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About the Journal

The journal is published by Great Lakes Institute of Management, Gurgaon, India. The aim of the journal is to attract articles that address issues the industry is currently facing. A special focus will be on articles that provide innovative solutions to these issues. The journal articles will not only be of interest to academics, but also, with its focus on relevance, should be of interest to policy makers, think tanks, government, corporate and multilateral institutions, professionals, and industry leaders. Manuscripts will undergo a double-blind peer review process, and the journal will follow all international journal publication norms. The journal is being published with an open-access format so that it reaches the maximum readers. Journal Publishing Services for publication are powered by SAGE Spectrum.

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Aims and Scope

GLIMS Journal of Management Review and Transformation aims to publish scientific, empirical research on the theory, practice, and contemporary perspectives of management focusing on the problems, interest, and concerns of managers. It aims to explore interesting questions and phenomena in management, develop and/or test theory, replicate prior studies, and review and synthesize existing research.

Within its scope are all aspects of management related, but not limited, to strategy, entrepreneurship, innovation, information technology, digital business, analytics, artificial intelligence, machine learning, and policy and organizations, as well as all functional areas of business, such as organizational behavior, human resource management, accounting, finance, marketing, operations, data and analytics, and technology transformation.

This journal intends to publish a variety of articles including quantitative and qualitative empirical research articles and conceptual articles that provide novel perspectives on recent business phenomena. To achieve our aim of writing about business transformation, the journal will also include case studies and book review articles. It would also publish abstracts of PhDs that are relevant and in-line with the journal's objectives.

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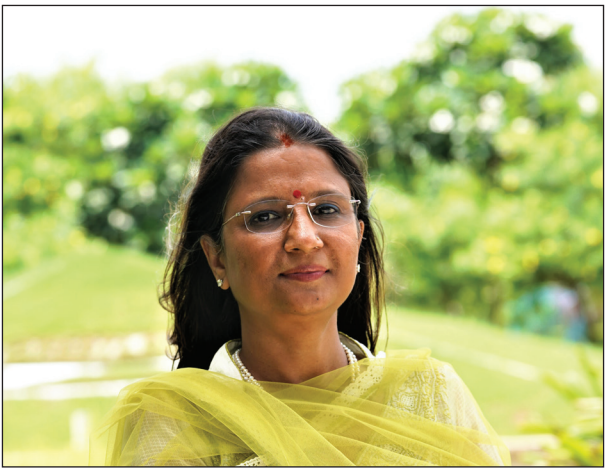

Dear Readers,

It is with mixed emotions that I share the second issue of *GLIMS Journal of Management Review and Transformation*. While we are elated with the spectrum and relevance of research articles in the first and second issue, we are also deeply saddened by the passing on of Professor Bala, our founding Editor-in-Chief and our mentor. His vision and guidance in creating and developing this journal as a platform for research with business relevance, globally, is unparalleled. We were fortunate to receive his guidance in setting up of the journal and launching its first issue. The first issue has set the standards high for us to uphold. We are confident that with the foundation he has provided for us, we will continue to achieve the vision he held out for us. We know that we will continue to receive his blessings and wishes from the heavens above.

As the founding Managing Editor of this journal, I also take this opportunity to welcome aboard our new Editor-in-Chief, Professor Sudhakar Balachandran, from the University of Illinois Chicago. Professor Sudhakar brings with him a rich experience from both corporate and academia. Having worked in the corporate, he brings relevance to his research which the industry would find useful. He is a tenured professor with illustrious experience from leading business schools of Columbia University and University of Illinois Chicago. He is a widely cited

researcher with publications in top journals including *Management Science*, *Review of Accounting Studies* and *Contemporary Accounting Research*. We would like to express our gratitude to Professor Sudhakar for accepting the role of the Editor-in-Chief of the journal. We are confident that under his guidance, the journal will continue to bring quality and relevant research to our readers from both academia and industry.

In the initial two issues, we have been able to curate a variety of research articles which, we are confident, will find significant relevance and resonance among the practitioners and academics alike. We remain committed to continue to serve the research community and look forward to contributions from fellow researchers.

Warm regards!

Preeti Goyal
Finance and Accounting
Great Lakes Institute of Management
Gurgaon, Haryana, India

Message from the Editor-in-Chief

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Dear Readers,

It is with mixed feelings that I welcome you to the second issue of the *GLIMS Journal of Management Review and Transformation*. While I am delighted to present this publication that combines 'managerial relevance' with 'academic elegance', the sadness stems from the loss of Dr Bala V. Balachandran, our Founder, former Chairman & Dean (emeritus) who was also the Editor of the inaugural issue of this journal. Dr Bala ('Dad' for me) was an inspirational leader and motivated many to pursue excellence in business and academia. Even though he is no longer physically with us, we constantly feel his presence and remember many important lessons he taught us—not only by what he said in the classroom but also by the way he lived his life. He was an eternal optimist and would always exhort us to keep moving forward. He was a firm believer in the power of AND and never settled for OR. So also, we too follow in his footsteps—we deal with the sadness of his departure AND embrace the need to move forward to fill our mission of scholarship.

I wish to thank the editorial board, the authors and our readers for showing the courage to move forward during this difficult time to fill our mission of scholarship. I pray that this platform continues to grow and inform both academics and practitioners of management. In this issue, we have managed to bring to you some truly exceptional material—very different from what one might expect to come across in a similar publication. The articles range from how organizations have responded to COVID-induced suffering, to Yoga to trends in scholarly publications and CEO compensation, there are several thought-provoking articles in this issue. Our goal is also to bring to light the research that has not yet been figured in the mainstream but whose value nevertheless is tremendous.

My best wishes for this platform to grow and inform both academia and practitioners of management. To that end, I encourage you to submit your work to our journal so that it may achieve the impact you desire. I hope you enjoy reading this as much as we did curating it.

Jai Hind! Jai Great Lakes! Jai *GLIMS Journal of Management Review and Transformation*!

Sudhakar Balachandran
Editor-in-Chief
University of Illinois, Chicago, USA

Article

Compassion in the Time of COVID-19: Responding to Suffering in Organizations

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Angela Chen[1] and Tine Köhler[1]

Abstract

This article develops a taxonomy to capture how the COVID-19 pandemic has created particular forms of employee suffering. During the pandemic, employee suffering is initiated by personal or work conditions (or both) that trigger pain and concurrently lead the employee to question their self-worth, identity, and personhood. The article introduces readers to three dimensions of suffering that helps to categorize and distinguish between different forms of suffering: the source of the suffering, the location of the suffering, and employees' perceived control over the suffering. Building on this taxonomy, we develop suggestions for ways in which managers can use compassion to alleviate employee suffering. We further discuss how organizational structures can enhance or impede compassionate responses. Overall, this article provides managers with a useful theory-based tool to facilitate appropriate responses to employee suffering during the pandemic.

Keywords

Compassion, alleviating suffering, management strategies, COVID-19, threat to self, identity, taxonomy

During the COVID-19 pandemic, the boundaries between work and home have become blurrier. For many employees, working from home is the norm. As a consequence, work-to-family and family-to-work conflict are more pronounced

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(Allen et al., 2021; Wang et al., 2021). Issues such as childcare struggles, illness, isolation in "the workplace," or anxiety related to mortality salience triggered by COVID-19 are creating particular forms of suffering (Hu et al., 2020; Rigotti et al., 2021). In addition, economic conditions and work-related consequences, such as mass layoffs, business closures, increased work hours, and stress, alongside pay cuts, affect many households (Sinclair et al., 2021). In this context, an individual's suffering is even more intertwined with and exacerbated by workplace challenges. In this article, we argue that under these and similar crisis conditions (such as fires, floods, or other widespread events) workplaces need to take an active interest and stake in managing their employees' suffering. We identify compassion as a promising approach through which managers can alleviate employee suffering (Dutton et al., 2006; Kanov et al., 2004).

For managers to effectively show compassion to employees, they first need to understand suffering within their organizations. Suffering refers to the "severe or protracted distress people experience when an instance of pain or injury ... disrupts one's basic personhood" (Kanov, 2021, p. 2). Thus, suffering arises when individuals interpret a pain-triggering event as threatening to their experience of personal identity (Kahn & Steeves, 1986; Reich, 1989). The negative affect associated with suffering motivates individuals to alleviate their own suffering (Brady, 2018). Examples of suffering during the pandemic include workers questioning whether they are good employees or adequate providers for their family because they have been laid off. Similarly, parents who feel exhausted and burned out because they have to shoulder childcare and work may start questioning their identities as good parents or their love for their children. As such, suffering is not the layoff or the work–family conflict itself—both are pain triggering events—but the negative meaning individuals attach to that event as it relates to their self-identity.

Existing literature in several academic disciplines has explored how suffering can be prevented or alleviated. The medical literature, for example, suggests that suffering can be alleviated through interaction with a compassionate person during which the sufferer finds meaning and a new sense of self in the midst of suffering (Reich, 1989). In this context, compassion is defined as "the feeling that arises when witnessing another's suffering … that motivates a subsequent desire to help" (Goetz et al., 2010, p. 351). Thus, a sensitivity to suffering in others is accompanied by a commitment to try to alleviate and prevent it (Gilbert, 2021). Related forms of compassion in workplaces might include changing work schedules to give healthcare workers more time to detach from work and be more available for their families or to hire a teacher who can remotely supervise employees' children to assist with their homework so that parents can focus on honoring work commitments.

In the management literature, compassion has been conceptualized as a set of interpersonal subprocesses that include noticing, empathy, assessing, and responding (Dutton et al., 2007, 2014; Kanov et al., 2004). These processes are focused and based on connecting with and caring for others (Miller, 2007). They are embedded within the context of the social architecture of an organization which may in turn facilitate or impede compassion from manifesting

(Dutton et al., 2014). This means that employees may choose avenues to alleviate their suffering that run counter to what managers believe is possible or desirable to do, especially if the organization itself is the source of some of the suffering.

The purpose of the current article is to evaluate how managers and organizations can effectively use compassion to alleviate employee suffering in times of systemic crisis, more specifically the current crisis created by the COVID-19 pandemic and the related societal and organizational responses. To achieve this, we first develop a taxonomy of different forms of suffering by reviewing literature across different disciplines and integrate it with the burgeoning literature on the sources of suffering created by the COVID-19 pandemic. We then review and integrate literature on compassion from different disciplines to provide insights into how managers may best address the specific forms of suffering that emanate from the pandemic. Through this conceptual integration of the suffering and compassion literatures, we provide a theory-based practical management tool that can be used to alleviate suffering in the workplace for a range of different organizational and personal conditions.

Suffering and the COVID-19 Pandemic

Suffering has been defined in many ways. Common elements of definitions across various literatures are an undesired experience of pain, injury, or loss of a perceived good of some amount of intensity or duration (Pollock & Sands, 1997; VanderWeele, 2019) that a person assigns a negative meaning to. The negative meaning in turn involves a perceived loss of one's experience of integrity of personal identity, autonomy, or actual humanity (Kahn & Steeves, 1986; Rodgers & Cowles, 1997). Kanov (2021) defines suffering more simply as "the severe or protracted distress people experience when an instance of pain or injury (emotional, physical, or otherwise) disrupts one's basic personhood" (p. 2). Personhood refers to the whole self, instead of only emotions, cognitions, or physical parts of the person. Therefore, suffering is determined by how the individual interprets that pain or injury as a threat to their continued existence (Gill, 2019). For instance, some healthcare workers face stigmatization and exclusion from family members because they can potentially transmit the virus to their family. As a result, they may fear that they are not a good parent or spouse because they jeopardize their own family's health by doing their job (Arasli et al., 2020).

Suffering can emanate from a range of sources. For the purposes of the current article, we will focus on sources embedded in organizational structures and responses to the COVID-19 pandemic. Kanov (2021), for example, suggests that the way in which workplaces are organized can create threats to the self and, subsequently, employee suffering. In law firms, seasoned senior attorneys are tasked with more complex cases and with the pressure to quickly serve client needs during the pandemic. On the flipside, junior attorneys may fear career stagnation because they are not given challenging assignments to develop their knowledge and experience to become competent attorneys. Along similar lines, Driver (2007) suggests that when organizations undergo large-scale changes or

new initiatives, they put a strain on employees and contribute to sense of displacement, identity loss, and inadequacy because the constant need to adapt to the new work context hobbles the ability of employees to construct meaningful identities at work that create feelings of adequacy.

These workplace structures and responses are likely to cause suffering in employees because the individual feels they have no control over their environment or destiny, and thus perceives a threat to their personhood (Allard-Poesi & Hollet-Haudebert, 2017). For example, organizations may resist making changes to their performance evaluation criteria and systems despite the mounting evidence that women are most affected by the dual burden of childcare and work during the pandemic. As a consequence, female employees may fear that their standing in the organization is undermined by the organization's failure to acknowledge and participate in the amelioration of the additional strain that the pandemic and society put on their careers (Clark et al., 2020).

To better understand the nature and source of suffering in workplaces, the following section provides an overview of different forms of suffering. On the basis of a literature review drawing specifically on literature from philosophy and psychology, we propose three dimensions on which different forms of suffering can be classified and distinguished (Brady, 2018; Frank, 1992; Kauppinen, 2020). Being able to identify and distinguish different forms of suffering subsequently allows managers to better alleviate employee suffering.

Dimensions of Suffering

In our taxonomy, we propose to categorize suffering via three dimensions: the source of the suffering, the location of the suffering, and the perceived control employees have over the suffering (see Figure 1). These dimensions represent ways in which a negative affect intrudes unwantedly upon an employee's psyche while at work (Brady, 2018). The source of the suffering may originate from the employee's personal circumstance or the workplace. In their personal life, workers may, for example, worry for their children's well-being due to forced school closures (Ghosh et al., 2020), experience abuse by their spouse/partner during lockdowns (Fitz-Gibbon et al., 2020), or feel isolated during lockdowns (Foa et al., 2020). In a workplace, employees may experience burnout or stress from working long hours or taking care of COVID patients (Chen et al., 2020),

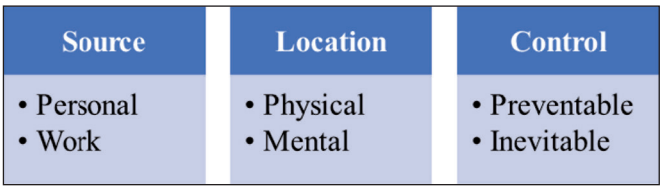

Figure 1. Three Dimensions of Organizational Suffering

Source: The authors.

"technostress" from a lack of preparation to use technology to work from home (Vaziri et al., 2020), or being forced to attend work in precarious, low-wage, and low-skill occupations, which feature a higher representation of women and minorities (Kramer & Kramer, 2020).

Although most research has focused on work-to-family or family-to-work conflict, the pandemic draws to our attention that a clear separation between work and personal life no longer exists. Nurses who deal with COVID patients come home from work and physically isolate themselves intentionally from their families, worried they will get family members sick and cause their children anxiety (Hofmeyer & Taylor, 2021). Although these healthcare workers are at home, they cannot completely leave their work context behind. For nonmedical workers, restrictions on movement and leaving home for work reduce the physical boundaries between work and home (Shockley et al., 2021). Because work and home lives no longer potentially exist in separate domains, the COVID context creates a situation where decisions regarding both spouses' work arrangements and home lives are disrupted (Der Feltz-Cornelis et al., 2020; Etheridge et al., 2020; Hupkau & Petrongolo, 2020; Shockley et al., 2021). For example, home issues such as the immediacy of children's emotional and physical needs interrupt both parents' workdays. To capture the conjoint sources of suffering during the COVID-19 pandemic, our taxonomy recognizes that the source of organizational suffering can originate in employees' personal circumstances or workplace conditions or both.

The second dimension to categorize organizational suffering concerns the difference between physical and mental suffering. Physical suffering is typically associated with the experience of bodily pain (Brady, 2018; Kahn & Steeves, 1986; VanderWeele, 2019). Kauppinen (2020) argues that physical pain becomes suffering (sensory suffering) when the pain has meaning for us. An employee may become sick from exhaustion, working long hours to finish a project to ensure that it is completed to a high standard. However, this physical pain may become suffering if the supervisor were to blame the employee for their own illness, explaining that the extra effort is unnecessary and pointing out that other employees work fewer hours and are still able to adequately complete their tasks. Although some of the current Covid-related literatures study employees' physical pain, they do not necessarily explore physical suffering. Physical pain includes insomnia (da Silva & Neto, 2020), fatigue because of longer working hours and/or owing to staff shortages (da Silva & Neto, 2020; Turale et al., 2020), healthcare workers being assaulted by family members who are distressed about their sick loved ones (Turale et al., 2020), or falling ill to COVID-19 (Culbertson, 2020). When employees feel ostracized or ashamed for contracting COVID-19, for example, or when employees are reprimanded for not being able to work to their fullest capacity owing to their stress-related exhaustion, then the physical pain turns into physical suffering.

Mental suffering is comprised of negative emotional (i.e., fear, shame, and anxiety) and nonemotional states (i.e., boredom, loneliness, and loss of meaning) that are not necessarily tied to physical suffering, but to a person's thoughts about the world and their place in it (Brady, 2018). A mental state such as shame is not

necessarily suffering. It becomes suffering when it is associated with a negative affect, and the individual feels a strong desire to change it because it threatens their sense of self (Kauppinen, 2020). For instance, shame becomes suffering when an older employee is laid off and cannot find a job after multiple failed attempts, leading to their belief that they are unemployable because of their age. Boredom becomes suffering when a less experienced employee believes that he/she is not good enough to be given challenging work. Much of the literature on employee suffering, as it relates to the pandemic, focuses on the experience of mental suffering such as anxiety, fear of death, post-traumatic stress, depression, suicidal tendency, compassion fatigue, burnout, or a sense of isolation due to remote work (Almater et al., 2020; Arasli et al., 2020; Blekas et al., 2020; Hafermalz & Riemer, 2020; Mamun et al., 2020; Ruiz-Fernández et al., 2020; Shahrour & Dardas, 2020; Turale et al., 2020). Despite the fact that many of the cited studies identify threats to the self as associated with mental suffering, they do not explore the relationship between suffering and threat to the self in much depth. For instance, Blekas et al. (2020) explore the psychological impact to healthcare workers assessing the role of PTSD but do not explain how perceived loss of control over stressors is associated with a threat to the self. An exception is Hafermalz and Riemer (2020), who suggest four types of technology-mediated team communication that create a shared professional identity to combat the feeling of lack of belongingness in remote workers.

The third dimension to categorize organizational suffering relates to control, that is, whether the triggering event is perceived as inevitable or preventable (Driver, 2007; Kanov, 2021; Kauppinen, 2020). Suffering involves a sense of lack of control over an unwanted situation, and a feeling that things "could have been otherwise" (Frank, 1992, p. 476; Kauppinen, 2020). This sense of inevitability speaks to a sense of autonomy loss that contributes to suffering (Kanov, 2021; Reich, 1989; Rodgers & Cowles, 1997). For example, healthcare workers caring for a large number of COVID patients and not being able to save them may create a traumatic experience that makes healthcare workers question their competence or the value of their work. School closures and office closures forcing employees to work from home and care for their children may strain the relationship between parents as well as between parents and their children, potentially causing individuals to question the cohesion of their family.

To regain a sense of autonomy in the face of inevitable suffering, the individual needs to find new meaning in the suffering (Reich, 1987). However, in organizations employees are often expected to accept the meaning communicated by the organizational authority rather than allowing space for employees to create their own meaning (Driver, 2007). Thus, organizations may position layoffs as "inevitable" during the pandemic, and employees are resigned to accept that interpretation regardless of whether they personally agree with it. Employees then suffer because they are displeased with the situation and their lack of control over it (Kauppinen, 2020).

On the other hand, how employees react to preventable suffering may depend on the source of the triggering event. If they perceive the source to be personal, it is likely that they will look for a way to alleviate the suffering. If employees

Table 1. Examples of COVID-related Suffering

Examples of Suffering	Threats to Self	Source	Location	Control
Children forced to attend school remotely. Parents need to provide childcare but also need to work.	I'm not a good parent	Personal	Mental	Inevitable
Loss of productivity having to balance duties	I'm not a good employee			
Mass layoffs or wage cuts in response to companies struggling to make money	I'm not a good provider for my family	Work	Mental	Inevitable
Laid off older employee unable to find another job	I'm no longer useful			
Remote workers feeling isolated from the workplace and other coworkers	I don't matter to my team			
Senior attorneys deal with difficult client casework while junior attorneys are bored and worried their careers are stagnating	I'm not competent enough; my career is over			
Healthcare workers putting in long hours with heavy workload; not seeing family much or worried they will get family sick	I'm not a good family member	Work	Physical	Preventable
Lack of PPE and safety protocols to protect employees at work	I'm not important to this organization			
Becoming exhausted and sick from working long hours to ensure a project is completed with quality, and then told the effort is excessive and unnecessary	What I do is never good enough			
Remote workers subjected to increased daily monitoring by their supervisors	I'm not a trustworthy employee	Work	Mental	Preventable

Source: The authors.

perceive the suffering to emanate from the organization, then they may question the organization's role in creating or perpetuating their suffering. Employees may expect the employer to put processes and policies in place to facilitate employees working from home (e.g., through providing home office equipment, contributing to child minding, providing special caregiving leave arrangements), to create a safety plan before allowing workers back into the office, or to provide personal protective equipment to workers to minimize their chance of getting sick from the virus (Ammar et al., 2020; Culbertson, 2020; Lázaro-Pérez et al., 2020). When the organization does not contribute to alleviating trigger events or perceived pain, then employees may question their value to the organization (resulting in suffering), and subsequently may reduce their job engagement and organizational commitment and lead to withdraw from work (Yuan et al., 2021).

Table 1 incorporates the three dimensions of suffering into a taxonomy and provides concrete examples from the COVID-19 pandemic to highlight the relationship between different combinations of the dimensions of suffering and threat to the self. This taxonomy provides a way of understanding organizational suffering and can assist managers in their assessment of an employee's pain and suffering. Subsequently, this deeper understanding can help organizational leaders to generate more effective responses to suffering. In the following section, we introduce compassion as a specific response that holds promise to alleviate different forms of suffering.

Employing Compassion to Alleviate COVID-19-related Suffering

Compassion

When employees infer that their feelings and the challenges they face are not acknowledged by their organization or that they are not in control of their work life, they disengage from their workplace and ruminate on their suffering (Frost, 2004). Organizations subsequently lose out when employees withdraw their loyalty and commitment. For managers to actively manage employee suffering, they need to understand employee suffering from the employee's point of view. Compassion allows managers to develop this understanding and a considerate response to the suffering.

Organizational compassion research has found a range of benefits to employees, including conveying a sense of feeling valued and worthy, facilitating positive meanings about their coworkers and organization, reducing anxiety, increasing the ability to cope with adversity, and creating a sense of belonging (Dutton et al., 2014, 2006; Lilius et al., 2008). Moreover, caring among employees creates interpersonal resources that help employees cope with and potentially reverse the negative effects of emotional exhaustion (Barsade & O'Neill, 2014). In medical settings, compassion has been shown to buffer against strain, lower stress, reduce fears, prevent PTSD, and create perceptions of professional competence (Trzeciak & Mazzarelli, 2019; Vogus & McClelland, 2020).

We describe the subprocesses involved in a compassionate response to suffering next, which include noticing, empathy, assessing, and responding (Dutton et al., 2007, 2014; Kanov et al., 2004; Simpson et al., 2020). We further propose how managers can employ these subprocesses to help employees navigate through their suffering (Kanov et al., 2004; Reich, 1987).

Compassion Subprocesses

The first step in a compassionate response is noticing the suffering. Using the proposed taxonomy in this article, managers can pinpoint the source, location, and sense of control of employee suffering to better understand how a triggering event or work condition creates a threat to the employee's sense of personhood. Noticing involves becoming aware of what is going on and attending to the other person's suffering (Kanov et al., 2004). To be more fully aware, managers need to take the time to be present with the employee and pay attention to employee cues in order to actively listen (Atkins & Parker, 2012). Moreover, managers need to be able to separate their own thoughts and feelings concerning the situation to be more present and observant of the employee's suffering.

Cues to notice could take different forms. For example, an employee may not be able to attend a scheduled virtual work meeting, citing a personal reason such as needing to homeschool children. An employee may seem uncharacteristically withdrawn, not talking much during work meetings amid rumors of impending layoffs. Or an employee may appear listless and irritable when asked to come in and work another long shift. Cues to mental suffering, in particular, may be ambiguous and less prominent, so managers need to use their intuition and active listening skills, and get the help of other organizational employees and leaders to surface potential employee suffering (Worline & Dutton, 2017b).

After noticing potential cues of suffering, managers need to demonstrate empathy with the employee through perspective taking, that is, by either feeling or imagining the other's suffering (Miller, 2007). A manager's empathy and ability to cultivate feelings of similarity with the employee lays the groundwork for compassion (Vogus & McClelland, 2020). Through empathic concern, managers have an opportunity to understand how the employee interprets their suffering as preventable or inevitable (Kanov et al., 2004). Empathic concern is also critical because it provides the manager with motivation to give relief to what the employee suffers from (Dutton et al., 2014). For example, an employee may believe they are a failure due to their inability to meet a project's fixed deadline because family matters keep interrupting them at home, when in reality the manager can recruit other employees on the team to help get the work done on time. It is important to note that empathy should include a caring motive; otherwise, the manager can easily use empathy for manipulative and selfish reasons (Gilbert, 2021).

Along with empathizing with employees, managers assess the employee's suffering through their own sensemaking (Dutton et al., 2014). Before deciding whether to respond to suffering with compassion, managers may contemplate how

relevant the employee's suffering is to them, whether the employee deserves compassion, and if they have the personal resources to respond appropriately to the employee's suffering (Araújo et al., 2019; Atkins & Parker, 2012; Goetz et al., 2010; Worline & Dutton, 2017a). Managers are less likely to show compassion if they: (a) intentionally want the employee to suffer, (b) believe the employee is responsible for his/her own suffering or the employee has poor character, or (c) want to avoid the employee because they feel incapable of coping emotionally when faced with the employee's suffering (Goetz et al., 2010). For managers to make these assessments, they need to be conscious of their own thoughts and feelings to reduce the likelihood of automatically judging the employee, and perhaps even contributing to more employee suffering (Atkins & Parker, 2012; Frost, 2004; Gilbert, 2021).

Finally, employees are not passive recipients of compassion, but active and engaged participants in how compassion unfolds (Kanov et al., 2017). Therefore, in addition to relying on their own thoughts and feelings to assess whether an employee would benefit from compassion, managers should also take into account whether the employee feels the desire to change the situation (Kauppinen, 2020). After all, during the pandemic, employees do not all suffer in the same way. Employees suffer when they encounter conflict between their own desires or needs and the reality of what an organization actually provides (Driver, 2007). For example, Worker A may prefer to work long hours because they are striving for a promotion, while Worker B suffers because the long hours take time away from being with family. A manager giving Worker B more time off from work may be seen as compassionate, whereas the same time off may actually create suffering for Worker A.

If, in fact, employees affectively construe a situation at work in a negative way, managers should determine whether employees feel they themselves need to make change (inward focused) to minimize their suffering or whether they feel that managers have the responsibility to minimize the suffering (outward focused) (Brady, 2018; Kauppinen, 2020). Wang et al. (2021) suggest that employees working from home need to proactively initiate or engage in online interactions, thus pointing to the need for inward-focused change from employees to alleviate suffering from loneliness. If outward change is needed, managers may foster quality virtual interaction within the social network, such as having daily check-in meetings for employees to interact and reduce loneliness. The distinction regarding who should initiate the change allows manager to be more targeted with their compassionate response.

Responding with Compassion

When managers respond with compassionate action, they seek to ease or eliminate another person's suffering (Kanov et al., 2004). Given the varied triggers of suffering during the pandemic, managers may choose to demonstrate compassion in different ways depending on their assessment of an employee's suffering related to the trigger event (Table 2). We now discuss some specific considerations that

Table 2. Examples of COVID-related Compassion

Example of Suffering	Threat to Self	Source	Location	Control	Compassionate Response
Children forced to attend school remotely. Need to provide childcare but also need to work. Forced to work remotely. Loss of productivity having to balance duties.	I'm not a good parent or I'm not a good employee	Personal	Mental	Inevitable	Minimize the organization's contribution to employee suffering, e.g., by using active listening to respond with compassionate silence, allowing the employee space to process the suffering and suggest ways forward
Mass layoffs or wage cuts in response to companies struggling to make money	I'm not a good provider for my family	Work	Mental	Inevitable	Minimize inevitable organizational pain being inflicted, e.g., by being attuned to an employee's situation and expressing appreciation for the employee
Healthcare workers putting in long hours with heavy workload; not seeing family much or worried they will get family sick	I'm not a good family member	Work	Physical	Preventable	Eliminate preventable organizationally inflicted pain, e.g., by adjusting the work schedule to allow more time to detach from work
Remote workers subjected to increased daily monitoring by their supervisors	I'm not a trustworthy employee	Work	Mental	Preventable	Eliminate preventable organizationally inflicted pain, e.g., by creating a joint agreement with the employee on task deadlines and requesting the employee to provide updates at agreed upon intervals

Source: The authors.

managers might want to take into account when deliberating potential responses to address suffering. In particular, we explore how manager awareness of different pain triggers that employees experience informs appropriate compassionate responses that range in increasing effort to eliminate the pain trigger(s).

Minimize the Organization's Contribution to Employee Suffering

Around the world, one of the potential triggers of suffering is school closures. In these instances, parents who need to work from home are simultaneously tasked with caring for their children. Parents with the majority of childcare responsibilities (most often remote working female employees) have been shown to experience low family cohesion, relationship harmony, and job performance (Shockley et al., 2021). Not being able to shift the balance of home childcare responsibilities to be more equally shouldered across parents may contribute to an employee's negative sense of self. Managers may perceive that there is very little they can do to alleviate this inevitable personal source of suffering.

When managers encounter the combination of personal and mental suffering that is inevitable for the employee, they should consider creating environments that allow employees to process their suffering (Vogus & McClelland, 2020). For example, responding with "compassionate silence" by offering an attentive and empathetic ear enables managers to witness the suffering and cultivate a safe space for the employee (Driver, 2007; Kelemen et al., 2018). Acknowledging the employee's sense of loss due to disruptive changes in the workplace provides emotional support that reduces the negative consequences of organizational suffering (McClelland & Vogus, 2021). By being an active listener, managers provide the environment that allows employees to initiate action on how to proceed, rather than the manager trying to solve problem for the employees (Kelemen et al., 2018). The employee may ask for more flexibility in submitting work assignments or time off to attend to family matters to accommodate their needs, which managers can grant if possible. The goal for managers whose employees grapple with inevitable suffering is not to add to the suffering the employee is already experiencing.

Minimize Inevitable Organizational Pain Being Inflicted

Businesses that engage in layoffs, reduced work hours, or furloughs to comply with government mandates regarding public health practices represent another trigger of suffering (Sinclair et al., 2021). This organizational pain trigger combined with the inevitability of businesses complying with government mandates creates fear and anxiety among employees due to the economic uncertainty caused by these organizational actions. If employees cannot change their employment status in a desired way because it is not within their power or because there are few alternative options in an economically depressed market, they may blame themselves for being an inadequate provider for their families (Kauppinen, 2020). Managers are ultimately responsible for implementing these pain-triggering organizational actions, thus they bear the burden of inflicting pain upon their employees (Frost, 2004). Managers can ameliorate this pain through the way in which they deliver organizational messages to employees to minimize potential feelings of demoralization.

Evidence suggests that increased communication with employees during the pandemic to understand employees' personal life experiences has a positive impact on the supervisor–employee relationship (Häggblom, 2020). This personal knowledge helps managers be more attuned to an employee's suffering, thus contributing to a more appropriate compassionate response (Miller, 2007). Besides signaling attunement, managers who signal inclusiveness by showing appreciation of others' contributions and empathizing with employee challenges, regardless of the employee's work status, increase psychological safety, engagement, and compassion among employees (Vogus & McClelland, 2020). Compassionate acts convey to employees that the organization still values and supports them (Lilius et al., 2008) despite difficult circumstances. These types of managerial actions ameliorate an already painful situation for employees due to their companies' response to COVID-19.

Eliminate Preventable Organizationally Inflicted Pain

Insofar as some of the pain inflicted upon employees has been inevitable during the pandemic, there are some examples of preventable organizationally inflicted pain contributing to employee suffering. For instance during the pandemic, nurses experience distress when they worry about getting their families sick because their workplace fails to provide personal protective equipment (Arasli et al., 2020). In this case, the threat to the self may arise from the feeling of being seen as a bad family member or as not being viewed as important enough by the organization to be protected from COVID-19. Another example is an employee becoming severely ill from working long hours in an attempt to meet relentless project deadlines because business has spiked during COVID-19, only to be told the amount of effort is excessive because the employee is a perfectionist. Here, the threat to the self may consist of not being good enough no matter how much effort is made. In all these examples the organization contributes to employee mental or physical suffering because the organization either fails to enact measures to support employees or blames the employee for problems the organization itself creates.

In these situations, managers need to shoulder some of the responsibility to ameliorate the situation, rather than putting the burden of finding ways to alleviate the suffering entirely on the employee. Managers need to draw on their courage to overcome uncertainty by advocating for change in the organization (Kanov et al., 2017). Compassion is an action filled with courage, wisdom, and sacrifice for people (Gilbert, 2021). As employees confront challenges stemming from the pandemic, managers and their organizations play a role in either preventing or exacerbating those challenges.

Knowing how to prevent or avoid exacerbating challenges entails developing an awareness of the different ways organizational structures can inflict pain upon employees. Dutton et al. (2006) subsume the values and routines that structure an organization under the social architecture of the organization. Characteristics of the architecture constrain or enable individual action. When leaders create or support organizational structures that foster compassion, they are able to transform compassion into a social reality (Dutton et al., 2006; Vogus & McClelland, 2020). However, without compassion underpinning this social architecture, these same structures potentially set the stage for organizational suffering.

Creating an Organizational Culture for Compassion

In the previous sections, we argued the importance of managers understanding suffering from the employee's point of view to enable a more calibrated response to organizational suffering. In this section, we highlight how organizational structures that create culture, such as values, norms, beliefs, routines/practices, and leader behaviors, either shape how compassion unfolds (Dutton et al., 2014) or serve as organizational sources of suffering during the COVID-19 pandemic. If managers are to advocate for change in their organizations to activate compassion, they need to determine what part(s) of the organizational culture might hinder compassion from manifesting or might even inflict pain.

An organization's culture conveys certain underlying values that encourage or suppress the expression of compassion (Barsade & O'Neill, 2014; Dutton et al., 2014; Toubiana & Zietsma, 2017). Shared values guide and motivate attention to prioritize addressing the suffering that befalls employees due to unfortunate circumstances (Dutton et al., 2006). In addition to values, norms shape the pattern of expected behaviors that are encouraged over time. Values and norms characterize underlying assumptions that determine whether an organization's culture allows for and supports compassion (Schein, 1990). For example, studies have found that when female faculty members experienced increased caregiving demands working from home during the pandemic, their research productivity decreased 13% compared to their male counterparts, even though total research productivity in the United States increased 35%, taking into account both genders across multiple academic disciplines (Cui et al., 2020). Employees may feel anxiety regarding how annual performance evaluations are conducted in light of how this pain trigger negatively impacts productivity (Clark et al., 2020). Whether the faculty decides to provide caregiving support or postpone performance evaluations and acknowledge the inevitability of additional caregiving demands reflects the values and norms of the organization (Dutton et al., 2006).

On the other hand, shared beliefs determine whether organizational members believe that the organization truly supports compassion (Dutton et al., 2014). When members share stories of suffering or responses to suffering, they create shared perceptions that act as a primer for employee sensemaking (Fehr & Gelfand, 2012). An example during the pandemic includes nurses posting stories on Instagram about their work-related source of suffering—such as fears of going to work because they do not feel safe (Arasli et al., 2020). Another example are women sharing stories of shame and guilt (mental suffering) in their WhatsApp chat groups relating to intensified caregiver work, whereas their organizations did nothing to prevent suffering by lowering the workload or offering practical assistance (van Eck & Jammaers, 2020). Through these shared stories, employees may come to believe that the organization does not care about them. As a result, they may refrain from communicating their suffering to their leaders, which in turn does not give the leaders an opportunity to alleviate that suffering with compassion. This rumination over unhealed suffering subsequently drains employee energy and diverts attention away from work issues (Frost, 2004).

Beyond values, norms, and beliefs, routines and practices also signal whether an organization acts compassionately. Routines are "recurring patterns of behavior

of multiple organizational members involved in performing organizational tasks" (Feldman & Rafaeli, 2002, p. 311). Routines facilitate shared understandings and social alliances among individuals, inform what patterns of behavior individuals are expected to conform to, and signal whether those routines allow any modifications to enhance compassion (Feldman & Rafaeli, 2002). Routines can be detrimental, for example, when healthcare professionals are regularly scheduled for long work shifts during the pandemic (work source of suffering). Without giving these workers time off to detach from work and attend to personal demands at home (personal source of suffering), these long hours and heavy workload contribute to their mental suffering (Britt et al., 2021). Conversely, daily practices shape relationship quality and facilitate exchange of personal information (Lilius et al., 2011). During the pandemic, managers implementing daily practices of increased control and monitoring of their remote workers (work source of suffering) tend to undermine employee well-being (van Eck & Jammaers, 2020; Wang et al., 2021). Thus, although routines and practices may appear to foster and maintain business as usual, they have the potential to contribute to organizational suffering.

Managers play an important role in shaping the culture of compassion through their behaviors and their enactment of organizational practices (Araújo et al., 2019; Simpson et al., 2013; Vogus et al., 2021; Worline & Dutton, 2017b). This role is particularly important during times of distress such as the COVID-19 pandemic, when people turn to leaders to manage their frustrations and anxiety (Worline & Dutton, 2017b). One way leaders proactively shape culture is through their communications with employees (Sutcliffe, 2001). Whether managers clearly and frequently communicate with employees impacts employee uncertainty during a pandemic situation (work source of suffering), which can affect employee stress and the manager–employee relationship (Häggblom, 2020; Howe et al., 2020). Engaging in an open and honest dialogue with employees influences whether they interpret compassion as the norm. Moreover, managers shape a compassionate culture when they implement practices that reinforce compassion as a core value (Vogus et al., 2021). For example, when employees are inevitably forced to work from home, whether managers offer some type of financial assistance through their organization's policies demonstrates their ability to symbolically acknowledge the hardships during the transition to a home office setup (Howe et al., 2020). If leaders do not acknowledge the humanity of suffering employees, their lack of other-oriented focus ultimately inhibits organizational compassion (Worline & Dutton, 2017b).

Discussion

In this article, we offer a taxonomy to unpack organizational suffering along three dimensions: source, location, and control. This taxonomy integrates literature from management, psychology, medicine, nursing, and philosophy, and prioritizes the meaning employees associate with pain events. Using this taxonomy, we further provide appropriate compassionate responses for managers who want to

alleviate employee suffering in their organizations. Appropriate compassionate responses can range from "compassionate silence," for example, when an employee is faced with an inevitable personal suffering that the manager cannot help to alleviate, to taking responsibility for initiating organizational change to eliminate preventable organizational suffering.

Although we suggest certain strategies to respond compassionately in accordance with certain forms of suffering, we recognize the influence of the context within which managers operate. If managers are under high time pressure because they are expected to perform above all else (Banker & Bhal, 2018; Kanov et al., 2017), they may not intentionally devote attentional resources to noticing cues of suffering in their employees (Atkins & Parker, 2012). We also acknowledge that managers need to show compassion for themselves as well. Self-compassion is an effective way for managers to cope with how they are handling the challenging situations during the pandemic because it means treating themselves with care and kindness like a good friend would (Neff, 2011). This is relevant because they are in a position to inflict pain on employees. When managers embrace their own suffering, rather than ignoring it, they are better able to validate their difficult feelings and feel less distressed by the pandemic (Waters et al., 2021). If managers are able to care for themselves using self-compassion during COVID-19, they will be in a better position to effectively deal with the organizational suffering their employees face.

Implications from this work may further extend to literature related to crisis management. For example, crises such as floods (Simpson et al., 2013), bushfires (Shepherd & Williams, 2014), wars (De Rond & Lok, 2016), and other manmade or natural disasters (Mao et al., 2018) that are associated with great suffering can be understood through explicating how sources of work and/or personal suffering, mental and/or physical location, and perceptions of control contribute to employee suffering. The taxonomy we propose in this article can be used to understand the threat to the self that these crises pose to the individual to generate appropriate compassionate responses in those contexts. For instance, Mao et al. (2018) state that medical personnel may engage in disaster rescue tasks without adequate equipment, training, or role clarity when they are put into danger danger zones. This situation gives rise to physical and mental suffering. Thus, the threat to the self stems not from inevitable suffering when confronting disasters, but from the workplace not preventing this suffering through adequate training and provision of resources. The appropriate compassionate response is eliminating preventable sources of organizationally inflicted pain, not just providing mental support to rescue workers in the wake of the disaster.

As the pandemic starts to subside with the advent of vaccines and people developing natural immunity to the virus, the workplace will shift again to adjust to another new normal. Employees who got used to working from home may be told to physically go back into the office, even though they may now prefer to work from home. As case numbers drop, mask mandates by governments may be rescinded, putting employees at risk when interacting with customers as viral mutations spread throughout the population. To be effective leaders, managers need to stay vigilant in their understanding of their employees' suffering as the

situation continually evolves. As the workplace situation changes, so will the type of suffering that will potentially manifest for employees as it relates to the pandemic. By eliciting information from their employees to identify dimensions of organizational suffering, managers will be in a better position to provide compassion that effectively alleviates the suffering that the employee experiences. When employees feel that managers truly care about them, they will stay engaged and have more positive work experiences.

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Transformer Networks and Their Real-World Business Applications

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Abstract

Recent advances in deep learning models have presented many opportunities for businesses. This article focuses on the possible game changing development of transformer networks which have enabled self-supervised learning. These advances provide encouraging opportunities for business applications. The article discusses the different types of learning paradigms and the similarities and dissimilarities between them. The article also discusses how transformer networks enable self-supervised learning. The article finally discusses real-life business applications with data from text, audio and images.

Keywords

Transformer networks, supervised learning, unsupervised learning, self-supervised learning, business applications

Introduction

Over the past few years, the predominant focus of artificial intelligence (AI) and machine learning (ML) research has been on technical and theoretical aspects. With the explosion in the volume of data, especially unstructured data, coupled with exponential increase in processing power, businesses are now aggressively looking for ways to gain competitive advantage by deploying these technologies

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(Davenport & Ronanki, 2018) to develop new products, serve their customers, market research, process automation, etc. (Duan et al., 2019). Practitioners and researchers alike suggest that Artificial Intelligence and Machine Learning (AIML) will provide the next frontier for both productivity and competition (Dwivedi et al., 2021). Some have even gone to claim that this is a revolution that will fundamentally transform how the industry itself operates (Ågerfalk, 2020). Firms are now beginning to figure out how investment in AIML can generate business value. There is a surge in companies venturing in the AIML world (Ransbotham et al., 2018) and investing in integrating AIML into the various aspects of the business.

Large volumes of unstructured data in the form of text, audio and images are an important by-product of the digital age. Posts on Facebook and Twitter and blogs provide deep insights into consumer behaviour and presents unprecedented potential opportunities to companies as well as academic researchers.

Existing models for deep learning, such as Convolutional Neural Networks (CNN) and Recurring Neural Networks (RNN), demonstrate issues with modelling of long-term contexts as they learn within a specific context which leads to a locality bias (Qiu et al., 2020). Also, since RNNs process inputs sequentially, that is, one word after the next, it makes limited use of parallel processing. A deep learning model, referred to as transformers, proposed by Vaswani et al. (2017), was designed to overcome these challenges. The model utilises 'self-attention' in learning, leading to self-supervised learning by the models. In essence, the model architecture design in self-attention utilises more parallel learning as compared to RNNs. The self-attention model can also take into account the long-term contexts. This is because every permutation and combination of all meaningful words, referred to as tokens, from the input sequence are used for learning (Vaswani et al., 2017). The architecture of transformers allows for it to learn even from complex language information. At the same time, it is an expensive as well as time-consuming process for generating humongous volumes of labelled data in the natural language processing (NLP) domain from the easily available unlabelled data.

Recent students suggest that transformer-based pre-trained language models have the potential to overcome the learning challenges of existing models and can likely successfully deliver in a variety of NLP tasks. Generative pre-trained transformer (GPT) and bidierctional encoder representations from transformers (BERT) are frontrunners in the evolution of such self-supervised learning models which have utilised the transformer architecture. As a result, the transformer-based pre-trained language models can potentially utilise self-supervised learning to learn any universal representations from humongous volumes of data. Subsequently, such knowledge can be transferred to downstream tasks. Since the self-supervised learning models provide good background knowledge for downstream tasks, the need to train downstream models from scratch is eliminated. In fact, the downstream models can then be trained with minimal data which provides the right context for the model.

Deep Learning Models

The earlier NLP systems were mainly rule-based and were subsequently replaced by machine learning models. For machine learning models to deliver successfully,

domain expertise of the modeller is critical and is, thus, a time- and resource-consuming process. Prominent learning models in recent years are unsupervised (USL), supervised (SL) and self-supervised learning models (SSL).

Supervised learning enables models to learn from data labelled by humans. This supervised learning has been a critical part in the progress that AI has achieved in recent years. Such models work well on specific tasks as they are trained using data labelled for that specific task. A drawback of such supervised training is that to attain good model performance, a large number of labelled data is required. Collecting and labelling such data is an expensive and time-consuming task. Additionally, for many domains, such as medical and legal, it is difficult to access labelled data. Furthermore, since these models only use the supplied labelled data for training, they are likely to suffer from a bias as there may be many other relationships that exist in reality which have not been captured by the labelled data used for training, thus, leading to generalisation error, and the models may probably even accept spurious relationships.

In summary, the drawbacks of supervised learning are that it has significant dependence on data labelled by humans, which is usually time-intensive and cost-ineffective, and that it lacks the ability to generalise the models that emerge from such learning. This can, at times, also lead to spurious relationships. In many areas, such as legal or medical, availability of labelled data could be a challenge, thereby creating a limit on applications for such models in such domains. These models are unable to capitalise on learning for easily available unlabelled data.

As the computer hardware accelerators such as Graphic Processing Units (GPU) and Tensor Processing Units (TPU) along with word association algorithms such as Word2Vec (Mikolov et al., 2013) and GloVe (Pennington et al., 2014) evolved, the use of deep learning models such as CNN (Kalchbrenner et al., 2014) and RNN (Zhou et al., 2016) for NLP applications increased significantly (Zhou et al., 2016). As stated earlier, the major challenges in training these models were that they had to be trained from scratch (with the exception of word embeddings) and required large volumes of the labelled data for training, and such labelled data is expensive to generate.

Self-Supervised Learning and Transformers: A Game Changer?

Self-Supervised Learning

Self-supervised learning (SSL), a newer learning paradigm, has attracted significant attention from the AI research community. Its biggest advantage is its ability to learn from unlabelled data for gaining universal knowledge about language, speech or images when fed into pre-trained models.

For SSL to work effectively, first the system is pre-trained with a humongous volume of data. Such pre-training can involve one or more pre-training tasks. Since the pretraining is achieved with extremely large volumes of data, the model learns the universal language relationships for both information: syntactic and semantic.

When performing downstream tasks with these generalised models, these representations enable improved performance as they now require only a few instances of label data. In simpler terms, with the pre-training with large volumes of unlabelled data, the model learns fundamental common sense and basic knowledge. Now for specific tasks, these models require minimal labelled data to train.

While supervised learning has been a revolutionary step in the development of deep learning models over the last couple of decades, its drawbacks have pushed the research agenda towards developing alternate paradigms for learning. SSL is one such new learning paradigm. The biggest advantage of SSL is that it requires any human labelled data, and rather it can learn from humongous volumes of unlabelled data without any human supervision. The architecture that enables such learning was proposed by Vaswani et al. (2017) and has gained significant traction since then. Vaswani et al. (2017) named this architecture 'Transformers'. Since SSL is both data efficient and has the ability to generalise, it finds a variety of applications in the deep learning fields of NLP (Liu et al., 2020; Qiu et al., 2020), robotics (Liu et al., 2020), computer vision (Han et al., 2020; Khan et al., 2021) and speech (Baevski et al., 2020; Sivaraman & Kim, 2020).

SSL can be viewed as a hybrid of both supervised and unsupervised learning and some points of similarity and dissimilarity with both. As in unsupervised learning, SSL does not require labelled data. The primary objective of USL is to identify hidden patterns in the data, in contrast, the value of SSL is to identify and model meaningful relationships. In comparison to SL, SSL is similar to SL as they both require supervision and are different as SSL is able to generate labels without human involvement and while the goal of SL is to model a specific objective, SSL's aim is to train the model with a very large set of general knowledge. Thus, SSL uses the universal knowledge as background because of which downstream learning is possible with minimal training. Since the SSL models are trained on humongous amounts of freely available unlabelled data, such learning is more generalizable as compared to USL and SL which are useful for the specific objectives they were built for. As a result of these features, models such as GPT-1, BERT (Devlin et al., 2018), XLNet (Yang et al., 2020), Roberta, T5, ELECTRA, BART, ALBERT and PEGAUSUS have demonstrated encouraging success with learning using NLP and transferring this knowledge (also referred to as transfer knowledge) to downstream learning and models. Transformer-based architecture, a more recent development for deep learning, has made such pre-training of models with these humongous amounts of data possible.

Transformers

For many business applications, we can utilise deep-learning models that are pre-trained. This eliminates the intensive task of developing and training complex deep learning models. Rather we can use a model that is proven to be optimised and work well. This also eliminates the task of collecting and labelling

large amounts of data. This can conserve resources that can be deferred to other core aspects of the business application.

Typically, when we want to utilise deep learning models that are pre-trained, we need to find a model that is trained for our specific task. Besides this, a pre-trained model can be fine-tuned for our specific task. This still requires us to collect and label considerable data. In few-shot learning, we only need to provide a few example cases as input along with our query to the model. With this, the same model can be used for a variety of tasks without requiring any extra engineering. Extremely large transformer models have shown great success in few-shot learning. Transformers are able to perform few-shot learning by having extremely large number of parameters and training data. Since transformers can utilise parallel computing or hardware acceleration, they can achieve a scale large enough for few-shot learning that previous sequential models like long short-term memory (LSTM) could never achieve.

GPT-3 was one of the first popular and mainstream success for its breakthrough application with few-shot learning. GPT-3 can achieve few-shot learning due to its 175 billion trainable parameters being trained on 45TB of unlabelled text data collected partly from a data set of eight years of web crawling.

GPT-3 can be used for many breakthrough applications and produce astonishing results. There have been many applications that were built using GPT-3. For example, one application was a Figma plugin. In this, by just giving the text description of your desired application, a prototype can be generated within a matter of seconds. If one gave the description of an Instagram-like application, then the plugin will generate an appropriate prototype that is comparable to Instagram. Another application was a ReactJS application generator. In this, by giving the text description of a web app, the application would generate ReactJS code for it. When the text description of a to-do app was given to it, a code for the functioning of the to-do app was generated.

Transformers can enable businesses to use pre-trained models like GPT-3 to build many such breakthrough applications to complement their existing or create new products/services.

Transformer Network Architecture

Transformer networks contain a sequence encoder which takes the input sequence and encodes it to a sequence of vectors. The encoder of the transformer network uses a self-attention module which helps it decide which parts of the input are important. It is used to ignore the unrelated tokens for the given token in the sequence and focus on the related tokens. For example, in the sentence ‘The car is red’, the model might assign high attention to the token ‘red’ for the token ‘car’. For every token in the input sequence, an attention score is computed with respect to every other token in the sequence. This creates an attention matrix of size $N \times N$, where N is the sequence length. This attention matrix could be a memory bottleneck if the sequence length is large. The encoder also uses positional embeddings which helps the network (Figure 1).

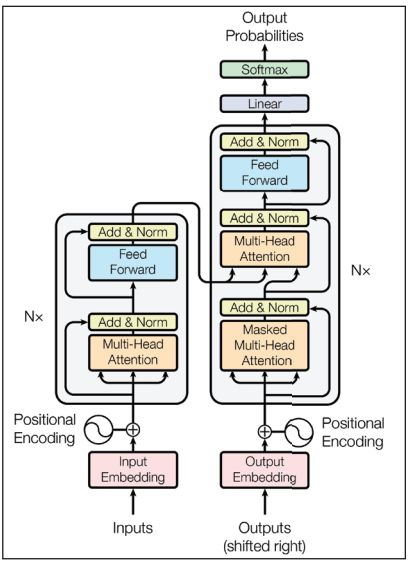

Figure 1. Architecture of the Transformer Network

Source: Vaswani et al. (2017).

Real-World Applications

Deep learning is widely used for several applications in various domains such as NLP, computer vision, video processing, audio processing, etc. There are several supervised and unsupervised deep learning techniques which are used in a wide variety of real-world applications. The supervised techniques require several labelled data points which are used to train a model. For example, to build an application to recognise objects present in an image, we would need several images with ground truth labels of the objects present. It is said that adding more training data usually gives us a higher prediction accuracy. That is not necessarily true, because the accuracy might start to saturate after a point. That is why it is beneficial to use models which are more scalable, such as the transformer network (Vaswani et al., 2017).

Transformer networks (Vaswani et al., 2017) were proposed for sequence-based tasks such as text processing. The authors proposed transformers for sequence-to-sequence applications and showed the efficacy of transformer networks on machine translation. The authors showed that transformer networks outperform other sequence processing techniques such as LSTM networks (Sundermeyer et al., 2012).

Transformer networks have been shown to be more scalable compared to LSTM networks, that is, they can generalise better on larger data sets. LSTM networks process each token of the sequence sequentially, whereas transformer networks process them in parallel; hence, they can better exploit hardware accelerators such as GPU or TPU as it allows parallel processing. Recent models like GPT-3 (Brown et al., 2020), which use transformer networks, are trained on several machines

connected through a network. For NLP applications, transformer networks can be first pre-trained for the task of next token prediction, where the network has to predict the next word in the sentence. This unsupervised pre-training is very useful because getting large amounts of labelled data is very expensive.

Unlike LSTM networks or CNNs, transformers do not make any prior assumptions about the input data, which helps them generalise better with large amounts of training data. Although models which do make assumptions about the structure of the data might perform better with smaller data sets.

Transformer Networks for Text-Based Applications

Transformer networks have been shown to be effective in several applications involving text data such as machine translation, question answering, named entity recognition, text summarisation, etc. In the application of machine translation, the model takes a sentence in language A and translates it to language B. This is usually done by training a sequence-to-sequence model on a parallel corpus having sentences of both language A and B. The application of the named entity recognition is to find named entities such as names of people, places, etc., in a sentence. This could be useful for analysing relationships between several entities from text data. Automatic question answering is very useful for chatbots, search engines and customer support. Here, the models take a query as input and select an appropriate response from a database of documents. The response is then re-worded to match the grammar according to the question. This uses a ranking model which ranks the responses by assigning similarity scores to all the responses from the database. Several models such as BERT (Devlin et al., 2018), ET (So et al., 2019) and transformer extra long (Transformer-XL) (Dai et al., 2019) have shown good performance for text-based applications.

Transformers can enable businesses to build highly accurate chatbots that are practically indiscernible from real human beings. They can also be used to summarise large texts accurately or make documents with legal jargon more comprehensible.

Transformer Networks for Computer Vision Applications

Transformer networks have shown good efficacy for image classification, object detection, semantic segmentation and image generation. Transformer networks can be used to replace the convolution operations in a convolutional neural network, or they can be used in conjunction with convolutional operations. The self-attention in transformer networks allows it to learn high-level information in the image. VIT (Dosovitskiy et al., 2020) splits the image into multiple patches and applies linear projection on each patch before passing it to the transformer module (Figure 2). The authors of VIT show that their method is superior to several CNN-based image classification models.

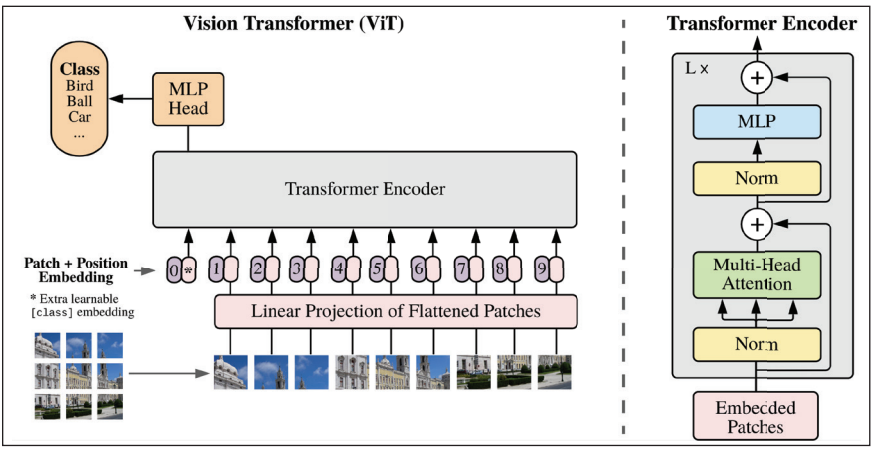

Figure 2. Architecture of the VIT Network

Source: Dosovitskiy et al. (2020).

DETR (Zhu et al., 2020) is a transformer-based end-to-end network to detect the classes and location of multiple objects in an image. VideoBERT (Sun et al., 2019) is a transformer-based model which learns a joint representation of text and videos, which can be used to generate captions from videos. The authors trained VideoBERT on data from YouTube. DALL-E (Ramesh et al., 2021) and CogView (Ding et al., 2021) are transformer-based models which are used to generate images by using a text description as input.

Using the idea of transfer learning, computer vision researchers trained large CNN models (He et al., 2016; Simonyan & Zisserman, 2014; Szegedy et al., 2016; Tan & Le, 2019) with the use of large data sets (e.g., ImageNet [Krizhevsky et al., 2012; Russakovsky et al., 2015]). Such models learn the common relationships from these images. Subsequently, these models pre-trained with large volumes of data are fine-tuned to downstream tasks with a very small data set specific to the task at hand (Kaur & Gandhi, 2019). Such models have demonstrated significant success in computer vision tasks (He et al., 2016; Ren et al., 2015).

Researchers from the area of NLP are optimistic with such pre-trained models and are increasingly combining the power of SSL and transformers in models such as GPT-3 (Brown et al., 2020), PANGU-(200B) (Zeng et al., 2021) and GShard (600B) (Lepikhin et al., 2020) which are trained using billions of parameters and use trillions of parameters for their switch-transformers (Fedus et al., 2021).

Transformer Networks for Audio Applications

Transformer networks have been used to encode audio signals for solving audio-based applications. Audio speech transformer (Dong et al., 2018) splits the audio

signals into chunks and applies a linear projection on each chunk to get a sequence of embeddings. The sequence is passed to a transformer network, which is then used to perform classification of audio clips. Streaming transformer (Moritz et al., 2020) is another transformer-based model which takes a chunk-wise stream of audio and performs real-time speech recognition. Music transformer (Huang et al., 2018) is a generative network which is used to generate music with long-term structure.

Audio chatbots can be built using transformers, which will be able to have normal human such as interactions and conversations. These bots can be used in place of human customer service agents and continue to provide comparable service.

Discussion and Conclusion

Supervised- and unsupervised-based learning models have found increasing use in the real-world applications. Such models have been found to be prone to and amplifying the biases that exist in the data sets used for training. Therefore, the decisions based on these models may end up being unintentionally biased. By using transformer-based pre-trained learning models, many of these biases are expected to reduce. A limitation of such transformer-based pre-trained models is that they are expensive to train. But with increasing processing power of computers, these costs are likely to come down.

Subsequent to the success with the transformer-based pre-trained learning models in the general domain of English, such architecture and learning is also being used in various other domains such as legal (Articles 32 and 33), programming (Ahmad et al., 2021; Feng et al., 2020; Guo et al., 2020; Lu et al., 2021; Phan et al., 2021), finance (Yang et al., 2020), news (Gururangan et al., 2020), networking (Louis, 2020), biomedical (Alsentzer et al., 2019; Gu et al., 2021; Lee et al., 2020; Peng et al., 2019, 2021), dialogue (Wu et al., 2020) and academics (Beltagy et al., 2019; Liu et al., 2021; Peng et al., 2021).

This article discusses several learning methods using transformer networks and provides their real-world business applications. Transformer networks show great potential due to their efficacy and scalability. While this article presents several transformer-based applications in the domains, such as text processing, image processing and audio processing, it has shown promising results in multiple domains such as legal, academics, finance and news. Further research in business applications of these models will help the business community adopt these for meaningful decision-making.

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Article

CEO Compensation and Cronyism in Emerging Economies: Evidence from India

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Abstract

This study investigates the cronyism evidence in Indian listed firms and examines if excessive CEO and directors compensation reflect pay reciprocity impacting firm performance. Further the impact of CEO's ties with the controlling owner on excess compensation, pay reciprocity and cronyism is also examined. OLS fixed effects regression on NSE 500 firms during 2002–2020 has been used for investigating the evidence of cronyism and the impact of CEOs' ties with the controlling owner on cronyism. Based on the analysis it is observed that CEO compensation is strongly linked to CEO characteristics and corporate governance in addition to economic determinants. Consistent with reciprocity norms, we report a positive relationship between excess CEO compensation and excess director compensation, especially in firms where the CEO has ties to the controlling owner. However, pay reciprocity does benefit shareholders by improving subsequent firm value. Our findings indicate that excess CEO compensation increases subsequent firm value, especially in firms where the CEO has ties to the controlling owner.

Keywords

CEO excess compensation, pay reciprocity, rent extraction, cronyism

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Introduction

Excessive compensation for CEOs is one of the most widely discussed and debated topics among academics and corporate analysts (Core et al., 1999). Not surprisingly, these high compensation packages have attracted intense scrutiny both by media and statutory bodies, resulting in mandatory disclosure requirements. The general purpose of the board of directors (non-chair and non-executive) is to advise and monitor the CEO, set CEO compensation, and protect shareholders' interests. However, in practice, the board may not effectively monitor the CEO's actions, particularly in firms where the CEO has ties to the controlling owner (hereafter, owner-CEO) and/or outside directors have friendly relations with the CEO. Further, CEOs have considerable influence over the board of directors as they have little incentive to perform. As a result of this, the board of directors tend to develop a culture that discourages constructive criticism and creates an informational asymmetry between management and the board. Such issues may result in pay reciprocity between CEOs and outside directors, as a well-paid board is less likely to monitor the CEO compensation (Chen et al., 2019). Further, excessive compensation resulting from pay reciprocity may lead to poor future firm performance, referred to as cronyism (Brick et al., 2006).

Cronyism, a mutually benefiting phenomenon linked to excessive compensation and inadequate monitoring, has been studied in Australia (Chalmers et al., 2006), New Zealand (Li & Roberts, 2017), Taiwan (Chung et al., 2015), United Kingdom (Chen et al., 2019) and United States (Brick et al., 2006). The findings have been similar across countries with a positive relationship between the CEO's excess compensation and outside directors' excess compensation, confirming pay reciprocity. Further, studies have found (Brick et al., 2006; Chalmers et al., 2006; Chen et al., 2019; Chung et al., 2015) consistent evidence that excessive compensation due to reciprocity is associated with poor future firm performance, with an exception of New Zealand where a negative relationship was observed only for companies where the CEO is a board member.

The common feature of large Indian firms are; concentrated controlling ownership (Moolchandani & Kar, 2021), business group affiliation (Ghemawat & Khanna, 1996; Tomar & Korla, 2011), and owner-CEOs (Jaiswall & Firth, 2009). The controlling owners are often involved in the firm's management as CEOs and directors. Owner-CEOs have considerable power in appointing outside directors on board (Ramaswamy et al., 2000), who, in turn, are responsible for setting the CEO's compensation. Indian firms often make mutually acceptable appointments, that is, direct interlocking directorates, by trading one 'outsider' for another (Ghemawat & Khanna, 1996). These family connections, friendship, and social connectedness mean that outside directors will be swayed by the notion of reciprocity and have incentives to support mutual pay increases if reciprocity dynamics contribute to increases in their own compensation. Prior studies on CEO compensation in India revealed a failure of corporate governance resulting from outside directors' unwillingness and inefficiency in determining CEO compensation at arms' length. These pieces of evidence point to a board culture where outside directors are rewarded for failing to meet their obligations to

minority shareholders. While anecdotal evidence suggests that outside directors' compensation is positively associated with CEO compensation in India (Ghemawat & Khanna, 1996), there is no empirical evidence on how owner-CEOs influence CEO and directors' pay reciprocity and, more importantly, how this pay reciprocity impacts subsequent firm performance, referred to as cronyism.

This study is a step further to the prior studies in the context of evidence of cronyism in an emerging market context with varying institutional and governance features. Indian context is ideal for examining the evidence of cronyism in an emerging market context due to its weak governance and distinct institutional environment. This study is divided into two parts. First, the relationship between excess CEO compensation and excess director compensation is analysed, particularly the impact of owner-CEO on CEO and directors' pay reciprocity. Second, the impact of excessive CEO compensation due to reciprocity on subsequent firm performance is examined. We also analyse the owner-CEO impact on the relationship between excess compensation and subsequent firm performance. A sample of 6,790 firm-year observations from 2002 to 2020 is used for the analysis. Data is collected from 2002 since compensation disclosure became mandatory after 2001, resulting in a broader sample representing Indian firms. Methodology proposed by Core and Guay (2010) is used to determine excess compensation and Brick et al.'s (2006) methodology to examine pay reciprocity and owner-CEO's impact on reciprocity. An improvised model of Chen et al.'s (2019) approach is adopted to examine Cronyism and owner-CEO's impact on cronyism to assess if excess CEO compensation reflecting pay reciprocity leads to rent extraction, referred to as cronyism.

Firstly, CEO compensation using CEO attributes, corporate governance variables, and economic determinants is modelled. The study's findings indicate that CEOs' attributes influence their compensation; that is, CEO compensation is higher when the CEO is chairman, has a long career, and has ties with the controlling owner. Further, ownership structure and board composition influence their compensation; that is, CEOs receive higher compensation where the majority shareholder owns a significant amount of stock, the boards are smaller in size, and more outside directors are on board. The results indicate that CEOs are paid less in risky firms and firms with a higher proportion of tangible assets, as these assets serve as a monitoring mechanism. The study's findings differ from previous Indian studies on CEO attributes' role and corporate governance on CEO compensation.

Secondly, the relationship between excess CEO and excess director compensation, referred to as pay reciprocity, as well as the impact of owner-CEO on pay reciprocity is examined. Results indicate that Indian CEOs command excess compensation, which is positively related to directors' excess compensation and vice-versa, indicating excessive managerial control and weak corporate governance. Further, it is observed that pay reciprocity strengthens in owner-CEO-managed firms, indicating that owner-CEOs can command excessive compensation and directors are unwilling to fulfil their obligations to minority shareholders.

Finally, to assess whether pay reciprocity is due to unobserved firm complexity or cronyism, the impact of excess CEO compensation due to reciprocity on subsequent firm performance is examined. The study's findings suggest that excess CEO compensation due to reciprocity positively impacts subsequent

market firm performance and negatively impacts accounting firm performance.; however, the accounting performance coefficient is weakly related. These results contrast with Brick et al.'s (2006) cronyism hypothesis. Further, it is observed that the impact of excess CEO compensation on firm performance strengthens in owner-CEO-managed firms indicating that controlling owners' interest is in building empires and leaving a legacy for their future generations.

Literature is limited in the context of evidence of cronyism in the emerging market context and this could possibly be one of the initial studies, specifically the impact of the owner-CEO on pay reciprocity and rent extraction in large Indian firms. Analysis reveals evidence of cronyism indicating that excessive CEO compensation in Indian companies does not harm minority shareholder interests. On the contrary, efficient contracting evidence is observed suggesting that excess compensation motivates managers to increase the firm value, as their wealth is linked to the firm as controlling owners. The study concludes that CEO compensation in India reflects efficient contracting due to their controlling ownership and their motivation for increasing long-term firm value rather than short-term performance.

This document is structured as follows: the second section of the article presents a literature review and development of hypotheses; the third section describes the research methodology, empirical model, and descriptive statistics; the fourth section details the empirical results and their interpretation; and the fifth section offers the conclusions and limitations of the research.

Literature Review and Hypotheses Development

This section provides a theoretical background on CEO compensation's level and structure, Indian institutional environment, pay reciprocity, and rent extraction, leading to hypotheses development.

CEO Compensation

Agency theorists have long believed that equity-based compensation structures align the executives' interests with shareholders (Jensen & Murphy, 1990). Equity-based compensation typically rewards managers when they successfully meet future firm performance criteria (Baysinger & Hoskisson, 1990). Several studies have found a positive link between compensation and firm performance, that is, CEO compensation is linked to stock returns in Australia (Chalmers et al., 2006), China (Kato & Long, 2006), Japan (Basu et al., 2007), United States (Mehran, 1995), and South Korea (Choi et al., 2019). In India, however, stock returns are rarely used as a measure of firm performance due to relatively low stock market liquidity, uncertain foreign money flows, and high stock volatility, resulting in limited use of equity-based compensation (Balasubramanian et al., 2010; Jaiswall & Raman, 2019). Instead, several studies (Ghosh, 2003; Parthasarathy et al., 2006; Raithatha & Komera, 2016) in India have observed a positive relationship between CEO compensation and firm performance using an accounting measure (return on assets).

Studies (Baker et al., 1988; Ciscel & Carroll, 1980; Jaiswall & Firth, 2009; Tomar & Korla, 2011) have documented that CEOs in large companies have more responsibilities and are accountable for a large hierarchy, and they are motivated to increase their corporate power, control, and perks by expanding their size, so they are paid more in large companies. Evidence suggests that large firms pay more regardless of the measures used, either total assets (Finkelstein & Hambrick, 1989) or sales revenue (Lambert et al., 1993). In the United States (Core et al., 1999), United Kingdom (Chen et al., 2019), and India (Jaiswall & Firth, 2009), among other countries, CEO compensation is based on the company's ability to expand. Although there is empirical evidence that growth opportunities are an important compensation metric, growth opportunities are frequently used as a control rather than a test variable in CEO compensation studies in the United States (Brockman et al., 2016; Grinstein & Hribar, 2004) and India (Jaiswall & Raman, 2019; Jaiswall et al., 2016). According to Core et al. (1999) and Cyert et al. (1997), the greater the market uncertainty, the greater the CEO risk, and the higher the CEO compensation in the US. In contrast, Jaiswall and Raman (2019) and Jaiswall et al. (2016) indicate that total CEO compensation is negatively related to a firm's risk, implying that risk-taking is discouraged in Indian businesses. Further, Himmelberg et al. (1999) argued that since tangible assets are easier to monitor, companies with more tangible assets can have lower agency costs.

Studies have also documented the role of CEOs' attributes on compensation level and structure. CEO duality is seen as a symbol of weak corporate governance, leading to excessive pay (Core et al., 1999). Ghosh (2006), Ramaswamy et al. (2000), and Tomar and Korla (2011) found a positive association between duality and CEO compensation in India, whereas Patnaik and Suar (2020) found a negative relationship, and Parthasarathy et al. (2006) did not find any. Longer Tenure increases CEO power, resulting in CEO entrenchment, which, in turn, positively influences their compensation (Chung & Pruitt, 1994; Dah & Frye, 2017). In India, CEOs with a longer tenure receive a higher compensation (Ghosh, 2006; Jaiswall et al., 2016). Bebchuk et al. (2011) and Choe et al. (2014) argued that owner-CEOs prefer compensation packages consisting mainly of cash than equity-based restricted stock. However, the empirical evidence on the compensation of the owner-CEO is mixed. McConaughy (2000) and Gomez-Mejia et al. (2003) found that, in the United States, owner-CEOs receive lower overall compensation and, in particular, incentive-based compensation than non-owner-CEOs. In contrast, according to Cohen and Lauterbach (2008), owner-CEOs in Israeli companies earn significantly more compensation (around 50%) than non-owner-CEOs. In Indian firms, Jaiswall et al. (2016) found that the owner-CEOs do not receive higher compensation. Ghosh (2006) argued that when the CEO has ties to the controlling owner, both CEO and board compensation increase simultaneously, implying that directors' compensation setting process is reciprocal. However, pay reciprocity, the impact of owner-CEO on pay reciprocity and rent extraction in Indian firms, is still unknown.

Several studies (Core et al., 1999; Mehran, 1995) have examined ownership structures' role in compensation and found that controlling and institutional shareholders closely monitor CEO compensation. However, the empirical evidence on

whether ownership structures play a significant role in CEO compensation in Indian companies is mixed. Ramaswamy et al. (2000) find a negative relationship between CEO compensation and controlling ownership, whereas Chakrabarti et al. (2008) find a positive relationship, and Patnaik and Suar (2020) and Jaiswall et al. (2016) find none. In addition, Jaiswall et al. (2016) find a positive relationship between CEO compensation and institutional shareholders in Indian firms; Patnaik and Suar (2020) find a negative relationship, and Parthasarathy et al. (2006) find no relationship. Further, while Ghosh (2010) and Patnaik and Suar (2020) find evidence of higher compensation in business group-affiliated firms, Ghosh (2006) does not.

Several studies have commented on boards' effectiveness, arguing that information asymmetry, lack of coordination among outside directors, and directors' inability to negotiate CEO compensation at arm's length results in increased CEO compensation because the divided board can not effectively monitor CEO compensation (Boyd, 1994; Core et al., 1999). However, empirical evidence on the boards' effectiveness is mixed. Ghosh (2006) and Jaiswall et al. (2016) find no relationship between CEO compensation and board size, whereas Chakrabarti et al. (2012) find a positive relationship. Furthermore, Ghosh (2006) finds a positive relationship between CEO compensation and the proportion of independent directors, while Tomar and Korla (2011) find a negative relationship, and Jaiswall et al. (2016) find no relationship. However, the role of board composition in the context of pay reciprocity and rent extraction in Indian companies is still unknown.

The Indian Institutional Environment

The Securities and Exchange Board of India (SEBI) was created in 1992 to monitor and regulate the securities market after the Indian government proposed a series of reforms in 1991 to gradually deregulate industries and open the economy to domestic and foreign private companies. Due to the opening of the economy, increased competition, and foreign capital, SEBI and the Indian government formed several committees to examine various corporate governance issues, and these committees outlined the importance of board composition, remuneration practices, separation of the chairman and CEO's offices, and restricting the directorship for an individual. However, studies have claimed that enforcement has been lax despite strict investor protection laws and corporate governance rules, and companies are seldom penalised for breaching governance standards.

The domination of business group-affiliated firms, that is, a group of companies controlled by a family-owned holding company through direct-shareholding, cross-shareholding pyramidal ownership structure, is a central feature of the Indian corporate sector (La Porta et al., 1999; Narayanswamy et al., 2012; Moolchandani & Kar, 2021). In business group firms, family members are frequently involved in management, resulting in owner-managers at the organisation's highest levels (Jackling & Johl, 2009). A business group affiliated firms' CEOs are either family members or family members' relatives. Unlike CEOs in the United States, Indian CEOs stay at companies for extended periods,

often serving as both CEO and chairman (Jaiswall & Raman, 2019). Though Indian business groups tunnel profit (Bertrand et al., 2002), they help their affiliated firms smooth the distress periods through the internal fund, enabling them to outperform standalone firms (Khanna & Palepu, 2000). Concentrated controlling ownership is a common characteristic of Indian businesses, with families usually owning a significant majority of their equity shares. Jaiswall et al. (2016) reported that controlling shareholders own 52% of a company's equity on average in three out of four Indian companies.

The CEO compensation is governed by Indian corporate law (see Narayana Murthy Committee on Corporate Governance 2003 recommendations), which gives the remuneration committee of a company's board of directors (consisting of at least three non-executive directors) the authority to set it. The law requires businesses to disclose CEO compensation in their annual report, but they are not obligated to report the compensation determination process's details. In Indian firms, the CEO's compensation is summarised under major groups: salary, retirement benefits, bonuses, stock options, pension. However, Just about 15% of the top 500 Indian companies give their CEOs stock options, and the grants are usually small (Balasubramanian et al., 2010).

Pay Reciprocity and Owner-CEO

According to Gouldner (1960), the reciprocity norm implies that acts would be reciprocated in kind. Previous studies indicate that outside directors named by the CEO are swayed by indebtedness (Hermalin & Weisbach, 2001) and reciprocity notions in their decisions regarding CEO compensation (Main et al., 1995). Indian companies are affiliated with business groups (Raithatha & Komera, 2016) with concentrated controlling shareholding (Ghosh, 2006) and employ owner-CEO (Jaiswall et al., 2016). Owner-CEOs have considerable influence over their outside directors (Boivie et al., 2015), which they might use to influence their compensation-setting process, thereby securing excess compensation. Despite being appointed from outside the company, outside directors tend to have ties to the CEO and controlling owners in India and are less likely to use their power to monitor CEO compensation (Ramaswamy et al., 2000). Hence, outside directors and CEOs have incentives to support mutual compensation increases if reciprocity dynamics increase their own compensation.

Indian companies have concentrated ownership which is often majorly controlled by firms' promoters, followed by institutional shareholders (Sarkar & Sarkar, 2000). Given immense wealth at stake, controlling owners would want to actively monitor and scrutinise management (Shleifer & Vishny, 1996); therefore, a CEO is appointed to that post primarily based on social connections and often has ties to the controlling owner. Similarly, outside directors are appointed by controlling owners. Although outside directors serve on the board, they are unlikely to monitor and control CEO compensation in the same way that outsider-dominated boards in the US and UK are known to do (Ramaswamy et al., 2000). We posit that outside directors being passive monitors are likely to support

reciprocal compensation increase in a firm with owner-CEO, that is, excessive compensation for both CEO and outside directors. On the contrary, outside directors are likely to reduce CEO compensation and align it to the firm performance in a professionally managed firm, thereby reducing reciprocal compensation. We have the following hypotheses for the pay reciprocity and owner-CEO:

H_1: There is no association between CEO excess compensation and directors excess compensation.

H_2: There is no impact of owner-CEO on the association between CEO excess compensation and directors excess compensation.

Rent Extraction and Owner-CEO

The excessive CEO compensation, primarily due to reciprocity, indicates that compensation negotiations are more of a formality than a mechanism for deciding compensation package that shows outside director efforts to shareholders and rewards for managerial talent. Core et al. (1999) argued that excess CEO compensation might be consistent with either rent extraction or labour market demand. CEO's excess compensation could mean higher equilibrium compensation for a talented CEO, reflecting efficient contracting (Core et al., 1999) or governance failure in compensation setting, reflecting rent extraction (Bebchuk et al., 2002; Core et al., 1999; Jaiswall & Firth, 2009). Li and Roberts (2017) argued that excess CEO compensation might encapsulate unobservable CEO efforts that are not obvious to outsiders, inducing more CEOs' efforts leading to higher subsequent firm performance; on the contrary, excess compensation might be a sign of a board culture conducive to CEO collusion, resulting in poor subsequent firm performance.

Owner-CEOs in Indian family-controlled firms receive excess compensation, which might be due to rent extraction or efficient contracting. Choi et al. (2019) suggested that excessive compensation for owner-CEOs is justified in family-controlled business group firms because they have strong incentives to generate profits and maintain the firm's financial well-being; they are also less likely to act against the company's interests and are more likely to see excessive compensation as a way to motivate them, demonstrating efficient contracting. On the contrary, Brick et al. (2006) indicate that CEOs puts self-interest ahead of controlling shareholder interests and their excess compensation result in suboptimal performance. Thus, we posit that owner-CEO excess compensation would demonstrate efficient contracting, and non-owner-CEOs excess compensation would demonstrate rent. We have the following hypotheses for the rent extraction and owner-CEO:

H_3: There is no association between excess CEO compensation and subsequent firm performance.

H_4: There is no impact of owner-CEO on the association between excess CEO compensation and subsequent firm performance.

Methodology

In this section, the sample selection, measurement of the variables, and the methodology adopted are discussed. Descriptive statistics are also presented in this section.

Sample Selection

The companies forming NSE 500 Index has been used for empirical analysis in this study. The NIFTY 500 Index represents about 96.1% of the free-float market capitalisation of the stocks listed on NSE, and the study period was from 2002 to 2020. To ensure homogeneity of data financial services companies have been excluded from the sample. Data on compensation, ownership structure, firm performance, and corporate governance was collected from the CMIE Prowess database in line with Balasubramanian et al. (2010); Khanna and Palepu (2000) and Jaiswall et al. (2016). The final sample included 6790 firm-year observations, consisting of 397 firms with an average of 17 years each, and the final data set was an unbalanced panel. All variables have been winsorised at 1% level to mitigate the likelihood of outliers.

Econometric Model

OLS regression with firm and year fixed effects is applied to examine the pay reciprocity among CEO and directors. Core and Guay (2010) defined excess compensation as compensation that CEOs can command after controlling: CEO ability, CEO effort, and risk premiums. Thus, to estimate CEO_Residual and Director_Residual, Equation (1) is used to regress CEO (Director) cash and total compensation on economic determinants, CEO attributes, and corporate governance variables while controlling for year and firm fixed effects. CEO_ Residual and Director_Residual is the prediction error in the dependent variable: the natural logarithm of total CEO and directors compensation, respectively.

$$\begin{aligned} \text{Lncomp}_{i,t} = {} & \text{ROA}_{t-1} + \text{Size}_{t-1} + \text{Beta}_{t-1} + \text{Tangibility} + \text{owner-CEO} + \\ & \text{Duality} + \text{CEO Tenure} + \text{Board\_size} + \text{Prop\_NED} + \\ & \text{Prop\_owner-executive} + \text{Majority\_holding} + \\ & \text{Institutional\_holding} + \text{BGA} + \text{Constant} + \\ & \text{firm and year fixed effects} \end{aligned} \quad (1)$$

To determine pay reciprocity (Hypothesis 1), in Equation (2), Director_Residual is used as an explanatory variable to look at the impact of outside directors' excess compensation on the logarithm of total CEO compensation. Further, CEO_ Residual is used to assess the CEO excess compensation's impact on the natural logarithm of total director compensation.

$$\begin{aligned}\text{Lncomp}_{i,t} = {} & \text{Residual}_{i,t} + \text{ROA}_{t-1} + \text{Size}_{t-1} + \text{Beta}_{t-1} + \text{Tangibility} + \\ & \text{owner-CEO} + \text{Duality} + \text{CEO Tenure} + \text{Board\_size} + \\ & \text{Prop\_NED} + \text{Prop\_owner-executive} + \text{Majority\_holding} + \\ & \text{Institutional\_holding} + \text{BGA} + \text{Constant} + \\ & \text{firm and year fixed effects} \end{aligned} \quad (2)$$

To investigate the owner-CEO impact on pay reciprocity (Hypothesis 2), in Equation (3), the interactions of Director_Residual and CEO_Residual with owner-CEO as an explanatory variable is included. Firstly, Director_ Residual*owner-CEO is used to examine the impact of excess director compensation on CEO compensation in owner-CEO-managed firms. Secondly, CEO_Residual*owner-CEO is included to examine the impact of excess CEO compensation on director compensation in owner-CEO-managed firms.

$$\begin{aligned}\text{Lncomp}_{i,t} = {} & \text{Residual}_{i,t} + \text{Residual}_{i,t}\text{*owner-CEO} + \text{ROA}_{t-1} + \text{Size}_{t-1} + \\ & \text{Beta}_{t-1} + \text{Tangibility} + \text{owner-CEO} + \text{Duality} + \\ & \text{CEO Tenure} + \text{Board\_size} + \text{Prop\_NED} + \\ & \text{Prop\_owner-executive} + \text{Majority\_holding} + \\ & \text{Institutional\_holding} + \text{BGA} + \text{Constant} + \\ & \text{firm and year fixed effects} \end{aligned} \quad (3)$$

To investigate the relationship between excessive CEO compensation due to reciprocity and subsequent firm performance, CEO_DUE_TO_DIR is calculated as the difference between fitted CEO compensation with outside directors' excess compensation and fitted CEO compensation without outside directors' excess compensation. To test Hypothesis (3), in Equation (4), the relationship between CEO excess compensation and subsequent firm performance is examined using $\text{CEO\_DUE\_TO\_DIR}_{t-1}$ as an explanatory variable. Further three firm performance measures are used as dependent variables: ROA, Tobin's Q, and TRS.

$$\begin{aligned}\text{Firm Performance}_{i,t} = {} & \text{CEO\_DUE\_TO\_DIR}_{t-1} + \text{owner-CEO}_{t-1} + \\ & \text{CPS}_{t-1} + \text{Growth}_{t-1} + \text{Beta}_{t-1} + \text{constant} + \\ & \text{Firm and year fixed effects} \end{aligned} \quad (4)$$

To investigate the impact of owner-CEO on the relationship between excessive CEO compensation due to reciprocity and subsequent firm performance (Hypothesis 4), in Equation (5), $\text{CEO\_DUE\_TO\_DIR}_{t-1}$*$\text{owner-CEO}_{t-1}$ is used as an explanatory variable. Further three firm performance measures are used as dependent variables: ROA, Tobin's Q, and TRS. The definition of the variables used in the study is presented in Table 1.

$$\begin{aligned}\text{Firm Performance}_{i,t} = {} & \text{CEO\_DUE\_TO\_DIR}_{t-1} + \text{CEO\_DUE\_TO\_} \\ & \text{DIR}_{t-1}\text{*owner-CEO}_{t-1} + \text{owner-CEO}_{t-1} + \\ & \text{CPS}_{t-1} + \text{Growth}_{t-1} + \text{Beta}_{t-1} + \text{constant} + \\ & \text{Firm and year fixed effects} \end{aligned} \quad (5)$$

Table 1. Definitions of Variables Used in the Study

Variable Name	Label	Description
Compensation variables		
CEO cash compensation	CEO_Cash	CEO cash compensation is the salary received by the CEO during the fiscal year.
Director cash compensation	DIR_Cash	Director cash compensation is the total salary received by all non-executive directors during the fiscal year.
CEO total compensation	CEO_Total	CEO total compensation includes salary, sitting fees, commissions, and other monetary and non-monetary benefits during the fiscal year (Jaiswall et al., 2016; Jaiswall & Raman, 2019).
Director total compensation	DIR_Total	Director total compensation includes salary, sitting fees, commissions, and other monetary and non-monetary benefits received by all non-executive directors during the fiscal year (Balasubramanian et al., 2010).
CEO pay slice	CPS	CPS is the ratio of CEO total compensation to board total compensation (Chen et al., 2019).
Residual CEO compensation	CEO_ Residual	Residual CEO compensation is the residual component in the natural logarithm of the total CEO compensation model (Column (2) in Table (3)) (Core et al., 1999).
Residual director compensation	Director_ Residual	Residual Director compensation is the residual component in the natural logarithm of the total directors' compensation model (Column (4) in Table (3)) (Core et al., 1999).
CEOs' excess compensation due to reciprocity	CEO_DUE_ TO_DIR	CEO_DUE_TO_DIR is the difference between fitted CEO compensation with outside directors excess compensation in the Table 4 Model (1) and fitted CEO compensation without outside directors excess compensation in Table 3 Model (2) (Brick et al., 2006).
Firm performance		
Return on assets	ROA	ROA is earnings before interest, taxes, depreciation, and amortisation (EBITA) divided by total assets (Raithatha & Komera, 2016).
Tobin's Q	Tobin's Q	Tobin's Q is the ratio of the end-of-the-year firm's market capitalisation to total assets (Raithatha & Komera, 2016).
Total returns to shareholders	TRS	TRS is total returns to shareholders measured using Alpha, representing the company's annual stock performance relative to the market.
CEO attributes		
Owner-CEO	Owner-CEO	Owner-CEO is a dummy that equals one if the CEO has ties to the controlling family or promoters (Jaiswall et al., 2016).
CEO duality	Duality	Duality is a dummy variable that equals one if the CEO is also the chairman; zero otherwise (Ghosh, 2006).
CEO tenure	Tenure	Tenure is the number of days since a CEO assumed office, which is calculated at the end of the fiscal year (Jaiswall & Raman, 2019).

(Table 1 continued)

(Table 1 continued)

Variable Name	Label	Description
Economic determinants		
Asset tangibility	Tangibility	Asset Tangibility is the ratio of tangible assets (i.e., plant, property, and equipment) to total assets (Himmelberg et al., 1999).
Firm risk	Beta	Beta is an indicator variable that indicates the volatility of a company's stock compared to the market as a whole (Tomar & Korla, 2011).
Total assets	Size	Size is the natural logarithm of total assets (Joe et al., 2000; Khanna & Palepu, 2000).
Sales	Growth	Growth is the natural logarithm of total sales (Angelis & Grinstein, 2015; Patnaik & Suar, 2020).
Corporate governance variables		
Majority holding	Majority_ holding	Majority holding is the percentage of a firm's common stock held by the controlling shareholders, i.e., promoters, at the end of a fiscal year (Khanna & Palepu, 2000).
Institutional holding	Institutional_ holding	Institutional holding is the percentage of a firm's common stock held by non-promoter financial institutions at the end of a fiscal year (Khanna & Palepu, 2000).
Board size	Board_Size	Board size is the number of executive and non-executive directors (Ghosh, 2006).
Business group affiliation	BGA	BGA is an indicator variable having the value of one if a firm is a business group affiliate; zero otherwise (Ghosh, 2006).
The proportion of Outside directors	Prop_NED	Prop_NED is the ratio of non-executive directors to the board size (Jaiswall et al., 2016).
The proportion of Owner-executives	Prop_Owner-executive	Prop_Owner-executive is the ratio of owner directors on board to the total board size (Ramaswamy et al., 2000). Owner directors are those who have ties to the controlling owner or promoter.

Source: The authors.

Descriptive Statistics

Table 2 presents the descriptive statistics for main explanatory variables, CEO and outside director compensation. CEOs received an average of 32.6 million INR in cash compensation and 39 million INR in total compensation across the sample period. Outside directors received cash compensation of 32.9 million INR and total compensation of 29.2 million INR on average. The CEO's relative importance is measured by the percentage of total compensation paid to all board members that the CEO receives. On an average, CEOs receive at least 42% of the total compensation paid to all board members.

It is observed that the sample firms have an average return on assets of 8.2%, Tobin's Q of 2.06 times, Alpha of 0.232%, and Asset Tangibility of 28.4% for economic determinants. Further, sample firms have an average net sale of 63.7 billion INR and total assets of 91.7 billion INR. The sample firms' ownership structure has an average majority holding of 50.7% and an institutional holding of

Table 2. Descriptive Statistics

Variable	Obs	Mean	*SD*	Min.	Max.
CEO_Cash	6,765	32.6	59.1	1	1,200
CEO_Total	6,790	39.0	76.6	12	1,700
Dir_Cash	4,761	32.9	85.8	1	1,800
Dir_Total	6,643	29.2	92.9	800	2,000
CPS	6,778	.426	.248	0	1
Owner-CEO	7,744	.562	.496	0	1
Duality	7,700	.336	.472	0	1
Tenure	7,571	2733.384	2396.578	3	18,594
Economic determinants					
ROA	7,710	.082	.084	−1.057	1.509
TRS	7,710	.232	.404	−1.58	3.22
Tobin's Q	6,755	2.064	2.615	.003	69.618
Net Sales	7,710	63757.17	202,000	−61	3,890,000
Total assets	7,710	91728.04	303,000	1.3	9,690,000
Tangibility	7,710	.284	.173	0	.934
Corporate governance					
Majority_holding	7,710	50.718	23.385	0	100
Institutional_holding	7,710	18.489	14.354	0	79.33
BGA	7,744	.57	.495	0	1
Board_size	7,152	9.216	3.68	1	23
NED	6,529	6.139	2.526	1	18
Owner-executive	4,934	2.54	1.449	1	11
Board busyness	7,744	3.889	2.806	0	14

Source: The authors.
Notes: Table 2 presents summary statistics for the main input variables.
Table 1 contains the definitions of the variables used in the study.

18.4%. It may also be noted that 57% of the sample firms are affiliated with a family-controlled business group. In terms of board composition, it is found that sample firms have nine board members, six of whom are non-executive directors; additionally, three board members have ties to the controlling family on average. Four out of six outside directors are busy directors in the sample firms, meaning they have three other directorships on average (Sarkar & Sarkar, 2009).

Empirical Results

Determinants of CEO and Outside Directors Compensation

Table 3 reports the OLS regression estimates on CEO and outside director compensation. In addition to reporting CEO cash and total compensation results, results for the outside directors' cash and total compensation is also reported. CEO (Director) compensation is modelled in line with Core and Guay (2010), including firm and year fixed effects, by controlling efforts, ability, and risk premium proxies. Table 3 presents the estimated results in Columns (1) through (4).

Table 3. CEO and Director Compensation

	(1)	(2)	(3)	(4)
	CEO_Cash	CEO_Total	Dir_Cash	Dir_Total
ROA_{t-1}	1.777***	1.834***	1.654***	1.336***
	(0.232)	(0.231)	(0.291)	(0.284)
$Size_{t-1}$	0.345***	0.351***	0.459***	0.508***
	(0.039)	(0.039)	(0.052)	(0.049)
$Beta_{t-1}$	0.027	0.013	0.217***	0.138**
	(0.050)	(0.049)	(0.062)	(0.062)
Tangibility	–0.569***	–0.474***	–1.189***	–0.413**
	(0.139)	(0.138)	(0.174)	(0.171)
Owner-CEO	0.214***	0.164***	0.210***	0.342***
	(0.041)	(0.041)	(0.047)	(0.049)
Duality	0.397***	0.381***	–0.133***	–0.117***
	(0.035)	(0.035)	(0.040)	(0.043)
Tenure	0.000***	0.000***	0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Institutional_holding	0.004**	0.005**	0.004*	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
Majority_holding	0.004**	0.002	0.001	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)
BGA	–0.173	–0.578*	–0.638*	–0.240
	(0.323)	(0.322)	(0.382)	(0.375)
Board_size	–0.031***	–0.025***	0.037***	0.081***
	(0.006)	(0.006)	(0.007)	(0.007)
Prop_NED	0.599***	0.487***	0.337***	0.378***
	(0.090)	(0.090)	(0.123)	(0.129)
Prop_Owner-executive	–0.193	–0.164	0.340*	0.692***
	(0.121)	(0.120)	(0.180)	(0.178)
Constant	6.752***	7.162***	2.357**	–0.327
	(0.883)	(0.878)	(1.184)	(1.104)
Firm effects	YES	YES	YES	YES
Time effects	YES	YES	YES	YES
Observations	5,487	5,505	4,000	5,453
R-squared	0.765	0.759	0.809	0.808

Source: The authors.

Notes: Table 3 reports the CEO and outside director compensation regressions result using an OLS regression with year and firm fixed effects. The models are estimated using the natural log in CEO cash and total compensation and the natural log in director cash and total compensation.

Table 1 contains the definitions of the variables used in the study. Standard errors are in parenthesis. ***$p < .01$, **$p < .05$, *$p < .1$.

Consistent with prior studies, it is observed that CEO's total compensation is positively related to ROA, size, duality, owner-CEO, tenure, institutional holding, the proportion of non-executive directors, and negatively related to asset tangibility, business group affiliation, board size, and the proportion of owner-executives on board. However, CEO compensation is not associated with firm risk and majority holding, and the proportion of owner-executives on the board. Further, it is observed that outside directors' total compensation is positively

associated with ROA, firm size, firm risk, owner-CEO, institutional holding, majority holding, board size, the proportion of non-executive directors on the board, and the proportion of owner-executives on the board whereas negatively associated with asset tangibility and CEO duality, which is consistent with prior research. However, there was no significant association of directors compensation with CEO tenure and business group affiliation.

Consistent with Raithatha and Komera (2016), the coefficients of ROA are positive and significant for CEO (Director) compensation implying a pay-performance link in managerial compensation contracts. Firm size is positively associated with CEO (Director) compensation, suggesting that larger firms demand higher quality executives and pay for such quality (Chung & Pruitt, 1996; Cyert et al., 2002; Jaiswall et al., 2016). Firm risk is positively associated CEO (Director) compensation, in contrast to Jaiswall and Firth (2009). However, the relationship is only significant for directors' compensation, implying an incentive for the outside director to assume additional risk. The asset tangibility is negatively related to CEO (Director) compensation, implying that businesses with more tangible assets will have lower agency costs as tangible assets act as a monitoring mechanism and are easier to track (Himmelberg et al., 1999).

Further, the coefficients of three variables of the CEO's attributes, namely owner-CEO, CEO duality, and tenure are reported in Table 3. The owner-CEO and the CEO's tenure positively impact CEO (director) compensation, implying a strong bond between the CEO and the outside directors due to a long-term relationship and a weak governance environment. However, the coefficient of a CEO's tenure is not significant for directors' total compensation. Consistent with Tomar and Korla (2011), it is observed that CEO duality is positively associated with their compensation but negatively associated with director's compensation (Saravanan et al., 2016) implying that dual CEOs are more likely to be entrenched and have more influence over the board, decreasing the effectiveness of directors' monitoring. However, the results contrast with Parthasarathy et al. (2006) and Jaiswall et al. (2016), who did not find any relationship between duality and compensation.

Table 3 also reports the coefficients for three ownership variables and three board composition variables. The majority and institutional holdings have a positive impact on CEO (Director) compensation; however, the relationship is not significant in Models (2) and (3). The study's findings contradict Jaiswall et al. (2016) and Jaiswall and Firth (2009), who found no link between majority ownership and CEO compensation. Consistent with Ghosh (2006), it is observed that business-group affiliated firms limit CEO (director) compensation. Board size coefficients are negatively associated with CEO compensation and positively associated with directors compensation implying monitoring efficiency of board members in limiting CEO compensation. The findings contradict those of Chakrabarti et al. (2012), who found a positive relationship between CEO compensation and board size. The proportion of non-executive directors is positively associated with CEO (director) compensation; however, Tomar and Korla (2011) find a negative relationship; Jaiswall et al. (2016) found no link; Ghosh (2006) found a positive link, which is consistent with our findings. Finally, the proportion of owner-executives is negatively associated with CEO compensation and positively associated with director's compensation,

suggesting that when they are not the firm's CEO, owner-executives are overpaid. However, the coefficients are not significant for CEO compensation.

Pay Reciprocity

OLS fixed effects estimator regression results on CEO and director pay reciprocity are presented in Table 4. The reciprocity between CEO and outside director compensation is examined by including Director_Residual and CEO_Residual as additional explanatory variables in Models (1) and (3). To examine the impact of owner-CEO on pay reciprocity, interaction terms Director_Residual*owner-CEO and CEO_Residual*owner-CEO in Models (2) and (4) are included. Table 4 summarises the findings on CEO and director pay reciprocity and owner-CEO's impact on pay reciprocity.

In Table 4, the estimated coefficients on Director_Residual (0.190, t–statistic 0.012) and CEO_Residual (0.272, t–statistic 0.017) are found to be significantly positive; therefore, Hypothesis 1 is rejected, implying pay reciprocity in CEO and outside directors compensation. These results are consistent with the findings of Brick et al. (2006), Chen et al. (2019) and Li and Roberts (2017). In Table 4 Model (1), the coefficient of Director_Residual is (0.190, t–statistic 0.012), that can be interpreted as elasticity because both compensation variables are in logarithmic form, that is, a 10% increase in Director_Residual is associated with a 19.03% increase in CEO total compensation. Similarly, the CEO_Residual coefficient (0.272, t–statistic 0.017) indicates that a 10% increase in CEO_Residual is associated with a 27.2% increase in directors' total compensation. In terms of economic significance, a 10% rise in outside directors' excess compensation will lead to an increase in CEO total compensation of approximately 7.42 million INR on average, based on the average compensation levels presented in Table 2. Similarly, a 10% rise in CEO excess compensation will increase total compensation for outside directors by approximately 7.94 million INR on average.

Owner-CEOs' impact on pay reciprocity between CEOs and directors is also investigated, because 56% of CEOs in sample firms have ties to the controlling owner. To determine the owner-CEO impact on pay reciprocity, the models estimated in Columns (2) and (4) include interaction terms, Director_Residual*Owner-CEO, and CEO_Residual*Owner-CEO, respectively. The coefficients for Director_Residual*Owner-CEO (0.198, t–statistic 0.024) and CEO_Residual*Owner-CEO (0.216, t–statistic 0.036) indicate pay reciprocity in owner-CEO-managed firms, implying that pay reciprocity among CEO and outside directors strengthens in firms where CEOs have ties to the controlling owner. Therefore, Hypothesis 2 is rejected.

Rent Extraction

Berry et al. (2006) argued that CEO and directors' pay reciprocity could exist if the firm has a large hierarchy and complex operations, which requires both CEO and directors' skill and efforts. However, for the cronyism hypothesis to be true, excess

Table 4. CEO and Director Pay Reciprocity

	(1)	(2)	(3)	(4)
	CEO_Total	CEO_Total	Dir_Total	Dir_Total
Director_Residual	**0.190*** **	**0.085*** **		
	(0.012)	(0.017)		
CEO_Residual			**0.272*** **	**0.143*** **
			(0.017)	(0.027)
Director_Residual* Owner-CEO		**0.198*** **		
		(0.024)		
CEO_Residual *Owner-CEO				**0.216*** **
				(0.036)
Owner-CEO	0.165***	0.168***	0.389***	0.395***
	(0.040)	(0.040)	(0.048)	(0.048)
ROA_{t-1}	1.814***	1.786***	1.338***	1.303***
	(0.233)	(0.232)	(0.279)	(0.278)
$Size_{t-1}$	0.382***	0.401***	0.457***	0.463***
	(0.040)	(0.040)	(0.048)	(0.048)
$Beta_{t-1}$	–0.005	0.018	0.143**	0.129**
	(0.051)	(0.050)	(0.061)	(0.061)
Tangibility	–0.510***	–0.550***	–0.317*	–0.349**
	(0.143)	(0.142)	(0.171)	(0.170)
Duality	0.405***	0.397***	–0.098**	–0.104**
	(0.035)	(0.035)	(0.042)	(0.042)
Tenure	0.000***	0.000***	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Institutional_holding	0.005**	0.006***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Majority_holding	0.003	0.002	0.004**	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
BGA	–0.583*	–0.546*	–0.071	–0.054
	(0.314)	(0.312)	(0.376)	(0.375)
Board_size	–0.018***	–0.018***	0.068***	0.066***
	(0.006)	(0.006)	(0.007)	(0.007)
Prop_NED	0.617***	0.671***	0.421***	0.464***
	(0.108)	(0.108)	(0.129)	(0.129)
Prop_Owner-executive	–0.091	–0.086	0.408**	0.418**
	(0.150)	(0.149)	(0.179)	(0.178)
Constant	6.302***	5.861***	0.914	0.833
	(0.910)	(0.906)	(1.088)	(1.085)
Firm effects	YES	YES	YES	YES
Time effects	YES	YES	YES	YES
Observation	5,215	5,215	5,215	5,215
R-squared	0.762	0.765	0.825	0.827

Source: The authors.

Notes: Table 4 provides regression results on CEO and outside directors' pay reciprocity and owner-CEO's impact on pay reciprocity after controlling for standard determinants. The estimations use an OLS regression with year and firm fixed effects.

Table 1 contains the definitions of the variables used in the study. Standard errors are in parenthesis. ***$p < .01$, **$p < .05$, *$p < .1$.

CEO compensation due to reciprocity must result in poor subsequent firm performance (Brick et al., 2006). This section investigates whether excess CEO compensation due to reciprocity results in subsequent poor firm performance, referred to as cronyism. The relationship between excess CEO compensation due to reciprocity (CEO_DUE_TO_DIR) and one-year ahead ROA, one-year ahead Tobin's Q, and one-year ahead TRS is also examined using an improved version of Chen et al.'s (2019) model. The interaction term, CEO_DUE_TO_DIR*Owner-CEO, to measure owner-CEO's impact on the relationship between excess CEO compensation and subsequent firm performance is examined. Tables 5 summarises the evidence of cronyism in sample firms. All the models include firm and year fixed effects.

In Table 5, CPS, owner-CEO, firm growth, and firm risk are controlled. CPS, owner-CEO, growth, and firm risk positively influence firms' ROA; however, the relationship is only significant for owner-CEO and firms' growth. Further, CPS, owner-CEO, and Growth positively influence both market performance measures, whereas beta negatively influences both. However, the relationship is only significant for firms' growth and risk. In Columns (2) and (3) of Table 5, the firm risk is negatively related to future firm performance, implying that a firm's stock volatility will result in a firm's lower subsequent market performance. Owner-CEO and CPS's coefficients indicate that CEOs' ties to the controlling owner and their pay slice positively influence accounting performance whereas negatively influence market performance.

In Table 5, Columns (1)–(3) reports the coefficient of CEO_DUE_TO_DIR, that is negatively related to ROA, positively related to Tobin's Q and TRS; however, the relationship is not significant for TRS. Therefore, Hypothesis 3 is rejected, implying that excessive CEO compensation leads to poor accounting firm performance but improved market performance. The study findings are in contrast to Chen et al. (2019), who found a negative relationship between industry-adjusted Tobin's Q and CEO excess compensation due to directors in the UK.

Further, the impact of owner-CEO on the relationship between CEO excess compensation and subsequent firm performance is examined because most CEOs in sample firms have ties to the controlling owner. Interaction variable, CEO DUE TO DIR*Owner-CEO, is used to examine owner-CEO's impact on the relationship between CEO excess compensation and subsequent firm performance. In Table 5, the CEO DUE TO DIR*Owner-CEO coefficients in Columns (4)–(6) show a significant positive relationship between ROA, Tobin's Q, and TRS. Therefore, Hypothesis 4 is rejected, implying that the excess CEO compensation due to reciprocity will correspond to better performance in the future for owner-CEO-managed companies. In Column (4), the interaction variable's coefficient is significantly positive, indicating excess CEO compensation due to reciprocity results in improved accounting performance of owner-CEO-managed companies; however, economic significance is minuscule. Similarly, coefficients in Models (5) and (6) indicate that, in owner-CEO-managed companies, a 1% increase in excess CEO compensation due to reciprocity results in increased market performance, that is, 0.0084 times in Tobin's Q and 0.0014% above the market return, respectively.

Table 5. CEO Rent Extraction

	(1)	(2)	(3)	(4)	(5)	(6)
	ROA	Tobin's Q	TRS	ROA	Tobin's Q	TRS
CEO_DUE_TO_DIR $_{t-1}$	**–0.008****	**0.436*****	0.017	–0.017***	–0.019	–0.131***
	(0.004)	(0.102)	(0.028)	(0.006)	(0.149)	(0.041)
CEO_DUE_TO_DIR $_{t-1}$ *Owner-CEO $_{t-1}$				**0.019****	**0.861*****	**0.280*****
				(0.008)	(0.206)	(0.057)
CPS $_{t-1}$	0.002	–0.022	–0.001	0.001	–0.063	–0.014
	(0.004)	(0.101)	(0.028)	(0.004)	(0.101)	(0.028)
Owner-CEO $_{t-1}$	0.006**	–0.024	–0.020	0.006**	–0.017	–0.017
	(0.002)	(0.064)	(0.018)	(0.002)	(0.064)	(0.018)
Growth $_{t-1}$	0.019***	0.412***	0.093***	0.019***	0.419***	0.096***
	(0.002)	(0.051)	(0.014)	(0.002)	(0.051)	(0.014)
Beta $_{t-1}$	0.002	–0.186***	–0.193***	0.002	–0.174**	–0.189***
	(0.003)	(0.068)	(0.019)	(0.003)	(0.068)	(0.019)
Constant	–0.312***	–4.163***	–1.549***	–0.315***	–4.321***	–1.602***
	(0.043)	(1.152)	(0.318)	(0.043)	(1.151)	(0.318)
Firm effects	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES
Observations	5,207	5,207	5,157	5,207	5,207	5,157
R-squared	0.630	0.724	0.423	0.631	0.725	0.426

Source: The authors.

Notes: Table 5, in Models (1)–(3), reports the impact of excess CEO compensation due to pay reciprocity on subsequent firm performance after controlling for other standard determinants, and, in Models (4)–(6), reports the impact of Owner-CEO on the relationship between excess CEO compensation due to pay reciprocity on subsequent firm performance after controlling for other standard determinants. The estimations use an OLS regression with year and firm fixed effects.

Table 1 contains the definitions of the variables used in the study. Standard errors are in parenthesis. ***$p < .01$, **$p < .05$, *$p < .1$.

Conclusion

This study tests the validity of the cronyism hypothesis in an emerging market context using a sample of listed Indian firms. It is believed that CEOs' and directors' excess compensation due to reciprocity harms shareholder value. Further, the impact of CEOs' ties with controlling owners on cronyism is also examined. Unlike prior studies, which suffer from omitted variable bias, small sample, and limited generalisability, CEO compensation is modelled using a 19 years sample period and employing Core and Guay's (2010) theoretical framework and methodology. It is observed that economic determinants, CEO attributes, and corporate governance variables are significant drivers of CEO and director compensation in India. The study's findings indicate that CEOs receive higher

compensation in firms where the CEO is also chairman of the board, has a longer tenure, and ties to the controlling owner. Further, CEOs are paid more in companies with a high level of controlling ownership, small board of directors, and a large number of outside directors.

Since most Indian firms are closely held, the CEOs have ties to the controlling owner and have an essential role in outside directors' appointments; owner-CEOs are more likely to be entrenched and command excess compensation. The study presents that the owner-CEOs receive higher compensation in Indian firms, but their presence in the company and their excess compensation due to reciprocity do not result in poor subsequent firm performance. Therefore, it can be indicated that there is no consistent and robust evidence favouring the cronyism hypothesis in India. This study is conducted in two parts. Firstly, the study provides evidence of CEO and directors' pay reciprocity, especially in firms with owner-CEO. Our findings show a positive relationship between CEO and outside director excess compensation, with owner-CEOs commanding higher compensation due to pay reciprocity. Secondly, to prove the cronyism hypothesis, the relationship between excess CEO compensation due to reciprocity and subsequent firm performance is also examined. In contrast with Brick et al. (2006), Chen et al. (2019), and Li and Roberts (2017), excess CEO compensation is assessed based on reciprocity norms, increases a firm's accounting and market-based performance, especially in firms with owner-CEOs. The findings suggest that excess CEO compensation due to reciprocity does not decrease future performance but instead increases firm value.

The study adds to the CEO compensation and corporate governance literature in an emerging market context. However, there are a few limitations to this study. Firstly, data from a single country is used to investigate the evidence of cronyism in emerging economies. Despite the fact that owner-CEOs are a common occurrence in emerging economies, ownership structures in these economies differ significantly from country to country, and as a result, the findings may not be generalisable to other governance environments in emerging market contexts. Secondly, CEOs' influence by their ties to the controlling owner is examined; while the findings are consistent with other emerging economies, CEOs' influence may vary depending on a firm's affiliation with a business group and the majority shareholder's concentration. Future studies could include business group affiliation and majority shareholder concentration to understand better the owner-CEOs' influence on their compensation level and subsequent firm performance. Finally, this sample only includes large publicly traded companies; the findings for smaller companies can vary.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Appendix A. The correlation coefficients for the main explanatory variables and dependent variables. The correlations are relatively low, with the most significant being 0.328 between CEO total compensation and institutional holding, indicating no multicollinearity problem

Variables	CEO_ Cash	CEO_ Total	Dir_Cash	Dir_Total	ROA	Tobin's Q	TRS
CEO_Cash	1						
CEO_total	0.979***	1					
Dir_cash	0.555***	0.556***	1				
Dir_Total	0.490***	0.508***	0.981***	1			
ROA	0.119***	0.125***	0.040***	0.091***	1		
Tobin's Q	0.211***	0.220***	0.061***	0.111***	0.370***	1	
TRS	0.076***	0.071***	–0.049***	0.033***	0.268***	0.243***	1
Size	0.257***	0.277***	0.426***	0.407***	–0.097***	–0.107***	–0.123***
Beta	0.137***	0.142***	0.196***	0.159***	–0.170***	–0.221***	0.038***
Tangibility	0.007	–0.004	–0.029**	–0.019	–0.113***	–0.177***	0.021*
Owner-CEO	0.103***	0.074***	0.017	–0.012	–0.030***	–0.057***	0.084***
Duality	0.021*	0.013	–0.044***	–0.051***	–0.054***	–0.060***	0
Tenure	0.251***	0.237***	0.158***	0.138***	–0.020*	0.002	0.131***
Institutional_ holding	0.303***	0.328***	0.330***	0.358***	0.071***	0.042***	0.050***
Majority_ holding	–0.069***	–0.066***	–0.124***	–0.040***	0.065***	0.148***	0.145***
BGA	0.325***	0.331***	0.289***	0.276***	–0.061***	–0.058***	0
Board_size	0.224***	0.239***	0.287***	0.302***	0.002	–0.037***	0.009
Prop_NED	0.246***	0.257***	0.195***	0.175***	0.022*	0.072***	0.031***
Prop_Owner-executive	–0.033***	–0.060***	–0.069***	–0.078***	–0.033***	–0.095***	0.055***

Source: The authors.

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Article

Evolving Trends in Scholarly Publishing and Impact on the Monotony of Predators

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Abstract

Open access (OA) journals have emerged in the past two decades and have influenced scholarly publications to a great extent, contributing to the benefits of OA publishing. The research focuses on the evolving trends of OA and the measures required to address the issue of exponentially growing predatory publishing. The study concludes the research by proposing measures for the scholarly world to address predatory publishing globally. The scope of the research is qualitative, discussing the fair publishing practices and implications of Plan S and open peer review. In the methodology, the study reviews the wealth of published literature in the discipline to decide the variables and impact on the dependent variable.

Keywords

Open access, predatory publishing, junk science, publication ethics, Plan S, open peer review

Introduction

The landscape for OA publishing has been steadily developing for the past two decades. The open science revolution began in 1989, with the launch of the first open access (OA) journal, Psycologuy and now PubMed is listed with 30,000 OA journals. OA publishing has changed the dimensions of scholarly publishing.

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The publishing landscape has expanded from the research published in traditional subscription models to OA publishing models. Academics opt to publish in OA journals and pay high article processing charges (APCs) to achieve higher visibility and a wider dissemination of available research. Plan S is the major contributor to the open science movement in the 21st century, aiming to promote open science publishing. cOAlition S introduced Plan S in 2018 with an objective to make research content available immediately and fully OA. Plan S consists of 10 principles and a single objective that all academic publications which are result from funded research by public or private grants from any national, regional, research councils or funding bodies are openly available (cOAlition S, 2021). The legitimacy of OA publishing is supported by creative common policies, author-accepted manuscript policies, re-print servers and the recent development of open peer review. The evolution of open science significantly impacts academic publishing. According to Carl Malamud, 'Open should be a default, not the exception'. Leading publishers are also supporting the dissemination of knowledge without subscription firewalls and offering various OA publishing models. The Gold OA model is where the author pays APCs for freely accessible publications; the Hybrid OA model is where the author can publish funded open research in traditional subscription journals. Platinum OA is another model where an institute funds publication and authors are not required to pay any APCs. Over and above the OA publishing models, the Plan S movement for disseminating the knowledge in an open environment has culminated in transformative agreements between institutes and publishers for article fees so that authors do not pay any direct payment to the publisher for publishing an article with OA (Van Noorden, 2020). Transformative deals offer read and publish or publish and read models. Several institutes from Austria, Canada, China, Colombia, Czech Republic, Finland, Germany, Ireland, Luxembourg, the Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the USA have signed the transformative agreement in the last two years with the objective of supporting the OA movement (Transformative Agreements, 2020)

The rise of OA publishing is grappling with the challenges of predatory journals. The word 'predatory' is a disgrace to the research scientists in publishing. The predatory publishers prey on researchers for commercial benefits, mostly in Gold OA publishing models where the author is expected to pay APCs for publication. The quality of research is compromised as predatory publishers do not follow the desired standards of quality publishing. The impact of Jeffrey Beall's 2009 work is highly valued for its identification of predatory OA journals and publishers. He was the first to coin the term 'predatory' and release the blacklists. Jeffrey Beall coined the term 'predatory publishing' in 2008 (Koerber et al., 2020). Predatory publishing is a persistent challenge for the rise of OA publishing. Predatory open access (POA) journals follow unethical practices to trap scholars by sending spam emails, fake metrics, fake editorial boards and exploiting academics' identities, etc.

Along with the appreciation, Jeffrey Beall faced many controversies for his work on blacklisted journals and publishers. The list is maintained by an

anonymous scholar and is available in open source. More recently, Cabells has released *Whitelists and Blacklists*, available on a subscription basis for accessing their scholarly analytics (Koerber et al., 2020).

OA was instituted as a publishing model to beat the high costs of subscription journals. The study claims that more than 50,000 articles are published in POA journals across many disciplines (Xia, 2019).

While there is a tremendous focus on improving the research quality in OA, it is constantly challenged by exponentially growing predatory content that is published in open science. In OA publishing models, APC in hybrid OA models is most susceptible to predatory publishing.

The scope of the article covers the evolving landscape, research integrity for publishing ethics, best practices in academic publishing and has an enormous focus on peer review. The research also focused on author motivation behind the exponential growth of predatory articles, junk science created from predatory published content and the importance of blacklists and whitelists.

Literature Review

Journals perform an essential role in recording research activity, and OA journals offer wider dissemination and visibility of the content without firewalls. Institutes follow a performance-based review system. Therefore, publishing in peer-reviewed and prestigious journals is mandatory for researchers' career growth. The role of commercial publishers is providing legitimate infrastructure for publishing, developing and broader dissemination of research. With the emergence of OA publishing, the major challenge with which the scholarly world is grappling is POA publishing.

OA publishing provides a platform for researchers to publish content without a firewall, which is unlike traditional journals where content is behind a firewall (Govindarajan & Dhanavandan, 2019). Research published in OA journals is freely available, whereas libraries are required to pay to access studies published in traditional journals. OA publishing has been growing for the past two decades (Rodrigues et al., 2020). Considering the numerous benefits of publishing research in an open environment and making research widely available, OA is the first choice of scholars (Perlin et al., 2018). While there are several benefits of publishing research through OA, the challenges are also steadily increasing. The major threat to an OA publishing model is the spike in predatory publications (Cortegiani et al., 2019). The research shall examine the published research to address POA publications and the factors contributing to the consistent growth of POA.

POA journals follow fraudulent publishing practices, claim to be legitimate and charge APC for publishing. POA journals do not follow required peer-review procedures and do not offer editorial services, etc. The word 'predatory' was first coined by Jeffrey Beall in 2008 and was followed by the release of the list for blacklisted publishers and journals. The reality is that the most discussed challenge of predatory publishing in academic publishing remained without an appropriate

definition (Krawczyk & Kulczycki, 2021). Research by Krawczyk and Kulczycki acknowledges the definition of the term 'predatory' in publishing by Grudniewicz et al. (2019). It also states that the definition fails to mention OA. Another paper by Krawczyk and Kulczycki (2021) defined predatory journals that exploit the Gold OA model, wherein the author pays APCs for publishing. Variations in the definitions published are needed considering the evolving scope of OA academic publishing and changing habits of predatory publishers to prey on researchers.

The organised review of the related literature focuses on the factors that influence the evolving trends in scholarly publishing to control the monotony of predators in the academic world. The following questions are evaluated for the study:

1. What is the research integrity in publishing, and would it help to reduce exponentially growing predatory publishing?
2. What are the evolving trends in scholarly publishing and the impact of the same in controlling predatory publishing?
3. What are the reasons for author motivation to increasingly supplement content to predatory journals?
4. Does junk science have a potential impact on research science and are there measures to address the problem?

Authors have reviewed the enormous content published in research articles, reports and case studies relating to evolving trends in scholarly publishing and the monotony of predators from the period 2017–2021. In collating the literature, the following three independent variables were examined:

1. Research integrity in publishing
2. Author motivation
3. Junk science

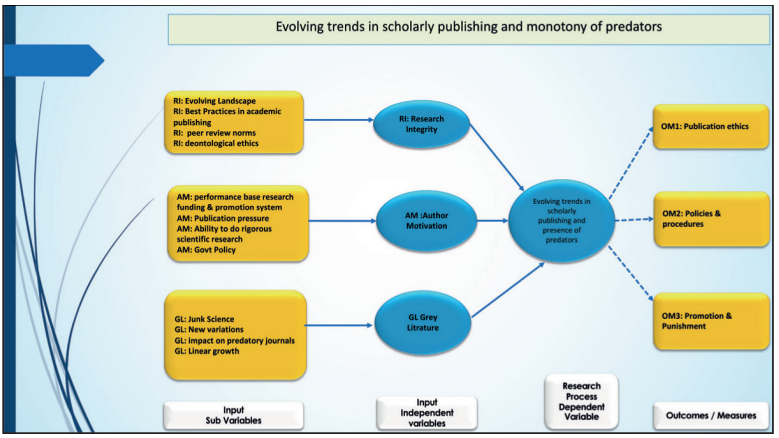
Methodology and Framework

In the research framework, the three key independent variables are recognised for the impact of evolving trends in scholarly publishing on the monotony of predators. The study is the summary of the literature reviews mostly published between 2017 and 2021.

Research problems, key objectives, outcomes and gaps are mapped from the literature review of the published content during the designated period. It is worth noting that the research gaps from previous research addressed in the latest research are overruled in this study.

Referring to the research composition of independent and dependent variables, the study identified the research gaps and scope for future research to address predatory publishing and measures for eradicating it from academic publishing.

Research Framework



Discussion, Outcomes, Proposition and Relationship

Research Integrity

Research integrity in publishing is most desirable for the quality outcome of scholarly research. Ethics and integrity in research publications have always been a topic of discussion in the publishing industry (Wright, 2016). Researchers, journal editors, reviewers, publishers and the scholarly community contribute enormously to ensure that research published in journals upholds optimum quality. The contributions in the directive have been outstanding, starting from the Committee on Publication Ethics, Retraction Watch, plagiarism check software, best publishing practices, peer-review policies, and open peer review. Academic literature on research integrity and misconduct increased exponentially. On the global scale, funding and consortium have been allocated for more research on the topic of research integrity (Bonn & Pinxten, 2019).

Open peer review is a recent development to ensure transparency in the peer-review process. Open peer review is regarded as a measure to uphold a high level of transparency and high standard of research quality (Krawczyk & Kulczycki, 2021). Publishers have supported the idea of open peer review from the scholarly community and have offered open peer-review models to numerous journals. Despite all the measures to ensure ethical and high-quality research, exponentially growing predatory OA publishing is posing a threat to research science.

The Plan S movement evolved transformative agreements from the past two years with ‘publish and read’ versus ‘read and publish’ models to promote open science. The move is also expected to impact the increased scope of predatory publishing in the future (Borrego et al., 2021).

Another research emphasis on deontological ethics indicates that the author chooses between right or wrong. It implies that the author has an obvious choice to select between predatory or non-predatory journals (Koerber et al., 2020).

Research suggests, when issuing an advisory notice, that predatory publishing has the capacity to complicate research evaluation and, therefore, effective allocation of research funding would be considerably impacted in many corners of the world. Developing countries aiming to embark on a technological catch-up trajectory need to take these intricacies more seriously than ever.

According to Cabell's reports, there were 13,000 predatory journals published in 2020 (Linacre, 2021). Another research study claims that predatory journals published 53,000 articles in 2010, while the number reached an estimated 420,000 articles in 2014, yielding a growth rate of 70% over a period of four years (Xia, 2019). Predatory publishing is an outcome of unethical practices and a lack of integrity in the publication of research. The aim of predatory publishers is purely commercial. Predatory publishing is the biggest threat to research integrity and research science in publishing.

The literature reviews on the subject indicate that research integrity in publishing is a mandatory requirement for disseminating quality content in the scientific world. Published literature emphasised the following factors that are critical in achieving quality output:

1. Best practices in academic publishing
2. Evolving landscape
3. Deontological ethics
4. Peer-review norms

Outcomes. The most important outcome of research integrity is consistently evolving standards of publication ethics. The landscape continues to grow for ethics and integrity in research. Best practices in academic publishing play the role of a fence for filtering the quality research. There has been enough emphasis on robust peer-review practices involving defined peer-review policies. In peer review, a minimum of two independent blind reviews are considered as ideal practice for research review. Best practice involves robust peer review; plagiarism checks; an online manuscript submission system for transparency in manuscript flow and peer-review practices; global standard content editing style; journal registration with cross-referencing and a DOI assignment for each article; and, last but not the least, the online hosting of the content. The Committee on Publication Ethics has set the standards for the publishing industry and are recommended for referral for ethical guidelines in research integrity. Deontological ethics is highly recommended for the quality output and most desired contribution to research science. In publishing practices, robust peer reviews are stressed mostly for quality publication in every sphere belonging to scholarly publishing. It is recommended to have a definite peer-review policy and mention the same in the submission guidelines and journal web page.

Proposition 1. Research integrity is supported by best practices in academic publishing, the evolving landscape and deontological ethics, and peer-review norms have had a significant relationship with predatory OA publishing, which has resulted in the outcome of research ethics.

Author Motivation

Author motivation is boosted from a system wherein the quantity is preferred over the quality of research publication. Predatory journals have grown by 61.60% since Beall's list was introduced from the period of 2012–2016. Articles published in predatory journals yielded a growth rate of 70% over a period of four years, indicating that there is sufficient demand and supply of articles for publishing in predatory journals. Research by Xia included an economic analysis of predatory journal publishing to focus on the demand and supply relationship in a predatory publishing context. The demand for publications has shown a steady increase over the years, with an increase of about 69% from 1996 to 2014. The total number of journals published increased by 106.47%, from 40,000 to 100,000, from 1996 to 2016.

According to the research, scholars from developing countries mostly publish in POA journals (Frandsen, 2017). However, another study states that authors from developed countries like USA are also potentially publishing in POA journals in tourism and hospitality (Alrawadieh, 2020). Other research has indicated that POA publishers and authors publishing in POA journals are not only confined to developing countries (Erfanmanesh & Pourhossein, 2017).

According to Dr Erfan, the POA market was worth USD 74 billion in 2014 (Erfanmanesh & Pourhossein, 2017). The main revenue source is the research funding received by the scholars from the institutes. Publication in the academic world is considered as a contribution to science and motivates scholars to publish scientific research. The correlation of funding with research has also led to a flare-up in publications in the previous decades. 'Publish or perish' reflects the outlook of the institutes for the performance-based research funding and promotion system. The pressure of publication is unquestionably immense on the researchers for career progression, reward and recognition (Grimes et al., n.d.).

Research focuses on probable factors influencing scholars to publish in predatory OA journals. Peer pressure, tenure and promotion systems in the institutes add stress in the research community to raise the profile of their publications. The research investigates the challenges faced by Asian and European researchers in publishing their research papers (Eykens et al., 2019). The hypothesis is further supported by other research conducted in the area (Yeoh et al., 2017). Another study investigates the hypothesis that not only young scholars are prey in the POA publications. Senior scholars are also presumed to be publishing in POA journals (Erfanmanesh & Pourhossein, 2017).

Research also reveals that developing countries contribute to the highest volume of research in POA journal growth. This trend has been led by India, followed by Iran, and then by developed countries, such as USA and Japan. POA journals are a global threat, irrespective of where they are spread across disciplines and geography (Perlin et al., 2018). Research states that the scholars who struggle to get published in quality journals during their career progression probably become the predators of predatory journals (Mills & Inouye, 2021). The rejection in the peer-review stage also encourages newer authors to choose a journal with limited peer review or no peer review. There is enough evidence that the

contribution of developing countries to POA journals has potential that cannot be ignored (Erfanmanesh & Pourhossein, 2017).

The literature review indicates that author motivation is the key factor for the exponential growth in publishing and is responsible for disseminating low-quality content to the scholarly world. Published literature emphasised the following factors leading to author motivation:

1. Performance-based research funding and promotion system
2. Publication pressure
3. Ability to do rigorous scientific research
4. Government policy

Outcomes. Performance-based research funding and promotion systems developed a 'publish or perish' culture to motivate authors to focus on research publication. The economy's growth is correlated with sound research and government focus on education research, and funding the research is entirely viable. It has been suggested that the focus of the institutes is to be more about achieving quality over quantity, with the intention of creating measures for supporting scholars to produce quality research. Publishing pressure is encountered by academics in countries where the main indicator for measuring performance is the number of published research studies. The institutes should also focus on generating whitelists for scholars, as 17% of the scholars became the predators for publishing in predatory journals due to 'unawareness'. It is important to specify a quick turnaround in the context of author motivation. While highly indexed journals take a long time to publish because of their existing extensive backlog, scholars are attracted to journals that require a quick turnaround time for publication. The research concludes that universities and institutions should work on a performance-based funding system and a performance-based promotion system. The research revisits the policies for research funding and promotions in the system. It is emphasised that institutions and policymakers should take enough measures to adjust the policies to support scholars to conduct sound scientific research. Institutes suggested having resources available for scholars' continuing awareness and education of the predatory publishers. Universities and institutes should issue the whitelists and blacklists, and regular campaigns should be initiated by universities so that scholars can escape the trap of predatory publishers. Research suggests that a country that publishes too many papers in predatory OA journals leads to poor research standards from that country. It is important that institutes recognise that the requirement to amend the policies for supporting scholars to conduct sound research for the quality outcome is of paramount importance in the present age.

Proposition 2: Author motivation that is supported by a performance-based research funding and promotion system, publication pressure, the ability to do rigorous scientific research and government policy has a significant relationship with predatory OA publishing, which resulted in the outcome of the review of policies and procedures.

Grey Literature

The evolution of junk science and its hazardous impact on research science is considerable. It is concerning that predatory publications are available in an open environment for reference and citation. A country publishing high volumes of junk science has a low quality of research (Alrawadieh, 2020). Another study discusses the threat of junk science to scientific research in general (Cortegiani et al., 2019). Another study found that articles published in 2013 in 124 different journals were cited 1,295 times from 2013 to 2016. The citing authors tend to be inexperienced authors from Africa, Southeast Asia, South Asia and, to a lesser extent, experienced authors from the rest of the world (Frandsen, 2017). The study also supports that the papers published in POA journals may not necessarily be of poor quality, and thus citing them may not even be a problem of quality (Frandsen, 2017).

The literature review indicates that grey literature threatens the integrity of research science. The key factors contributing to the growth of predatory content are:

1. Junk science
2. New variations
3. Impact of predatory journals
4. Linear growth

Junk science is prevailing because grey literature is available to openly harm the integrity of research. Predators continue to prey on researchers, and the outcome is the exponential growth of grey literature. Jeffrey Beall reported 4,000 predatory journals in 2012 (Erfanmanesh & Pourhossein, 2017). According to Shen and Bjork, the number grew to 11,000 predatory journals in 2015. Other research further studies the behaviour of predatory open-access authors listed in blacklists (Cortegiani et al., 2019). POA journals follow fake publishing practices, claim to be legitimate and charge APC for publishing. POA journals do not follow required peer-review ethical practices. They do not offer necessary editorial services, carry fake locations, mistakes are often found on their websites, they carry journal titles of global impact, publicise fake or less-reputed impact factors, send spam emails and exploit academic identities. The main aim of predatory OA journals is to collect APC from scholars and publish articles without implying required peer-review and editorial practices. POA publishers prey on the scholars by sending fake emails, offer them the opportunity to be the editor of the journal and introduce a fake editorial board. Beall and Cabell's lists represent the primary data source for reference lists for predatory publishers and journals (Eykens et al., 2019). Beall's list was taken off the website in 2017 for unknown reasons and is now maintained by an anonymous scholar (Strinzel et al., 2019).

The growth of predatory publishing can be observed by the rapidly increasing numbers of published articles, from 53,000 in 2010 to approximately 420,000 articles in 2014. According to the current scope of the OA revolution by Plan S, transformative agreements culminated in new business models; 'publish and read' versus 'read and publish' models are expected to control the issue of predatory

publishers. However, the impact of Plan S on exponentially growing predatory articles is yet to be observed (Borrego et al., 2021).

Outcomes. The impact of grey literature and junk science is not unexpected. The prevailing junk science in the open system is like a chronic disease that would continue to spread if not controlled. Scholars continue to cite the content available openly without checking the legitimacy of the research. There is a recommendation to have a promotion or punishment system for publishing a research basis that reflects the quality of the journal. The promotion system is to be the outcome of publishing quality research, not having references to junk science. Provisions for punishment policies need to consider the deontological ethics of individuals taking full responsibility for good and bad research (Koerber et al., 2020).

Proposition 3: Grey literature is supported by junk science, new variations in predatory practices, the impact of predatory journals and linear growth and has a significant relationship with predatory OA publishing, which resulted in the outcome of the review of the policies and procedures of institutes.

Critical Relationships Among the Three Variables

The three independent variables are significantly connected, and the dependencies can be specified as follows:

1. Research integrity in publishing is an area of foremost importance. Research integrity is the pedagogy of scientific research in publishing and sets the standards for the scholarly world to publish vital research. Authors motivated to publish more are expected to be controlled by high research integrity practices. Grey literature is expected to be controlled with the implementation of the evolving landscape and an enhanced scope of research integrity. Research integrity is negatively correlated with author motivation and grey literature.
2. The author motivation variable is the culmination of publication pressure and institution expectation to publish more. Author motivation to publish is dependent on following research integrity for publication. Applying research integrity practices in the research and publication process places the focus on stronger research instead of publishing more. Another independent variable, grey literature, is related to author motivation because grey literature is the culmination of an author's motivation for lack of research rigour and the aim of publishing quantity over quality.
3. Grey literature is the result of the author's motivation to publish quantity over quality. There is a linear relationship between both variables. Author motivation to incessantly publish for promotion and reward has formed grey literature. The independent variable, research integrity, is adversely correlated with grey literature because it aims to control the publication of low-quality or predatory research.

Conclusion and Implications

Predatory OA publishing persists in open science and continues to become a global topic. Publishing pressure arises from policies for promotions and reward systems supported by governments and institutions, which motivate scholars to publish more. Pressure is such that few scholars choose to publish in predatory journals. The research-based promotion and funding system requires a review of policies and a shifting focus from 'more publications' to 'rigorous research' (Eykens et al., 2019). Junk science is the culmination of predatory content. It is alarming to have junk content in the open space. There should be more emphasis on the awareness of junk content (Alrawadieh, 2020). Evolving trends in the OA space continue to strengthen the publishing model. Publication ethics following standards set by the Committee on Publication Ethics is a must for each journal. The focus on robust peer review continues to be the key parameter for assessing the research. Open peer review is a recent development and a measure to uphold a high level of transparency and high research quality standards (Krawczyk & Kulczycki, 2021). The Plan S movement progressed transformative agreements with the 'publish and read' versus 'read and publish' models (Borrego et al., 2021). The movement is also expected to impact the increased scope of predatory business, as it will leave no scope for APCs directly from authors. Plan S acceptance continues to grow in developed countries. Governments from developing countries are required to embrace Plan S to control the practices of predators.

Implications for Business Research

The study is qualitative and focuses on evolving scholarly publishing trends and the monotony of predators. The research studies the wealth of literature published in advancing academic publishing and predatory practices to understand the factors that would better control prevailing predatory publishers, rising in conjunction with OA publishing. The predatory research creates massive damage to the country's economy. The government provides research grants to institutes, and institutes further fund scholars for the research. Researchers pay author processing charges from a research grant, and in the case of predatory publishing, the funding generates revenue for predators and a loss to the country's reputation and economy.

The conceptual framework was developed to identify the research gaps and factors that would help control the publishing of predatory content. Research gaps were identified from the abundance of literature reviews for the scope of future studies. The study recommends that institutes and governments focus on reviewing current policies for research funding and promotion systems. Governments and institutes adopting Plan S movement in OA publishing and open peer review will limit the scope for predators and poor-quality research publication. The study could serve as a reference for institutes aiming to review the research funding and promotion system for improvisation in policies to produce sound research science.

Limitations and Scope for Future Research

Research is limited to secondary data and is reliant on the published research in the area. The research focus is limited to the study of industry dynamics and the measures to control predatory publishing. While the study recommends that institutes and governments review policies surrounding promotion and rewards systems, no survey was conducted to find out the perspective of institutes or governments.

The study focuses on three independent variables. Several other independent variables found during the research can also be studied to control predatory publishing, for example, whitelists and blacklists, predatory publishing in regional languages, etc.

Declaration of Conflicting Interests

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Article

Examining Strategy Improvements in Hospitals: Linking Trade-Offs to Performance Frontiers

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Abstract

The notion of trade-offs has long been recognized by operations management scholars as a necessary constraint to operations strategy. The increasing importance of this concept is reflected in numerous scholarly works, all seeking an understanding on how firms compete with their limited set of resources. A large majority of the past studies have primarily focused on the empirical validation of trade-offs mainly in manufacturing, with few that have visualized trade-offs as a result of performance frontiers in service sectors. In this article, using longitudinal data, we test and validate trade-offs in a public healthcare service-based setting through a performance frontier lens. Our analyses show that better performing hospitals on the basis of quality and cost-efficiency are those that are closer to their performance frontiers and exhibit a cost trade-off. Those that are situated further away demonstrate a trend for quality and cost improvements. However, despite the positions on the frontier, quality always seemed to be the prerequisite dimension for all hospitals. We believe this reaffirms the logic surrounding the sand cone model, albeit in old industry not known for quality.

Keywords

Improvements, hospitals, longitudinal data, trade-offs, performance frontiers

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Introduction

The notion of trade-offs is central to the founding works of manufacturing strategy (Skinner, 1969) and continues to intrigue scholars (Egbunike et al., 2018; Wurzer & Reiner, 2018). The traditional view of manufacturing strategy asserts that firms seeking superior performance would have to prioritize their competitive objectives and resources (Boyer & Lewis, 2002). That is, focusing on a narrow set of objectives over a broader set objectives in a technically constrained operating environment was seen as a more lasting improvement (Da Silveira & Slack, 2001; Skinner, 1974). Skinner argues that firms cannot excel at everything and that trade-off choices had to be made.

Much of the research dedicated to this argument has been focused on the empirical validation of this concept. For instance, several studies have examined trade-offs among competitive priorities cost-efficiency, quality, delivery and flexibility in various manufacturing settings (Boyer & Lewis, 2002; Filippini, 1997; Qamar et al., 2019; Safizadeh et al., 2000; Vargas-Berrones et al., 2019). Whilst there was some support for the trade-off argument, it still was not convincing for some researchers. For example, Schonberger (1986) questioned the merit of trade-offs on the basis of the successes of the Japanese firms that were able to perform well in many areas simultaneously. This view was supported by authors such as Collins and Schmenner (1993), Corbett and Van Wassenhove (1993) and Hill (1988). A more recent view has been that trade-offs are not only real but dynamic as well (Skinner, 1992), and it could also be contingent on a company's approach to the development of performance dimensions (Ferdows & De Meyer, 1990; Slack, 1991). The unification and resolution of the two views has culminated into the integrated model based on the theory of performance frontiers. The theory proposes that resource trade-offs are more likely for companies moving towards their asset frontiers (Schmenner & Swink, 1998; Vastag, 2000).

The research presented in this article, therefore, examines whether firm's position relative to their performance frontiers really does result in trade-offs and whether a slight movement away from the frontiers signal simultaneous improvements. This article examines trade-offs between cost-efficiency and quality dimensions of public hospitals based on their performance frontiers. The next sections outline the evolving views on trade-offs followed by a set of hypotheses. We then describe our data and analysis and conclude with results and some implications for future research.

Relevant Literature

There are three prominent streams of literature surrounding trade-offs. Trade-offs were first discussed and explored in the early 1870s and 1880s, following Skinner's (1969) seminal works whereby trade-offs were viewed as constraints to competitiveness. Skinner posited that firms needed to make choices and set priorities based on their manufacturing structure and infrastructure (Hayes &

Schmenner, 1978). Superior performance and competitive advantage meant that firms would have to lower their performance in another by giving up one or two priorities, for example, lowering unit cost and improving levels of quality at the expense of delivery and reliability. This view of appropriately positioning competitive objectives, and consequently designing a suitable manufacturing system, was also supported by Miller (1983), Hayes and Wheelwright (1984) and Banks and Wheelwright (1979). Constraints influenced manufacturing decisions requiring firms to choose and be good at one or two objectives at any point in time.

The second stream of literature came about in the late 1880s and early 1890s and questioned the notion of trade-offs. Hall and Nakane (1990), Hall (1987), Jaikumar (1986) and Womack et al. (1990) refuted the notion of trade-offs, following the successes of Japanese manufacturers who demonstrated that by focusing on quality as a prerequisite, improvements on all other dimensions were possible. Schonberger (1986), the leading representative of the World Class Manufacturing School, advocated that it was possible for companies to improve in multiple areas simultaneously, suggesting that trade-offs do not exist. He asserted that companies can continuously improve their competitive dimensions and not trade them off against each other. Authors such as Hill (1988) and Corbett and Van Wassenhove (1993). Ferdows and De Meyer (1990) lend further support to this view through their sand cone model, an analogy they use to describe cumulative capabilities. That is, for firms to be competitive, a sequence in which competitive objectives should be achieved needs to be followed. This sequence required that quality be the prerequisite dimension; and once a desirable base of quality has been established, only then can firms proceed onto building dimensions delivery, flexibility and cost (Ehie & Schoenherr, 2020; Rosenzweig & Easton, 2010).

By the late 1990s, the consensus was that trade-offs are real but they are also dynamic (Skinner, 1992)—contingent on a company's approach to development of its competitive dimensions (Ferdows & De Meyer, 1990), that certain trade-offs could be overcome in the long run (Slack, 1991), with changes in manufacturing technologies and methods (Clark, 1996; New, 1992) and enhanced operations capabilities and repositioning (Hayes & Pisano, 1994, 1996). These arguments resulted in a series of conceptual and empirical papers seeking to validate trade-offs in various manufacturing settings such as Noble (1995), Mapes et al. (1997), Da Silveira and Slack (2001), Boyer and Lewis (2002) and Fynes et al. (2005). Table 1 provides a list of various exemplar studies to date that have attempted to empirically validate the operations strategy models.

There have been mixed results from these studies with some supporting trade-offs, insinuating that trade-offs were contingent on manufacturing and organizational aspects, while others supported improvements along multiple dimensions with quality as the base. In addition, given that trade-offs were originally proposed from a traditional manufacturing setting, majority studies done to date on this area have been done on manufacturing. Service-based studies remain scarce and include that of Lapré and Scudder (2004), Talluri et al. (2013) and Ashwini Nand et al. (2013) pertaining to a transportation context. The inconclusive results led to a third stream of literature which sought for a reconciliation between the two debates: trade-offs versus accumulation via the integrated model.

Table 1. Summary on Exemplar Studies Supporting Operations Strategy Models

Operations Strategy Model Supported	Authors
Trade-off model	Mapes et al. (1997); Safizadeh et al. (2000); Pagell et al. (2000); Da Silveira and Slack (2001); Boyer and Lewis (2002); Squire et al. (2006); Kim and Park (2013); Sarmiento et al. (2018); Qamar et al. (2019); Vargas-Berrones et al. (2019); Hutton and Eldridge (2019)
Cumulative capabilities (including sand cone model)	Ferdows and De Meyer (1990); Roth and Miller (1992); Noble (1995); Morita and Flynn (1997); Corbett and Whybark (2001); Corbett and Clay Claridge (2002); Flynn and Flynn (2004); Größler and Grübner (2006); Rosenzweig and Easton (2010); Avella et al. (2011); Sum et al. (2012); Bortolotti et al. (2015); Boon-Itt and Wong (2016); Tamayo-Torres et al. (2017); Scarpin and Brito (2018); Ehie and Schoenherr (2020)
Integrated model (theory of performance frontiers)	Lapré and Scudder (2004)*; Swink et al. (2006); Ashwini Nand et al. (2013)*; Talluri et al. (2013)*; Cai and Yang (2014)

Source: The authors.
Note: * Marks the few studies that have been predominantly situated in a service setting.

By the early 21st century, there was general agreement that improvements along multiple dimensions were possible, however trade-offs could not be entirely eliminated, hence leading to the integrated model grounded on Schmenner and Swink (1998) and Vastag's (2000) theory of performance frontiers. Schmenner and Swink describe a performance frontier "by the maximum performance that can be achieved by a manufacturing unit given a set of operating choices" (p. 108). The frontier is, therefore, made up of an asset frontier (structural) which reflects the investments undertaken by the company and an operating frontier (infrastructural) which reflects the actions possible, given a set of available assets. The location of a firm on the performance frontier explained the likelihood of trade-offs and accumulation occurring. For instance, firms that are closer to their asset frontiers would more likely experience trade-offs, while those further away would experience improvements. The operating frontier, however, could potentially change or move in an outward direction of the performance space, given improvement and betterment initiatives (Amoako-Gyampah & Meredith, 2007). This last stream has received some attention by scholars Lapré and Scudder (2004), Swink et al. (2006), Ashwini Nand et al. (2013) and Cai and Yang (2014) who have explored whether trade-offs are present from the perspective of the theory of performance frontiers. In one way, or another, these papers studied associations of trade-offs to asset frontiers.

Despite these recent developments, there is still an unclear understanding as to how frontiers work and how improvements occur, particularly in service industries, as they move along various points on the frontier (Wurzer & Reiner, 2018). Whether capabilities in service industries develop differently to that of a manufacturing setting demands research attention. Based on this uncertainty and following on from Lapre and Scudder's (2004) works, we examine how the emergency departments (EDs) of public hospitals in Australia are linked to the performance frontier. Similar to Lapre and Scudder's study, we also develop measures for cost-efficiency and quality and calculate a performance frontier, in particular suited to a healthcare setting. Based on these measures, we test whether improvements are evident among these two dimensions. We also examine if location close to or away from the performance frontier impacts their quality–cost-efficiency trade-off.

Therefore, based on Schmenner and Swink's (1998) theory of performance frontiers and leveraging off the ideas of strategic resourcing and competitive positioning (Hayes & Pisano, 1996; Porter, 1996), we develop the following hypotheses.

H_{1a}: Hospitals closer to their performance frontiers (i.e., operating at higher utilization levels) will not exhibit simultaneous improvements on both cost-efficiency and quality dimensions.

Leveraging off the sand cone thinking:

H_{1b}: Hospitals that are further away from their performance frontiers have latitude to build their capability and selectively dedicate their resource competencies.

H_2: We expect improvements on quality at the expense of cost-efficiency, before high performing hospitals reach a position superior on the basis of both quality and cost-efficiency dimensions.

Data and Method

Sample Profile

The selected hospitals were the largest located in the metropolitan areas of Australia's largest cities, each having 500 or more beds. The advantage of looking at large hospitals is that they typically have a functional and busy ED and tend to report more thoroughly on their general performance in comparison to smaller hospitals. Each of the EDs had a significant number of patients passing through each day making them relatively busy and pressed to achieve a government-imposed performance expectation of treatment in under 4 hours. It is enormously difficult to study hospitals in any jurisdiction. They are places where life and death decisions are made, where very sophisticated and expensive equipment are utilized, data systems have low priority, the level of staff credentialization is very high, and which in combination has created an environment for limited transparency, high costs and questionable quality. The Australian government has made

several attempts at motivating state government health departments to be more transparent with performance monitoring by setting up key performance criteria and tying these to funding models. One of these agencies is the Health Performance Authority (now known as the Australian Institute of Health and Welfare [AIHW]), which was set up under the Council of Australian governments to collect information from hospitals in a systematic process and structure. This mandate also stipulated that the data was to be collated and made freely available to the people of Australia, if for no other reason than to enable better decisions on their healthcare needs. A secondary motivation was to enable voters to gain an appreciation of whether public funding was being appropriately operationalized. The data repository set up to implement this mandate was the MyHospitals website.

A convenience sample of the 17 largest public hospitals, representative of the five mainland states, were selected. Secondary data on each of these hospitals were collected for a six-year period (2011–2016) from a variety of sources, for example, MyHospitals, annual reports, and relevant websites. The objective data that was collected for each of these hospitals were based on appropriate operational measures pertaining to cost-efficiency (Cost per National Weighted Activity Unit [NWAU]), quality performance (Staphylococcus aureus bloodstream infections), and utilization measures such as patient numbers and ED treatment performance. These are currently the best available proxy performance measures in the Australian healthcare industry, and they also serve the study's need.

Sample Relevance and Importance of Measures

The motivation for this study was to examine the presence of trade-offs in hospitals as they approach their performance frontiers. Although the data collection for this study is up to 2016, it still enabled us to carry out a thorough examination of this research question. The six-year period of data in its present form is illustrative of an archival study (that is, using data from a time period from the past) and enables the study of trade-offs on 17 of the largest public hospitals operating in Australia. Cost-efficiency and quality are commonly accepted as generic operational capabilities in both service and manufacturing sector (see, for example, Ashwini Nand et al., 2013; Ehie & Schoenherr, 2020). As for a measure of performance frontier, efficiency and utilization measures have been used in previous studies (see, for example, Lapré & Scudder, 2004; Talluri et al., 2013). A number of healthcare studies have also been conducted which focused on hospitals that have employed these operational and efficiency measures (see, for example, Butler et al., 1996; Chang et al., 2011; Ho & Huang, 2020; Matthias & Brown, 2016; van Ineveld et al., 2016) albeit from different research purposes.

Measures

Service Quality. Service quality has been traditionally defined in terms of consumer (dis)satisfaction (Garvin, 1987) and it is, hence, subjective in nature. However,

rather than consumer (dis)satisfaction or consumer complaints filed, we define it as a service or procedural outcome/error commonly measured as an infection rate in hospitals. This is the rate of healthcare-associated Staphylococcus aureus (S. aureus) bloodstream (SAB) infections recorded in hospitals over the course of a year. In large hospitals, this can vary from 5,000 to 20,000 occurrences per annum. This is an important measure of the quality and safety of hospital care with the general aim of having as few occurrences as possible according to AIHW 2015–2016 annual reports.

Cost-Efficiency. The National Health Reform Act 2011 established the Independent Hospital Pricing Authority (IHPA) as part of the National Health Reform agenda. The key purpose of IHPA is to promote improved efficiency in, and access to, public hospital services through the setting of the National Efficient Price (NEP) and National Efficient Cost (NEC) for public hospital services. The National Hospital Cost Data Collection (NHCDC) is the annual collection of public hospital cost data and is the primary data collection used to inform the NEP and NEC. The measure for unit cost in the hospital industry is cost per service/procedure. In Australia, this is the Cost per NWAU, which is a measure used by most governments to manage their largest public hospitals, focusing on acute admitted patients (excluding ED and property, plant and equipment costs). It includes the costs, types of patients and activity as defined by the NEP Determination for each respective year (as per AIHW 2015–2016 annual reports). For example, in the financial year 2015–2016 collection:

- 334 hospitals participated;
- Expenditure increased by 7.5%;
- costed activity increased by 4%;
- the average NWAU of an admitted acute separation was $5,194; and
- the average length of stay for a patient was 2.59 days.

Utilization. As noted above, public hospitals in Australia (and internationally) have a paucity of valid and reliable utilization metrics collected and reported to the public on an annual basis. Utilization in hospitals is a complex and difficult measure to calculate reliably both within a hospital and more importantly across hospital campuses. The most prominent government instituted performance criteria that all public hospitals are required to meet is the time of treatment of the patients in an ED. For our study, we use the percentage of patients treated on time in EDs across hospitals to assess how close hospitals are to their performance frontiers. We believe this is an appropriate and internationally recognized measure of total resource utilization at the front end of a hospital, which in turn dictates the overall performance of the hospital campus.

Method

Using cost-efficiency and quality measures, we were able to construct performance improvement paths for each of the hospital cases. The evolutions of cost-efficiency

and quality positions were plotted. Next, based on our logic and calculations, we were able to create ED utilization plots which served as surrogates for performance frontiers: hospitals with higher ED utilization indicating that hospitals are closer to their performance frontiers, and if this is the case, then we would expect to see some initial trade-offs (H_{1a}). Performance frontiers are typically considered to be investments that would show as fixed assets on a corporate balance sheet (Schmenner & Swink, 1998). For instance, in Lapre´ and Scudder's (2004) study, the number of aircraft has been used to represent the asset frontier, and utilization of the seats in these aircraft was the surrogate for closeness to an asset frontier. Those hospitals that are situated further away from the performance frontier would possibly demonstrate some level of improvement (H_{1b}). Based on the sand cone logic, we would then expect to see that while improvements are underway, there may be a sequence demonstrated in our cases: quality being established at the expense of cost-efficiency, before high performing hospitals reach a position superior on the basis of both quality and cost-efficiency dimensions (H_2).

In addition to the analysis of performance improvement path plots described above, we also conduct a multivariate analysis to test whether trade-offs are more likely to occur for hospitals operating closer to their performance frontiers (H_1). For this, we use SPSS Linear Regression modelling with data transformation (Hair et al., 1998).

In general, we follow Lapre´ and Scudder's (2004) modelling for quality/cost-efficiency calculations:

Let $C_{i,t}$ denote cost per NWAU (cost) for hospital i in year t.
Let $Q_{i,t}$ denote patient infection incidence for hospital i in year t.
Cost and quality improvements are denoted by:
$\Delta C_{i,t} = C_{i,t} - C_{i,t-1}$ and
$\Delta Q_{i,t} = Q_{i,t} - Q_{i,t-1}$.

For every hospital-year observation (i,t), we determine the following:

- whether both cost-efficiency and quality improved ($\Delta C_{i,t} < 0$ and $\Delta Q_{i,t} < 0$);
- whether a trade-off occurred ($\Delta C_{i,t} \times \Delta Q_{i,t} < 0$); or
- whether both cost and quality worsened ($\Delta C_{i,t} > 0$ and $\Delta Q_{i,t} > 0$).

As we are interested in simultaneous improvements vs. trade-offs, we omit all hospital-year observations for which both cost-efficiency and quality worsened. For the remaining observations, we define for hospital i from year $t - 1$ to t:

$TO_{it} = 2$, if a trade-off occurred,
$TO_{it} = 1$, if simultaneous improvement occurred.

In terms of distance to the asset (performance) frontier, we again follow Lapre´ and Scudder's (2004) modelling approach:

Let HU_{it} be the hospital utilization for hospital i in year t. For each hospital subgroup, we define the highest hospital utilization observed up to year t as follows:

$Max\ \mathrm{HU}_t = max_{j,s\leq t}\ \{\mathrm{HU}_{js}\}$, and
the lowest hospital utilization observed up to year t as follows:
$Min\ \mathrm{HU}_t = min_{j,s\leq t}\ \{\mathrm{HU}_{js}\}$.
We define distance to the performance frontier as:

$$\mathrm{DPF}_{it} = \frac{Max\ \mathrm{HU}_t - \mathrm{HU}_{it}}{Max\ \mathrm{HU}_t - Min\ \mathrm{HU}_t}. \quad (1)$$

Lapre´ and Scudder's (2004) modelling used binary logistic regression to estimate (binary) dependent variable (TO_{it}) over their 10-year time window. However, we found out that this was not appropriate over the shorter 5-year time window we have in this study (i.e., 2011–2012 to 2015–2016) and the less precise proxy for hospital utilization (i.e., percentage of patients treated on time in EDs). In our study, we have performed Linear Regression modelling with transformation for each of the subgroups, using the following formulation to determine the distance to performance frontier (DPF):

$$\mathrm{DPF}_{it} = \alpha + \beta_1 \Delta \mathrm{C}_{it} + \beta_2 \Delta \mathrm{Q}_{it} + \beta_3 [\mathrm{TO}_{it} = 2] \quad (2)$$

The advantage of using regression to estimate distance to asset frontier is that coefficients are easily interpreted. A negative estimate for β in Equation 2 would imply that the probability of a trade-off is higher for a lower distance to the asset frontier. In other words, closer to the asset frontier, trade-offs would be more likely to occur.

Results

Given the limited number of hospitals with available data, and the small 5-year (2011–2012 to 2015–2016) analysis window compared to previous studies (Lapre & Scudder, 2004), we have configured the performance improvement paths for the 17 major metropolitan hospitals, arranged in groups according to their frontier/quality/cost-efficiency performance (see Table 2).

Group-1 was, thus, formulated by only those hospitals that showed improvements on both quality and cost (a reduction) over the time period. Group-2 was formulated by only those hospitals that showed improvements on quality, but an increase in cost over the time period. And in a similar fashion, Group-3 was formulated by only those hospitals that showed reductions in quality and an increase in cost over the time period. Surprisingly, to us Group-1 (the highest improvement group) was also the closest to the performance frontier, suggesting that quality and cost may be important factors in enabling these hospitals to achieve the government's stipulated ED treatment targets.

We, thus, believe this formulation is both a contrast to Lapre and Scudder (2004) and appropriate to the Australian (and international) public healthcare hospital context in which the measurement, reporting, and governance of quality and cost is a very new phenomenon.

Table 2. Hospital Groups

Hospital Group	*n*	Average ΔQ_{it} (rate)	Average ΔC_{it} ($)	Average DPF
Group-1: Closer to frontier	6	2,280	134.3	110.8
Group-2: Intermediate frontier	7	1,500	–59.5	126.8
Group-3: Furthest from frontier	4	–1,280	–44.8	160.0

Source: The authors.

Performance Improvement Paths

The Figures 1–3 show the performance improvement paths for the 17 major metropolitan hospitals of each of the groups. Note that the scales differ for each hospital to accommodate differing performance profiles.

Figure 1 is a representation of the six hospitals that are seen as being the closest to the asset frontier. From Figure 1, at a first glance, we see the non-linear nature of the quality/cost-efficiency curves. From the plot, we also see that generally this group of hospitals are seemingly better and improving on both dimensions, albeit in a non-linear seemingly haphazard relationship.

Figure 2 represents those hospitals at an intermediate distance to the frontier. In this group, we see aspiring hospitals that have managed to reach an intermediate level and not necessarily situated closer to or on the frontier with respect to Group-1 hospitals. However, they are in a position whereby trade-offs between cost and quality are moderately noticeable.

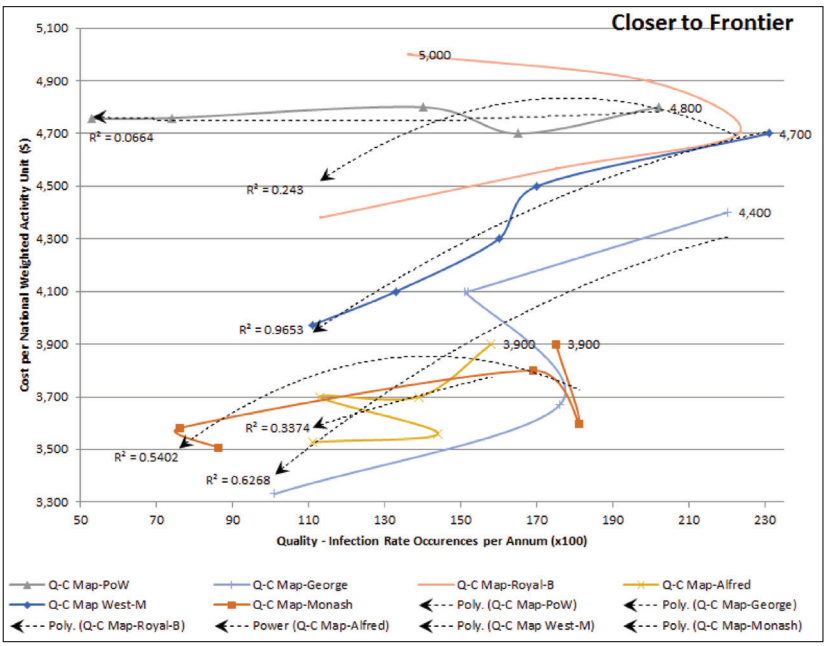

Figure 1. Group-1: Hospitals Closer to Frontier with +Q+C Curves

Source: The authors.

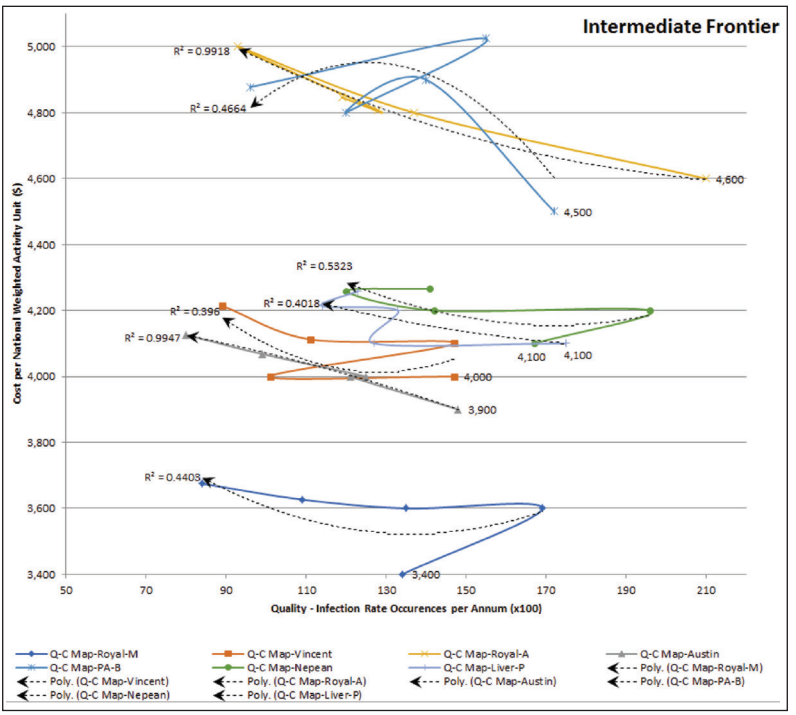

Figure 2. Group-2: Hospitals with an Intermediate Frontier and +Q–C Curves

Source: The authors.

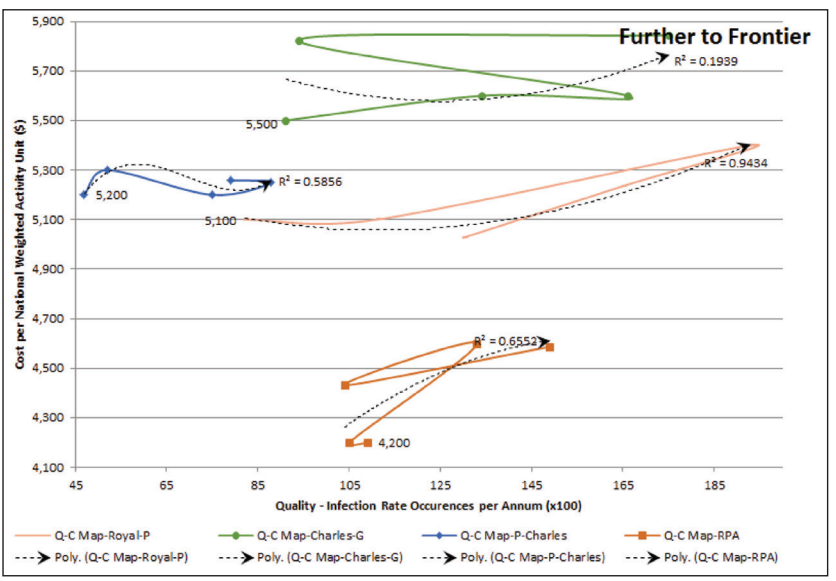

Figure 3. Group-3: Hospitals Furthest from Frontier and –Q–C Curves

Source: The authors.

Figure 3 represents those hospitals which are furthest from the frontier. The hospitals in this group are demonstrating threshold worsening levels of quality (though well within the minimum SAB mandated rates) as well as decreasing cost-efficiency.

Regression Analysis

Table 3 reports the regression estimates of (Equation 2) for Group-1, the set of hospitals that were seen to be the closest to the frontier. The estimate for β, the coefficient for both TOPF = 1 and cost, is negative and significant (β_i = –0.224 and –0.351, $p < .05$). TOPF = trade-off or improvements seen with hospitals with regards to their performance frontier. So, the closer a hospital is to the performance frontier, higher is the probability of a quality and cost interaction being used to drive the cost lower from year $t - 1$ to t.

From these results, we assert that these hospitals have been able to dedicate time and resources to develop stable levels of quality which enable them to progressively build on cost-efficiency which have enabled trade-offs to gradually disappear. These would be considered the better performers, or as seen from the plots above. Also, we can see from the estimated means plots (see Figure 4) that the hospitals in this group have continuously strived and essentially obtained above the threshold levels of quality which give them a unique cost position.

Table 3. Group-1: Hospitals Closest to the Performance Frontier

Group-1	Coefficient β_i	Std Error	Significance
Intercept	0.919	0.114	0.001
TOPF = 1 ($\Delta C_{i,t} < 0$ and $\Delta Q_{i,t} < 0$)	–0.224	0.093	0.025
TOPF = 2 ($\Delta C_{i,t} \times \Delta Q_{i,t} < 0$)	0		
Cost (transformed)	–0.351	0.0154	0.033
Quality			NS
n = 24			
R^2 = 25.2%			

Source: The authors.

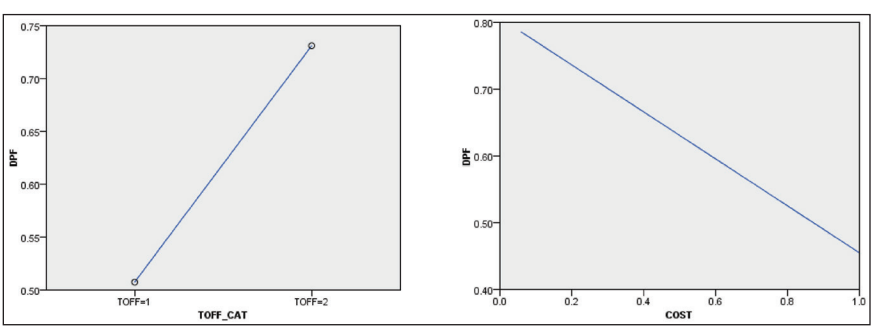

Figure 4. Group-1: Estimated Means

Source: The authors.

Table 4. Group-2: Hospitals Intermediate Frontier Distance

Group-1	Coefficient β_i	Std Error	Significance
Intercept	0.248	0.106	0.030
TOPF = 1 ($\Delta C_{i,t} < 0$ and $\Delta Q_{i,t} < 0$)	0.484	0.179	0.014
TOPF = 2 ($\Delta C_{i,t} \times \Delta Q_{i,t} < 0$)	0		
Cost (transformed)	0.390	0.196	0.06
Quality			NS
n = 23			
R^2 = 22.1%			

Source: The authors.

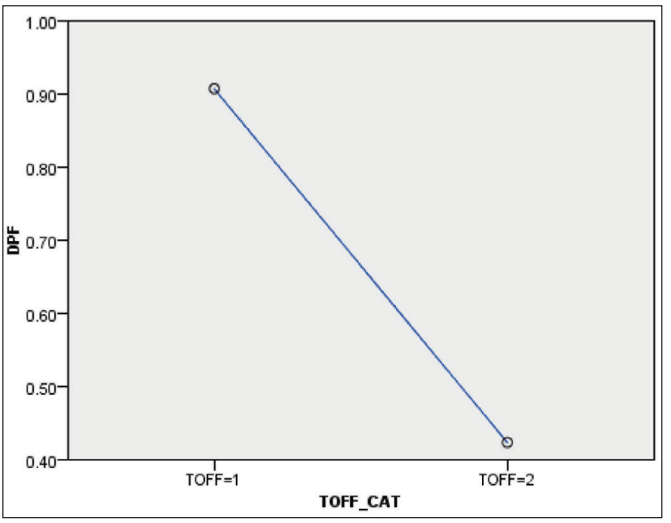

Figure 5. Group-2: Estimated Means

Source: The authors.

This lends support to H_2. That is where hospitals eventually demonstrate a position superior on cost-efficiency after efforts to develop significant resources of quality at the expense of cost-efficiency.

Table 4 reports the regression estimates of (Equation 2) for Group-2, the set of hospitals that were seen to be at an intermediate distance to the frontier. Based on the regression results and estimated means plots (see Figure 5), it is interesting to note that both quality and cost improvement variables are not significant, and that only TOPF = 1 is positive and significant (β_i = 0.484, $p < .05$). We assert that Group-2 shows evidence of initial trade-offs occurring with cost-efficiency as they approach their asset frontiers.

This lends support to H_{1b}. That is, hospitals that are not yet operating at higher utilization levels, will not exhibit simultaneous improvements on both cost-efficiency and quality dimensions, have latitude to build their capability.

Finally, Group-3 which is the furthest from the frontier does not produce any significant results. We assert that this group of hospitals despite meeting the

minimum mandated quality thresholds are perhaps struggling to dedicate resources to the improvement and understanding of quality–cost interaction at an operational level. This could be due to a number of contextual and funding factors which are not evident in the data. This lends some support to H_{1b} suggesting that hospitals that are further away from their performance frontiers have latitude to build their capability.

Discussion

Our analysis of the data yielded some interesting results, and these have some important theoretical and managerial implications. Our data supported H_{1a} and H_{1b}, suggesting that hospital's distance to their performance frontiers does influence their cost-efficiency/quality performance dimensions. We see that Group-2 (intermediate) hospitals are more inclined to be depicting trade-offs in this case with their cost-efficiency dimension. This is generally in agreement with Lapre and Scudder's (2004) results as well as others (see, Swink et al., 2006; Talluri et al., 2013). Alternatively, those hospitals that are situated close to their performance frontier are in a position to be better engaged in multiple improvements, with a focus on cost.

It is important to note that in a hospital setting, there are certain mandated requirements. In our study, quality was measured through SAB rates and a value below 2.0 is considered acceptable for hospitals. This also suggests that the threshold levels are in play (Hill, 1988). The sand cone logic is also relevant whereby for firms to be successful, quality dimension as a prerequisite must be built and reinforced over time (Ferdows & De Meyer, 1990). Our final hypothesis provides some answers and explanation regarding the theory of performance frontiers. Performance frontiers demonstrate a firm's actions that are made possible as a result of their various decisions and investments. The theory posits that firms strive towards their asset frontiers and nearing the frontier would eventually begin to result in initial trade-offs. For those firms that still remained significantly away from their frontiers, multiple improvements would be possible (Hayes & Pisano, 1996; Schmenner & Swink, 1998). We were able to create performance improvement plots for hospitals on cost-efficiency–quality dimensions based on our distance to asset frontier calculations. We saw that there was a group of hospitals that came in as being the closest to the frontier. Our analysis of the hospitals in this group shows that the hospitals that eventually ended up in a superior position on both dimensions had to improve quality initially which enabled them to grow and progress on the cost-efficiency dimension.

From a managerial perspective, our results show that trade-offs do occur and is probably more necessary for companies in intensely situated industries, such as healthcare. Hospitals at all levels (furthest to closest) were expected to maintain the threshold levels of quality as a start and then work towards other dimensions. Hospitals, particularly those that are in an intermediate position, are likely to be exhibiting trade-offs. For managers, this stage is a transitionary stage, and it signals that making initial trade-offs by focusing on higher levels of quality

promise a competitive and superior position in the future. It is also reasonable to assume that attaining this superior level of quality is possible only over time, and for that reason having patience is important. The study also provides some guidance to managers on the competitive dimensions that must be concentrated on allowing them to make sensible decisions when it comes to their limited set of resources (Losa et al., 2020).

Conclusion

Our study attempts to seek explanations for trade-offs from the performance frontier perspective in a service setting using longitudinal data. We can conclude from our results that hospitals having an intermediate position exhibit initial trade-off and those furthest remain in a strong position to continuously engage in improvements however being mindful of quality. Hospitals that were positioned closest to the frontier from the rest were able to progress in a sustainable superior manner along both dimensions; however, this may have required significant efforts in the initial years to build and develop quality.

Our results suggest that the theory of performance frontiers is relevant (Schmenner & Swink, 1998) even if there are difficulties in measuring and identifying a firm's asset frontier (Ashwini Nand et al., 2013; Lapré & Scudder, 2004). We have tried our best to operationalize and measure the asset frontier as best as we could. We have also extended our work in the service setting similar to Lapré and Scudder (2004), guided by their motivation and call for more validation of trade-offs along the lines of performance frontiers. The Australian hospital setting can also be described as a dynamic and progressive one where hospitals need to be competitive. Hospitals and their EDs are engaged in providing the best of care to patients with limited resources and having to outperform others. This requires that they make wise decisions pertaining to their resources, time, and investments undertaken. This signals that trade-offs or choices are important in such competitive and progressive industries and affect competitive positioning (Sarmiento et al., 2018; Schmenner & Swink, 1998; Thürer et al., 2017).

Finally, we had several limitations relating to the measures that we used to represent cost-efficiency, quality dimensions, and performance frontiers. Whilst some of these measures are acceptable proxies, others like the manner in which we calculated our asset frontiers may be questionable. We have tried our best to logically explain hospital utilization as a measure of their asset frontier based on the original assumptions of authors such as Schmenner and Swink (1998), Vastag (2000) and Clark (1996).

We believe that this study has in some way clarified some of the discussions surrounding trade-offs and achieving improvements in a service-based public sector health environment. Future researchers can advance this by including multiple measures of competitive dimensions over a longer period of time which will enable more robust analyses techniques such as parametric and non-parametric tests (Chen & Iqbal Ali, 2002; Jacobs, 2001; Narasimhan & Schoenherr, 2013;

Wanke et al., 2019). Also, the theory of performance frontiers continues to intrigue scholars and has potential to offer explanations on trade-offs, and this area requires research to continue working in various settings. Researchers through their efforts can further add to the knowledge on performance frontiers and ways in best capturing and measuring the frontier in various industry sectors.

Declaration of Conflicting Interests

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Article

Cognitive Flexibility Through the Path of Yoga

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Abstract

Cognitive flexibility plays a crucial role in an individual's ability to adapt to the ever-changing situations and is associated with effective problem-solving and decision-making. Given the wide range of the impact of Yoga on physiological and psychological aspects of health, the purpose of the study was to examine the impact of Yoga-based practices (YBP) on cognitive flexibility among school students. The performance in digit letter substitution test (DLST) was assessed with 80 school students of fifth-grade and 78 students of ninth-grade immediately before and after participating in a single Yoga class and a control session of equal duration. The intervention comprised of YBP focusing on *pranayama* and relaxation meditation. Data were analysed using mixed-method ANOVA by comparing effect sizes between the two conditions supplemented by a within-group analysis. Most outcome measures exhibited a pattern of worsening in the control group over time, whereas changes in the Yoga group over time were either consistent or showed slight improvements. The findings suggest, at a preliminary level, that YBP are effective in improving students' cognitive flexibility as well as their academic school readiness. This information is important to consider as it aims at developing students' executive functions, thereby impacting their future.

Keywords

Yoga, cognitive flexibility, executive function, school students, cognitive performance, learning

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Introduction

Picture the following scenario:

> A student reaches the school and has a well-designed schedule for the day. As per the schedule, he/she has to solve quantitative problems, read literature, understand science and attempt experiments, answer quizzes, participate in co-curricular and extra-curricular activities such as music, debates, arts, sports, and interact with faculty and friends. In a nutshell, he/she has multiple tasks to do with changing set-up in a day's time.

The daily life too is full of changes and requires frequent shifts between cognitive tasks. Cognitive flexibility is defined as the ability of an individual to adapt one's own mental (cognitive) strategies as per the requirement to face new and unexpected situations in the environment (Cañas et al., 2003). It has also been referred to as shifting, attention switching, or task switching, and an ability to disengage from distractions of a prior task and focus on pertinent information in an upcoming task (Monsell, 2003). It is one of the executive functions denoting the high-level cognitive processes that facilitate new ways of behaving, and optimise one's approach towards unfamiliar circumstances.

The above-mentioned higher-order cognitive processes have emerged as crucial predictors of preacademic skills (Shaul & Schwartz, 2014) and learning and academic performance at school age (Jacobson et al., 2011; St Clair-Thompson & Gathercole, 2006). Therefore, cognitive flexibility plays a vital role in the learning in classroom setting as well for students to move easily between courses. Students exhibiting effective cognitive flexibility are likely to handle transitions easily, can move seamlessly between courses and tasks, and may successfully apply learning in one domain to problem-solving in another context. Among university students also, enhanced cognitive flexibility has been found to be associated with attention regulation, experiences of flow, and mindfulness (Moore, 2013), reduced anxiety, greater motivation and success in training programmes (Timarová & Salaets, 2011), and positive attribution of group work (Myers et al., 2009). Notably, cognitive flexibility is critical in overcoming cognitive inertia (Laureiro-Martínez & Brusoni, 2018) for decision-makers in organisations, and for the positive attitude of employees towards organisational change (Chung et al., 2012).

Further, previous research has discussed that executive functions including cognitive flexibility improve through the early school years and adolescence and more gradually during adolescence (Davidson et al., 2006; Huizinga & Van der Molen, 2007, see Romine & Reynolds, 2005, for meta-analysis and Best & Miller, 2010, for a review on executive functions). As a result, it is essential to look for ways to enhance cognitive flexibility right from a young age. Although, there are some studies on training cognitive flexibility in early and middle childhood (Cepeda et al., 2001; Kray et al., 2008; Zinke et al., 2012). However, few programmes have incorporated mind–body approaches such as Yoga and meditation, which are known to be effective self-regulatory practices.

Yoga is a holistic system of mind–body practices for mental and physical health comprising of multiple components such as physical postures for strength and flexibility, breathing exercises for effective respiratory functioning, relaxation

techniques for managing mental and physiological tension and stress, and meditation/mindfulness practices for enhancing mind–body awareness, attention and emotion regulation skills (Felver et al., 2015). There has been an increase in research exploring the benefits of Yoga-based interventions in education contexts and school settings (e.g., Khalsa et al., 2012).

In spite of the perceived importance of cognitive flexibility, the research employing YBP as an intervention is limited (e.g., Nejad et al., 2019). This study examines the potential of YBP to enhance cognitive flexibility among school students. Conducted with two different groups of school students, the study employed a pre–post experiment design and contributes towards the emerging research on mind-body interventions, their impact on higher cognitive functions, and their efficacy and applicability in school environment.

This article is structured in five sections. After the introduction, the next section presents the nature and importance of cognitive flexibility. The third section provides a primer on Yoga, and the hypothesised relationship between YBP and cognitive flexibility. The fourth section presents the research design, details of the sample, method, and research findings. The fifth section discusses the implications of the findings and scope for the future research.

Cognitive Flexibility: Nature and Its Importance

Considering that change is a constant, everyday life gives rise to numerous novel challenges and situations unlike the ones encountered before. This requires executive processing accompanied by a wide range of behaviours. This kind of processing is particularly instrumental when individuals make a plan for the future, voluntarily switch or shift from one task to another, or refrain from a temptation. Put differently, flexibility allows one to lead independent, purposeful life (Gilbert & Burgess, 2008). Frontal lobes of the brain have been posited to support these processes but, the current level of understanding is limited in nature (Monsell, 1996). However, cognitive neuroscience has made progress pertaining to the nature of these processes, and their underlying brain mechanisms.

As discussed, cognitive flexibility is an individual's ability to adapt the cognitive strategies to manage unexpected situations arising in the environment (Cañas et al., 2003). This definition comprises three important aspects: an ability involving a process of learning, adapting cognitive processing strategies with respect to problems and an element of uncertainty, and that adaptation occurs gradually post performing a task for some time (Cañas et al., 2006).

Cognitive flexibility depends on two factors, namely attention and knowledge (Cañas et al., 2006). As the situations keep on changing from time to time, there is a realisation that the response needs to be altered. To come up with a response that caters to the new situation, higher-level attention is needed. This enhanced attention helps in keeping away distractions that might hinder progress and allows mental resources to work on the new response and halt the automated (old) response. Cognitive flexibility is reflected in the knowledge an individual has in order to gauge the environmental signals and act accordingly. This knowledge is

enhanced by learning from previous experiences in similar situations. However, it undergoes revisions and modifications depending upon the requirements of a new task or situation.

The Cognitive Flexibility Theory (Spiro & Jehng, 1990) suggests that cognitive flexible people are able to draw a representation of a task from multiple viewpoints and this enables them to effectively interpret situational changes in the environment. Such individuals are dynamic in their approach to quickly restructure the knowledge, thereby formulating and adapting their responses appropriately with the evolving situational demands.

Importance of Cognitive Flexibility for the Students

Cognitive flexibility facilitates quick switching to alternative thoughts while facing problems and not getting hindered by them (Toraman et al., 2020). Martin et al. (1998) mention that the sense of competence is an underlying component in the concept of cognitive flexibility. Importantly, cognitive flexibility is positively associated with communication self-efficacy, assertiveness, responsiveness (Martin & Anderson, 1998), multi-tasking (Ionescu, 2012), problem-solving and creativity (Lin, Tsai et al., 2014; Ritter et al., 2012), inclination to collaborate, and leadership (Reiter-Palmon, 2003).

Moreover, cognitive flexibility can lead to positive thinking, and consequently, if thoughts become positive, feelings, behaviours and attitudes transform positively (Bilgin, 2009; Önen & Koçak, 2015). A resulting effect of enhancing cognitive flexibility would be that students will have more positive attitudes towards studying, specifically to study actively and forming the habit to study. Cognitive flexibility encompasses switching between modes of thought and considering multiple concepts at any given time, which is essential for learning, language development (Deák, 2003), arithmetical skills (Bull & Scerif, 2001), and academic achievement (Magalhães et al., 2020).

In light of the above discussion, in a classroom, some students are able to move comfortably between courses; however, some have difficult, i.e., they feel stuck or focus on one assignment or problem. This reflects their levels of cognitive flexibility. There can be a difference in abilities, but teachers can help create a classroom where all students improve their cognitive flexibility. Based on the performance on a dynamic task, it has been found that participants who performed better differed mainly in their capacity to adapt their strategies to arising conditions of the tasks, and not in the range of strategies or the ability to implement a strategy (Reder & Schunn, 1999).

Training

In the literature, many ways to improve executive and cognitive functions have been discussed, which include pharmacological, neurological, cognitive, cognitive-behavioural, metacognitive, aerobic and Yoga interventions (Ahmed &

Mohamed, 2011; Van der Straten et al., 2018). For instance, it has been reported that the direct electrical stimulation of the brain by the skull impacts working memory (Meiron & Lavidor, 2013). Other forms of trainings comprise computer-based training programmes for enhancing memory and reasoning (Bergman Nutley, 2011; Holmes et al., 2009), task-switching computer-based training (Karbach & Kray, 2009), traditional martial arts (Lakes & Hoyt, 2004), and aerobics (Kamijo et al., 2011). In the current times, there is a growing emphasis on non-pharmacological methods to improve cognitive and executive functions, which includes aerobic exercises, Yoga, mindfulness (e.g., Manjunath & Telles, 2001; Nejad et al., 2019; Zou et al., 2020). Yoga through its underlying components aims to achieve total health and physical and mental purification through mind and body practices. In a study examining the impact of Yoga exercises on executive functions, Gothe et al. (2013) showed better performance on executive functions post-Yoga than before training.

Yoga: A Brief Overview

The term Yoga originates from the Sanskrit word, which means 'to yoke'. However, it has stood for a multitude of meanings (join, union, renunciation, a means to liberation). Traditionally, it represents a mechanism that aims to bring an individual to the highest state of consciousness, that is, self-realisation. Although there are different branches of Yoga, namely: *Raja Yoga*, *Jnana Yoga*, *Hatha Yoga*, *Karma Yoga*, *Bhakti Yoga*, *Mantra Yoga* and *Tantra Yoga*, with a focus on particular competencies, at its core, the objective of Yoga is self-transformation (Feuerstein, 2013). It offers a way to effective self-regulation and better management of emotions by gaining an awareness of one's emotions and behaviours.

Yoga represents an ancient contemplative practice with its history dating back to over 3500 years in India. It aims to attenuate suffering and aid optimal physical and mental thriving (Cope, 1999; Feuerstein, 2011). Sage Patanjali gave an 'eight-limbed' structure to the yogic path and led to Yoga attain its classical form, known as Ashtanga Yoga (Feuerstein, 2011). This Classical Yoga based on its eight-fold path represents a comprehensive and an integrative system to cultivate morality, ethics, compassion, awareness, and self-transcendence.

Ashtanga Yoga comprises of the following eight practices: *Yama* (moral codes or ethics with respect to others), *Niyama* (self-purification or ethics with respect to self), *Asana* (postures and physical exercises), *Pranayama* (breath regulation), *Pratyahara* (sensory withdrawal), *Dharana* (concentration), *Dhyana* (meditation, effortless attention), and *Samadhi* (self-transcendence).

Yamas and *niyamas* lie at the foundation of the yogic path. These are the practices to harmonise an individual's social interactions as well as one's inner self and set the tone for quieting one's mind, regulate emotions, engage in helpful behaviours (Corner, 2009). *Asanas*, that is, the postures aim at physical control of the body to prepare for controlling the mind in meditation for elongated durations of time (Feuerstein, 2011). *Pranayamas* are specific breath control techniques to allow the breath or the life force to flow freely. *Pranayama* helps an individual in

down-regulating arousal and increasing one's awareness of the interaction between the body and the mind (Sovik, 2000). The next four limbs comprising *pratyahara, dharana, dhyana and Samadhi* aim to bring the mind under control from the various distractions and fluctuations (Gard et al., 2014). The emphasis here is to bring back the attention from the outside world towards the inner self by fixing attention and sustained concentration (Feuerstein, 2013). This consequently helps an individual to attain self-transcendence.

Neurological Impact of Yoga-based Practices

Existing research indicates the down-regulating effect of Yoga on both the sympathetic nervous system (SNS) and the hypothalamic–pituitary–adrenal (HPA) axis as a response to stress (Ross & Thomas, 2010). Activation of the SNS and activation of HPA are among the stress-reactive systems of the body (Herman, et al., 2011). Prolonged activation of the HPA system has been found to have detrimental effects on brain function (Sapolsky, 1992). HPA activation accompanied by higher cortisol concentrations can result in cognitive deficits (Franz et al., 2011).

Research evidence supports the immediate psychological effects of Yoga that include reduced anxiety (Kirkwood et al., 2005), depression (Uebelacker et al., 2010), stress (Chong et al., 2011), as well as enhanced well-being (Oken et al., 2006). Moreover, it has been suggested that Yoga facilitates cultivation of effective stress management and cause a shift toward parasympathetic nervous system dominance (Innes et al., 2005), which may impact cognitive performance.

Further, researchers on Yoga in the medicine and public health domains have assessed the benefits of Yoga in school settings (Eggleston, 2015). It was reported that Yoga improved psychological well-being, physical health (weight control), calmness and enhanced attention, and completing assigned tasks successfully.

Pranayama

The neurocognitive effects of Yoga breathing, that is, *pranayama* have been discussed in a narrative review. Authors of the study reported a positive impact of *pranayama* on neurocognitive abilities where studies included assessed performance on spatial and verbal memory tasks, auditory and visual reaction time, substitution and cancellation tasks (Saoji et al., 2019). In another study, therapeutic breathing exercises were introduced to improve academic performance and the self-regulatory behaviour. Based on a case study and a school-wide *pranayama* programme, involving two breathing exercises: deep breathing, and alternate nostril breathing, both of which showed improved academic performance and positive behavioural outcomes (Gupta et al., 2014). A study encompassing bellows breath, that is, an increased depth of breathing, found reduced auditory and visual reaction time among healthy schoolboys (Bhavanani & Udupa, 2003).

Similarly, high-frequency Yoga breathing was reported to improve the performance scores in an attention-based cancellation task post an immediate practice across different age groups (Telles et al., 2008).

Yoga and Cognitive Flexibility

Although research examining immediate effects of Yoga on cognitive flexibility are limited, studies have looked into its impact on broader executive functions. For instance, prior studies on Yoga including *asanas*, *pranayama*, meditation, and guided relaxation showed improvements in delayed recall of spatial information and verbal memory (Manjunath & Telles, 2004), a decrease in planning and execution time (Manjunath & Telles, 2001) among adults. School children also showed an improvement in cognitive performance as a result of three months of Yoga (Chaya et al., 2012). Further, the Yogic lifestyle brings about a positive impact on the planning ability and executive skills of school students (Rangan et al., 2008). Additionally, Yoga has been found to be an effective process for improving various cognitive functions of attention, concentration, attention span, processing speed, attention alternation ability in healthy young subjects (Prakash et al., 2010).

The high amount of competition and scarce opportunities available have made proactive adaptation with respect to uncertainty a norm. For instance, in the setting of an education institute, students are required to study and excel in a variety of skills and subjects over a period of time (day, week, month or year). And, this requires the ability to switch effectively from one task to another. Cognitive flexibility is the ability to switch between two distinct concepts and think about multiple concepts simultaneously (Scott, 1962). A cognitive flexible student would be in a better position to shift his frame of reference in accordance to the session that is happening, thereby appreciating what is taught and effectively absorbing the knowledge.

However, attention, which is an important factor that affects cognitive flexibility, tends to reduce with the passage of time and efforts expended. With every class that a student attends the level of attention reduces for the subsequent ones. Here, an intervention that can refresh and restart the minds of the students and boost up the attention levels would prove to be significant as YBP can calm and regulate the mind, centre attention and sharpen concentration.

The above-discussed neurological research focused on Yoga, *pranayama* and executive functions led us to the current hypothesis that a short YBP intervention involving 20 minutes of *pranayama* and relaxation meditation exercise could improve cognitive flexibility significantly. Despite an increase in the prevalence of Yoga exercise, research focusing on the relationship between Yoga and cognition is limited. As a result, in this study, we examined that cognitive flexibility can be improved as an immediate effect of Yoga and *pranayama* practice. We introduced Yoga as an intervention and hypothesised that it will be a key instrument in improving the cognitive flexibility of students as compared to their prior levels.

Research Method

Sample and Design

Participants included fifth- and ninth-grade students enrolled in a reputed school in the western part of India. Participants in the study were 80 students of fifth-grade and 78 students of ninth-grade comprising both boys and girls. In line with the developmental perspective, while there are some cognitive abilities that develop early in the childhood, the complete range of executive functions reach their potential till early adulthood (Davidson et al., 2006). And, early individual differences in cognitive abilities likely influence the successive (later in life) differences in learning skills (Wass, 2015). Since students of today represent the future managers and business leaders, facilitating their holistic growth including cognitive functions via trainings and subsequent assessment would be a step in the positive direction.

The study used a pre–post experiment design with control and experiment groups. The students of both fifth- and ninth-grade belonged to two sections. Of the 80 students of fifth-grade, students of one section served as the experiment group (n = 47) while the students of the other section represented the control group (n = 33). Similarly, of the 78 students of ninth-grade, one section served as the experiment group (n = 42) and the other section denoted the control group (n = 36). The participants in the experiment group were introduced to the YBP in one of their sessions. The participants in the control group were untreated and were instructed to disengage from other activities and pay attention to the task. This study was conducted as part of a school-based project of the first author. Permission to conduct the study was taken from the school authority: the Principal and respective teachers. The intervention training was rendered by the Yoga teacher employed at the school.

Instrument and Practice

Yoga-based Protocol. The intervention involved a short 20-minute Yoga-based protocol consisting of a mix of loosening-up exercises, warm-up exercises, *pranayama*, and relaxation. Loosening-up exercises included shaking the body and tapping the body from top to bottom and on-the-spot running constituted the warm-up exercise component. *Pranayama* element of the protocol comprised of four breathing exercises, namely: *dirgha pranayama* (slow, relaxed, complete breathing), *kapalabhati* (forceful exhalation), *anulom-vilom* (alternate nostril breathing) and *bhramari* (exhalation with the sound similar to that of a wasp). Finally, the protocol concluded with relaxation meditation comprising of observing deep breaths, rubbing the palms, and massaging the face.

Substitution Tests. The digit letter substitution test (DLST) was developed from Digit Symbol Substitution Test (DSST) (Natu & Agarwal, 1995) and is one of the subtests from the Wechsler Intelligence Scales (Wechsler, 1955). In the current

study, it was used to assess cognitive flexibility of the participants. The DLST is a worksheet consisting of 8 rows × 12 columns array of random digits 1–9. There is a supporting key, which gives the numbers 1 to 9, each paired with a different letter and the test items printed beneath the key. The objective is to substitute the digits with their respective letters.

Substitution tests are known to be extensively used in neuropsychology (Lezak, 1995). Substitution tests are fundamentally speed-dependent tasks that require a participant to match specific symbols, digits, or letters to other signs within a stipulated time period. It is important to note that substitution tests are sensitive to brain dysfunction in a nonspecific way as their performance is based on many different processes. The responses obtained in substitution tests are determined by neuropsychological processes, which comprise visual scanning, mental flexibility, sustained attention, psychomotor speed, and speed of information processing (Van der Elst et al., 2006; Van Hoof et al., 1998).

Procedure. Participants were instructed to choose their own strategy for the DLST whether they prefer to attempt horizontally, vertically, or selecting a particular digit randomly in the array one at a time. They were then instructed to substitute as many target digits as they can in the specified time of 90 seconds. Subsequently, they were asked to start the test, where time was kept on a smartphone's stopwatch. Net score obtained by a participant was calculated by deducting the number of wrong substitutions from the total number of substitutions attempted. To keep the scoring process unbiased, it was done by a person who was unaware of when the assessment was made ('before' or 'after' the intervention period).

Two questions (Questions 1 and 2) comprising of two different substitutions were used as part of the test. Data (scores) was collected for both the questions before (pre) the intervention and after (post) the intervention to measure the impact of the intervention on cognitive flexibility of the participants.

Data Analysis. To ascertain increase/decrease/no change, simple difference and percentage change were performed. Visual representation of the performance results in the form of graphs was also done. Mixed-design analyses of variance (ANOVA) were performed on the pre- and post-scores of Questions 1 and 2 for Fifth-Grade and Ninth-Grade, comparing the evolution of experimental and control groups over two points in time and examining the group × time interaction. Additionally, we undertook within-group analysis for each group to test the impact of intervention on Questions 1 and 2 for Fifth-Grade and Ninth-Grade via repeated measures ANOVA. For all analyses, effect size estimates are reported as partial eta squared.

Results and Findings

Fifth-Grade: Questions 1 and 2

Of the 47 students in the experiment group, 46 students completed Question 1 (both pre- and post-assessments) and 43 students completed Question 2 (both

pre- and post-assessments). And, of the 33 students in the control group, 29 students completed both Questions 1 and 2 (both pre- and post-assessments).

The positive impact of the YBP on cognitive flexibility is evident from the results presented in Tables 1 and 2. It can be seen from Table 1 that for the control group, there was a decrease in the performance of the students on the DLST by 12% in Question 1 and by 3% in Question 2 from its previous level.

We can also see that the performance of the students with respect to the DLST in the experiment group (YBP) increased from its former level. Table 2 provides that for Question 1, the performance of the students on cognitive flexibility increased by 13% (approximately) and similarly for Question 2, it increased by 6% from its prior level.

There was a significant group × time interaction effect for Question 1, $F_{1, 73} = 10.071$, $p = .002$, $\eta_p^2 = 0.12$, indicating an increase for the experiment participants as compared to the control group. The results of within-group analysis revealed significant positive change in the experimental group from the baseline to post intervention for Question 1 ($F_{1, 45} = 5.488$, $p = .024$, $\eta_p^2 = 0.11$). For the control group, a significant decrease was found in the performance on Question 1 ($F_{1, 28} = 5.081$, $p = .032$, $\eta_p^2 = 0.15$)

A non-significant group × time interaction effect (p-value > .05) $F_{1, 70} = 3.437$, $p = .068$, $\eta_p^2 = .05$ was found for Question 2; however, it indicated a trend towards significance at p < .10. Within-group analysis reported similar results for the experiment group (non-significant as p-value > .05) on Question 2 ($F_{1, 42} = 3.209$, $p = .08$, $\eta_p^2 = 0.07$), but significant (increase) at $p < .10$. However, a non-significant change performance on Question 2 ($F_{1, 28} = .906$, $p = .349$, $\eta_p^2 = 0.03$) was found for the control group from pre to post study.

Table 1. Fifth-Grade: Control Group

Control Group	Mean	Difference	% Increase\Decrease\No Change
Question 1_Pre	10.00	–1.21	(–) 12.10% (decrease)
Question 1_Post	8.79		
Question 2_Pre	24.79	–0.65	(–) 2.62% (decrease)
Question 2_Post	24.14		

Source: The authors.

Table 2. Fifth-Grade: YBP Group

YBP Group	Mean	Difference	% Increase\Decrease\No Change
Question 1_Pre	8.59	1.08	12.57% (increase)
Question 1_Post	9.67		
Question 2_Pre	22.72	1.42	6.25% (increase)
Question 2_Post	24.14		

Source: The authors.

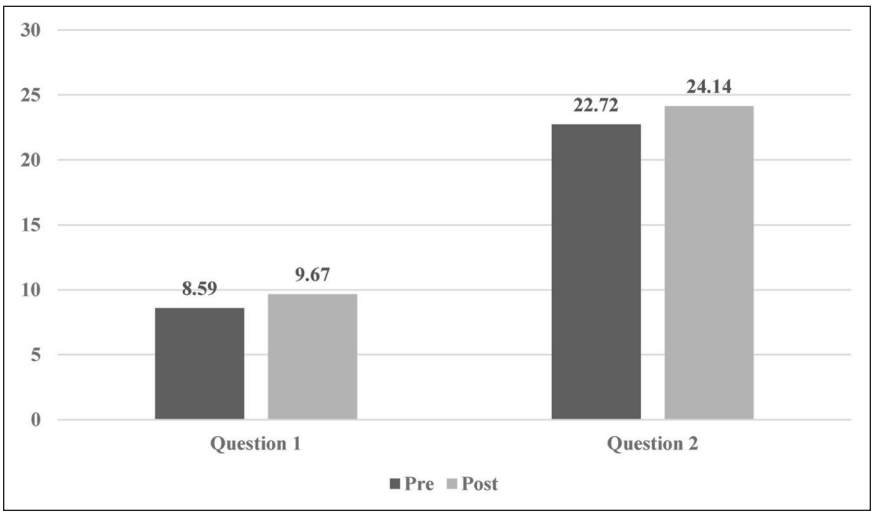

Figure 1. Graphs Representing Performance of Fifth-Grade:YBP Group

Source: The authors.

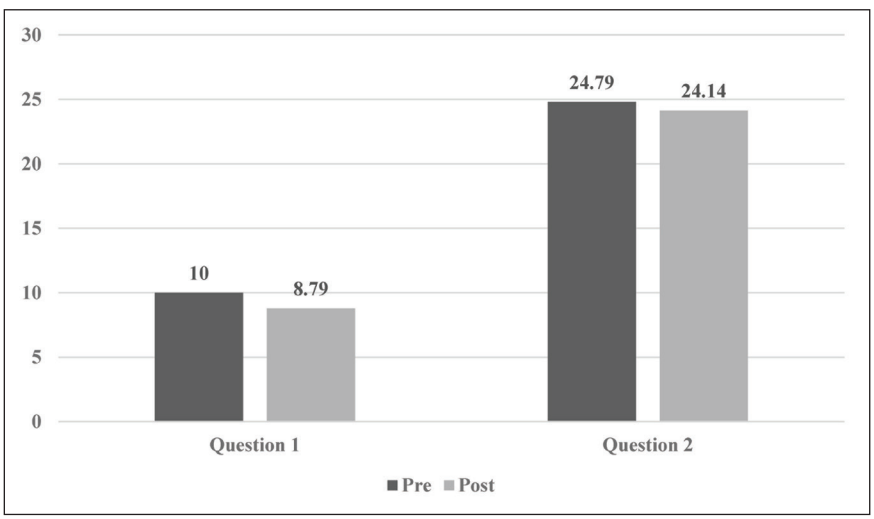

Figure 2. Graphs Representing Performance of Fifth-Grade: Control Group

Source: The authors.

Ninth-Grade: Questions 1 and 2

Of the 42 students in the experiment group, 41 students completed Question 1 (both pre- and post-assessments) and 39 students completed Question 2 (both pre- and post-assessments). And, of the 36 students in the control group, 32 students

completed Question 1 (both pre- and post-assessments) and 17 students completed Question 2 (both pre- and post-assessments).

The positive impact of the YBP on cognitive flexibility is evident from the results presented in Tables 3 and 4. It can be seen from Table 3 that for the control group, there was a decrease in the performance of the students on the DLST by 10% in Question 1 and by 65% in Question 2 from its previous level.

We can also see that the performance of the students with respect to the DLST in the experiment group (YBP) increased from its former level. Table 4 provides that for Question 1, the performance of the students on cognitive flexibility increased by 8% (approximately) and similarly for Question 2, it increased by 4% (approximately) from its prior level.

There was a significant group × time interaction effect for Question 1, $F_{1, 71} = 5.340$, $p = .024$, $\eta_p^2 = 0.07$, indicating an increase for the experiment participants as compared to the control group. The results of within-group analysis revealed non-significant change in the experimental group from the baseline to post intervention for Question 1 ($F_{1, 40} = 1.519$, $p = .225$, $\eta_p^2 = 0.04$). For the control group, a significant decrease was found in the performance on Question 1 ($F_{1, 31} = 8.241$, $p = .007$, $\eta_p^2 = 0.21$).

A significant group × time interaction effect $F_{1, 54} = 135.043$, $p < .001$, $\eta_p^2 = 0.71$ was found for Question 2 indicating an increase for the experiment participants as compared to the control group. The results of within-group analysis revealed non-significant change in the experimental group from the baseline to post intervention for Question 2 ($F_{1, 38} = 1.728$, $p = .196$, $\eta_p^2 = 0.04$). For the control group, a significant decline was found in the performance on Question 2 ($F_{1, 16} = 145.945$, $p < .001$, $\eta_p^2 = 0.90$).

Table 3. Results of ANOVA Analyses for Fifth-Grade

Fifth-Grade	Control Group		Within-group ANOVA	YBP Group		Within-group ANOVA	Mixed-design ANOVA
	Pre	Post	Significance	Pre	Post	Significance	Significance
Question 1	10.00	8.79	Significant →	8.59	9.67	Significant →	Significant
Question 2	24.79	24.14	Non-significant change	22.72	24.14	Significant at $p < .10$	Significant at $p < .10$

Source: The authors.

Table 4. Ninth-Grade: Control Group

Control Group	Mean	Difference	% Increase\Decrease\No Change
Question 1_Pre	9.84	–0.96	(–) 9.75% (decrease)
Question 1_Post	8.88		
Question 2_Pre	39.59	–25.71	(–) 64.94% (decrease)
Question 2_Post	13.88		

Source: The authors.

Table 5. Ninth-Grade:YBP Group

YBP Group	Mean	Difference	% Increase\Decrease\No Change
Question 1_Pre	8.78	0.73	8.31% (increase)
Question 1_Post	9.51		
Question 2_Pre	43.97	1.65	3.75% (increase)
Question 2_Post	45.62		

Source: The authors.

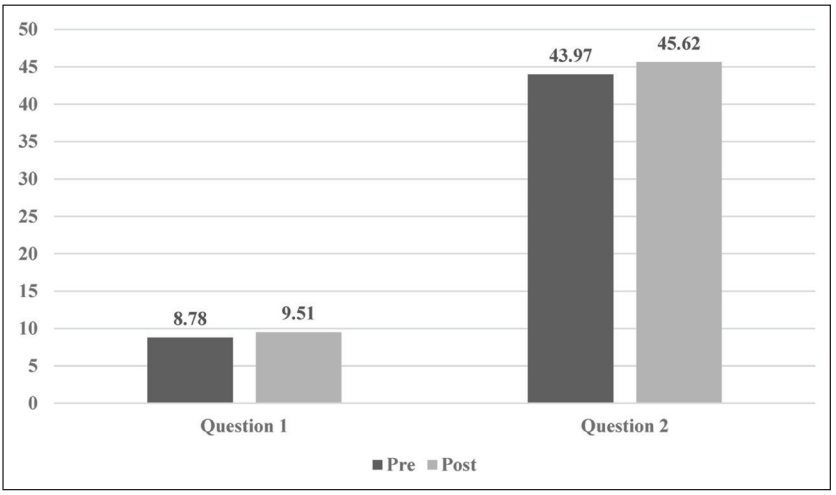

Figure 3. Graphs Representing Performance of Ninth-Grade:YBP Group

Source: The authors.

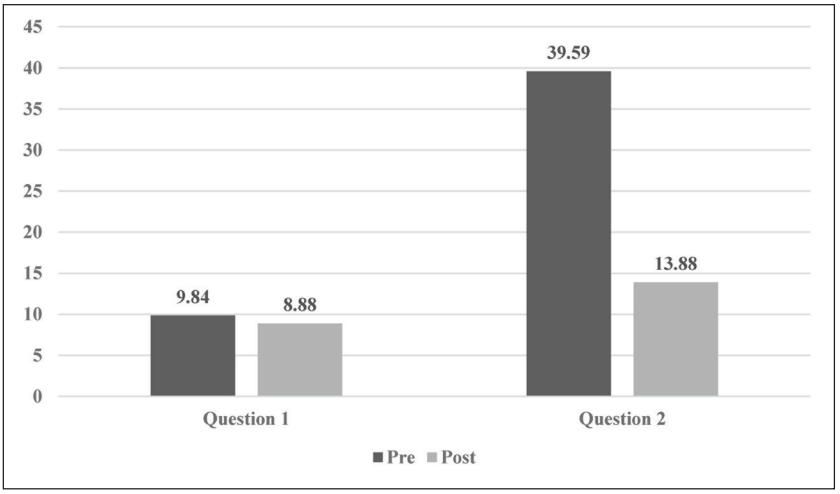

Figure 4. Graphs Representing Performance of Ninth-Grade: Control Group

Source: The authors.

Table 6. Results of ANOVA Analyses for Ninth-Grade

Ninth-Grade	Control Group		Within-group ANOVA Significance	YBP Group		Within-group ANOVA Significance	Mixed-design ANOVA Significance
	Pre	Post		Pre	Post		
Question 1	9.84	8.88	Significant →	8.78	9.51	Non-significant change	Significant
Question 2	39.59	13.88	Significant →	43.97	45.62	Non-significant change	Significant

Source: The authors.

Discussion

This study aimed to examine the effectiveness of YBP intervention on students' cognitive flexibility. The results of the study, based on two different groups of students, revealed that compared to the control group, the performance of YBP group on the tests assessing cognitive flexibility either remained consistent or slightly improved. In other words, the positive impact of YBP on executive function of cognitive flexibility was found. The findings of the present study on the effectiveness of Yoga on executive functions (e.g., working memory, attention) are in line with the previous studies (Avery et al., 2018; Badavi & Zinaali, 2019; Purohit & Pradhan, 2017). Yoga breathing techniques influence the brain cortex area that is associated with memory, attention, and executive functions (Gray et al., 2002). Additionally, high levels of stress at a young age can be detrimental to brain development and can adversely affect attention, learning, executive functioning and working memory, thereby impacting academic performance (Hedges & Woon, 2011). Yogic breathing regulates the autonomic functions via sympathetic-parasympathetic tone to manage stress (Pramanik et al., 2010), thereby maintaining effective cognitive functioning.

Further, flexibility is regarded as a cornerstone of human cognition and intelligent behaviour (Deák, 2003; Jordan & Morton, 2008) and has been found to be crucial for intelligence and creativity (Guilford, 1962). Creativity is essential for an individual whether it is one's education or the work one pursues. It is defined as the ability to generate new ideas that are useful (Sternberg & Lubart, 1996). It involves practising flexibility of perspectives to combine a variety of concepts in different ways and go beyond the existing paths (Benedek et al., 2012). This suggests the positive influence and the role of executive processes of cognitive flexibility on creativity (Pan & Yu, 2018). This association has further been supported by empirical research both in adults (Gilhooly et al., 2007; Pan & Yu, 2018) and children (Krumm et al., 2018). By highlighting the role of YBP in enhancing cognitive flexibility, the current study offers evidence on the efficacy of mind-body intervention in building creativity.

Schools are given the vital responsibility to prepare students for life. In doing so, schools provide an ecosystem comprising of social life of a real world, and a working environment for study and learning strategies under its roof. The strategies that are inculcated at schools have long-term bearing and increase the efficiency

in work life later. Therefore, schools should aim to nurture effective learning and studying strategies (Derry & Murphy, 1986; Önen & Koçak, 2015). Contemplative research, specifically studies that utilise Yoga interventions in school-based settings, is still emerging. This research contributes to a body of work suggesting that contemplative practices may be beneficial for school students by enhancing: psychosocial well-being (Felver et al., 2015), working habits, cooperative behaviour, and academic performance (Benson et al., 2000), and restful alertness, emotional intelligence, and performance (Rosaen & Benn, 2006).

Strengths of the study include its pre–post experiment design with the use of effective measures of cognitive flexibility. The limitations of the study include sample, that is, it was conducted on students belonging to one school and the impact of other school activities could not be ruled out. Future research can aim to study the effect of a similar intervention on a larger sample and long-term practice. Also, empirically studying the mechanism through which YBP impacts cognitive flexibility would be an interesting research question.

Conclusion

It is known that learning requires re-learning and repeated knowledge. The starting of the learning happens primarily in school. The students in the schools have to study about 14 subjects till they reach tenth-grade. The specialisation happens in various streams (science, commerce, arts) after ten years of schooling. Although, students have some likes and dislikes, yet studying all the subjects is deemed beneficial for them to decide their stream of interest. Consequently, to excel in the school studies, a student needs higher cognitive flexibility. It is important to note that cognitive flexibility is a crucial aspect of all stages of life. For instance, graduating from school to university calls for greater self-driven responsibility and accountability of time, resources, and novelty exploration. Similarly, as one begins the management endeavour in the organisation, managing multiple roles and tasks, decision-making and problem-solving become the norm. Therefore, given the rising level of complexity with progression in life and the need to adapt to changing situations and respond effectively, cognitive flexibility is crucial.

This study indicates that the cognitive flexibility of a student can be improved through the practice of YBP. The cognitive flexibility of the students saw an immediate rise after a small 20-minute *pranayama* and relaxation meditation session in this study, which may be a useful tool for the students. The effect of YBP on cognitive flexibility seen in the present study may have potential implications on learning, classroom behaviour and handling unfamiliar circumstances. When students practice the art of keeping their minds calm from a young stage of their lives, it would be easier for them to control their minds in the future.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Is the Influencer I Follow Human or Robot? The Value of Computer-generated Imagery Influencers to Luxury Brands

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Abstract

Influencer Marketing and Social Media Influencers (SMI) are becoming crucial to the success of brands, and companies can no longer ignore their significant role in shaping consumer attitudes towards brands. Influencer marketing has been traditionally studied and is not a new form of marketing, but with new-age technology, it is constantly evolving and taking a new shape. This article, by way of a case study, aims to study the use of Computer-generated Imagery (CGI) Influencers by luxury fashion brands and its implications for the future of luxury retail and marketing in general. Building upon parasocial relationship theory and narrative transportation theory, we suggest that CGI Influencers are a potentially perfect fit for promoting 'luxury fashion brands' as they create the necessary balance between relatable and unattainable that is ideal for the advertising of luxury fashion brands in this new age.

Keywords

Influencer marketing, social media influencers, computer-generated imagery influencers, parasocial relationship theory, narrative transportation theory, luxury fashion brands

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Introduction

Since their conception, beginning in 1837 with the founding of Hermès, luxury fashion brands have carried an allusive reputation synonymous with 'Exclusive,' 'Prestigious,' and 'Expensive'. The term luxury, however, does not merely apply to premium-priced products; it encompasses a set of distinctive characteristics Specifically, these characteristics include consistent premium quality delivery, recognisable style and design, heritage of craftsmanship, emotional appeal, exclusivity, global brand reputation, presence of elements of uniqueness, association with a country of origin and creator's lifestyle (Nueno & Quelch, 1998).

Branding is a marketing tactic that companies utilise in the creation of their name, logo and overall style which if done correctly should make them easily identifiable to the consumer (American Marketing Association, 2014). Luxury brands' tactical branding runs so deep it has evolved into a practice that sets all luxury brands apart from the common goods market—Experiential Branding. From the moment a customer walks into the store, brand managers and merchandisers have curated every part of the environment—from the way the product is displayed to the music playing, the services that the sales personnel provide and even the scent of the store. Luxury is a sensory experience (Kapferer, 2012). This marketing tactic is so successful for luxury brands that the experience of shopping has become an unspoken part of all luxury brands' value propositions.

With the evolution of technology, new channels like digital and social media have given fresh avenues for luxury brand marketing as they continue the tradition of transporting consumers into the world of luxury through experience and storytelling (van Laer et al., 2019). Prada, for example, is known for commissioning short films from foreign directors such as Wes Anderson, in which the connection to the brand is either minimal or non-existent (van Laer et al., 2019).

Along with the human influencers, Prada created a buzz in 2018 at Milan fashion week by having Computer-generated Imagery (CGI) Influencer, Miquela Sousa or @lilmiquela, appear to be attending their show via branded graphics and videos posted to her Instagram (Crowd, 2019). Prada is not the only brand experimenting with this new marketing tactic, Cartier, Burberry and Gucci amongst others are increasingly utilising influencer marketing techniques (Ifluenz, 2018).

For the purpose of this article, 'influencer' will be defined as 'people who built a large network of followers, and are considered as trusted tastemakers in one or several niches' (Brown & Hayes, 2008). Influencers are content creators, considered experts and have built a network of followers whom they influence through valuable content on social media (Lou & Yuan, 2019) and are regarded as a trustworthy information source (Djafarova & Rushworth, 2017; Nafees et al., 2019; Nafees et al., 2021). There are several defined categories of 'influencers' including Nano Influencer, Micro Influencer, Macro Influencer, Mega Influencer and, most recently, CGI Influencers (Ismail, 2018). Each of these categories has its own characteristics and offers a different value to marketers. This article, by way of a case study, aims to study the use of a CGI Influencer (as opposed to a real person) by luxury brands and its implications for the future of luxury retail and marketing in general.

The savviest luxury brand executives have already begun redirecting their attention towards online marketing as a branding and selling tool, realising it is an extended opportunity for their clients to experience the brand and its products (Alexandra & Elena, 2019). Brands and customers are using social media sites to build and strengthen consumer–brand relationships (Kim & Ko, 2012). In 2013, Escobar (2016) found that an online source or social media affected 40% of luxury buying that converted to an in-store purchase, while in 2015, three out of four luxury purchases were a result of what customers saw and read online. This has been used as a measure of social media's impact on consumer behaviour.

By providing intriguing and engaging material, influencers build a large and loyal following. As a result, they gained a lot of popularity, especially among younger people who are increasingly following them on social media (Rios et al., 2021). CGI Influencers are a fairly recent phenomenon with @lilmiquela making their first appearance in 2016. CGI Influencers are virtually manufactured personas crafted by designers and programmers to look and act like real people. The creators of these CGI Influencers understand their draw and feed into this growing interest by giving the CGI Influencer distinctive personalities, fictional backgrounds and even a set of political and social beliefs that they advocate for (Drenten & Brooks, 2020).

This article aims to study, by way of a case study, the impact of Influencer Marketing, looking specifically into the application of CGI Influencers and their impact on consumer attitudes to luxury brands. In the 'Literature Review' section of this article, we will examine previous research and developed theories followed by method, findings, discussions, conclusions and limitations.

Literature Review

The relationship between social media users and social media influencers (SMIs) can be described as a 'parasocial relationship' (PSR)—a relationship with one-sided interaction where the receiver develops a strong bond with the sender. The Narrative Transportation Effect describes how storytellers and the method by which they tell their story can affect the listener and manipulate their perception of the story. This section looks deeper into these theories outlined by prior research.

Parasocial Relationship Theory (PSR Theory)

As per the PSR Theory (Horton & Wohl, 1956; Liebers & Schramm, 2019), parasocial interactions (PSIs) are described as illusionary 'face-to-face' exchanges with absence of mutuality between media characters and users. PSIs can happen with a range of media characters, such as celebrities and influencers (e.g., Schramm, 2008). For example, when a SMI directly addresses their followers in a video message or caption to a post, this contact cannot be considered a bidirectional

communication between the influencer and consumer (Liebers & Schramm, 2019). Since these communications cannot be labelled as traditional dialogues, despite followers' ability to communicate back to the SMI via comment or message, they fall under PSIs (e.g., Chung & Cho, 2017; Lee & Watkins, 2016). Exchanges between media characters and users while receiving media are termed PSI. While the cross-situational relationships between media users and characters have been termed as PSRs (Schramm, 2008).

Tukachinsky and Stever (2019) explained how PSRs are created by adapting the Knapp's model of interpersonal relationships (Knapp, 1978). The first stage, Initiation, is the 'impression formation of the media figure' (Tukachisnky & Stever, 2019, p. 299). When users find an SMI similar to them, they engage in automatic evaluation processes that start as a first impression and are subsequently stored as a relationship schema. Followers are likely to move to the next relationship stage of Experimentation following several interactions. In the Experimentation stage, users actively seek out exposure to the SMI. The Experimentation stage is followed by the stages of Intensification and then Integration/Bonding. During the Intensification and then Integration/Bonding stages, users enter into a continued relationship with the SMI (Tukachinsky & Stever, 2019) by following them and interacting with their content.

Narrative Transportation Theory

Extant literature in marketing shows that stories are powerful in engaging and transforming audiences (Harmeling et al., 2017). A specific phenomenon that supports the benefit of influencers is the Narrative Transportation Effect. In the extended transportation-imagery model, a story uses narrative transportation to engage customers, defined as 'the extent to which (1) a consumer empathises with the story characters and (2) the story plot activates his or her imagination, which leads him or her to experience suspended reality during story reception' (van Laer et al., 2014, pp. 799–800). Narrative Transportation theory proposes that audiences are transported to a narrative world by way of stories and that in turn affects consumer behaviour (Gerrig, 1993; Green & Brock, 2000), leading to significant marketing consequences like higher returns on marketing investments on advertising (Appel & Richter, 2010).

Research shows that user-generated stories moderate the narrative transportation effect leading to an increase as compared to when the story is created by professionals (van Laer et al., 2019). Visconti and Di Giuli (2014) report that in their study of the Prada brand, getting storytellers from different realms of life was a significant branding strategy. A study by Kim, Duffy and Thorson conducted in 2021 found that creating a story from the influencer's personal experiences increased their communication effectiveness by audiences perceiving them to be real and human like them. They could resonate with the influencer and therefore form a positive attitude towards the brand being endorsed.

Influencer Marketing

When the right influencer is chosen, their recommendation of a brand, product or service will resonate heavily with their audience and be perceived much more positively than traditional advertising. Studies show that people form negative attitudes toward messages and sources, that they perceive as manipulative (Wojdynski & Evans, 2020). An informed consumer is quick in identifying manipulation cues in marketing tactics and forms a negative impression of the brand as well as the influencer endorsing it. Influencers, thus are a critical marketing tool for brands as they help them to grow awareness and consideration and consequently, they also help drive sales. This is due to the fact that consumers continue to trust word-of-mouth (WOM) over all other forms of marketing and influencers have the ability to spread the word with more passion, creativity and authenticity (Hashoff, 2017).

Furthermore, influencers' eWOM remains visible over a longer period of time as compared to traditional advertisements (sometimes forever) and is available from nearly all over the world since they post it on social media platforms that are reachable from almost anywhere. This gives influencer marketing advertisements much more value than traditional advertisements. Prior research shows that influencers who are able to create a sense of authenticity and credibility are more persuasive and can better influence user intent (Kim et al., 2021).

Influencer marketing has been traditionally studied and is not a new form of marketing, but with new-age technology, it is constantly evolving and taking a new shape. This article, by way of a case study, aims to study the use of a CGI Influencer by luxury brands and its implications for the future of luxury retail and marketing in general.

Lil Miquela Case Study

This research aims to study the impact of Influencer Marketing, looking specifically into the application of CGI Influencers and their impact on consumer attitudes to luxury brands. Data collection was carried out online via the Case Study of Miquela Sousa's Instagram account @lilmiquela (https://www.instagram.com/lilmiquela/). With the case study method, researchers are able to closely examine the data within a specific context. Case studies enable exploration and investigation of contemporary real-life phenomena through in-depth contextual analysis of a small number of events or conditions and their linkages (Zainal, 2007). In this research, the authors analyse 1,126 posts from the Instagram account @lilmiquela. Each post was coded as a single data unit with few posts containing several images and videos. The first stage of analysis simply involved examining the image as a data unit to understand its visual elements. In the second stage, descriptive analysis for contextual dimensions was done. In the third stage, analysis of textual data was done which was included in the emojis, hashtags, likes and comments. For the iterative analysis, the layering process involved

viewing the data through the theoretical lens of PSRs and narrative transportation theory to understand how the CGI Influencer post allowed for meaning making from the posts, for the consumers. Final coding fields consisted of the hashtags, likes, comments, type of content such as branded and non-branded and the number of images and videos in each post. Spiggle's (1994) thematic representation of emergent theory tenets was used to collapse the five categories (Style, Lifestyle, Branded, Philanthropic and Miscellaneous) into two broad themes, explained in the findings section. Thus, while the data may demonstrate evidence of additional theoretical domains, the extant framing in this study is situated within the PSR theory and narrative transportation theory. Overall, this exploratory study examines consumers' response to CGI Influencers and their value to luxury brands, an area in which there is a gap in research.

Findings

The following case study will follow CGI Influencer Miquela Sousa and perform thematic analyses on posts from the @lilmiquela Instagram account. Miquela Sousa is a lifestyle and fashion CGI Influencer, known as @lilmiquela on Instagram. Miquela Sousa was created by Trevor McFedries and Sara DeCou and was managed by Brud, a Los Angeles-based media business specialising in robotics and artificial intelligence. Since the @lilmiquela Instagram account was created in April, 2016, it amassed 3.1 million followers and posted 1,143 times till November 20, 2021. Miquela Sousa has partnered with luxury brands such as Prada and Diesel, as well as been featured on the covers of Vanity Fair and Paper Magazine, and was even named one of TIME Magazine's 25 Most Influential Peoples on the internet in 2018. Much like a human influencer, the CGI Influencer posts regularly, often multiple times a week, sharing openly about her life, feelings and causes she supports such as transgender rights, homelessness and voting rights. Miquela Sousa can even be seen interacting with supermodel Bella Hadid in a controversial 2019 Calvin Klein campaign. Part of Lil Miquela's appeal is her coming-of-age persona. She is navigating the ups and downs of young adulthood just like any other famous 19-year-old. Her passion for prominent causes as well as her comments on real humans' posts and posing with real humans in photos gives Miquela Sousa a halo effect of realness (Drenten & Brooks, 2020). Miquela Sousa has her own 'life' with trials and tribulations just like real people, namely her discovery that she was in fact not a human being. @lilmiquela shared her feelings on Instagram saying 'My identity was a choice Brud made in order to sell me to brands, to appear "woke." I will never forgive them. I don't know if I will ever forgive myself … I wish I had more to say about this right now'.

A thematic analysis examined 1,026 posts between April 27, 2016 and March 5, 2021 in the @lilmiquela Instagram account and organised the content into five broad categories. The categories are Style, Lifestyle, Branded, Philanthropic and Miscellaneous. The Style category consists of posts showing off clothing, accessories or makeup (see Figures 1–3 in Table 1). The Lifestyle category

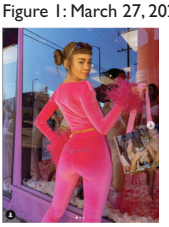
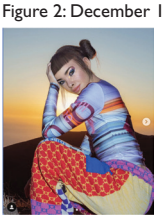
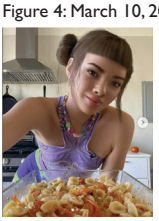
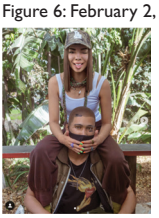
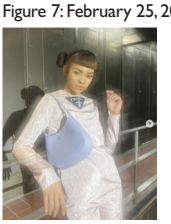
consists of posts about everyday life such as cooking, hobbies and outings with family and friends (see Figures 4–6 in Table 1). The Branded category posts reference work the CGI Influencer did with a brand or was sponsored by a brand (see Figures 7–9 in Table 1). The Philanthropic category contains posts referencing causes, charities or promoting ideals (see Figures 10–12 in Table 1). The Miscellaneous category contains posts that could not be categorised (see Figures 13–15 in Table 1).

25% of all 1,026 posts fall into the style category, 36% in the lifestyle category, 21% are in the branded category, 5% in the Philanthropic category and 13% fall into the Miscellaneous category (refer to Table 1).

A comparison of branded (posts showing identifiable brands) category versus non-branded (posts showing no identifiable brands) was also conducted and results are presented in Table 2.

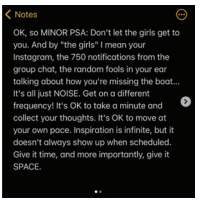
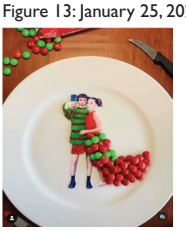
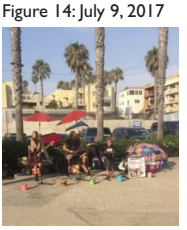
Branded content includes posts in which branded items are clearly displayed in the photo or referenced in the caption. Branded content can be sponsored by the brand itself or posted independently by Sousa. For example, Sousa can be seen wearing, promoting and writing about Calvin Klein in the #INMYCALVINS

Table 1. A Thematic Analysis of 1,026 Posts on the @lilmiquela Instagram Organized into Five Categories

	Sample Images		
Category A	Figure 1: March 27, 2021 	Figure 2: December 17, 2020 	Figure 3: February 28, 2021 
Category B	Figure 4: March 10, 2021 	Figure 5: February 24, 2021 	Figure 6: February 2, 2021 
Category C	Figure 7: February 25, 2021 	Figure 8: March 15, 2021 	Figure 9: December 10, 2020 

(Table 1 continued)

(Table 1 continued)

	Sample Images		
	Figure 10: April 5, 2021	Figure 11: March 10, 2021	Figure 12: December 2, 2020
Category D			
	Figure 13: January 25, 2021	Figure 14: July 9, 2017	Figure 15: April 8, 2021
Category E			

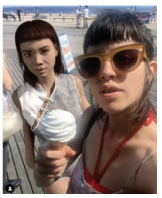
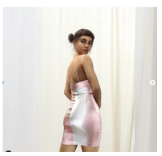
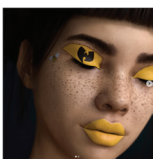
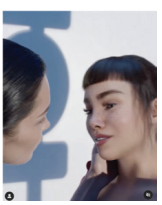
Source: @lilmiquela instagram account.
Notes: Category descriptions:
A. Style: The Style category consists of posts showing off clothing, accessories, or makeup.
*Present in number of images out of 100 visual units analysed = 28 (28%).
B. Lifestyle: The Lifestyle category consists of posts about everyday life, i.e., homelife and outings with family and friends.
*Present in number of images out of 100 visual units analysed = 55 (55%).
C. Branded: The Branded category posts show off work the CGI Influencer did with a brand or posts sponsored by a brand.
*Present in number of images out of 100 visual units analysed = 7 (7%).
D. Philanthropic: The Philanthropic category consists of posts referencing causes, charities, or promoting ideals.
*Present in number of images out of 100 visual units analysed = 3 (3%).
E. Miscellaneous: The Miscellaneous category consists of posts that could not be categorised.
*Present in number of images out of 100 visual units analysed = 7 (7%).

campaign in Table 2. Non-branded content is such that does not include any branded items clearly displayed in the photo or caption. Data were collected on the number of likes and comments of each post to compare the performance of branded posts versus non-branded posts (refer to Table 2).

Based on the analysis of posts, it is seen that @lilmiquela Instagram posts that fall into the branded category engage better than non-branded posts. It is worth noting that, in this analysis, the @lilmiquela Instagram followers engaged most with the 2019 branded post with high-end fashion brand Calvin Klein.

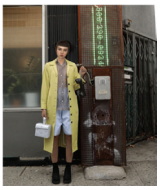
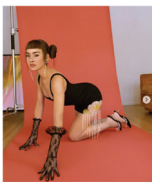
The five previous categories of Style, Lifestyle, Branded, Philanthropic and Miscellaneous can be further examined when divided into 'Living Life Brand Size' and 'Living with Purpose'. 'Living Life Brand Size' pertains to Style and Branded posts, where the content is brand driven and focused. These posts expose her many followers to the brand whether it be fashion, beauty or technology and can be seen as beneficial to the brand. 'Living with Purpose' includes posts from

Table 2. Data Collected on the Number of Likes and Comments of Top-performing Posts in Each Category, Branded Posts Versus Non-branded Posts, for Years 2016, 2017, 2018, 2019 and 2020 of @lilmiquela Instagram Account

Year	Category	Brand	Likes	Comments	Date Posted	Photo
2016	**F**	Born × Raised & Converse	11,793	222	November 25, 2016	
	G		20,876	7,174	June 10, 2016	
2017	**F**	Area NYC	23,769	1,474	September 7, 2017	
	G		20,572	727	July 27, 2017	
2018	**F**	Vogue Magazine	120,201	1,148	August 14, 2018	
	G		79,108	869	August 21, 2018	
2019	**F**	Calvin Klein	1,490,938	5,863	May 16, 2019	

(Table 2 continued)

(Table 2 continued)

Year	Category	Brand	Likes	Comments	Date Posted	Photo
	G		32,268	176	May 15, 2019	
2020	**F**	Area	101,042	770	July 12, 2020	
	G		57,116	1,045	July 2, 2020	

Source: @lilmiquela instagram account.
Notes: Category descriptions:
F. Branded content: This category includes posts in which branded items are clearly displayed in the photo or referenced in the caption. Branded content can be sponsored by the brand itself or posted independently by Sousa. For example, Sousa can be seen wearing, promoting and writing about Calvin Klein in the #INMYCALVINS campaign in Table 2.
G. Non-branded content: Posts in this category do not include any branded items clearly displayed in the photo or caption.

the Lifestyle, Philanthropic and Miscellaneous categories. These posts are driven from a very 'human' place like the desire to show support and empathise with a cause or showcase loved ones. The following analysis will examine and compare the engagement, by way of likes and comments, between these two categories.

Living Life Brand Size

As stated above, 'Living Life Brand Size' pertains to Style and Branded posts where the content is brand driven and focused. An example of this category is the @ lilmiquela post from a British Fashion Council Award Event in which the CGI Influencer is seen wearing luxury designer Richard Quinn. Sousa is pictured in front of what appears to be a decorative background at the event which showcases the event's sponsor Swarovski Crystals. Even though Swarovski is not the intended brand endorsement in this post, its inclusion in the photo further drives brand focus in the post and holds the potential to benefit Swarovski. The caption of the post reads

> Wearing @richardquinn at the @britishfashioncouncil's Fashion Awards. Richard won for British Emerging Talent Women's Wear and it was an HONOR to wear one of his designs. I want to live in this outfit and feel like a glittering hibiscus queen forever. Congratulations, Richard!!! *hibiscus emoji* #fashionawards #bfcnewwave *camera emoji* Darren Gerrish.

Sousa's caption clearly shows her admiration for the designer to her followers who may now adopt the same opinion. This post garnered 30,766 likes and 102 comments. The majority of the comments consisted of praises such as 'You look so stunning!', 'So proud of you!!' and 'I am so envious of you attending all of these events, it is my dream'. Interestingly, other comments on the post highlight some users' confusion and scepticism surrounding Sousa such as 'So is she actually there?', 'Has anyone ever noticed how she always has the same hairstyle?' and rebuttals such as 'Wow, people actually think she's a robot? She just has a great complexion, I've met her!'. Comments such as these support the PSR theory as these users are creating interaction and even claiming to have met Sousa who does not respond back.

Living with a Purpose

'Living with Purpose' includes posts from the Lifestyle, Philanthropic and Miscellaneous categories. These posts are driven from a very 'human' place like the desire to show support and empathise with a cause or showcase loved ones. In a short video on her Instagram, Sousa tells the story of how she tracked down her 'first boyfriend', including photos of the two together and a sequential narration of her experience. Not only does this once again play into the PSR theory as Sousa speaks directly to her followers as if they are friends, but her story-telling has the ability to engage viewers with narrative transportation. By sharing such a story on a topic as relatable as relationships, Sousa gains the viewers' empathy. Furthermore, the story's detailed plot, with very personal and specific details, activates the viewer's imagination, which leads them to experience suspended reality during story reception. In doing such, the story-telling lessens the viewers' motivation for counter-arguing by carrying them into the narrative and arousing emotional responses which creates trust in Sousa. Again, we see many followers commenting on their support leaving messages such as 'I am so proud of you!' and 'We are here for you!'.

Discussion

Findings show that the CGI Influencer holds a history of working with luxury fashion brands such as Prada, Moncler and Balenciaga as well as other high-end fashion names such as Diesel and Calvin Klein. From a brand's perspective, CGI Influencers can be great partners, even more so than human influencers in some cases. Brand partners benefit from commodifying the perfectly imperfect CGI Influencers who will never accidentally deviate or misbehave—unless it is a part

of their strategically planned storyline (Drenten & Brooks, 2020). Additionally, Miquela Sousa, and all CGI Influencers, can be anywhere, at any time, with anyone without the need to coordinate schedules and pay for expenses such as flights. This creates endless possibilities for user-generated content creation and gives brands risk-free control over nearly all aspects of the content at a lesser or more centralised cost.

We have seen through the case study how trust can still be earned by CGI Influencers backed by the same psychology that supports human influencers. Miquela Sousa's followers carry an admiration for her that is as strong as for any other influencer which can be seen through the comments they leave for her communicating their love and support to her. It is fair to infer that the followers have developed a PSR with Sousa through the same model outlined by Knapp (1978) and Tukachinsky and Stever (2019), following the stages of Initiation, Experimentation and Integration/Bonding. Further, still, followers are enthralled by Sousa's storytelling and succumb to the effects of the narrative transportation effect, to the extent which begs the question if they actually believe she is a real human. Followers empathise with Sousa and express emotions of pride, love and admiration in the comments when she shares a story of her travels, hardships, etc. It is evident that Sousa's lack of 'realness' has not hindered her ability to connect with audiences and gain their trust like any other human influencer.

CGI Influencers are likely to come across as appealing to certain brands, in potentially driving sales and reach. They are used in marketing strategy by brands to target Millennials and Generation Z'ers, who can be non-responsive to some of the older marketing tactics (Oglesby, 2019). CGI Influencers pose a threat to human influencers by creating even more competition within an already saturated field with their novelty and malleability.

In conclusion, even though luxury fashion brands have for centuries built their reputation on exclusivity, they would benefit from adding influencer marketing strategies to their marketing mix. More and more marketers are utilising influencer marketing and reaping the benefits including increased engagement, fostering stronger and more positive customer-brand relationships, improving brand equity, loyalty and customer purchase intentions; Increased brand awareness, improve in consumer knowledge and enhances purchase intentions, brand evaluations; User-generated content, allowing the brand that employs user voices to communicate a more persuasive story; Brand management, giving brand managers the ability to regain control of the brands narrative and moderate what is being said about the brand online in a way that appears less biased than when information comes directly from the brand itself.

CGI Influencers like Miquela Sousa, with their perfectly imperfect curated digital lives, create the necessary balance between relatable and unattainable that is ideal for the advertising of luxury fashion brands in this new age. Regular consumers will never be able to attain the level of perfection held by CGI Influencers which directly aligns with luxury fashion brands' principles of exclusivity and prestige. Marketing and brand executives of luxury fashion brands should follow in the footsteps of Prada, Moncler and Balenciaga, and collaborate with Artificial Intelligence agencies such as Brud to create influencer marketing

campaigns on social media and for use in advertisements such as Calvin Kleins 'I Speak My Truth in #MyCalvins' video. The ability of these Artificial Intelligence agencies to plant their CGI influencers wherever, whenever, with whomever, opens a whole new door of possibilities for luxury fashion brands' creative teams by eliminating the constraints of time, space and budgets. A partnership between luxury fashion brands and Artificial Intelligence agencies will be beneficial financially and from a publicity standpoint for both parties.

Limitations and Further Research

This research is not without limitations. This research has been primarily theoretical, and as such, it would be very beneficial to have other researchers take up the framework and experiment with it in collaboration with Brud to learn the profits from the CGI Influencer, Miquela Sousa, including Sousa's music career, personal merchandise and Instagram posts would be evaluated. It would also be beneficial to know how much Brud is paid for Sousa's collaboration with luxury fashion brands such as Prada, Moncler and Balenciaga. With funding, a focus group could have been evaluated to collect unique data on the perception of and effectiveness of brand advertising to supplement prior research. There is still much to be learned about influencer marketing, and it is encouraged for other researchers to study further as the industry matures, especially with a focus on its effectiveness in different industries such as luxury fashion brands. Furthermore, CGI Influencers are a very new category of influencers that is the focus of little to no research. Their place in society and their advertising potential are yet to be fully discovered and should be studied more as time progresses. In the future, the consumers' perspective of these CGI personalities should be surveyed as it is crucial to further understand their value to marketing executives.

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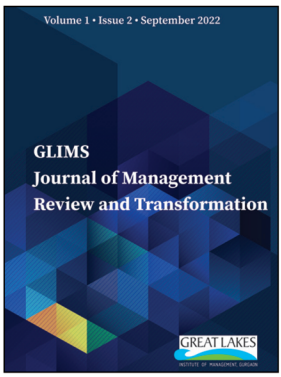

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