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Picture Content in Annual Reports Matters: Framing as a Strategy for Impressing Potential Investors

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This study examines the association between a firm's economic situation and the use of pictorial content in its annual reports. In other words, we shed light on whether firms in a specific economic situation intentionally choose particular picture content for the illustrations in their annual reports. We argue that the content of pictures can be used as an additional disclosure instrument to highlight signals beyond objective financial data, that is, an attempt to moderate readers' decision-making processes. Corporate disclosure can be designed at multiple levels of corporate communication to influence addressees' perceptions. We analyse 4770 annual reports from FTSE-350 firms between 2000 and 2021 using Google Vision API's artificial intelligence to examine if this special form of corporate disclosure is affected by corporate economic performance. Our findings suggest that decisions about pictorial elements in annual reports are associated with firms' economic situation. Our paper contributes to the integration of communication theory, behavioural finance and voluntary disclosure theory to comprehend the use of pictorial information in annual reports. This study broadens the rare evidence regarding information design choices in annual reports with a particular focus on picture usage. By acknowledging the interdependence between framing and voluntary disclosure, researchers and practitioners can refine communication strategies and interventions to promote honest and successful financial disclosure whilst also considering the various communication theory factors involved.

Investor relations represent activities of companies that communicate financial and non-financial decision-relevant information to current or potential investors, financial analysts, the press and rating agencies (Bassen et al. 2010). A fundamental issue in accounting research is thus whether and how firms utilise voluntary disclosure to inform or influence the decision-making of financial reports' addressees. Companies' disclosure no longer only comprises classical accounting information; pictures and graphics are transmitted as an integral part of presentations. Therefore, we define picture content in annual reports as a specific type of voluntary disclosure that allows complex and intended multi-messages to be communicated beyond traditional quantitative financial information and narratives (Preston et al. 1996; Davison 2007; Campbell et al. 2009).

In general, corporate disclosure offers opportunities to increase transparency nowadays (Cho et al. 2012), but voluntary disclosure can also be influenced by tailoring information to frames that resonate most with specific stakeholder groups. For example, a company may frame its sustainability efforts as an integral part of its long-term strategy, which appeals to environmentally conscious investors (Benford and Snow 2000). The scientific field of behavioural finance, a cornerstone of behavioural economics, attempts to explain such effects and thus establishes more realistic models of the entire capital market and its participants (von Nitzsch et al. 2001). This involves looking for empirical findings on human behaviour when making financial decisions (Camerer and Loewenstein 2004; De Bondt et al. 2008; Trost and Fox 2022). We argue that framing is one of the effects analysed within the behavioural finance framework, and is relevant to explain voluntary

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disclosure. Framing theory posits that how information is presented and framed can shape individuals' perceptions, attitudes and decision-making processes (Thaler 1980; Kahneman and Tversky 1986). In the context of voluntary disclosure, the framing theory indicates that a company's presentation of information can affect how stakeholders interpret and respond to it. Additionally, companies can strategically frame information to downplay negative issues or emphasise positive ones. This may involve using euphemisms or vague language to obscure negative financial performance (Gamson and Modigliani 1989). Voluntary disclosures that are too comprehensive, sometimes called corporate propaganda, could potentially lead to obfuscation (Aras and Crowther 2009; Cho et al. 2012). Obfuscation is the writing or presentation of information that obscures an intended message (Courtis 2004a). Studies have shown that the level of difficulty in reading annual reports has increased over the years (Dyer et al. 2017).

This raises the question of whether firms in various economic situations deliberately choose to use and design disclosure to manage potential investors' perceptions using pictures and designing annual reports with specific picture elements. The current literature provides evidence that companies can influence stakeholder perceptions by, for example, highlighting the positive aspects of their financial performance (Patelli and Pedrini 2014; Patelli and Pedrini 2015; Qian and Sun 2021; Al-Alwani and Mousa 2022) or their corporate social responsibility (CSR) initiatives (Renneboog et al. 2008; Barnett et al. 2020; Gillian et al. 2021). This is consistent with the concept of 'framework sponsorship', as discussed by Entman (1993).

Our study suggests that organisations can shape perceptions by highlighting positive performance (enhancement) or hiding negative results (obfuscation), in line with Merkl-Davies et al. (2011), when integrating accountability and legitimacy theories.

This study analyses the voluntary disclosure of pictures and special picture content in annual reports and their relationship with companies' economic success. This topic is relevant because there is a pictorial turn (Mitchell 2018) in companies' disclosure (Campbell et al. 2009; Davison and Warren 2009) that might contribute adequate, addressee-oriented insights into companies' actual economic situations (Davison and Warren 2009; Straßner 2012; Beattie 2014). Although it is well accepted that readers may find it easier to remember the content of pictures than other information in annual reports (Courtis 1997), accounting research has not analysed its association with profitability as a measure of companies' economic situation. We assume that, depending on their economic situation, companies use pictures in their annual reports, depending on their economic situation, to impress potential investors. Furthermore, in line with the theory of picture-superiority effect, it has been suggested that when pictures and words are presented serially in an explicit memory task, the recall of the pictures is superior (Paivio 1991; Whitehouse et al. 2006). Pictures in annual reports could effectively capture readers' attention and shape their perceptions through a combination of picture content and narratives (Zillmann et al. 1999; Ang et al. 2020). This is in line with the view that investor relations are often used to influence the behaviour of analysts and investors (Kirk and Vincent 2014).

In this context, companies may include special information content in their disclosure to highlight signals which are not solely due to objective financial considerations but also subjective factors that are based on how individuals organise and prioritise their decisions. This is particularly important when we consider that annual reports are not only addressed but also read by a wide variety of users (Mittelbach-Hörmanseder and Barrantes 2021). Understanding the role of framing in voluntary disclosure offers a more comprehensive understanding of how psychological biases and cognitive processes influence individuals' communication of financial information. Recognising the interplay between framing and voluntary disclosure, researchers and practitioners can better tailor communication strategies and interventions to encourage transparent and effective financial disclosure or use special voluntary disclosure content to create obfuscation.

Although prior research focuses on descriptive and normative analyses of pictures in annual reports (e.g., David 2001; Davison 2007; Campbell et al. 2009; Ang et al. 2020), this study examines the association between picture content in annual reports and companies' economic success. Therefore, we suggest that disclosure is designed at multiple levels of corporate communication to influence addressees' perceptions. In doing so, we aim to analyse whether differences exist between economically well-positioned and poorly positioned companies vis-à-vis investors' decisions regarding pictorial elements in annual reports. This study contributes to the literature in the following ways. Previous studies have examined the relationship between framing and disclosure using several research options, mainly focusing on narratives (e.g., Entman 1993; D'Angelo 2002; Ashuri and Halperin 2017; Allee et al. 2021). We contribute by analysing whether the picture content in annual reports can be understood as an intended communication instrument that companies use to steer investors' perceptions.

Therefore, first, we show that companies may use a large number of pictures and a large amount of picture content in their annual reports to obfuscate their economic situation. Using insights from communication theory, we demonstrate the relationship between

the picture content in annual reports and a company's success. Thus, this study extends the rare evidence about information design in annual reports with respect to the use of pictures to uncover management's opportunistic disclosure behaviour or enhance corporate disclosure information. We extend the findings from earlier literature and analyse the scope of picture content as a whole for its relationship with the economic success of companies and find indications that obfuscation is also present. Finally, in the second step, we conclude that companies voluntarily disclose pictures in annual reports to manage investors' expectations using special picture content in their annual reports. Thus, insights from behavioural finance could impact disclosure decisions, as companies could categorise the information provided in annual reports based on their relevance to individual recipients. Therefore, we analyse how the special content of pictures is associated with companies' economic success, suggesting that special picture content matters. Therefore, we combine an interdisciplinary approach with new technical capabilities using artificial intelligence through the Google Vision API. We analysed the annual reports of all companies listed in the FTSE-350-Index and ended up with 340 of 350 listed companies, covering 4770 firm-years between 2000 and 2021. Our findings show that specific picture content can be associated with less or more profitable companies, depending on the companies' disclosure intentions.

The remainder of this paper is structured as follows. In the next section, we describe the theoretical framework used to develop our research hypotheses. After that, we present the research design, sample selection and variable measurements. Next, we discuss the results in detail. The final section summarises our findings and contributions.

Literature Review

Research on investor relations has a history of over 50 years (Hoffmann et al. 2018), focusing mainly on small sample sizes. Arguing that pictures and aesthetically pleasing designs are not trivial, some authors suggest that pictures play an important role in the overall rhetoric of annual reports (Beattie and Jones 1992, Graves et al. 1996, Campbell et al. 2009). Additionally, it is widely accepted that annual financial reports provide useful information for reducing information asymmetry (Bassen et al. 2010). Essentially, it can be suggested that information asymmetry among investors creates trading frictions because of adverse selection (Glosten and Milgrim 1985) that can be mitigated by reducing information asymmetry through corporate disclosure (Diamond and Verrechia 1991). From this perspective, it is important to understand the factors that can potentially cause such asymmetry. Therefore, voluntary disclosure is mainly considered as a means of decreasing problems regarding information asymmetry arising in traditional financial reporting (Burgman and Roos 2007, Arvidsson 2011).

It is important to consider how corporate disclosures are designed to address information asymmetries. Such problems have already been analysed in detail in the context of the presentation of fundamental accounting information against the background of obfuscation. Courtis (2004a), in a study of external reporting documents from 60 Hong Kong public companies, find that there is an association between obfuscation and corporate profitability, age, complexity and location of hardest-to-read passages. He offers three possible explanations for this finding: management may deliberately condone the use of a particular writing technique, whether malicious or non-malicious, to maintain a degree of opacity. A third explanation results from the fact that different people write different sections of corporate reports or even different sections of a part of a report (Courtis 2004a). Li (2008) shows in his analysis of US companies based on the management obfuscation hypothesis which is derived from Bloomfield's (2002) incomplete revelation hypothesis, that 'annual reports of firms with lower earnings are harder to read' and 'firms with annual reports that are easier to read have more persistent positive earnings' (Li 2008). The incomplete revelation hypothesis is based on Grossman and StiglitDaz' s (1980) model, according to which, in efficient markets, the return on data analysis must correspond to the costs of the analysis (Bloomfield 2008). This partial revelation hypothesis argues that managers have incentives to hide information in complicated disclosure when company performance is poor, as the market delays the uptake of information due to its complicated presentation (Bloomfield 2002; Li 2008). Consequently, the managerial obfuscation hypothesis predicts a negative relationship between a firm's current performance and its annual report (Li 2008). Goncalves et al. (2022) reach similar conclusions for European companies, finding that companies reporting operating losses are more likely to publish more complex annual reports than those reporting an operating profit.

There are also a variety of studies in the context of graphics, whereas pictures have hardly been examined. Frownfelter-Lohrke and Fulkerson's (2001) study of US and non-US financial statements concludes that most companies design graphics in their disclosure that can be misleading to users. Thus, many of them do not conform to the guidelines for good graphics set out in previous literature (Frownfelter-Lohrke and Fulkerson 2001). Melis and Aresu (2022) obtain similar results, showing that companies may use graphic content to portray selfish and non-neutral presentations of their performance

(Melis and Aresu 2022). Weber et al. (2005) discuss the relevance of presentation formats in corporate disclosure in terms of how they affect investors' expectations about risk and corporate profitability. They suppose that the type of corporate disclosure information plays an important role in investors' risk assessment of an investment and suggest that if investors are familiar with a special type of corporate disclosure, the risk of an investment is significantly underestimated. Conversely, if they are not familiar with the type of disclosure, the risk is estimated to be higher than is actually the case. Cho et al. (2012) analyse graphs in sustainability reports issued by firms from six countries and find substantial evidence for enhancement and obfuscation in graph displays.

If we consider this against the background of behavioural finance, investors' decision-making processes are influenced by many different factors (Trost and Fox 2022), which affect information perception, information-processing or decision-making (Daxhammer and Facsar 2013). Depending on the stage of the decision process and the respective influencing factors, numerous effects have been researched in recent years (e.g., De Bondt et al. 2008), which are regularly used to explain various behaviours of financial market actors (Goldberg and von Nitzsch 2004; Daxhammer and Facsar 2012). Since the use of pictures in financial statements is primarily aimed at creating a positive corporate image (Ang et al. 2020), effects that influence information perception are of particular importance, so that investors' information-processing and investment decisions are more likely to take into account the more positive characteristics of the company. This includes framing (Thaler 1980; Kahneman and Tversky 1986) and associated behavioural anomalies, such as the availability heuristic (Kliger and Kudryavtsev 2010) and selective perception (Bruner and Postman 1951; Canosa 2009).

The framing effect refers to the phenomenon in which the presentation of a fact in different ways leads to different decisions (Thaler 1980; Kahneman and Tversky 1986), whilst the availability heuristic is the tendency of people to prefer easily accessible sources of information. As a rule, orientation is based on readily available memories (Kahneman and Tversky 1973). In the context of selective perception, information is sought, selected and perceived in such a way that it fulfils expectations (Canosa 2009). This can be promoted, for example, by a one-sided selection of picture content on the part of companies or investors who view only a limited number of pictures. The cause of these effects lies in the fact that the individual whilst striving to act rationally, has a limited ability to fully recognise and process alternatives. These restrictions result from the information asymmetries mentioned above (market imperfections and information acquisition costs), limited cognitive abilities (leading to simplifications, the so-called heuristics) and psychological stress, which is caused, for example, by time pressure or fear of loss (Simon 1957).

Hypothesis Development

Companies have various motivations for engaging in voluntary disclosure in their annual reports. Verrechia (1990) highlight that managers may opt to increase voluntary disclosure to rectify undervaluation in the capital market, even if the act of disclosure incurs costs. Furthermore, Diamand and Verecchia (1991) and Kim and Verecchia (1994) establish a relationship between voluntary disclosure and information asymmetry, demonstrating that voluntary disclosure enhances the overall quality of shared information.

Consequently, companies can utilise voluntary disclosure to communicate signals to stakeholders about the fundamental aspects of the company that may not be adequately captured in current earnings (Davis et al. 2012; Allee and Deangelis 2015; Goncalves et al. 2022). Building on the premise that a company's financial and economic performance are intertwined with voluntary disclosure, it can be hypothesised that pictures, as a distinctive form of voluntary disclosure, hold the potential to enrich the understanding of firms' current economic realities in a targeted, efficient and expeditious manner (Davison and Warren 2009; Straßner 2012; Beattie 2014).

Pictures in annual reports

Although voluntary disclosure is commonly acknowledged as a means of providing information by emphasising positive management outcomes (Aras and Crowther 2009; Cho et al. 2012), it is also possible, as suggested in the psychology literature, that voluntary disclosure, particularly beyond quantitative information and in the form of narratives, can result in concealment (Merkl-Davies et al. 2011; Cho et al. 2012).

Previous research has shown that companies may use voluntary disclosure to manipulate transparency by reducing clarity, particularly when they use disclosure to disguise poor performance (Bloomfield 2002). In this respect, the obfuscation hypothesis suggests that managers may have incentives to hide information when corporate performance is poor because the market may delay the uptake of information in complicated disclosure (Bloomfield 2002). Li (2008) provides empirical evidence that a negative relationship may exist between a company's current performance and the complexity level of its annual report. The inclusion of pictures with varied themes and the use of obscure narrative information in annual reports can be deliberately distracting (Merkl-Davies and Brennan 2007; Cho et al. 2012).

This could distract readers from the verbal information with positive connotations highlighted in the pictures, ultimately leading to the concealment of important data (Courtis 2004b).

Previous studies analysing the use of graphs in corporate financial reports also suggest efforts to obfuscate information. Courtis (1998) proposes a bias in how management presents data, favouring communication methods that hide negative news through rhetorical strategies. Merkl-Davies and Brennan (2007) find that manipulation can extend beyond rhetoric to visual and structural elements, as exemplified by the inclusion of graphs. However, it is also possible that the use of visuals to convey information and data has considerable potential because of their ability to provide a more 'direct and immediate' perspective on the data, as Beattie and Jones (2000) point out. Additionally, these graphical representations are easier to recall, as noted by Beattie and Jones (1992). Muino and Trombetta (2009) state that the literature on financial graphs recognises a significant number of graphs that display bias. Therefore, it is important to maintain objectivity when evaluating graphs (Cho et al. 2012) or other pictorial information in corporate disclosure.

Overall, we suggest an association between the extent of picture usage and the complexity of picture content in annual reports and companies' profitability. We assume that managers may strategically conceal information through less transparent disclosure because higher processing costs may not be fully incorporated into market prices (Bloomfield 2002; Li 2008). According to the managerial obfuscation hypothesis, we assume a negative association between a company's current performance and the complexity level of pictures in annual reports. Therefore, more profitable companies may use more pictures and picture elements to conceal their information. Thus, we propose the following hypothesis:

H1: The level of pictures per page in annual reports is negatively associated with profitability.
H2: The level of total picture content in annual reports is negatively associated with profitability.

Special picture content in annual reports

Although the obfuscation hypothesis predicts that a high number of pictures in annual reports may be used to distort the overall information overview, we assume – drawing on communication theory and impression management theory – that special picture content, such as 'people content', 'social content' and 'tangible asset content,' can enhance the overall information of an annual report at multiple levels of corporate communication, thereby influencing addressees' perceptions. We explain our assumptions in the following section.

People content

Drawing insights from communication theory, the significance of people-oriented content emerges from the assumption that readers' perspectives are shaped by their encounters with other individuals and the readers themselves. When organisations incorporate pictures featuring individuals in their annual reports, this approach is envisaged to lead to heightened audience identification with the company. Second, such pictures enable companies to convey an amplified sense of accountability through their annual report design choices (Moran 2006; Campbell et al. 2009).

Furthermore, it is worth noting that readers might retain the content of pictures more readily compared to information contained within annual reports (Courtis 1997). Building on this, Campbell et al. (2009) formulate a communication theory grounded in the works of Levinas (1993) and Bauman (1993) to elucidate the utilisation of facial representations in annual reports. Communication theory posits that readers' perspectives are shaped by the visages of other individuals and proposes that the presence of more individuals in pictures is likely to foster a stronger sense of company identification. Accordingly, using people-oriented content in pictures presented in an annual report signifies a heightened sense of responsibility demonstrated by the disclosing company (Campbell et al. 2009). This content has the potential to enhance the disclosure quality. This perspective aligns with the concept that individuals perceive a connection when addressed by another person in annual reports (Campbell et al. 2009), consequently fostering a sense of identification with the company.

The power of pictures or other frames in texts to shape the perception and interpretation of corporate information by different stakeholders can be understood in terms of framing theory and is relevant to how corporate success can be linked to the content of annual reports. In a broader context, Collins and Kothari (1989) provide evidence that positive financial results elicit greater stock market reactions when investors perceive that performance will continue in future periods. Moreover, Barton and Mercer (2005) suggest that managers have an incentive to provide disclosure that points to permanent factors when performance is good and temporary factors when performance is poor. Furthermore, we assume that profitable firms are motivated to provide more and better information to the capital market than less profitable firms. This could be due to greater social constraints and public pressure (Watts and Zimmermann 1978; Holthausen and Lefwich 1983; Marston 2004; Marston and Polei

2004), or because profitable firms derive some of their competitive advantage from more and better communication (Verrechia 1983; Dye 1985). Therefore, we suggest that more successful and, therefore, more profitable companies are motivated to use 'people content' in their annual reports in order to encourage investors to identify more with the firm (Courtis 1997). Thus, the third hypothesis is stated as follows:

H3: The level of 'people-content' pictures in annual reports is positively associated with profitability.

Social content

Studies have already pointed out that companies' profitability and reputation are significant predictors directly related to social disclosure (Cowen et al. 1987; Brammer and Pavelin 2006). Therefore, social engagement needs to be addressed during business development. Social aspects and activities such as service quality, community relations and employee welfare have been identified as having the potential to improve a company's financial efficiency (Hou et al. 2019; Torelli et al. 2020). In addition, Lu et al. (2023) provide evidence that social factors are positively associated with firms' profitability efficiency, thus confirming the findings of Cantele and Zardini (2018), who assume that the social factors of firms are positively associated with their competitive advantages through the mediating role of corporate reputation as well as customer satisfaction. By contrast, Adeyemi (2019) discusses social well-being and corporate profitability as paradoxical combinations when companies attempt to balance social well-being and profitability for long-term success. Hence, the argument against CSR fades away when confronted with the considerable influence of today's corporations' general business goals (Adeyemi 2019).

Therefore, to illustrate the potential link between the disclosure of pictures and social activities in corporate disclosure and a company's economic success, it is necessary to understand how these activities affect different dimensions of the company's business. We suggest that when companies emphasise and transparently communicate their social activities, such as community engagement, employee welfare and sustainable practices, a potential relationship with profitability can be recognised. Moreover, Preston et al. (1996) claim that pictures may not reflect the reality of a company's situation but can shape reality. In this case, companies may use a variety of attractive pictures to distract addressees from the actual situation of the company (Courtis 2004b) and try to shape perceptions of the company's situation in a way that influences investors' expectations. The use of pictures in annual reports, as well as the use of objective narrative information (Merkl-Davies and Brennan 2007; Cho et al. 2012), can deliberately distract readers from verbal information, with positive aspects emphasised in pictures, thus leading to the concealment or obfuscation of relevant information (Courtis 2004b).

Signalling theory suggests that profitable firms are more motivated to provide more and better information to the capital market than less profitable firms. This may be due to greater social constraints and public pressure (Watts and Zimmermann 1978; Holthausen and Lefwich 1983; Marston 2004; Marston and Polei 2004) or because profitable firms derive some of their competitive advantages from more and better communication (Verrechia 1983; Dye 1985).

Owing to conflicting debates on reconciling corporate decision-making between profit considerations and considerations for the needs and interests of different actors or social welfare, it is unclear which direction the mode of action should take (Jensen and Meckling 1976; Adeyemi 2019). Therefore, we propose the following nondirectional hypothesis:

H4: The level of 'social-content' pictures in annual reports is associated with profitability.

Tangible asset content

Resource-based theory suggests that stakeholders demand information about how companies develop capabilities and resources in pursuit of better performance and competitive advantage (Rumelt 1984; Barney 1991; Schroeder et al. 2002; Wilk and Fensterseifer 2003). It can be argued that companies displaying more tangible assets, such as products, plants and equipment, aim to demonstrate how they leverage private knowledge to develop advanced technologies. We suggest that a combination of internal and external learning within a manufacturing facility results in distinct proprietary methods and machinery (Schroeder et al. 2002). This culminates in enhanced manufacturing efficiency, which can be presented as pictures in annual reports to communicate information beyond narratives and quantitative information.

Therefore, considering picture content with 'tangible asset content' in annual reports, we posit that this content can captivate stakeholders' attention and encourage them to delve deeper into the company's operations and financial situation. Increased stakeholder engagement may lead to better-informed investment decisions, increased customer loyalty and strengthened relationships with suppliers and partners, all of which can contribute to improved profitability (Grant 1991; Russo and Fouts 1997; Hughes et al. 2022; McGahan 2021).

Additionally, regarding brand perception and recognition, pictorial 'tangible asset content', which could also refer to a company's products, might showcase a company's industrial processes and products and positively influence how stakeholders perceive the company

(Narver and Slater 1990). Favourable brand perception can lead to higher consumer trust and greater market share, ultimately affecting profitability. Moreover, the effective use of pictures with 'tangible asset content' can convey a strong brand image associated with innovation, operational excellence and commitment to quality (Mabkhot et al. 2017). A strong brand image can resonate with consumers, thereby increasing brand loyalty, driving sales and positively affecting the company's bottom line (Park et al. 1986; Keller 2003; Zhang 2015).

Furthermore, we assume that the 'tangible asset content' in pictures can offer stakeholders a transparent view of a company's operational activities. Transparent communication enhances trust among investors, customers and regulatory bodies. Trust can translate into reduced information asymmetry, lowered financing costs and increased market value, positively influencing profitability (Bae et al. 2019). By showcasing operational processes and facilities through pictures, companies may demonstrate their transparency and commitment to accountability. This can enhance investor confidence, potentially leading to higher stock valuations and reduced capital cost, ultimately impacting companies' success and profitability positively (Hassan 2018; Nguyen et al. 2020; Kanapickiene et al. 2021).

We assume that this relationship is mediated by factors such as enhanced stakeholder engagement, improved brand perception and increased transparency in conveying operational activities. Consequently, our fifth hypothesis is as follows:

H5: The level of 'tangible asset content' pictures in annual reports is positively associated with profitability.

Research Design

This section describes the sample selection and empirical design used to evaluate the hypotheses in the preceding section. To better understand the association between economic success and pictures as well as picture content in annual reports, we first describe the dependent and independent variables of interest before establishing the regression models.

Sample selection

The dataset used in this study comprises constituents of the FTSE 350 index as of 1 April, 2019. The FTSE 350 index holds significant relevance for the empirical analysis because of its composition and representation of the broader UK stock market landscape. This index encompasses large and mid-cap firms listed on the London Stock Exchange, ensuring a representative sample size, with 33.64% of the large-cap firms and 66.36% of the mid-cap firms included. Additionally, companies listed on this index tend to attract significant investor attention, making their financial performance and reporting practices crucial in shaping market sentiment and trends. Their financial reporting practices and communication strategies have implications for investors' decision-making and market dynamics, making them pertinent subjects for empirical analysis and providing an ideal sample for analysing our research question.

Therefore, we manually gathered annual reports from company websites and the Northcote website (www.northcote.co.uk). The final dataset encompasses 4770 annual reports from 2000 to 2021, representing 340 FTSE 350 companies. The remaining annual reports were inaccessible for inclusion. Pictures were extracted from 4530 annual reports, accounting for approximately 95% of all the collected annual reports. The sampling process is summarised in Table 1. The industry distribution is listed in Table 2.

Relevant dependent and independent variables

Dependent variables

To focus on the success of a business, the influences of various profitability factors must be identified and measured. Currently, there is no agreement in the literature on the selection of appropriate dependent variables that accurately capture corporate economic success and corporate performance. Accordingly, in line with Ajaz et al. (2020), we integrate three proxies commonly used in prior literature to represent economic success: return on assets (ROA), return on sales (ROS) and return on equity (ROE).

As one of the most popular measures of profitability, we begin by integrating ROA as the first proxy. Therefore, following Altman (1968), we calculate it as follows:

$$ROA = \frac{EBIT}{AVERAGE\ TOTAL\ ASSETS} \quad (1)$$

Therefore, higher ROA values are better because they indicate greater efficiency in using companies' resources (Mashayekhi and Bazaz 2008).

Next, we use ROS, another of the most accepted indicators of profitability (e.g., Perisa et al. 2017; Becker-Blease et al. 2010) and calculate the proxy as follows:

$$ROS = \frac{EBITDA}{TOTAL\ REVENUE} \quad (2)$$

Thus, we suggest that a higher ROS is preferable; companies with a high value of this indicator retain a larger

Table 1 **Sample selection procedure**

	No. of firms	No. of firm years
No. of firms listed on 1 April 2019 (selection date)	350	
Firms with available annual reports	340	4770
Firms with extractable annual reports	331	4714
Firms with pictures in annual reports	331	4530

Table 2 **Industry distribution per firm-year with picture content in annual reports**

No	Global industry classification standard no. (GIC-No)	Industry name	No. of annual reports with picture content	
1	10	Energy	120	3%
2	15	Materials	440	10%
3	20	Industrials	846	19%
4	25	Consumer cyclical	712	16%
5	30	Consumer staples	295	7%
6	35	Healthcare	182	4%
7	40	Financials	1062	23%
8	45	Information technology	172	4%
9	50	Communication services	185	4%
10	55	Utilities	142	3%
11	60	Real estate	374	8%
	Total		4530	

share of their revenue after covering operating costs than companies with a lower value.

The ROE was used as the final proxy for analysing economic success. This indicator measures a company's success in generating profits for its shareholders. As stated by Inchsani and Suhardi (2015), the formula is as follows:

$$ROE = \frac{EBIT}{TOTAL\ EQUITY} \tag{3}$$

A company's favourable position increases with higher ROE value, indicating its greater ability to generate results per unit of invested capital.

All three proxies for economic success are measured as the natural log of ROA, ROE and ROS (Lückerath-Rovers 2013; Isidro and Sobral 2015; Ajaz et al. 2020).

Independent variables of interest

To obtain information about the picture content of the annual reports, we extracted all pictures using Adobe Acrobat Pro DC. Li et al. (2021) show that these functions deliver good results with respect to the extraction of graphs and financial tables from financial datasets.

Therefore, to analyse Hypothesis 1, we measure the *PICTURE INDEX* as a proxy for the ratio of pictures per page, as follows:

$$PICTURE\ INDEX = \frac{TOTAL\ NUMBER\ OF\ PICTURES}{TOTAL\ NUMBER\ OF\ PAGES} \tag{4}$$

The higher the value of this indicator, the more pictures are shown in relation to the pages of the annual report.

To concentrate on the picture content to analyse Hypothesis 2, it was necessary to identify all the relevant information content from each picture in the annual reports. Therefore, we used the Google Cloud Vision API to annotate the picture content labels and obtain a description of the picture content. Consequently, we were able to indicate 4976 different labels for picture content. Following the previous literature, we adopted Cooke's (1989, 1992) methodology and created a content index score for the voluntary disclosure of picture content complexity, which is calculated as follows:

$$TOTAL\ CONTENT\ INDEX = \frac{TOTAL\ NUMBER\ OF\ PICTURE\ CONTENT}{TOTAL\ NUMBER\ OF\ PICTURES} \tag{5}$$

The higher value of this indicator shows a higher complexity of content per picture.

In line with our developed Hypotheses 3, 4 and 5, we used artificial intelligence by using dictionaries and

Table 3 Examples of picture content in annual reports

People content	Tangible asset content	Social content
Hand	Metropolitan	Food
Finger	Cityscape	Party
Grandparent	Residential	Sports
Eyelash	Urban	Singing
Baby	Roof	Sport
Child	Infrastructure	Meal
Player	Project	Junk
White-collar	Vehicle	Salad
Blue-collar	Construction	Chef
Construction	Industry	Musical
Businessperson	Project	Stadium
Smile	Metal	Map
Face	Helmet	Fun
Father	Electronics	Photography
Farmworker	Gadget	Diving
Spokesperson	Skyscraper	Leisure
Ironworker	Construction	Music

Figure 1 Picture example for 'People Content'; Reference: Annual Report of BT GROUP, 2018

Figure 2 Picture example for 'Social Content'; Reference: Annual Report of BARCLAYS, 2021

manually clustering the content labels into several categories to assign each of the 4976 labels to one of three categories: 'people content', 'tangible asset content' and 'social content'. To identify specific information, such as 'people content', we looked for pictures featuring, for example, blue-collar workers or businesspersons. For 'tangible asset content', we identified pictures of buildings, machines and other tangible assets. Regarding social activities, we found pictures of parties, sports activities and meals. For better understanding, some label examples for each category are shown in Table 3 in words, and picture examples are provided in Figure 1, which presents 'people content'. Figure 2 shows an example of 'social content', and Figure 3 provides an example from an annual report to illustrate 'tangible asset content'.

Focusing on special picture content in annual reports, we calculated a specific content-dependent disclosure index. Regarding the analysis of how the voluntary disclosure of pictures with special content in annual reports impacts profitability, we followed Cooke's (1989, 1992) approach. Thus, we divided the total number of pictures per firm year and firm to calculate a special disclosure index for each content category (e.g., 'people content', 'social content' and 'tangible asset content').

Figure 3 **Picture example for 'Tangible Asset Content'; Reference: Annual Report of BP, 2015**

This produced the following disclosure index formula.

$$\textit{DISCLOSURE INDEX} = \frac{\textit{TOTAL NUMBER OF PICTURE CONTENT WITH "X" CONTENT}}{\textit{TOTAL NUMBER OF CONTENT LABELS}} \quad (6)$$

Therefore, we created disclosure indices for each content type by considering the following independent variables:

$$\textit{PEOPLE CONTENT INDEX} = \frac{\textit{TOTAL NUMBER OF "PEOPLE" CONTENT}}{\textit{TOTAL NUMBER OF CONTENT LABELS}} \quad (7)$$

$$\textit{SOCIAL CONTENT INDEX} = \frac{\textit{TOTAL NUMBER OF "SOCIAL" CONTENT}}{\textit{TOTAL NUMBER OF CONTENT LABELS}} \quad (8)$$

$$\textit{TANGIBLE ASSET CONTENT INDEX} = \frac{\textit{TOTAL NUMBERS OF "TANGIBLE ASSET" CONTENT}}{\textit{TOTAL NUMBER OF CONTENT LABELS}} \quad (9)$$

In all cases, there was no overlap among the three categories; however, each picture contained different types of content. We assume that for all categories, a higher disclosure score indicates a higher level of pictures with special content type in the annual report.

Regression models

The purpose of this study is to analyse the relationship between companies' profitability and pictures, the total extent of picture content and specific picture content in annual reports.

We created three regression models to test our five hypotheses. These regression models contain commonly accepted determinants of profitability and are consistently adjusted and expanded based on the objective of each hypothesis, as explained below.

All regression models focus on the same three dependent variables. Following prior studies (e.g., Lückerath-Rovers 2013; Isidro and Sobral 2015; Ajaz et al. 2020) our proxies for measuring profitability focus on *ROA*, *ROS* and *ROE*, based on the calculations described above. In line with previous literature, we included several control variables to determine the explanatory power of voluntary disclosure of pictures and their content for each respective dependent variable.

To test Hypothesis 1, we used *Picture Index*, as measured above, as the independent variable of interest to quantify the extent of picture usage in annual reports. To evaluate our Hypothesis 2, which analyses the association between profitability and the complexity of picture content, we used *Content Index* as an independent variable of interest. Finally, to test Hypotheses 3, 4 and 5, we replaced the independent variable of interest by integrating *People_Content*, *Social_Content* and *Tangible_Asset_Content*, as measured above.

We used *Capital Intensity* as a control variable, measured as the ratio of total assets to total revenue, serving as a proxy for barriers to entry. Capital intensity reflects the existence of large sunk costs that can act as a barrier to entry into the industry and is assumed to have a negative association with profitability (McDonald 1999; Feeny 2000). *Liquidity* is included as an additional control variable, calculated as the ratio between total cash and current liabilities, as mentioned in early studies (Majumdar 1997; Jónsson 2007). *Employee ratio* is integrated and measured as the quotient of the total number of employees to total assets, aligning with Dewenter and Malatesta (2001).

Another accepted determinant of profitability is firm *Size*. We incorporated it into our regression model,

measuring firm *Size* as the logarithm of total assets, consistent with the analysis of Hansen and Wernerfelt (1989) and Keating (1997) from a strategic perspective. We note that size could serve as an indicator for diversification and suggest that larger companies may be more profitable than smaller ones (Babalola 2013; Fareed et al. 2016). Following Ahmed and Hossain (2010), we posit a negative relationship between leverage and profitability. Thus, we included *Leverage* as an independent variable, measured as the ratio of total liabilities to total assets.

Additionally, we considered *Age* as an independent variable, calculated as the number of years firms have operated up to 2021. In line with Akben-Selcuk (2016), we assume a negative association between age and profitability. We included firm years as a control variable named *Year-Dummy* since it could impact companies' profitability. *IndustryDummy* was also included as a control variable because it may influence companies' profitability consistent with Machin and Van Reenen (1993). In the second and third models, we extended the first model by integrating the total number of pages (*Pages*) and the total number of pictures (*Pictures*), both measured as their respective totals.

Therefore, we evaluated Hypothesis 1 using the following regression equation for Model 1:

Model 1:

$$\begin{aligned} PROFITABILITY = {} & \beta_0 + \beta_1 PICTURE\ INDEX \\ & + \beta_2 CAPITAL\ INTENSITY + \beta_3 EMPLOYEE\ RATIO \\ & + \beta_4 LIQUIDITY + \beta_5 SIZE + \beta_6 LEVERAGE + \beta_7 AGE \\ & + \beta_8 YEAR\ DUMMY + \beta_9 INDUSTRY\ DUMMY + \varepsilon_{i,t}. \end{aligned} \tag{10}$$

To analyse Hypothesis 2 we developed the following regression Model 2:

Model 2:

$$\begin{aligned} PROFITABILITY = {} & \beta_0 + \beta_1 TOTAL\ CONTENT\ INDEX \\ & + \beta_2 PAGES + \beta_3 PICTURES + \beta_4 CAPITAL\ INTENSITY \\ & + \beta_5 EMPLOYEE\ RATIO + \beta_6 LIQUIDITY \\ & + \beta_7 SIZE + \beta_8 LEVERAGE + \beta_9 AGE_{10} YEAR\ DUMMY \\ & + \beta_{11} INDUSTRY\ DUMMY + \varepsilon_{i,t}. \end{aligned} \tag{11}$$

Finally, to analyse Hypotheses 3, 4 and 5, we used the following regression equation in Model 3:

Model 3:

$$\begin{aligned} PROFITABILITY = {} & \beta_0 + \beta_1 PEOPLE\ CONTENT\ INDEX \\ & + \beta_2 TANGIBLE\ ASSET\ CONTENT\ INDEX \\ & + \beta_3 SOCIAL\ CONTENT\ INDEX + \beta_4 PAGES \\ & + \beta_5 PICTURES + \beta_6 CAPITAL\ INTENSITY \\ & + \beta_7 EMPLOYEE\ RATIO + \beta_8 LIQUIDITY + \beta_9 SIZE \\ & + \beta_{10} LEVERAGE + \beta_{11} AGE \\ & + \beta_{12} YEAR\ DUMMY \\ & + \beta_{13} INDUSTRY\ DUMMY + \varepsilon_{i,t}. \end{aligned} \tag{12}$$

Empirical Results

This section reports the descriptive statistics and the results of hypotheses testing.

Descriptive statistics

Table 4 presents the descriptive statistical analysis of the data collected in this study, including the number of observations, mean, standard deviation, and minimum and maximum values.

Table 5 presents the pairwise Pearson and Spearman correlations of all pertinent variables. The correlations for independent variables do not suggest the presence of multicollinearity, with the highest value being 0.540. Thus, we can infer that all correlation values are below the critical value of 0.80. We further assessed multicollinearity among the explanatory variables using the variance inflation factor (VIF), and the VIFs did not exceed 4.0 (results not reported). Thus, there appears to be no issue of multicollinearity for the subsequent regressions. However, heteroscedasticity is present in the regression models. Consequently, we utilised robust standard error. In general, there seem to be no significant concerns regarding violated assumptions of the OLS regression.

Of the 4770 annual reports in the sample, 4530 contain at least one picture. This means that only about 5% of all reports examined do not feature any pictorial elements. Figure 4 displays a rising trend in the use of pictures in annual reports between 2000 and 2021. Our findings align with those of Rahman et al. (2014) on the inclusion of graphs in annual reports. Campbell et al.'s (2009) findings suggest an increasing tendency to feature pictures of human subjects in annual reports, which was confirmed by our data. Figure 5 presents an overview of this trend with respect to the picture content of the annual reports in the analysed sample.

Moreover, there has been a sudden increase in the frequency of picture content relative to the total number of pictures, particularly after 2016.

Hypothesis testing

Tables 6–8 present the coefficients and *p*-values (in brackets) obtained by applying the described OLS

Table 4 Descriptive statistics

	N	Mean	SD	Min	Max
TOTAL NO. OF PICTURES	4714	68.62	115.26	0.00	3808.00
TOTAL NO. OF PAGES	4714	137.20	64.37	8.00	564.00
PICTURE INDEX	4714	0.53	0.75	0	16.63
TOTAL CONTENT INDEX	4714	10.64	5.23	0.00	20.00
PEOPLE CONTENT INDEX	4714	0.13	0.11	0.00	0.80
SOCIAL CONTENT INDEX	4714	0.26	0.12	0.00	0.92
TANGIBLE ASSET CONTENT INDEX	4714	0.36	0.15	0.00	1.00
CAPITAL INTENSITY	4477	4.619	231.16	−13 798.25	5555.50
EMPLOYEE RATIO	3873	0.01	0.01	0.00	0.15
LIQUIDITY	4487	24 198	43 132	−6.91	12.21
TOTAL ASSETS	4530	22 975.22	110 847.47	0.00	2 052 980.00
SIZE (log of total assets)	4530	26 115	31 778	−6.91	14.53
LEVERAGE	4530	0.53	0.27	0.00	2.25
AGE	4714	82.89	67.69	3.00	505.00
FISCAL YEAR	4714	2012.41	5.21	2000.00	2021.00

Note: Picture Index is calculated as the ratio of the total number of pictures divided by the total number of pages. *Total Content Index* is calculated as the ratio of the total number of picture content divided by total number of pictures. Disclosure indices for picture content distinguish between *People, Social and Tangible Asset* items in pictures, and are measured for each proxy as a disclosure ratio. This ratio is calculated as the total number of disclosed items with content-specific items for each firm-year in relation to the total number of all reported picture content items for each company in each firm year. *Pages* is calculated as the total number of pages of the annual report. *Pictures* is calculated as the total number of pictures in the annual report. *Capital Intensity* is measured as the ratio of total assets to total revenue. *Employee RATIO* is calculated as the total number of employees divided by total assets. *Liquidity* is calculated as a quotient of total cash and current liabilities. *Size* is calculated as the logarithm of total assets in the actual annual report. *Leverage* is calculated as the quotient of total liabilities and total assets in the actual annual report. *Age* is calculated as the number of years firms have operated up to 2021. *Fiscal Year* is included as the actual firm year.

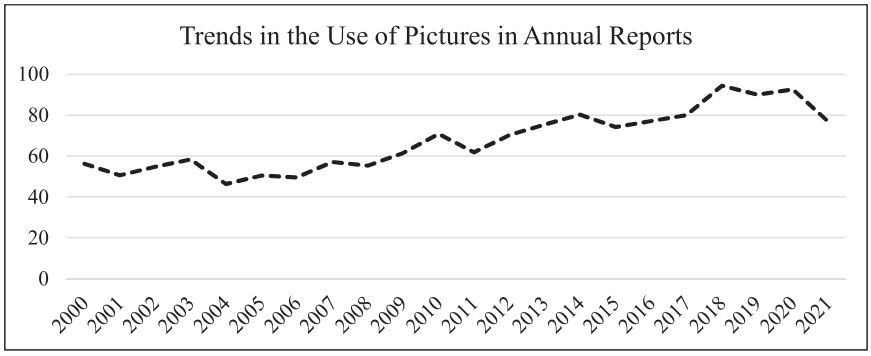

Figure 4 Trends in the use of pictures in annual reports

regression method with heteroscedastic-robust standard errors to estimate regression model equations (10–12). As shown in Tables 6–8, there is some evidence supporting our five hypotheses.

Table 6 reports the results of a multivariate regression for Hypothesis 1. To address the potential association between the dependent variables for measuring profitability (ROA, ROS and ROE) and pictures in annual reports, as presented by the *Picture Index*, we demonstrate a significant negative relationship in all three models. As suggested in Hypothesis 1, the obfuscation hypothesis may explain why managers include a higher number of pictures per page to obfuscate information in their annual reports. For all three dependent variables, we consistently report a significant negative association between profitability and the *Picture Index*.

Table 7 reports the results of the multivariate regression analysis examining the association between profitability and picture complexity. The results, once again, confirm the assumed obfuscation hypothesis for all three proxies used for profitability. Therefore, it can be suggested that higher picture-content complexity may lead to obfuscation, negatively affecting profitability as measured by the *Content Index*. This strategy may be integrated by management to influence investors' perceptions in a negative way.

Results for Hypotheses 3, 4 and 5 are presented in Table 8. As suggested in Hypothesis 3, Table 8 provides evidence of a favourable relationship between pictures containing 'people content' and company profitability. The regression results demonstrate a positive and significant association in line with Hypothesis 3. Therefore, it

Table 5 Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
PICTURE I. (1)	1	−0.096***	−0.197***	−0.210***	−0.036*	−0.151***	0.667***	−0.085***	0.111***	−0.080***	−0.068***	−0.028*	−0.057***
CONTENT I. (2)	−0.128***	1	−0.141***	0.435***	0.081***	0.238***	0.203***	0.066***	−0.108***	0.029	0.006	−0.053***	−0.044***
PEOPLE C.I. (3)	−0.190***	−0.140***	1	0.108***	−0.093***	0.087***	0.026	0.013	0.005	0.079***	0.079***	0.090***	0.029
SOCIAL C.I. (4)	−0.232***	0.516***	0.067***	1	−0.218***	0.123***	0.046***	−0.022	0.053***	0.030	0.019	0.001	0.007
TANG. AS. C. I. (5)	−0.053***	0.224***	−0.118***	−0.013	1	−0.034**	0.120***	0.001	−0.004**	−0.106***	−0.064***	−0.052***	−0.027
PAGES (6)	−0.111***	0.223***	0.042***	0.115***	−0.006	1	0.362***	0.174***	−0.215***	0.514***	0.543***	0.174***	0.045***
PICTURES (7)	0.511***	0.064***	−0.117***	−0.065**	0.008***	0.188***	1	0.042***	−0.029	0.153***	0.198***	0.060***	−0.043***
CAPITAL INT. (8)	−0.006	0.011	0.016	0.006	−0.020	0.003	−0.002	1	−0.783***	0.171***	0.360***	−0.118***	−0.068***
EMPLOYEE R. (9)	0.018	−0.094***	−0.031*	0.047***	−0.024	−0.166***	−0.036**	−0.005	1	−0.257***	−0.394***	0.124***	0.093***
LIQUIDITY (10)	−0.042***	0.021	0.045***	0.033**	0.002	0.539***	0.073**	−0.001	−0.118***	1	0.775***	0.304***	0.126***
SIZE (11)	−0.055***	0.017	0.084**	0.011	0.003	0.551***	0.008***	0.004	−0.212***	0.779***	1	0.336***	0.168***
LEVERAGE (12)	0.017	−0.112***	0.035**	0.011	0.033**	0.285***	0.056***	−0.002	0.142***	0.441***	0.384***	1	0.117***
AGE (13)	−0.074***	−0.086***	0.063***	−0.018	−0.057***	0.128***	−0.038***	0.005	0.013	0.137***	0.181***	0.149***	1

Notes: The Pearson (Spearman) correlations are reported below (above) the diagonal. The significance levels are as follows: ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

Picture Index (PICTURE I.) is calculated as the ratio of the total number of pictures divided by the total number of pages. *Total Content Index* (CONTENT I.) is calculated as the ratio of the total number of picture content items divided by the total number of pictures. Disclosure indices for picture content distinguish between *People, Social and Tangible Asset* items in pictures. These indices are measured for each proxy as a disclosure ratio, calculated as the total number of disclosed items with content-specific items for each firm year in relation to the total number of all reported picture content items for each company in each firm-year. *Pages* is calculated as the total number of pages in the annual report. *PictureS* is calculated as the total number of pictures in the annual report. *Capital Intensity* is measured as the ratio of total assets to total revenue. *Employee RATIO* is calculated as the total number of employees divided by total assets. *Liquidity* is calculated as the quotient of total cash and current liabilities. *Size* is calculated as the logarithm of total assets in the actual annual report. *Leverage* is calculated as the quotient of total liabilities and total assets in the actual annual report. *Age* is calculated as the number of years firms have operated up to 2021.

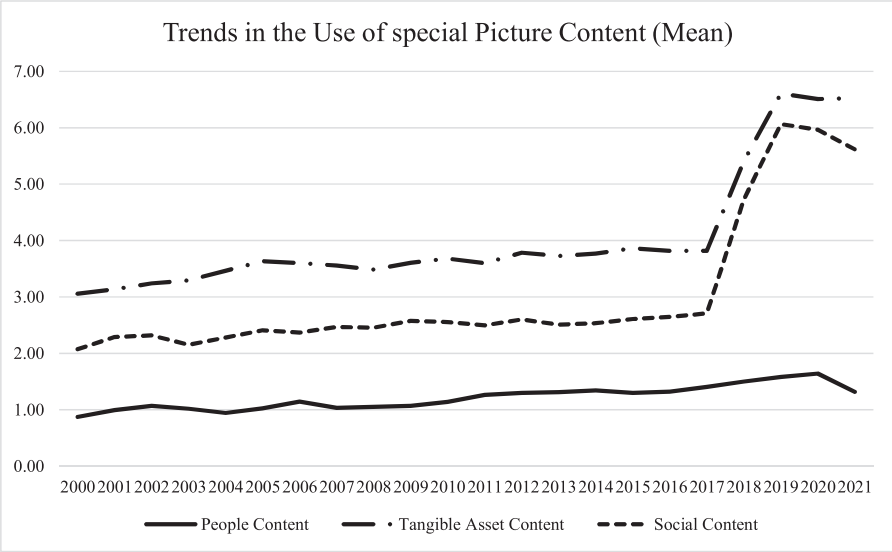

Figure 5 **Trends in the use of special picture content in annual reports**

is proposed that companies with a high level of 'people content' in pictures in their annual reports may achieve greater business profitability. Consequently, stakeholders' perceptions of annual reports are potentially influenced by these pictorial elements. Regarding Hypothesis 4, it was postulated that corporate profitability and reputation serve as substantial predictors that possess an association with social disclosure (Cowen et al. 1987; Brammer and Pavelin 2006). We find that, in most cases, there is a positive association between the use of 'social content' in pictures in annual reports and companies' profitability. However, as significance is not consistent across all cases, additional analyses may be required to determine if the proposed hypothesis can ultimately be accepted or rejected. The current analysis suggests that more profitable companies may tend to enhance information for their readers with pictures reflecting social welfare activities.

Regarding Hypothesis 5, we posited a positive association between 'tangible asset content' in annual reports and profitability. However, contrary to our hypothesis and theoretical assumptions, we find a negative association between the use of 'tangible asset content' in annual reports' pictures and companies' profitability. Therefore, our hypothesis was rejected. The evidence does not support our proposal that companies can demonstrate their accountability and transparency by displaying pictures of their operational processes and facilities. Instead, we find evidence of a significant negative correlation between the 'tangible asset content' in pictures firms' profitability.

On the one hand, the standard distraction argument in disclosure research could be considered: companies with poorer profitability may use pictures of 'tangible asset content' to divert readers' attention from their actual situation. This, in turn, decreases confidence among stakeholders, affecting stock valuations and increasing capital costs, thereby influencing profitability (Hassan 2018; Nguyen et al. 2020; Kanapickiene et al. 2021). On the other hand, the theoretical basis for Hypothesis 5 might be insufficient to explain real-life disclosure practices. Hypothesis 5 was suggested based on pure economic theory. Journalism research indicates that contemporary news reporting and social media have shifted focus from material content to social aspects. This shift is due to the increasing resonance of personal content with modern audiences in recent decades (Marwick 2015; Al Najar 2018) and might result from the increasing credibility of reports that are more authentic than aesthetic (Farid 2023).

This change in communication habits might have outweighed rational economic choices in disclosure practices in our sample. Our empirical results support the view that more profitable companies are more likely to adopt these contemporary reporting practices than less profitable firms. It seems plausible that more profitable companies apply more modern communication patterns to highlight their innovative edge. Consequently, these companies may use fewer pictures with 'tangible asset content' to avoid being associated with outdated forms of communication. We suggest that further research should integrate economic and communication research streams to explore this possible interaction in detail.

Regarding the impact of the control variables featured in all regression equation models, their effects were anticipated, as outlined in our initial model estimations. All control variables conform to the expected results. Using White's (1980) test, we detected heteroscedasticity. Therefore, we subsequently utilised robust standard

Table 6 **Results Hypothesis 1**

	ROA beta/*p*	*ROS* beta/*p*	*ROE* beta/*p*
Picture Page Ratio	−0.028*	−0.034**	−0.045***
	(0.053)	(0.017)	(0.002)
Capital Intensity	−0.251***	−0.116***	−0.073***
	(0.000)	(0.000)	(0.001)
Employee Ratio	0.043***	−0.102***	0.061***
	(0.000)	(0.000)	(0.000)
Liquidity	0.071***	−0.126***	0.070***
	(0.007)	(0.000)	(0.006)
Size	−0.391***	0.130***	−0.324***
	(0.000)	(0.000)	(0.000)
Leverage	−0.129***	−0.234***	0.542***
	(0.000)	(0.000)	(0.000)
Age	0.049***	−0.014	0.044***
	(0.001)	(0.251)	(0.002)
Year-Dummy	YES	YES	YES
Industry-Dummy	YES	YES	YES
R^2	0.400	0.395	0.396
N	3324	3694	3546

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
The table reports the standardised regression coefficients, *p*-values (in parentheses) and significance for the OLS regression. The dependent variables are the three profitability proxies: *ROA* is measured as the ratio of EBIT to total assets; *ROS* is included as EBITDA margin, calculated as EBITDA divided by the total revenue; *ROE* is measured as the ratio of EBIT to total equity. For the profitability proxy, a higher value indicates better business profitability. All proxies are included as the natural logarithm of their values.
Picture Index is calculated as the ratio of the total number of pictures to the total number of pages. *Capital Intensity* is measured as the ratio total assets to total revenue. *Employee RATIO* is calculated as the total number of employees divided by total assets. *Liquidity* is calculated as the quotient of total cash to current liabilities. *Size* is calculated as the logarithm of total assets in the actual annual report. *Leverage* is calculated as the quotient of total liabilities and total assets in the actual annual report. *Age* is calculated as the number of years firms have operated until 2021. *Year-Dummy* is a binary dummy variable for all assigned fiscal years, and *INDUSTRY-DUMMY* is a binary dummy variable for all included industries.
Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively.

Table 7 **Results Hypothesis 2**

	ROA beta/*p*	*ROS* beta/*p*	*ROE* beta/*p*
Total Content Index	−0.059***	−0.029*	−0.044**
	(0.001)	(0.097)	(0.023)
Pages	−0.019	−0.029	0.0267
	(0.481)	(0.276)	(0.273)
Pictures	−0.014	−0.026**	−0.026**
	(0.231)	(0.044)	(0.027)
Capital Intensity	−0.253***	−0.117***	−0.072***
	(0.000)	(0.000)	(0.001)
Employee Ratio	0.043***	−0.102***	0.060***
	(0.001)	(0.000)	(0.000)
Liquidity	0.074***	−0.122***	0.067***
	(0.005)	(0.000)	(0.008)
Size	−0.382***	0.145***	−0.333***
	(0.000)	(0.000)	(0.000)
Leverage	−0.128***	−0.233***	0.541***
	(0.000)	(0.000)	(0.000)
Age	0.050***	−0.013	0.044***
	(0.001)	(0.301)	(0.002)
Industry-Dummy	YES	YES	YES
Year-Dummy	YES	YES	YES
R^2	0.402	0.396	0.320
N	3324	3694	3546

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
The table reports the standardised regression coefficients, *p*-values (in parentheses), and significance levels for the OLS regression. The dependent variables are the three profitability proxies: *ROA* is measured as the ratio of EBIT to total assets; *ROS* is included as the EBITDA-Margin, calculated as EBITDA divided by total revenue; *ROE* is measured as the ratio of EBIT to total equity. For each profitability proxy, a higher value indicates better business profitability. All proxies are expressed as the natural logarithm of their values.
Total Content Index should be calculated as the ratio of the total number of picture content to the total number of pictures. *Pages* is calculated as the total number of pages in the annual report. *PictureS* is calculated as the total number of pictures in the annual report. *Capital Intensity* is measured as the ratio of total assets to total revenue. *Employee RATIO* is calculated as the total number of employees divided by total assets. *Liquidity* is calculated as the quotient of total cash to current liabilities. *Size* is calculated as the logarithm of total assets in the actual annual report. *Leverage* is calculated as the quotient of total liabilities to total assets in the actual annual report. *Age* is calculated as the number of years firms have operated until 2021. *Year-Dummy* is a binary dummy variable for all assigned fiscal years, and *INDUSTRY-DUMMY* is a binary dummy variable for all included industries.
Statistical significance at the 10%, 5% and 1% level is indicated by *, ** and ***, respectively.

error, following Hoechle (2007). Several robustness tests were conducted to determine whether sampling issues or specific model specifications influenced the results. Robust results were obtained across alternative models using different control variables. The actual results show a relationship between the currently disclosed profitability and the currently disclosed pictures in annual reports.

In summary, our results, along with established theoretical assumptions, suggest that a higher number of pictures and greater complexity in picture content may be used to conceal negative organisational performance in areas related to the balance, accuracy and clarity of a company's disclosure. These findings are consistent with Merkl-Davis et al. (2011). Additionally, we highlight that special picture content, particularly those containing people, may have potential enhancing effects on companies' disclosure and can be useful for investors in interpreting a company's actual economic situation. Regarding other items such as 'social content' or 'tangible asset content' in pictures, further analyses are needed to determine if these elements have a significant impact.

Table 8 **Results Hypotheses 3, 4, 5**

	ROA beta/*p*	*ROS* beta/*p*	*ROE* beta/*p*
People Content	0.037***	0.030**	0.025*
	(0.009)	(0.033)	(0.087)
Social Content	0.027*	0.029*	0.016
	(0.083)	(0.080)	(0.298)
Tangible asset Content	−0.032*	−0.032**	−0.030*
	(0.055)	(0.028)	(0.057)
Pages	−0.033	−0.039	0.017
	(0.206)	(0.145)	(0.492)
Pictures	−0.007	−0.019	−0.020*
	(0.586)	(0.156)	(0.068)
Capital Intensity	−0.254***	−0.117***	−0.073***
	(0.000)	(0.000)	(0.001)
Employee Ratio	0.040***	−0.105***	0.058***
	(0.001)	(0.000)	(0.000)
Liquidity	0.074***	−0.121***	0.067***
	(0.005)	(0.000)	(0.008)
Size	−0.373***	0.150***	−0.327***
	(0.000)	(0.000)	(0.000)
Leverage	−0.126***	−0.231***	0.542***
	(0.000)	(0.000)	(0.000)
Age	0.053***	−0.012	0.045***
	(0.000)	(0.345)	(0.002)
Industry-Dummy	YES	YES	YES
Year-Dummy	YES	YES	YES
R^2	0.403	0.398	0.320
N	3324	3694	3546

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
The table reports the standardised regression coefficients, *p*-values (in parentheses), and significance for the OLS regression. The dependent variables are the three profitability proxies: *ROA* is measured as the ratio of EBIT to total assets; *ROS* is calculated as the EBITDA margin (EBITDA divided by total revenue); *ROE* is measured as the ratio of EBIT to total equity. For each profitability proxy, a higher value indicates better business profitability. All proxies are used with the natural logarithms of their values.
Disclosure indices for picture content distinguish between *People, Social and Tangible Asset* items in pictures. These indices are measured for each proxy as a disclosure ratio, calculated as the total number of disclosed items with content-specific items for each firm-year in relation to the total number of all reported picture content items for each company in each firm year. *PagES* is calculated as the total number of pages in the annual report. *PictureS* is calculated as the total number of pictures in the annual report. *Capital Intensity* is measured as the ratio of total assets to total revenue. *Employee RATIO* is calculated as the total number of employees divided by total assets. *LiQuidity* is calculated as the quotient of total cash to current liabilities. *Size* is calculated as the logarithm of total assets in the actual annual report. *Leverage* is calculated as the quotient of total liabilities to total assets in the actual annual report. *Age* is calculated as the number of years firms have operated until 2021. *Year-Dummy* is a binary variable for all assigned fiscal years, and *INDUSTRY-DUMMY* is a binary dummy variable for all included industries.
Statistical significance at the 10%, 5% and 1% levels is indicated by *, ** and ***, respectively.

Limitations

Although our analyses contribute to understanding the relationship between voluntary disclosure of pictures in annual reports and companies' economic success, this study has some limitations. The first is the current lack of data availability regarding how companies' press teams handle the preparation of visual design for annual reports and who decides on implementing specific items related to pictures. Including some of these variables in future studies could be valuable, as well as controlling for different corporate governance systems or other institutional contexts. Another limitation is that the empirical evidence in our sample is restricted to FTSE 350 companies. Further research with a sample outside of the UK would also be beneficial.

Additionally, the hypotheses may suggest a bidirectional relationship between the voluntary disclosure of pictures and companies' profitability. Although we tested this and found consistent results, we decided to exclude additional analyses and results regarding bidirectional relationships, as these additional theoretical and empirical findings might be relevant for further research questions and are not part of the current analysis. Moreover, it might be interesting to analyse the lag or lead relationship between picture disclosure and companies' profitability.

Furthermore, due to a lack of data availability concerning stock market information, we were unable to integrate market-based profitability measures into our empirical research. Future research could benefit from market-based analyses, such as using Tobin's Q or key performance indicators related to market returns. The voluntary disclosure of pictures raises questions about market reactions from investors, opening a new research field. Moreover, it would be interesting to explore how different investors interpret the same picture content signal and whether institutional investors interpret it differently from retail investors.

Regarding the analyses of the relationship between picture content and companies' profitability, we did not include additional causality tests to confirm the causal direction from picture content in annual reports to companies' profitability. Therefore, endogeneity was not observed in our study and may exist. This area could be of interest for further analysis. Therefore, future research should focus on identifying other endogenous factors that affect both picture disclosure and profitability.

Conclusion

Our findings suggest that the content of pictures in annual reports is significant to understanding companies' profitability comprehensively. Therefore, content analysis of pictures should be given thorough consideration. Our research demonstrates that companies utilise pictures and picture content as a form of voluntary disclosure to inform or influence stakeholders in decision-making processes. Pictorial aids enable the

communication of nuanced and intricate messages beyond standard financial figures and textual descriptions (Preston et al. 1996; Davison 2007; Campbell et al. 2009). In the context of voluntary disclosure, framing theory suggests that the presentation of a company's information can influence stakeholders' interpretation and reaction. This topic raises interesting questions about companies using pictures in their annual reports to impress potential investors, depending on their economic situation.

Previous studies have primarily focused on narrative disclosure, graphs and tables in annual reports. Few studies have investigated the use of pictures or graphs using very small samples (e.g., Beattie and Jones 2000; Campbell et al. 2009). Recent advancements in artificial intelligence technology now allow us to examine large-scale samples. Therefore, this study aims to improve our understanding of how firms use pictures as an additional instrument in their corporate disclosure strategies, beyond quantitative financial data and narratives. Based on theoretical frameworks from accounting and communication research, we established five hypotheses.

First, we argued that the number of pictures in relation to pages in annual reports and the extent of picture content can be used to distract from relevant information, suggesting that companies may practice obfuscation of information by increasing the use of pictures and picture content. Therefore, in line with the obfuscation hypothesis, a negative association between a high number of pictures or complex content and profitability is assumed.

Second, we proposed that special picture content in annual reports matters and might enhance corporate disclosure. We suggested that 'people-content' pictures may improve corporate disclosure and be associated with higher profitability because companies with a higher number of people-content pictures in annual reports may portray a greater sense of responsibility and accountability. Another hypothesis focused on the association between 'social content' in pictures in annual reports and companies' profitability. We posited that companies could potentially impact their profitability by emphasising and transparently communicating their social activities, including community engagement, employee welfare and sustainable practices. Additionally, Preston et al. (1996) arguedthat pictures may reflect the reality of a company's situation. Our last hypothesis focused on pictures in annual reports that convey 'tangible asset content', suggesting a positive relationship with companies' economic success. Thus, we assumed that such pictures could captivate stakeholders and stimulate further exploration of a company's operations. Increased stakeholder engagement may result in better-informed investment decisions, enhanced customer loyalty and strengthened relationships with suppliers and partners, all of which may contribute to improved profitability (McGahan 2021).

Our research shows that firms use pictures and pictorial content in annual reports to influence readers' perceptions. The obfuscation hypothesis is supported when analysing the extent of picture usage and picture content.

We find that although an increasing number of pictures in annual reports leads to obfuscation, the content of these pictures matters. In line with voluntary disclosure and communication theories, our findings indicate that greater usage of pictorial content featuring people is associated with higher profitability. Yet, content showcasing social elements may be used to divert attention from a company's situation. Regarding pictures with 'tangible asset content', our findings reveal a negative association, contrary to our initial suggestions. 'Tangible asset content' in reporting might not align with contemporary communication habits. More profitable companies may use more modern disclosure practices to attract attention, whilst less profitable firms tend to employ more conservative methods. Further research could explore this by incorporating insights from communication theory and journalism theory. The research findings support the notion that including pictorial content in annual reports is considered by companies to be a suitable tool for enhancing readers' engagement. Specifically, incorporating pictures into annual reports can effectively capture readers' attention and shape their perspectives through the integration of pictorial content and narratives. Therefore, framing effects can offer insight into the reasons and methods by which firms disclose financial information.

Data Availability Statement

The basic data are publicly available from the sources mentioned in the paper. All other data supporting the results of this study are available from the authors upon reasonable request.

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