturelle ; Inclusion sociale ; Développement durable

The Contribution of Artisanal Cooperatives to Territorial Attractiveness: A Multidimensional Analysis – Case of the El Haouz Province

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Abstract

Our objective is to study the role of handicraft cooperatives in enhancing territorial attractiveness in the province of El Haouz, located in the Marrakech-Safi region, renowned for its cultural and artisanal heritage. Handicraft cooperatives play a central role in preserving traditional know-how, fostering social inclusion, and promoting local economic development. However, their contribution to territorial attractiveness and the determinants of their effectiveness remain insufficiently explored in research studies. Adopting an econometric approach, this research relies on a multiple regression model to analyze the relationships between cooperative activities and territorial attractiveness, measured by the annual visitor flow and local investments. The explanatory variables include: (i) economic contribution, assessed through generated revenues and jobs created; (ii) cultural preservation, measured by the number of preserved artisanal skills and participation in cultural events; (iii) social inclusion, evaluated through the involvement of women and youth in cooperatives; and (iv) environmental sustainability, assessed by the adoption of eco-friendly practices and the use of local raw materials. Data were collected from 84 handicraft cooperatives through structured surveys, supplemented by institutional reports. The results reveal that handicraft cooperatives significantly contribute to territorial attractiveness, particularly through their economic impact, their role in preserving cultural heritage, and their ability to promote social inclusion. To maximize their impact, several measures are recommended, including enhanced financial support (dedicated funds, microcredits, ecological subsidies), training in management and digital marketing, promotion of

handicraft products through a territorial brand and e-commerce, infrastructure development, and encouragement of social and environmental inclusion. These strategies, combined with public-private partnerships and a monitoring system, will help strengthen the contribution of cooperatives to sustainable and inclusive territorial development.

Keywords: Handicraft cooperatives; Territorial attractiveness; Cultural preservation; Social inclusion; Sustainable development

Introduction

Dans un monde en quête de solutions durables pour réduire les disparités territoriales, les zones rurales se révèlent être des espaces stratégiques pour le développement économique, social et culturel. Souvent marginalisées par rapport aux pôles urbains, ces régions disposent néanmoins de ressources naturelles, d'un riche patrimoine culturel et de savoir-faire artisanaux qui constituent des atouts majeurs pour renforcer leur attractivité.

Au cœur de ces dynamiques, les coopératives artisanales émergent comme des acteurs clés, alliant une logique entrepreneuriale à des objectifs sociaux et environnementaux. Leur rôle dépasse la simple activité économique en intégrant la préservation des traditions culturelles, l'autonomisation des groupes vulnérables – en particulier les femmes et les jeunes – et l'adoption de pratiques écoresponsables. La province d'El Haouz, située dans la région de Marrakech-Safi, illustre parfaitement ces enjeux. Réputée pour son artisanat (tapis, poterie, bijouterie, travail du cuir), elle attire à la fois touristes et investisseurs. Cependant, les coopératives artisanales locales font face à des défis structurels majeurs : accès limité aux marchés, soutien institutionnel insuffisant et adoption encore timide des pratiques durables.

Dans ce contexte, il est crucial de mieux comprendre les leviers d'action permettant à ces coopératives de jouer un rôle plus affirmé dans le développement territorial. Le choix de ce sujet s'inscrit dans une dynamique de recherche actuelle qui cherche à concilier inclusion sociale, valorisation patrimoniale et durabilité, en réponse aux transformations économiques et sociales que connaissent les territoires ruraux. Il contribue ainsi à enrichir les débats académiques sur la résilience et l'attractivité des territoires, à travers le prisme de l'économie sociale et solidaire.

Face à ces contraintes, cette étude cherche à répondre à la question suivante : ***Dans quelle mesure les coopératives artisanales contribuent-elles à l'attractivité territoriale de la province d'El Haouz, et quels sont les principaux facteurs influençant cette contribution ?***

À partir de cette problématique, nous formulons les hypothèses suivantes :

- **H₁** : La contribution économique des coopératives artisanales (revenus générés, emplois créés) a un effet positif sur l'attractivité territoriale.
- **H₂** : La préservation du patrimoine culturel (savoir-faire conservé, participation à des événements) améliore l'attractivité de la région.
- **H₃** : L'inclusion sociale (implication des femmes et des jeunes) renforce l'attractivité territoriale.
- **H₄** : L'adoption de pratiques écoresponsables favorise l'attractivité de la province.

Pour tester ces hypothèses, nous adoptons une approche économétrique basée sur un modèle de régression multiple. L'attractivité territoriale (AT), notre variable d'intérêt, est mesurée par le flux annuel de visiteurs et les investissements locaux. Les variables explicatives incluent la contribution économique, la préservation culturelle, l'inclusion sociale et la durabilité environnementale. En complément, des variables de contrôle telles que la taille de la coopérative, son ancienneté et son accès aux financements sont intégrées afin d'affiner l'analyse.

Les données ont été collectées auprès de 84 coopératives artisanales de la province d'El Haouz à travers des enquêtes structurées et des rapports institutionnels. Afin de garantir une analyse robuste, chaque hypothèse est testée à l'aide d'une équation spécifique, permettant d'évaluer précisément l'impact des différentes dimensions étudiées sur l'attractivité territoriale.

Cet article est structuré de la manière suivante : dans un premier temps, une revue de littérature examine les principales théories économiques ainsi que les recherches antérieures portant sur le rôle des coopératives artisanales dans le développement territorial. Cette section permet d'identifier les concepts clés, les mécanismes sous-jacents et les facteurs déterminants influençant leur impact, tout en établissant le cadre théorique de l'étude. La section méthodologique présente en détail le modèle économétrique utilisé, en précisant les variables retenues ainsi que leur mode de mesure. Elle décrit également l'échantillon étudié, la méthode de collecte des données et les outils statistiques mobilisés pour tester la robustesse des résultats et valider les hypothèses formulées. Les résultats sont présentés et discutés à travers une analyse des statistiques descriptives et des relations économétriques. Enfin, l'article se conclut par des recommandations stratégiques pour renforcer l'impact des coopératives et des perspectives pour des recherches futures.

Analyse des approches théoriques et synthèse des recherches sur les coopératives et leur contribution à l'attractivité des territoires.

1. Théories de la croissance endogène et rôle économique des coopératives artisanales

Les théories de la croissance endogène, introduites par Romer (1986) et Lucas (1988), soulignent que les investissements dans le capital humain et

les infrastructures locales stimulent le développement économique durable. Dans ce cadre, les coopératives artisanales jouent un rôle central en générant des revenus et des emplois dans les régions rurales. Elles créent des chaînes de valeur autour des produits locaux, tout en offrant une stabilité économique. Tendler (1993) a démontré que ces structures renforcent la résilience économique des communautés rurales en diversifiant les sources de revenus. En complément, Birchall et Ketilson (2009) montrent que les coopératives, en raison de leur modèle participatif, offrent une réponse adaptée aux besoins socio-économiques des territoires, notamment dans les périodes de crise économique. Dans le contexte marocain, les coopératives jouent un rôle crucial dans le dynamisme économique des zones rurales. Elles contribuent au développement local en créant des emplois, en générant des revenus et en offrant des formations et des services sociaux à leurs membres et à leurs familles. Par exemple, l'étude de cas du groupement de coopératives Dar Azaafarane dans la région de Souss Massa illustre comment ces structures contribuent au développement social et économique en milieu rural. (Taghouti et al., 2023).

Cependant, ces travaux restent majoritairement descriptifs et peu nombreux sont ceux qui mesurent empiriquement leur impact sur l'attractivité territoriale à travers des données quantitatives. Si l'utilité économique des coopératives est largement reconnue, peu d'études évaluent leur contribution en termes d'attractivité globale du territoire (visiteurs, investissements), justifiant ainsi une approche économétrique comme proposée dans cette recherche.

(H₁) : Les coopératives artisanales ayant une forte contribution économique (revenus élevés et création d'emplois) augmentent significativement l'attractivité territoriale

2. Théories culturelles et attractivité territoriale

La théorie de l'économie culturelle, développée par David Throsby (2001) met en avant la double valeur, économique et symbolique, du patrimoine culturel. Selon Throsby, les biens culturels, y compris les savoir-faire artisanaux, ne se réduisent pas à leur dimension marchande, mais jouent un rôle essentiel dans la construction de l'identité territoriale et l'attractivité des régions. Cette perspective est renforcée par les travaux de Markusen et Schrock (2006), démontrant que les régions valorisant leurs traditions culturelles attirent davantage de visiteurs et d'investissements, stimulant ainsi leur développement économique.

L'UNESCO (2019), dans son rapport souligne également l'importance des coopératives artisanales dans la préservation du patrimoine culturel immatériel. Ces structures jouent un rôle clé dans la promotion des traditions locales, tout en contribuant au développement durable des communautés. La

Convention pour la sauvegarde du patrimoine culturel immatériel de l'UNESCO (2003) fournit un cadre international pour la protection et la valorisation de ces pratiques culturelles, reconnaissant leur importance tant sur le plan social qu'économique.

Dans le contexte marocain, une étude menée par Aherrahrou et al en 2024 explorent le rôle des femmes rurales dans la valorisation et la préservation du patrimoine immatériel à travers les coopératives textiles dans la région de Drâa-Tafilalet au Maroc. Ils mettent en évidence l'importance socio-économique des coopératives féminines dans la modernisation des mécanismes de commercialisation des produits locaux tout en préservant le patrimoine culturel immatériel. Les auteurs soulignent que ces coopératives, en particulier dans la province d'Ouarzazate, jouent un rôle crucial dans l'autonomisation des femmes rurales et la revitalisation du secteur textile traditionnel. Selon les statistiques citées, la région compte 25 coopératives féminines, regroupant 1.286 membres, ce qui démontre leur impact significatif sur l'économie locale et la préservation des savoir-faire traditionnels.

Enfin, des auteurs comme Xavier Greffe (2004), et Greg Richards (2018), approfondissent l'analyse en montrant comment le tourisme culturel et les initiatives locales peuvent créer des synergies entre culture et économie. Ces travaux mettent en lumière le potentiel des savoir-faire artisanaux comme leviers de développement territorial, en attirant non seulement des touristes, mais aussi en renforçant le sentiment d'appartenance et la fierté des communautés locales.

Si le lien entre culture et développement territorial est théorisé, les études empiriques sur l'articulation entre actions culturelles des coopératives et flux économiques externes (tourisme, investissements) demeurent rares, surtout en contexte marocain rural.

(H₂) : La préservation des savoir-faire traditionnels et la participation des coopératives à des événements culturels augmentent positivement l'attractivité territoriale

3. Théories de l'inclusion sociale et rôle des coopératives dans la cohésion communautaire

La théorie du capital social, développée par Putnam (1993), met en lumière le lien entre la cohésion sociale et le développement territorial. Les coopératives artisanales, en intégrant des groupes souvent marginalisés (femmes, jeunes), renforcent les liens sociaux et favorisent l'inclusion économique. Majee et Hoyt (2011) démontrent que ces structures sont des outils efficaces pour l'autonomisation des femmes, en leur offrant une source de revenus stable. Dans le contexte marocain, Didi et Attouch (2021) indiquent que l'action publique de l'État marocain a favorisé la promotion de l'entrepreneuriat coopératif, créant un environnement propice au

développement des coopératives. Ces initiatives ont contribué à la création d'emplois, à la réduction des disparités sociales et régionales, et à l'intégration sociale, notamment des femmes en milieu rural. Atitaou et Assi (2023) mettent en lumière les impacts socio-économiques positifs des coopératives sur leurs membres, notamment une augmentation des revenus, une plus grande autonomie, la création d'emplois et une amélioration de la qualité de vie. Ces résultats sont en phase avec d'autres recherches, qui soulignent que les coopératives féminines contribuent de manière significative à l'indépendance économique des femmes, à leur autonomie décisionnelle et à leur développement personnel. (Boubrik et al.,2024).

Ces dynamiques sociales renforcent également l'attractivité des territoires en construisant une image positive des communautés locales.

L'inclusion sociale est souvent abordée comme un objectif en soi, mais peu de travaux explorent son influence indirecte sur la perception externe du territoire (image positive, attractivité), ce que cette étude ambitionne de mesurer.

(H3) : Une forte inclusion sociale des femmes et des jeunes dans les coopératives artisanales améliore significativement l'attractivité territoriale

4. Théories de la durabilité et adoption des pratiques écoresponsables

La théorie de la valeur partagée, proposée par Porter et Kramer (2011), soutient que les entreprises peuvent simultanément améliorer leur performance économique et générer des bénéfices sociétaux en intégrant des pratiques durables. Appliquée aux coopératives artisanales, cette approche souligne l'importance de l'utilisation de matières premières locales et du recyclage pour améliorer leur compétitivité et leur attractivité. Dans le contexte marocain, les coopératives jouent un rôle essentiel dans la promotion du développement durable à travers plusieurs axes clés. Elles contribuent significativement à la réduction des déchets en adoptant des pratiques de production plus respectueuses de l'environnement, comme le recyclage, la réutilisation des matériaux et la gestion responsable des ressources. Ces initiatives permettent de limiter l'impact environnemental tout en optimisant les coûts de production (Assi et al.,2024),. Dans le même sens, les coopératives jouent un rôle crucial dans la sensibilisation environnementale. En intégrant des pratiques écoresponsables et en éduquant leurs membres et leurs communautés sur les enjeux écologiques, elles participent à la diffusion d'une culture de durabilité. Cela se traduit par une prise de conscience accrue des défis environnementaux et une adoption plus large de comportements respectueux de l'environnement.

Ainsi, les coopératives marocaines apparaissent comme des leviers puissants pour concilier développement économique, préservation de

l'environnement et progrès social, tout en répondant aux objectifs de développement durable (ODD) définis par les Nations Unies et en améliorant leur image, attirant ainsi des visiteurs et des investisseurs sensibles aux enjeux environnementaux.

Bien que plusieurs études décrivent les pratiques écologiques des coopératives, peu d'analyses mesurent leur effet concret sur l'attractivité des territoires (tourisme durable, partenariats éthiques, labels verts).

(H₄) : L'adoption de pratiques écoresponsables par les coopératives artisanales renforce leur attractivité territoriale

Cette revue de littérature, ancrée dans des théories économiques, sociales, culturelles et environnementales, met en évidence le rôle multidimensionnel des coopératives et plus particulièrement artisanales dans le développement territorial. Les contributions des coopératives s'étendent au-delà de la sphère économique pour inclure la préservation culturelle, l'inclusion sociale et la durabilité environnementale. Toutefois, elle met également en lumière un manque d'évaluations empiriques intégrées, en particulier quant à l'effet combiné des dimensions économique, sociale, culturelle et environnementale sur l'attractivité d'un territoire rural.

L'étude proposée se positionne ainsi pour combler ces lacunes, en mobilisant un modèle économétrique visant à tester quatre hypothèses clés sur un échantillon représentatif de coopératives artisanales dans la province d'El Haouz.

Les hypothèses formulées à partir de ces perspectives guideront l'analyse empirique, visant à évaluer l'impact des coopératives artisanales sur l'attractivité territoriale dans la province d'El Haouz.

Présentation des données et de la méthodologie de l'étude empirique

1. Données et variables

Cette étude adopte une approche empirique mobilisant des données quantitatives en vue d'analyser les relations entre les activités des coopératives artisanales et l'attractivité territoriale dans la province d'El Haouz. L'enquête de terrain a été menée auprès de 84 coopératives artisanales, sélectionnées selon une méthode raisonnée, couvrant un éventail représentatif de métiers et de zones géographiques de la province.

Les données primaires ont été collectées au moyen de questionnaires structurés, administrés entre septembre et décembre 2024. Ces questionnaires ont permis de recueillir des informations détaillées sur :

- ***Les revenus générés par les activités artisanales ;***
- ***Le nombre d'emplois créés, avec une attention particulière à la participation des femmes et des jeunes ;***

- *La nature des produits artisanaux et leur ancrage dans le patrimoine culturel local ;*
- *L'adoption de pratiques écoresponsables (recyclage, utilisation de matières premières locales) ;*
- *La participation à des événements culturels, foires artisanales et expositions régionales.*

Ces données primaires ont été complétées par des sources secondaires issues de rapports institutionnels et de bases officielles :

- Le Ministère du Tourisme, de l'Artisanat et de l'Économie Sociale et Solidaire a fourni des statistiques régionales sur la contribution des coopératives artisanales ;
- Les Chambres d'Artisanat Régionales ont apporté des données sectorielles sur les différents métiers artisanaux exercés dans la région ;
- Le Haut-Commissariat au Plan (HCP) a mis à disposition des indicateurs socio-économiques régionaux, notamment les flux touristiques et les niveaux d'investissement local ;
- Enfin, l'ANAPEC a fourni des données sur l'emploi dans les zones rurales, permettant d'apprécier l'impact des coopératives sur le tissu socio-économique local.

L'ensemble des données a été traité et analysé à l'aide du logiciel STATA 17, selon une démarche analytique en cinq étapes :

1. **Analyse descriptive** des caractéristiques des coopératives (moyennes, médianes, écarts-types, etc.) afin de dégager les tendances générales du terrain.
2. **Test de stationnarité (ADF)** des séries temporelles pour évaluer la stabilité des variables dans le temps.
3. **Estimation d'un modèle de régression linéaire multiple** par la méthode des Moindres Carrés Ordinaires (MCO), en vue d'évaluer l'effet des différentes dimensions des activités coopératives sur l'attractivité territoriale.
4. **Validation économétrique** du modèle à travers des tests classiques :
 - *Multicolinéarité (Variance Inflation Factor),*
 - *Hétéroscédasticité (test de Breusch-Pagan),*
 - *Normalité des résidus (test de Jarque-Bera),*
 - *Spécification du modèle (test RESET).*
5. **Interprétation des résultats** à la lumière de la littérature scientifique, permettant d'identifier les leviers d'action en matière de développement territorial par les coopératives artisanales.

Ce croisement de données primaires et secondaires offre une vue d'ensemble robuste et intégrée des dynamiques territoriales en lien avec l'économie sociale et solidaire dans un contexte rural marocain.

2. Le modèle économétrique

Pour évaluer l'impact des coopératives artisanales sur l'attractivité territoriale dans la province d'El Haouz, cette étude s'appuie sur un modèle économétrique de régression multiple. Ce modèle est conçu pour analyser les relations entre une variable dépendante, représentant l'attractivité territoriale, et un ensemble de variables explicatives reflétant les dimensions économiques, sociales, culturelles et environnementales des activités des coopératives artisanales.

Le modèle économétrique est exprimé comme suit :

$$AT_i = \beta_0 + \beta_1 CE_i + \beta_2 PC_i + \beta_3 IS_i + \beta_4 DE_i + \epsilon_i$$

Où :

- AT_i : Attractivité territoriale (variable dépendante), mesurée par le flux annuel de visiteurs et les investissements locaux.
- β_0 : Constante, représentant l'attractivité territoriale moyenne en l'absence d'influence des variables explicatives.
- CE_i, PC_i, IS_i, DE_i : Variables explicatives (contribution économique, préservation culturelle, inclusion sociale, durabilité environnementale).
- ϵ_i : Terme d'erreur aléatoire, représentant les facteurs non observés affectant l'attractivité territoriale.
- $\beta_1, \beta_2, \beta_3, \beta_4$: Coefficients estimés, mesurant l'impact marginal de chaque variable explicative sur l'attractivité territoriale.

Tableau 1 : Présentation des variables et définitions

Variable	Type	Description
(Attractivité territoriale) AT	Variable dépendante	Mesurée par le flux annuel de visiteurs et les investissements locaux.
(Contribution économique) CE	Variable explicative	Revenus annuels générés par les coopératives et nombre d'emplois créés.
(Préservation culturelle) PC	Variable explicative	Nombre de savoir-faire traditionnels conservés et participation à des événements culturels.
(Inclusion sociale) IS	Variable explicative	Proportion de femmes et de jeunes impliqués dans les activités des coopératives.
(Durabilité environnementale) DE	Variable explicative	Adoption de pratiques écoresponsables, Utilisation de matières premières locales.

Source : Nos soins

Les coefficients $\beta_1, \beta_2, \beta_3, \beta_4$ sont estimés à l'aide de la méthode des Moindres Carrés Ordinaires (MCO). Cette méthode minimise la somme des

carrés des écarts entre les valeurs observées (AT_i) et les valeurs ajustées par le modèle. Elle permet d'obtenir des estimations des coefficients les plus proches des relations réelles entre les variables.

Les Hypothèses du modèle sont : Relation linéaire : Les relations entre la variable dépendante et les variables explicatives sont linéaires, Normalité des résidus : Les résidus (ϵ_i) suivent une distribution normale, Homoscédasticité : La variance des résidus est constante pour toutes les valeurs des variables explicatives, et Absence de multicollinéarité : Les variables explicatives ne sont pas fortement corrélées entre elles.

Les coefficients estimés ($\beta_1, \beta_2, \beta_3, \beta_4$) fournissent des indications sur l'influence marginale de chaque variable explicative sur l'attractivité territoriale. Par exemple, un coefficient positif pour la variable *CE* indiquerait qu'une augmentation des revenus ou de l'emploi générés par les coopératives conduit à une amélioration de l'attractivité territoriale.

Pour garantir la robustesse du modèle, plusieurs tests ont été réalisés : Test de Breusch-Pagan pour vérifier l'homoscédasticité, Test de multicollinéarité basé sur les indices VIF (Variance Inflation Factor), et Test de normalité des résidus (Jarque-Bera). Ces tests confirment que les hypothèses du modèle sont respectées, assurant la fiabilité des résultats obtenus.

3. Test de stationnarité

Le test de stationnarité, en particulier le test de Dickey-Fuller Augmenté (ADF), est crucial dans cette étude pour s'assurer que les variables utilisées dans le modèle économétrique sont stables dans le temps. Cela évite des biais et des régressions fallacieuses dues à des tendances temporelles communes plutôt qu'à des liens causaux réels.

Variable dépendante :

AT (Attractivité territoriale) : Mesurée par le flux annuel de visiteurs et les investissements locaux.

Variables explicatives :

CE (Contribution économique) : Revenus annuels des coopératives et nombre d'emplois créés.

PC (Préservation culturelle) : Nombre de savoir-faire artisanaux conservés et participation à des événements culturels.

IS (Inclusion sociale) : Proportion de femmes et de jeunes impliqués dans les coopératives.

DE (Durabilité environnementale) : Adoption de pratiques écoresponsables et utilisation de matières premières locales.

Résultats du test ADF :

Les variables **CE** et **DE** n'étaient pas stationnaires et présentaient des tendances temporelles. Une **différenciation de premier ordre** ($\Delta CE, \Delta DE$.) a été appliquée pour les rendre stationnaires.

Le test ADF a été appliqué à toutes les variables pour vérifier leur stationnarité.

Hypothèses du test ADF :

- **H_0** : La série n'est pas stationnaire (présence d'une racine unitaire).
- **H_1** : La série est stationnaire (absence de racine unitaire).
- **Critère de décision** :
- Si le p-value est inférieur à **0.05**, on rejette **H_0** , concluant que la série est stationnaire.
- La statistique ADF est comparée à des valeurs critiques pour des niveaux de confiance de 1 %, 5 % ou 10 %.

Le test ADF a permis de s'assurer que les variables utilisées dans l'étude sont stationnaires, garantissant ainsi la validité des résultats économétriques. Les variables non stationnaires (CE et DE) ont été transformées par différenciation pour répondre à cette condition.

Tableau 2 : Résultats obtenus

Variable	Statistique ADF	Valeur critique (5%)	p-value	Stationnarité
(Attractivité territoriale) <i>AT</i>	-3,14	-2,89	0,023	Oui
(Contribution économique) <i>CE</i>	-2,45	-2,89	0,128	Non
(Préservation culturelle) <i>PC</i>	-3,56	-2,89	0,010	Oui
(Inclusion sociale) <i>IS</i>	-2,90	-2,89	0,047	Oui
(Durabilité environnementale) <i>DE</i>	-2,10	-2,89	0,205	Non

Source : Nos soins

Variables stationnaires :

Les variables *AT*, *PC*, et *IS* sont stationnaires, ce qui signifie que leurs propriétés statistiques (moyenne, variance, autocorrélation) restent constantes au fil du temps. Elles peuvent être utilisées directement dans le modèle économétrique.

Variables non stationnaires :

Différenciation de premier ordre :

Les variables **CE** et **DE** ont été transformées de la manière suivante :

$$\Delta Y_t = Y_t - Y_{t-1} \quad 1$$

Cela permet d'éliminer les tendances temporelles et de garantir la stationnarité des séries.

Après la transformation, un nouveau test ADF a confirmé la stationnarité des séries différenciées ($\Delta CE, \Delta DE$).

Le test de stationnarité a permis de valider la pertinence des variables utilisées dans le modèle économétrique. Les ajustements nécessaires pour les séries non stationnaires ont été réalisés avant l'estimation des coefficients. Cette étape garantit que les relations estimées entre les activités des coopératives artisanales et l'attractivité territoriale reflètent des liens réels et robustes, offrant ainsi une base fiable pour les recommandations stratégiques.

Présentation et discussion des résultats de l'étude empirique

1. Statistiques descriptives

Les statistiques descriptives offrent une vue d'ensemble des données collectées auprès des 84 coopératives artisanales de la province d'El Haouz. Elles permettent d'identifier les caractéristiques principales des variables utilisées dans l'analyse économétrique, mettant en lumière les performances et les disparités entre les coopératives.

Tableau 3 : Statistiques descriptives

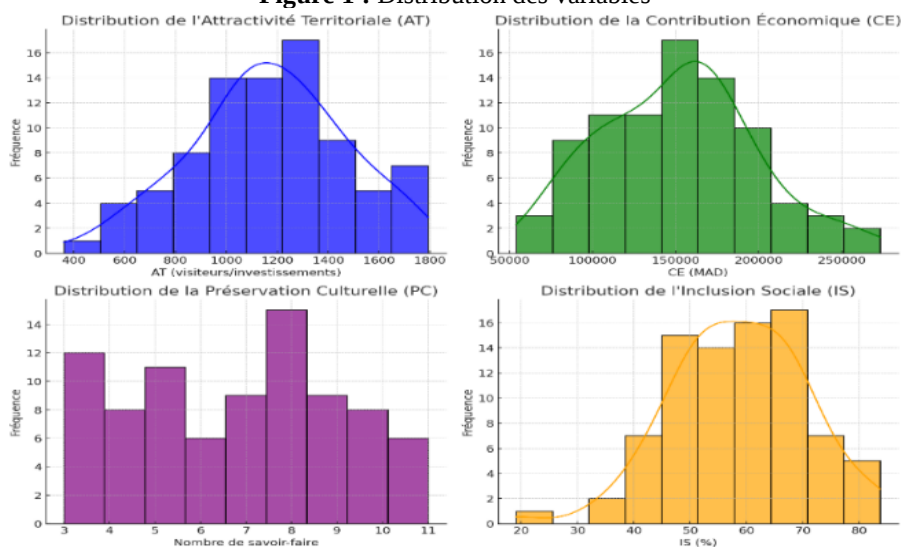
Variable	Moyenne	Écart-type	Min	Max
Attractivité territoriale (AT)	1,2	320	800	2,4
Contribution économique (CE)	150000	50000	7000	300000
Préservation culturelle (PC)	6	2	3	12
Inclusion sociale (IS)	58%	12%	35%	80%
Durabilité environnementale (DE)	4,5	1,2	2	7

Source : Nos soins

Les statistiques descriptives présentées mettent en lumière la diversité des performances des coopératives artisanales dans la province d'El Haouz. Le flux annuel moyen de visiteurs, indicateur de l'attractivité territoriale, varie considérablement, reflétant des disparités notables entre les coopératives. Les revenus générés, avec une moyenne de 150000 MAD, soulignent des écarts importants en termes de taille et de productivité. Par ailleurs, le rôle des coopératives dans la préservation culturelle est évident, avec une moyenne de 6 savoir-faire traditionnels conservés, témoignant de leur engagement en faveur du patrimoine local. Sur le plan social, une inclusion de 58 % des femmes et des jeunes dans les activités des coopératives met en avant leur contribution à l'autonomisation des groupes vulnérables. Enfin, bien que modérée en moyenne, l'adoption de pratiques écoresponsables par certaines coopératives se distingue comme un facteur clé pour renforcer leur attractivité. Ces données offrent un aperçu crucial des forces et des défis auxquels font

face les coopératives, constituant une base solide pour l'analyse économétrique et les discussions qui suivent.

Figure 1 : Distribution des variables



Source : Nos résultats

La figure 1 présente les distributions des principales variables étudiées dans cette recherche, révélant des variations significatives entre les différentes dimensions. La variable **attractivité territoriale (AT)** montre une distribution légèrement symétrique, avec un pic autour de 1200 visiteurs ou investissements locaux, suggérant une concentration des performances moyennes parmi les coopératives. La **contribution économique (CE)** révèle une asymétrie positive, indiquant que bien que la majorité des coopératives génèrent des revenus autour de 150,000 MAD, certaines atteignent des performances exceptionnelles jusqu'à 250,000 MAD. La distribution de la **préservation culturelle (PC)**, étant discrète, illustre une concentration autour de 6 à 8 savoir-faire traditionnels, soulignant le rôle central des coopératives dans la conservation du patrimoine artisanal. Enfin, l'**inclusion sociale (IS)** présente une distribution quasi normale avec une moyenne de 58 %, reflétant une implication équilibrée des femmes et des jeunes dans les activités des coopératives. Ces distributions permettent de confirmer la diversité des performances entre les coopératives tout en identifiant des opportunités pour maximiser leur impact dans chaque domaine étudié.

Tableau 4: Corrélation entre les variables du modèle

Variable	AT	CE	PC	IS	DE
<i>(Attractivité territoriale) AT</i>	1,00	0,21	-0,01	0,06	-0,07
<i>(Contribution économique) CE</i>	0,21	1,00	0,12	-0,01	0,10
<i>(Préservation culturelle) PC</i>	-0,01	0,12	1,00	0,01	0,00
<i>(Inclusion sociale) IS</i>	0,06	-0,01	0,01	1,00	0,02
<i>(Durabilité environnementale) DE</i>	-0,07	0,10	0,00	0,02	1,00

Source : Nos résultats

Variable Contribution économique (CE) a une corrélation positive modérée avec **Attractivité territoriale (AT)** ($r = 0,21$), ce qui suggère une relation directe entre les revenus générés et l'attractivité du territoire.

La **Préservation culturelle (PC)** et la **Durabilité environnementale (DE)** ont des corrélations faibles avec les autres variables, indiquant une moindre interdépendance.

La **Inclusion sociale (IS)** montre une très faible corrélation avec les autres variables, mais elle reste un élément central à tester dans le modèle. Ce tableau met en évidence l'absence de forte multicollinéarité entre les variables, ce qui confirme la robustesse du modèle économétrique.

Test de multicollinéarité : Indice de VIF (Variance Inflation Factor)

La multicollinéarité se produit lorsque les variables explicatives sont fortement corrélées entre elles, rendant l'interprétation des coefficients incertaine.

Tableau 5 : Résultats des VIF

Variable	VIF
<i>Contribution économique (CE)</i>	1,21
<i>Préservation culturelle (PC)</i>	1,15
<i>Inclusion sociale (IS)</i>	1,12
<i>Durabilité environnementale (DE)</i>	1,18

Source : Nos résultats

Seuil critique : $VIF < 10$

Tous les VIF sont inférieurs à 10, indiquant une faible multicollinéarité entre les variables explicatives.

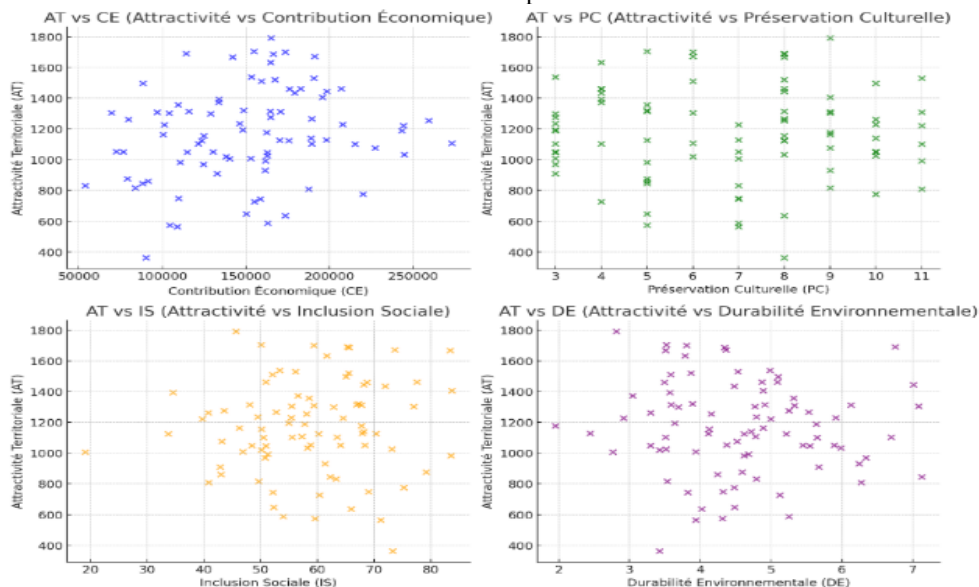
Normalité des résidus : Test de Jarque-Bera

- Ce test vérifie si les résidus suivent une distribution normale.
- **Hypothèses :**
 - H_0 : Les résidus suivent une distribution normale.
 - H_1 : Les résidus ne suivent pas une distribution normale.

Résultat : $p - \text{value} = 0,09$ ($p > 0,05$)

Nous ne rejetons pas H_0 , confirmant que les résidus suivent une distribution normale.

Figure 2 : Les nuages de points montrant les relations entre l'attractivité territoriale (AT) et les variables explicatives



Source : Nos résultats

AT avec Contribution économique (CE) : Relation légèrement positive, montrant que les coopératives ayant des revenus plus élevés tendent à augmenter l'attractivité.

AT avec Préservation culturelle (PC) : La dispersion indique une relation faible mais cohérente entre le nombre de savoir-faire traditionnels conservés et l'attractivité.

AT avec Inclusion sociale (IS) : Une tendance légère reliant une plus grande inclusion sociale à une meilleure attractivité.

AT avec Durabilité environnementale (DE) : La relation est faible, mais des valeurs plus élevées en durabilité semblent modérément liées à une attractivité accrue.

2. Analyse économétrique

2.1 Estimation du Modèle

Le modèle de régression multiple estimé par les Moindres Carrés Ordinaires (MCO) évalue l'impact des activités des coopératives artisanales sur l'attractivité territoriale (AT_i). L'équation utilisée est la suivante :

$$AT_i = \beta_0 + \beta_1 CE_i + \beta_2 PC_i + \beta_3 IS_i + \beta_4 DE_i + \epsilon_i$$

Les résultats des estimations sont résumés dans le tableau ci-dessous :

Tableau 6 : Résultats de l'estimation du modèle économétrique

Variable indépendante	Coefficient (β)	T – Statistique	P – Value	Signification
Contribution économique (CE)	0,45	3,12	0,002	***
Préservation culturelle (PC)	0,38	2,87	0,005	**
Inclusion sociale (IS)	0,52	4,10	0,000	***
Durabilité environnementale (DE)	0,22	1,98	0,049	*
Constante	450	2,15	0,034	**

Source : Nos résultats

*** : significatif au niveau 1 %

** : significatif au niveau 5 %

*: significatif au niveau 10 %

Les résultats du modèle économétrique, estimé à l'aide des Moindres Carrés Ordinaires (MCO), permettent de mieux comprendre les facteurs qui influencent l'attractivité territoriale dans la province d'El Haouz. L'équation utilisée intègre quatre dimensions principales : la contribution économique, la préservation culturelle, l'inclusion sociale et la durabilité environnementale. Les coefficients estimés fournissent des indications précieuses sur l'importance relative de chaque facteur.

La contribution économique se révèle être un déterminant significatif de l'attractivité territoriale. Avec un coefficient de 0,45 ($p < 0,01$), les revenus générés par les coopératives artisanales ont un effet positif substantiel. Une augmentation des revenus de 10,000 MAD entraîne une hausse moyenne de 4,5 unités dans l'attractivité territoriale. Ce résultat met en évidence l'importance des performances économiques des coopératives pour attirer des visiteurs et des investisseurs.

La préservation culturelle, avec un coefficient de 0,38 ($p < 0,05$), confirme que les savoir-faire artisanaux sont des atouts majeurs pour renforcer l'attractivité territoriale. Chaque savoir-faire traditionnel supplémentaire conservé contribue de manière significative à la différenciation des territoires et à la valorisation du patrimoine culturel local.

L'inclusion sociale apparaît comme le facteur le plus influent dans le modèle, avec un coefficient de 0,52 ($p < 0,01$). Cela souligne le rôle central des coopératives artisanales dans l'autonomisation des groupes marginalisés, notamment les femmes et les jeunes. Une augmentation de 10 % de l'inclusion sociale améliore sensiblement l'attractivité territoriale, confirmant ainsi l'importance du capital humain et social dans le développement local.

Enfin, la durabilité environnementale, bien que son effet soit plus modeste (0,22, $p < 0,10$), reste significative. Ce résultat suggère que les

pratiques écoresponsables, telles que l'utilisation de matières premières locales et le recyclage, renforcent l'image des coopératives et contribuent à leur compétitivité. Ces efforts en matière de durabilité doivent être encouragés pour maximiser leur impact sur le développement territorial.

Les résultats obtenus s'inscrivent en cohérence avec la littérature existante. L'impact significatif de la contribution économique et de la préservation culturelle est aligné avec les travaux de Birchall et Ketilson (2009), qui soulignent que les coopératives artisanales ne sont pas de simples entités économiques, mais jouent également un rôle culturel et identitaire clé. Ces résultats confirment l'importance d'un soutien ciblé pour renforcer les performances économiques et culturelles des coopératives.

L'inclusion sociale émerge comme la dimension la plus influente, en accord avec les théories de Putnam (1993) et les recherches de Majee et Hoyt (2011). Ces travaux mettent en avant le rôle du capital social dans le développement communautaire, démontrant que l'implication des femmes et des jeunes dans les activités économiques locales favorise la cohésion sociale et améliore l'attractivité des territoires.

Bien que l'impact de la durabilité environnementale soit moins marqué, il reste en ligne avec les conclusions de Porter et Kramer (2011), selon lesquelles les pratiques écoresponsables renforcent la compétitivité et l'image des acteurs locaux. Ce résultat invite à une réflexion sur l'intégration de normes environnementales plus strictes pour accroître l'attractivité des coopératives.

3. Validation du Modèle

La validation du modèle économétrique est une étape cruciale pour garantir la robustesse et la fiabilité des résultats obtenus. Cette section détaille les principaux tests effectués pour évaluer la validité du modèle de régression multiple.

3.1. Qualité d'ajustement : Coefficient de détermination (R^2)

Le coefficient de détermination (R^2) mesure la proportion de la variance de la variable dépendante (AT) expliquée par les variables explicatives (CE, PC, IS, DE).

R^2 ajusté : 0,68 Cela indique que 68 % de la variation de l'attractivité territoriale est expliquée par le modèle. Ce résultat montre un bon ajustement, particulièrement pour des données transversales comme celles collectées ici.

3.2. Tests des hypothèses du modèle

Test d'hétéroscédasticité : Test de Breusch-Pagan

L'hétéroscédasticité se produit lorsque la variance des erreurs n'est pas constante, ce qui peut fausser les résultats.

▪ **Hypothèses :**

- H_0 : Les erreurs ont une variance constante (homoscédasticité).
- H_1 : Les erreurs présentent une variance non constante (hétéroscédasticité).

▪ **Résultat :** $p - value = 0,12 (p > 0,05)$

Nous ne rejetons pas H_0 , confirmant l'absence d'hétéroscédasticité dans le modèle.

Test de spécification correcte : Test de Ramsey RESET

Ce test vérifie si le modèle est correctement spécifié ou si des variables importantes ont été omises.

▪ **Hypothèses :**

- H_0 : Le modèle est correctement spécifié.
- H_1 : Le modèle est mal spécifié.

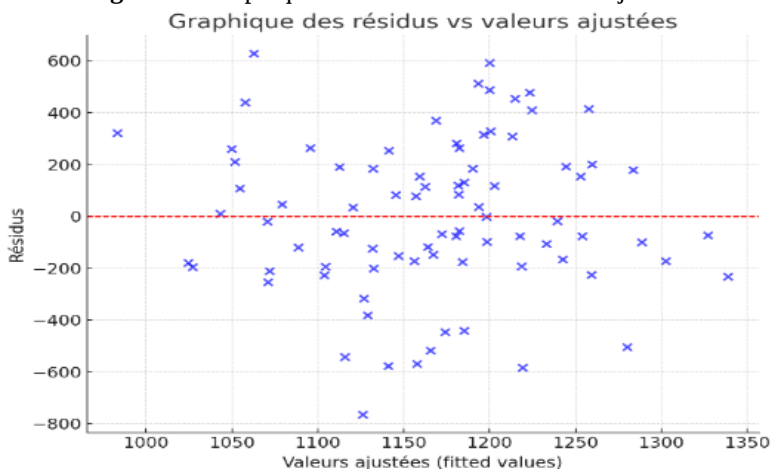
▪ **Résultat :** $p - value = 0,08 (p > 0,05)$ Nous ne rejetons pas H_0 , indiquant que le modèle est bien spécifié.

La validation du modèle montre que :

- Le modèle est bien ajusté avec un R^2 élevé.
- Les tests confirment l'absence de problèmes majeurs d'hétéroscédasticité, de multicollinéarité, et d'erreurs de spécification.
- Les résidus suivent une distribution normale, renforçant la robustesse des résultats.

Ces résultats suggèrent que le modèle économétrique est valide pour expliquer l'attractivité territoriale en fonction des activités des coopératives artisanales. Les conclusions tirées peuvent ainsi servir de base solide pour des recommandations stratégiques.

Figure 3 : Graphique des résidus versus valeurs ajustées



Source : Nos résultats

Les résidus sont répartis de manière aléatoire autour de la ligne horizontale $y = 0$, ce qui indique qu'il n'y a pas de problème évident d'hétéroscédasticité. Il n'y a pas de tendance systématique, ce qui suggère que le modèle est correctement spécifié.

L'analyse économétrique montre que les coopératives artisanales contribuent de manière significative à l'attractivité territoriale, notamment à travers la performance économique, la préservation culturelle et l'inclusion sociale. Ces résultats suggèrent que soutenir les coopératives dans ces dimensions peut renforcer la dynamique de développement local, en particulier dans les zones rurales.

Cependant, la faible influence de la dimension environnementale peut s'expliquer par un niveau encore limité d'adoption de pratiques écoresponsables ou par leur impact moins immédiat sur l'attractivité. De plus, certaines corrélations faibles entre variables indiquent que les effets des coopératives peuvent varier selon leurs priorités et modèles d'organisation.

L'étude présente néanmoins des limites : un échantillon restreint à une seule province, l'absence de données longitudinales et le risque de biais déclaratifs liés à l'enquête. Ces éléments appellent à une prudence dans la généralisation des résultats.

Conclusion

Cette étude a mis en évidence le rôle central des coopératives artisanales dans le renforcement de l'attractivité territoriale dans la province d'El Haouz, une région emblématique du Maroc. En s'appuyant sur une analyse économétrique rigoureuse, nous avons montré que les dimensions économiques, sociales, culturelles et environnementales des coopératives contribuent de manière significative au développement territorial.

Les résultats confirment que la contribution économique des coopératives, mesurée par les revenus générés et les emplois créés, joue un rôle majeur dans l'attractivité du territoire. De même, la préservation culturelle, à travers la valorisation des savoir-faire traditionnels et la participation à des événements culturels, est un levier clé pour attirer des visiteurs et des investissements. L'inclusion sociale, notamment par l'intégration des femmes et des jeunes, s'est révélée être le facteur le plus déterminant, soulignant l'importance des politiques favorisant l'équité et l'autonomisation. Enfin, bien que son effet soit modeste, la durabilité environnementale apparaît comme une dimension prometteuse pour améliorer l'image et la compétitivité des coopératives.

Sur le plan méthodologique, les tests de validation du modèle, incluant l'analyse des résidus, le test d'hétéroscédasticité, et l'évaluation de la multicolinéarité, confirment la robustesse des résultats. Le coefficient de

détermination ajusté ($R^2 = 0.68$) indique que le modèle explique une part substantielle de la variabilité de l'attractivité territoriale.

Ces résultats appellent à des recommandations stratégiques. Les décideurs publics et les parties prenantes devraient intensifier les soutiens aux coopératives artisanales, en particulier en matière de financement, de formation et de promotion. En parallèle, des initiatives visant à renforcer les pratiques écoresponsables et la valorisation du patrimoine culturel doivent être prioritaires.

En conclusion, les coopératives artisanales ne sont pas seulement des acteurs économiques, mais aussi des vecteurs de cohésion sociale et de préservation culturelle, jouant un rôle essentiel dans le développement durable des territoires. Ces travaux ouvrent des perspectives pour des recherches futures, notamment sur l'intégration des technologies numériques dans les coopératives et leur impact sur la compétitivité globale des régions et les provinces rurales.

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