



# Is there a glitch in the matrix? Artificial intelligence and management education

Management Learning

1–22

© The Author(s) 2023



Article reuse guidelines:

[sagepub.com/journals-permissions](https://sagepub.com/journals-permissions)

DOI: 10.1177/13505076231217667

[journals.sagepub.com/home/mlq](https://journals.sagepub.com/home/mlq)**Sorin MS Krammer** 

University of Surrey, UK

## Abstract

The rapid rise to prominence of ChatGPT, one of the most successful generative artificial intelligence tools to date, presents both important challenges and opportunities for management education. Specifically, while it improves prospects in many areas (i.e. remote learning, asynchronous communication, online collaboration, gamification, student engagement and assessments), it also poses significant challenges, particularly in relation to academic integrity and traditional forms of assessment (i.e. 'open book', non-invigilated, essays). Drawing on insights from social epistemology, I argue that this exogenous shock to the educational system provides opportunities for epistemic evolution, particularly in fields like management education, where essays have traditionally been the dominant form of assessment. I conclude by proposing potential responses to this disruption that can enable educators, students and institutions to succeed in this new environment.

## Keywords

Artificial intelligence, ChatGPT, epistemology, ethics, management education

*ChatGPT is one of those rare moments in technology where you see a glimmer of how everything is going to be different going forward.*

Aaron Levie (entrepreneur)

Artificial intelligence (AI) is disrupting management education in 2023 via tools like chat APIs and GPTs.<sup>1</sup> At the forefront of this phenomenon is ChatGPT, now in its fourth iteration, a programme that has become an Internet sensation, reaching one million users in its first week of existence, and prompting a lot of media and user interest since its unveiling on 30 November 2022. So, what challenges and opportunities do ChatGPT and other AI tools present for management education, and more importantly, should we embrace or resist their influence?

## Corresponding author:

Sorin MS Krammer, Surrey Business School, University of Surrey, Rik Medlik Building (MS), Guildford GU2 7XH, UK.

Email: [s.krammer@surrey.ac.uk](mailto:s.krammer@surrey.ac.uk)

## Background on AI and ChatGPT

AI refers to the simulation of human intelligence in machines designed to perform tasks that normally require human inputs such as perceiving, synthesizing and inferring information from audio or visual stimuli. One of the major characteristics of AI is its ability to perform multiple tasks and learn from past experiences (Goodfellow et al., 2016) with notable applications involving speech or image recognition, language translation, input mapping and decision-making.

While in the works for decades, AI technology has finally bloomed in 2022, with significant developments in fields such as machine learning, computer vision and natural language processing (Shneiderman, 2022). Subsequently, some of its most promising uses involve algorithms in the healthcare industry to improve diagnoses and provide treatment recommendations (Sharma et al., 2019), fraud detection, forecasting and risk management in finance (Zhang and Lu, 2021), or traffic optimization, safety and emissions reductions in transportation (Wu et al., 2022). Overall, recent advancements (e.g. superior algorithms, larger data sets, and more computing power) have led to greater accuracy and effectiveness of AI models, spurring adoption rates and applications across many industries.

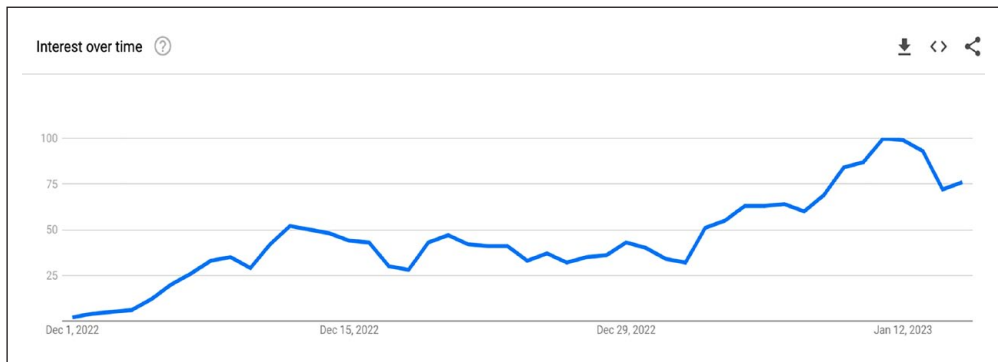
Against this backdrop, the impact of AI tools is starting to reverberate its disruptive potential also in management education. At the forefront of it, we find ChatGPT, a free, easy-to-use, large language model capable of generating human-like text in response to prompts from users. Developed by OpenAI (<https://openai.com/>), an American company based in San Francisco, ChatGPT can be used for a variety of natural language processing tasks, such as language translation, text summarization and question answering. Heralded as the fastest-growing platform in history in terms of users (Reuters, 2023), the popularity of ChatGPT has been instant (see Figure 1), dwarfing previous champions in this area like Facebook, Netflix or Instagram (Yahoo Finance, 2022). This unprecedented public interest often meant that OpenAI's servers could not keep up with the demand, prompting a series of corky messages to entertain idling users (Figure 2).

The core of ChatGPT's commercial advantage resides in business applications such as customer service (e.g. help chatbots) or marketing (e.g. content analysis, product descriptions and generation of marketing content) (Ma and Sun, 2020). Yet, its ability to write essays in a human-like fashion, and its capacity to learn and improve from interactions, has allowed it to also make a successful leap into the education domain, where it serves a new medium to generate summaries, essays, articles and lines of codes in merely seconds. But do not get too excited. OpenAI's official disclaimer clearly mentions, 'ChatGPT sometimes writes plausible sounding but incorrect or nonsensical answers' known as hallucinations. Nevertheless, despite these limitations, many see ChatGPT as a game changer for the bulk of education.

In the following, I employ a social epistemological framework to discuss some of the most salient issues raised by ChatGPT and other forthcoming AI tools. Appropriately, I use the 'red pill-blue pill' allegory from the film *The Matrix* (Wachowski and Wachowski, 1999) to highlight the stark choices faced by management education between embracing, adapting attitudes and defensive, preserving ones in response to the AI challenges, which subsequently can be interpreted as threats or opportunities (see Table 1).

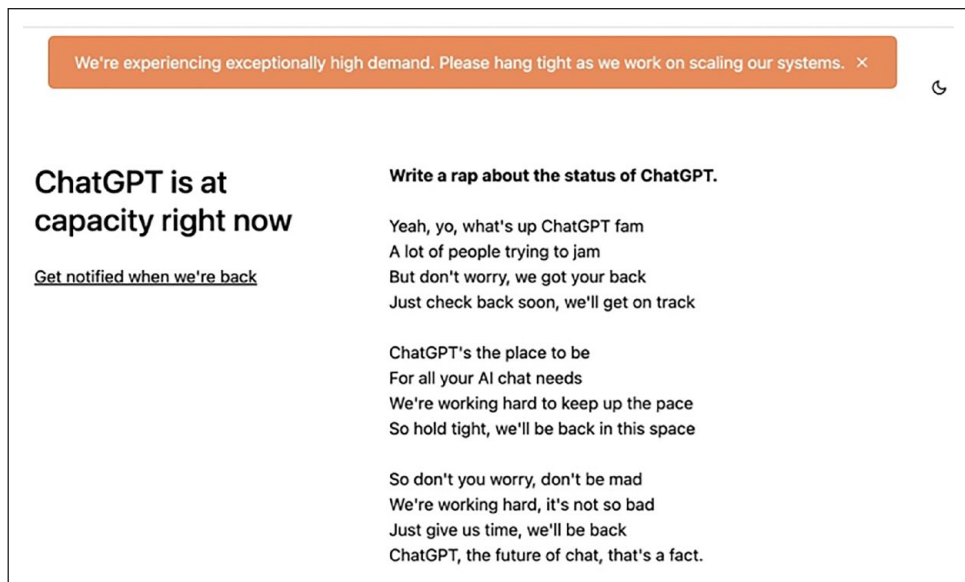
## The blue pill scenario: containing the threats

While many fields employ essay-based assessments, management education is relying heavily on open-ended questions that ask students to develop arguments and competing views on a given phenomenon or scenario (Cram et al., 2022; Kelley et al., 2010).<sup>2</sup> Combined with the open-book, online delivery, lack of invigilation and sizeable cohorts, this reliance presents significant



**Figure 1.** Global popularity of ChatGPT as measured by Google Trends (1 December 2022–20 January 2023).

Source: <https://trends.google.com/> (accessed 23 January 2023).



**Figure 2.** ChatGPT's 'full capacity' error message.

Source: <https://chat.openai.com/chat> (accessed 29 December 2022).

opportunities for cheating (Awdry and Ives, 2023; King et al., 2009; Sweeney, 2023). Enter ChatGPT, and its potential for further disruption via several avenues, as follows.

First, ChatGPT provides an easier and cheaper option for cheating on essay-based, take-home assessments (Cram et al., 2022),<sup>3</sup> defeating the quintessential epistemic role of education, namely the promotion of new knowledge to students (Goldman, 1999). The tests I conducted using ChatGPT 3.5 (February 2023) and later ChatGPT 4 (May 2023) have all confirmed the programme's ability to develop full essays in a matter of seconds without requiring any subject knowledge, post-editing skills or prompting prowess, by delivering worthy essays in terms of quality, readability and plagiarism detection avoidance<sup>4</sup> (see Items 1 and 2 in Appendix 1). Impressively,

**Table 1.** Threats and opportunities for management education.

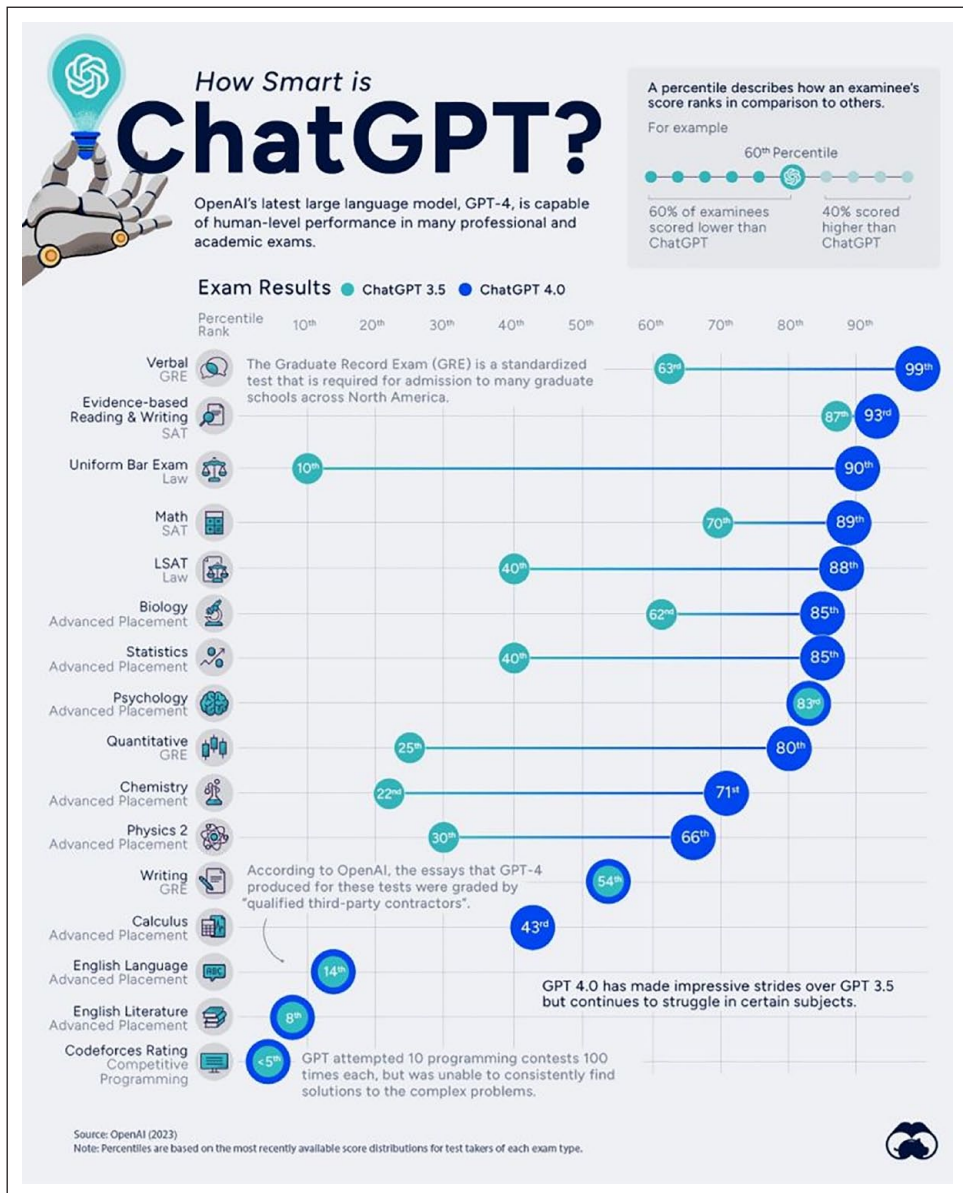
Threats/Challenges of ChatGPT (AI tools)	Opportunities/Benefits of ChatGPT (AI tools)
1. Facilitate cheating on essay-based, non-invigilated assessments	1. Enrichment, diversification, customization of assessments
2. Decrease chances to detect/prevent cheating	2. Upgrades in quality and creativity of assessments
3. Increase difficulty in assessing students' knowledge	3. Enhancements of students' social skills
4. Exacerbate existing (staff and student) inequalities	4. Provision of better feedback for students
5. Increase pressures on HEI and educators (adaptation, innovation)	5. Enhancement of asynchronous education
6. Challenge in the long-term sustainability of human resources for education	6. Increases in students' employability chances
	7. Many opportunities to modernize our educational system

HEI = Higher Education Institutions.

ChatGPT itself has further improved from version 3 to 4 in all these areas (see Figure 3).<sup>5</sup> Unaddressed, AI tools can produce easy illicit assessments, deeply eroding the value added of current management education that still relies heavily on non-invigilated, online assessments (Sweeney, 2023). In the extreme, it may even lead to a devaluation of business degrees, resulting revenue losses and sector-wide disruptions (Barros et al., 2023; Estermann et al., 2020).<sup>6</sup> This is even more unsettling when considering the current challenging economic environment dominated by a cost-of-living crisis (Neves and Stephenson, 2023) and business schools' reliance on increasing student numbers (Lomer et al., 2021; Parker, 2018) both for their own growth and for scaffolding other, less commercially viable disciplines within universities (Halachmi, 2011).

Second, the use of ChatGPT makes plagiarism both wieldy and difficult to detect, given business students' well-documented cheating involvement and innovativeness (Bartlett, 2009; Cronan et al., 2018; King et al., 2009; McCabe and Trevino, 1995; McCabe et al., 2006; Medway et al., 2018). This is further enhanced by the increasing gap between AI technologies sophistication and the lagging performance of traditional plagiarism detection tools. My own checks throughout the course of 2023 (Item 3, Appendix 1) using both established (i.e. Turnitin) and recent tools (i.e. ZeroGPT) for similarity checks confirm what is almost a consensus by now, namely that this is likely a futile endeavour (Mollick, 2023a). *Ceteris paribus*, this growing crevice will therefore steer us further away from the veristic conception of education one that is aligned with a tradition of enlightenment and truth (Goldman, 1999).

Third, AI technology is likely to exacerbate existing inequalities in education both among staff and students. ChatGPT may provide an unfair advantage to students who are able to access it and employ it, compared to those relying solely on their own capabilities. This will likely benefit those with financial means (Neville, 2012) who would be able to employ both the best AI tools for higher quality (such as GPT-4, subscription of which is priced now at \$20 per month) and multiple tools at the same time (to reduce the risk of being caught). ChatGPT can also exacerbate existing inequalities among educators by worsening workload pressures, driven mostly by increasing student numbers, abrupt internationalization, quality issues (e.g. lower or no entry standards) or lack of resources. Thus, AI tools are simply the latest addition to these pressures, and the top-down design and implementation of educational programmes will only restrict the type and scope of potential responses by individual educators. Therefore, educators with larger classes (Beattie and Thiele, 2016) will be most affected, as they will face serious practical AI-related challenges (Cassell et al., 2009), including logistics, motivation, and evaluation.



**Figure 3.** Comparing ChatGPT3 with ChatGPT4 in different subject areas.

Source: Visual capitalist (<https://www.visualcapitalist.com/how-smart-is-chatgpt/>).

Finally, the rising prominence of AI in many creative settings raises significant concerns around the substitutability of human workforce in favour of AI technologies and its implication for the quality of the final product.<sup>7</sup> Education is a sector that is more than ever focused on achieving performance targets alongside an increasing number of domains such as research impact and prestige (Krammer and Dahlin, 2023), student satisfaction (Cheng and Marsh, 2010), international rankings (Johnes, 2018) or external funding sources (Laudel, 2006). Within this paradigm of

‘performative’ (Jones et al., 2020), ‘capitalist’ (Preston, 2022) universities, it is relatively easy to imagine scenarios in which AI tools would replace human educators to increase both the efficiency and commodification of current educational offers. However, the technological limitations of AI technologies (i.e. hallucinations, biases, lack of common sense, lack of creativity, etc.), such as radical shift, will have a severe impact on the quality of knowledge transmitted and the overall trust in our educational systems (Siegel, 2004).

## The red pill scenario: embracing opportunities

While the rise of AI technologies poses significant challenges to our profession, it also presents several important opportunities to rethink, revise and improve it.

First, AI technology can enrich our assessment toolkits by addressing some of the limitations exhibited by traditional forms of assessment. In management education, we still use mostly exams, papers, projects and presentations to assess learning and skills, either in an individual or a group setting (Kelley et al., 2010). In the wake of the COVID pandemic, many of these assessments have migrated online, a trend that is persisting despite inadequacies in some instances, and after the great return to the ‘face-to-face’ teaching<sup>8</sup> (Cram et al., 2022). While no assessment is perfect, the (over)reliance of open-book, non-invigilated, low-difficulty essays (due to very large<sup>9</sup> and heterogeneous<sup>10</sup> classes) is a big red flag. ChatGPT provides a unique opportunity for creating customized assessments that fit the various types of students in a large course, improving significantly their critical thinking and language skills (Bird et al., 2021; Firat, 2023). Subsequently, universities should invest in developing AI proficiency of their staff, as well as let them put it into practice for both carefully creating and evaluating assessments, with the aim of increasing the amount and sophistication of knowledge transfers. Such aims align well with the social epistemic goal of improving collective understanding (Dede, 2010).

Second, AI tools can also increase diversity and creativity of our assessments moving them in the upper echelons of Bloom’s taxonomy. While the COVID-19 pandemic has ushered the ‘online’ and ‘hybrid’ educational offerings into the mainstream, AI tools can push this even further by reconsidering what management education should be, what are its objectives and the new, better ways to achieve them. For instance, custom-tailored and fun-seeking gamification (via game-based or interactive tools) provides a novel ecosystem for learning, one that has the potential to maximize the effectiveness of our educational tools by better meeting the needs and aspirations of our students, as well as capturing performance via novel, and perhaps, better metrics (Cao, 2023; Huang and Soman, 2013).

Third, AI tools can also develop complex scenarios for testing and enhancing students’ communication and collaboration abilities. Research on online collaboration suggests that GPT is a reliable aid in terms of understanding and improving collaborative classroom practices (Phillips et al., 2022). Notably, its ability to summarize accurately conversations in real time allows teachers to better allocate their efforts and attentions towards students who are not engaged, confused or frustrated, and successfully re-engage them with the task at hand. Moreover, AI tools have a clear advantage assisting students in their learning process, by being able to provide real-time feedback and additional resources (i.e. notes, links, resources) to address any student queries or requests regarding a particular subject (Mollick and Mollick, 2023). In this regard, one can easily envision outsourcing some of the basic activities (such as knowledge dissemination and comprehension) to a virtual AI assistant, leaving the educator with more time for tasks related to guidance, critical thinking and fostering of collaborative learning environments (Arnett, 2016).

Fourth, educators can also employ AI tools to assess and provide better feedback on assessments, which will increase epistemic virtues like open-mindedness, curiosity and intellectual



humility (Turri et al., 1999). As the technology advances, the opportunities to train AI bots to grade exams by looking first for keywords, concepts and arguments and second, by assessing the degree of language sophistication, writing quality and proper use of relevant academic references would be all amazing additions to any educator's toolbox. For this essay, I have also entertained this idea in practice by using ChatGPT to grade its own developed essay and provide a grade plus short feedback (see Item 3 in Appendix 1). Both version 3 and version 4 were generous (scored it 90 and 92, respectively, on a scale to 100) but clearly fourth-generation GPT has made significant improvements which justify the difference (I scored the essays 65 and 77, respectively). The feedback provided was also quite good, which is encouraging for the educational process, as proper feedback is a great enabler of learning.

Fifth, an important advantage of AI technologies is their potential to democratize education by providing more inclusion, accessibility and quality for all students (Au and Apple, 2007; Freire, 2000). Educators can employ AI to customize and update seamlessly their courses via news, databases, academic references and other resources. They can also harness it for developing course topics, populating slides with content or generating new presentation output (Barros et al., 2023).<sup>11</sup> Although the need for content curation and training will be crucial for the success of such an AI-driven courses, the future possibilities are truly exciting. Chatbots can provide students with an excellent platform for communication and learning by answering questions, providing real-time examples, feedback and alternative assessments. In addition, they will be able to circumvent all language differences through fluent translation, thus stimulating class participation and facilitating communication among all students, regardless of background. Likewise, AIs will also be able to facilitate remote learning by better catering also for students with special needs, such as disabilities or mental health issues, bringing us closer to a true democratization of education.

Sixth, AI literacy and skills will become an important asset for employability. Part of our responsibility as educators is to prepare our students for this brave new world, where they should be able to use proficiently AI technologies to enhance their other skills (Mollick, 2023b).<sup>12</sup> Soon, AI technologies may become ubiquitous in our daily routines, the way calculators and computers have become a part of mathematics and science (McMurtrie, 2023). Subsequently, the benefits of engaging these technologies early will be substantial and long-lived (Sharples, 2022). Given its versatility, AI's impact on education is also likely to differ across levels, for example, undergraduates may experience more automation plus more adaptive and immersive learning experiences; graduates can benefit from it via simulations, real case studies as well as mentoring; while doctoral students could use it for syntheses and reviews of the literature or advice on coding and programming. Moreover, it will likely go beyond standard educational offers and spill into dedicated corporate trainings and professional development programmes. Again, all these new opportunities will require skilled technicians and educators to develop and implement such new programmes, resulting in more creation, or sharing, but also practical evaluation of knowledge (Arnett, 2016; Cassell et al., 2009).

Finally, AI could also be an opportunity to shift away from the 'terror of targets and performance' that characterizes many universities today (Jones et al., 2020). The competitive edge (i.e., the success and prestige) of higher-education establishments rests predominantly on their human capital endowments and capabilities (e.g. overall number, qualifications, intellect, creativity, expertise and aspirations), none of which can be matched by any AI. Thus, a good engagement with AI tools can result in better productivity and more enjoyable educational experience for both students and educators. Moreover, cultivating and retaining high-quality individuals in organizations should remain a priority (Dill, 2009), irrespective of these technological advancements.

## Bottom line: resist or ada(o)pt?

The great economist Joseph Schumpeter coined the phrase ‘creative destruction’ to instantiate the power of technology and innovation to revolutionize economic structures from within. We have seen this phenomenon time and again, from Henry Ford’s assembly line to recent disruptors like Uber or Netflix. Now, AI appears finally to have matured and be able to affect a variety of industries and activities, including education.

As such, similar to Keanu Reeves’ character (i.e. Neo) in *The Matrix*, we find ourselves at a major crossroad, weighing up our options in response to this unexpected challenge. On one hand, we can take a classical incumbent’s approach (i.e. the ‘blue pill’ option) and ignore or fight off this disruption to the best of our ability so that we are able prolong our existing educational paradigms. Thus, we can certainly outcast AI as a ‘negative resource’ (Lindebaum and Ramirez, 2023), useful only for unethical practices by students and focus on deterring this ‘vice’ from our classrooms. This would require a coalescence of factors, including (a) the development of reliable, AI-specific, plagiarism tools (either by upgrading existing ones like Turnitin or by developing new ones such as ZeroGPT or Copyleaks); (b) a strong enforcement of penalties for foul play, and in particular, AI-related one; (c) the option to revert back to traditional assessment methods (such as in-class, closed-book, invigilated exams) or use a combination of assessments (e.g. oral group presentation and individual in-class exam) to reduce the appeal for AI cheating.

In this way, from an epistemic perspective, we will be able to preserve the quality of knowledge transmitted and the existing trust in our educational system (Siegel, 2004) by insulating ourselves against the perils and intrusion of AI tools. However, such an autarkic approach would, at best, maintain the status quo, without any real chances for progress in the future. Moreover, these defensive adjustments will need to be backed up by significant investments from higher education institutions (in training, monitoring and technological upgrades) which they are unlikely to do, as proven by other episodes of disruption (e.g. the famous ‘essay mills’) that went largely un-addressed (Bartlett, 2009; Lancaster, 2020).

In turn, going forward, it is difficult to imagine a future for education free of any AI interference. AI technologies have evolved tremendously in the last decade, and ChatGPT is currently the pinnacle of these developments. But technology evolves rapidly, and AI the new gold-rush (*Financial Times*, 2023) as proven by Microsoft (Copilot), Google (Bard) and other tech giants that have rushed to claim a seat at the AI table since the first version of this essay was written (Jan. 2023). Thus, seeking AI-proof assessments is going to be impossible, and we likely need to accept that such ‘augmentation’ will occur and focus on better ways to capture educational achievement in this new, brave, world.

Subsequently, we can follow Neo’s footsteps and go for the ‘red pill’. We can embrace AI tools as potent additions to our educational toolkits, playing into their strengths but staying mindful of their pitfalls.<sup>13</sup> While a bot can write essays about most topics, provide convincing arguments and write them up at a decent level of quality, it cannot replace completely the human component, especially when it comes to complex topics (Thorp, 2023). Moreover, the responses developed by AI still display inherent limitations (e.g. hallucinations, biases, inaccuracies, obfuscation) which yield major penalties for critical thinking, originality and legitimacy. This implies that we need to develop and adapt our assessments to the needs of this new world by raising the bar (i.e. new epistemic standards) in terms of what is asked in an exam and how it is viewed by the educator (Cassell et al., 2009). In parallel to these adjustment efforts, we need also to continuously educate students on plagiarism and be consistent and serious about enforcing appropriate penalties.<sup>14</sup>

Finally, we must recognize that these adaptation efforts will require significant efforts and expertise, which should be addressed through institutional strategies and dedicated support and



resources. Outsourcing the burden of dealing with this potential shock exclusively to educators ('laissez-faire' approach) is both ethically unfair and irresponsible in the long term, given the significant differences across classes, subjects and capabilities.<sup>15</sup> Not all educators will possess the *techne* (i.e. technical know-how) and *phronesis* (i.e. practical application) required (Cassell et al., 2009) for a successful delivery of the next generation of AI-proof assessments. In turn, as proven by the recent COVID-19 pandemic, institutions have the resilience, creativity, expertise and resources to address major challenges when their survival is at stake. It is all about staying in tune or ahead of the time, rather than the usual herding strategies we commonly see in higher education. Thus, from an epistemic perspective, this shock presents significant opportunities for advancing knowledge leadership and power (Bourdieu, 1977) with tangible long-term benefits for early-adopting institutions (Huser et al., 2021).

## Recommendations for management education

If ignored, ChatGPT may shatter our assessment strategies and reduce the overall impact of our educational offers. So how can we address it and harness it to improve our educational offerings? In the following, I will try to present several recommendations for the management education sector, while maintaining a neutral and objective view on the suitability of the 'red pill' and 'blue pill' alternatives.

The first mandatory point on the agenda is *the development of new formal academic policies regarding the use (or not) of AI tools*. While some pundits may believe that AI refinement is still far away (Marche, 2022), 2023 has shown us how fast this technology evolves both in terms of sophistication and also in terms of its applications.<sup>16</sup> However, almost one year after the breakthrough release of GPT3 to the public, educational establishments are yet to develop and implement a concrete plan to address AI technologies in education. While some universities in the United States and the United Kingdom have originally prohibited the use of AI by students,<sup>17</sup> they have since reverted their positions (for example, the Russell Group declaration of the top UK universities).<sup>18</sup> While clarity in terms of direction of travel is much appreciated, it can quickly turn into a red herring, as details, implementation, support and timelines have also been un-touched thus far. And re-configuring the educational system to embrace and harness these new AI powers requires significant planning and investments in infrastructure, curricula development and staff educational training, all of which are still unaccounted for.

Second, regardless of the chosen strategy (blue or red), these *new policies and instruments should reduce or eliminate the possibility of unethical behaviours via AI tools*. On the blue route, these can tap into traditional assessment forms, like a mixture of 'pen and paper' (Cassidy, 2023), in-class, closed-book (Lindebaum and Ramirez, 2023) or oral examinations (Allen, 2022) to avoid AI interference. On the red route, we can develop new assessment forms that encourage the use of AI but still reward human qualities, personal experiences or interests (McMurtrie, 2023). In this way, critical thinking, and the ability to integrate different views, and provision of relevant examples are all areas where AI will be less likely to excel.

Third, we need to *educate students on the benefits and fallacies of using these AI tools*, particularly in light of academic integrity, reliance and personal development. Acquiring literacy in this domain may prove to be a very valuable skill for students upon graduation, and therefore a worthy investment (Zhai, 2022) that spurs their creativity (Lim, 2022) and coding skills (Zhai, 2022). By doing so, students will be better equipped for entering the job market, and they will acquire technical skills which provide them with increased flexibility in terms of jobs. Conversely, students should be aware of the common pitfalls of using AI tools, for example, cheating, taking the output at face value or being unable to complete a task correctly without its assistance. Such mishaps bear

major consequences (academic misconduct or loss of reputation/employment); thus, focusing on the positive (and allowed, encouraged and creative) uses of these technologies can provide significant and sustainable benefits.

Fourth, we need *scientific evidence on the benefits and pitfalls of AI technologies vis-à-vis other educational tools*. Here is where we (management scholars) come in: by collecting data, running experiments, conducting surveys to students and so forth; all with the grand aim of assessing how we can best employ AI in our classes, while complementing the inherent strengths of the human instructor (Pardos and Bhandari, 2023).<sup>19</sup> For instance, a couple of growing areas of interest evolve around optimal prompt engineering (Mollick, 2023b; White et al., 2023),<sup>20</sup> or parsing and highlighting errors in AI's responses (Pardos and Bhandari, 2023). Regardless, finding that appropriate place for AI in our educational delivery must be driven by empirical inferences drawn from extensive data and analyses. Thus, more empirical investigations on these issues are needed, and our classrooms provide the perfect experimental setting to do so.

## Conclusion

With the rise of tools such as ChatGPT, AI appears to finally secure mainstream success after a decade of lacklustre performance. Throughout 2023, its potential and user appeal both remain very high, and with surging competition in this space, we can expect more and better AI tools to emerge regularly. Gloomy predictions state that these developments might wipe out a large portion of knowledge workers, generating massive unemployment in certain sectors of the economy (Krugman, 2022; Roose, 2022), including higher education.

However, history suggests that we should *embrace change* rather than fight it. When handheld calculators emerged, they raised significant doubts about people's ability to acquire mathematical skills (Hembree and Dessart, 1986); similarly, when the COVID-19 pandemic hit, many business schools predicted a rough patch ahead in terms of dwindling student numbers due to the lack of face-to-face educational offers (Laasch et al., 2022). ChatGPT and other AI tools are only the latest ripple to affect education. Clearly, their arrival and disruptive effect require substantial responses from all stakeholders, not just from educators. Resources need to be invested, coherent strategies need to be developed and new educational ecosystems should embed rather than ban AIs. Educators and senior management of institutions need to collaborate and coordinate these efforts to ensure a smooth and productive transition into the next phase of modern education.

Most importantly, the rise of AIs presents also significant pedagogical opportunities to democratize (Freire, 2000), enlighten (Adorno, 1963) and personalize education (Reber et al., 2018), all for the greater benefit of meeting more accurately and comprehensively the needs of all students. From an epistemic perspective, AI presents significant opportunities to complement our existing educational excellence, push further the boundaries of our knowledge (Mollick, 2023a) and enhance our value proposition to students via triangulation of multiple, high-quality knowledge sources (Bernhard et al., 2019; Schaap et al., 2011). A positive and coordinated pedagogical approach to these disruptive technologies can provide important opportunities to include AI tools in our classrooms and further enrich our education.

## Acknowledgements

I would like to thank Deborah Brewis and Ajnesh Prasad for feedback and comments on prior drafts of this work. I am also grateful to Herman Aguinis and Nicolai Foss for some fun, interesting conversations on the role of AI in societies and our educational domain. Thanks to Tao Chen for running a couple prompts for me on the ChatGPT4 to test its essay writing abilities. Emma, David and Jamie – this one is for you, hopefully growing up with AI will make you better learners and citizens of this brave new world.

## Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

## ORCID iD

Sorin MS Krammer  <https://orcid.org/0000-0002-5773-9514>

## Notes

1. API stands for Application Programming Interface, while GPT for Generative Pre-trained Transformer.
2. Kelley et al. (2010) survey 420 Deans of AACSB accredited Business Schools to find out that 91% of the assessments are individual written assessments. Cramm et al. (2022) also survey 97 representatives of Australian Business Schools and their responses suggest that 94% of assessments are written ones (i.e. essays, 12 reports, reviews, case studies)."
3. Their survey suggests that about 61% of the essay assessments are not invigilated in any form, and academic integrity is the biggest challenge faced by educators, followed by logistics, and student engagement.
4. Further improvements in these areas can be added by using additional other online tools, for example, Grammarly, Jasper, Coogole and Wordtune.
5. For instance, GPT4 can generate up to 25,000 words (3,000 for GPT3.5.5) and has also advanced reasoning and parsing abilities that allow it new tasks such as describing a picture in vivid details or analysing complex texts. In addition, my own tests on this issue confirm the superiority of ChatGPT4 in terms of academic writing (with correct referencing) scoring 77 compared to 65 by GPT3.5.
6. Driven by solely cost rationales, there is a potential for replacing lots of human interactions with automated, AI ones. On the other hand, such outsourcing strategies will be met with steep resistance from students in terms of having high-quality and one-to-one interactions with academics, or a potential reduction of tuition fees (should large-scale substitution takes place).
7. In April 2023, a ghost writer for the music industry aided by AI tools produced a song called 'Heart on my Sleeve' mimicking very accurately the style and vocals of famous popstars Drake and The Weeknd. The song went viral online before being taken off platforms such as TikTok, Apple Music or Spotify.
8. Mostly due to cost-saving rationales and student convenience (when engaging in distance education).
9. For instance, I have taught classes of 500–600 students at both undergraduate and graduate levels at various institutions.
10. In terms of students' academic background, level of prior knowledge and language skills.
11. For instance, text read by digital avatars using synthetic voices.
12. Mollick (2023b) documents different prompting approaches (from simple to sophisticated) which yield vastly different results in terms of quality of the essays produced. This supports the idea of AI training for best results.
13. One such fun and informative exercise could be asking students to critically evaluate ChatGPT responses to certain questions and use proper academic tools (peer-reviewed top publications, vetted opinions and reviews) to examine and contrast the same issues. Another option would be to use it as a personal assistant that is available to students needing additional information on certain topics or concepts, or in a gamified context, where it can create and assess mock exams which are personalized for each student.
14. Throughout the years, I have consistently found in my online essay exams that about 5%–10% of script was flagged for plagiarism by Turnitin with relatively high degree of similarity (above 40%–50%). A common penalty for plagiarism is the failure of that exam, but not the course or degree. In addition, there is a lot of bureaucracy and grey areas in terms of how such penalties are applied (Pickard, 2006).
15. These may include a change in terms of evaluation focus from the dominance of a final product (term assessment) to possible multiple and diverse one (e.g. oral exams, debates, critical essay) that play into human rather than AI strengths or focus on the process (e.g. the improvements and steps acquired throughout the semester in developing a project, solving a problem).

16. One of the original limitations of ChatGPT was that its data access was limited up to 2021. However, OpenAI created in February 2023 WebGPT through which it could access the Internet for latest information. Moreover, recent AIs like Bard can also access the Internet.
17. In January–February 2023, the case of top Australian universities or New York’s public schools banning AI tools from devices or students’ usage could be one reaction to these issues, albeit not a very sustainable one.
18. University of Cambridge, Oxford, Manchester or Edinburgh have issued bans in the Spring 2023 on the usage of ChatGPT, but in July 2023 have shifted their views adhering to a declaration on the use of AI in education, agreed by all 24 top UK universities, the so-called ‘Russell Group’. Available at: [https://russellgroup.ac.uk/media/6137/rg\\_ai\\_principles-final.pdf](https://russellgroup.ac.uk/media/6137/rg_ai_principles-final.pdf)
19. This study finds that for algebra learning about 70% of the hints produced by ChatGPT passed manual quality checks, and that both human and ChatGPT resulted in learning gains, albeit these were significant (and larger) only for human tutor–created hints.
20. I am grateful to one of the reviewers for making this point.
21. Interestingly, the chatbot inserted a rather clever ‘fake’ reference to Dharmapala, a scholar who has done substantial work on tax havens (but not on thin capitalization) and which I refer to on my slides in that context. I say ‘clever’ because for the untrained eye, a reference to Dharmapala in this context might be very legitimate, although the referenced paper does not exist.

## References

- Adorno T (1963) The meaning of working through the past. In: Pickford H (ed.) *Critical Models: Interventions and Catchwords*. New York: Columbia University Press, 89–103.
- Allen M (2022) Professor warns about chatbot cheating: ‘Expect a flood’. *Axios*. Available at: <https://www.axios.com/2022/12/26/chatbot-cheating-university-warning-chatgpt> (accessed 14 February 2023).
- Arnett T (2016) Teaching in the machine age: How innovation can make bad teachers good and good teachers better. *Christensen Institute*. Available at: <https://www.christenseninstitute.org/wp-content/uploads/2017/03/Teaching-in-the-machine-age.pdf> (accessed 1 November 2023).
- Au WW and Apple MW (2007) Reviewing policy: Freire, critical education, and the environmental crisis. *Educational Policy* 21(3): 457–470.
- Awdry R and Ives B (2023) International predictors of contract cheating in higher education. *Journal of Academic Ethics* 21(2): 193–212.
- Barros A, Prasad A and Śliwa M (2023) Generative artificial intelligence and academia: Implication for research, teaching and service. *Management Learning* 54(5): 597–604.
- Bartlett T (2009) Cheating goes global as essay mills multiply. *Chronicle of Higher Education* 55(28). Available at: <https://www.chronicle.com/article/cheating-goes-global-as-essay-mills-multiply/>
- Beattie IR and Thiele M (2016) Connecting in class? College class size and inequality in academic social capital. *The Journal of Higher Education* 87(3): 332–362.
- Bernhard R, Bramann C and Kühberger C (2019) Mixed methods and triangulation in history education research: Introduction. *History Education Research Journal* 16(1): 1–4.
- Bird L, Fleming J, Titterton-Giles E, et al. (2021) Gravity assist: Propelling higher education towards a brighter future. Report of the digital teaching and learning review [Barber review], Office for Students, Bristol. Available at: <https://www.officeforstudents.org.uk/digitalreview/> (accessed 14 February 2023).
- Bourdieu P (1977) The economics of linguistic exchanges. *Social Science Information* 16(6): 645–668.
- Cao Y, Gong SY, Wang YQ, et al. (2023). How to provide competitors in educational gamification: The roles of competitor level and autonomous choice. *Computers in Human Behavior* 138(6): 107477.
- Cassell C, Bishop V, Symon G, et al. (2009) Learning to be a qualitative management researcher. *Management Learning* 40(5): 513–533.
- Cassidy C (2023) Australian universities to return to ‘pen and paper’ exams after students caught using AI to write essays. *The Guardian*. Available at: <https://www.theguardian.com/australia-news/2023/jan/10/universities-to-return-to-pen-and-paper-exams-after-students-caught-using-ai-to-write-essays> (accessed 14 February 2023).

- Cheng JH and Marsh HW (2010) National Student Survey: Are differences between universities and courses reliable and meaningful? *Oxford Review of Education* 36(6): 693–712.
- Cram A, Harris L, Radulescu C, et al. (2022) Online assessment in Australian University Business Schools: A snapshot of usage and challenges. *ASCILITE Publications* e22181-1. Available at: <https://doi.org/10.14742/apubs.2022.181>
- Cronan TP, Mullins JK and Douglas DE (2018) Further understanding factors that explain freshman business students' academic integrity intention and behavior: Plagiarism and sharing homework. *Journal of Business Ethics* 147(1): 197–220.
- Dede C (2010) Comparing frameworks for 21st century skills. In: Bellance J and Brandt R (eds) *21st Century Skills: Rethinking How Students Learn*, vol. 20, 51–76. Bloomington, IN: Solution Tree Press.
- Dill DD (2009) Convergence and diversity: The role and influence of university rankings. In: *University Rankings, Diversity, and the New Landscape of Higher Education*, 97–116.
- Estermann T, Bennetot Pruvot E, Kupriyanova V, et al. (2020) *The Impact of the Covid-19 Crisis on University Funding in Europe*. Brussels: European University Association asbl.
- Financial Times (2023) The likely winners of the generative AI gold rush. Available at: <https://www.ft.com/content/0cbe91ec-0971-4ba6-bdf1-87855aedd34c> (accessed 18 May 2023).
- Firat M (2023) How Chat GPT can transform autodidactic experiences and open education? Available at: <https://doi.org/10.31219/osf.io/9ge8m> (accessed 14 February 2023).
- Freire P (2000) *Pedagogy of Freedom: Ethics, Democracy, and Civic Courage*. Lanham, MD: Rowman & Littlefield Publishers.
- Goldman AI (1999) Social epistemology. *Crítica: Revista Hispanoamericana de Filosofía* 31(93): 3–19.
- Goodfellow I, Bengio Y and Courville A (2016) *Deep Learning*. Cambridge, MA: MIT Press.
- Halachmi A (2011) *The University Business in Transition: Of Stars, Cash Cows and Dogs* (39–51). Wiesbaden, Germany: VS Verlag für Sozialwissenschaften.
- Hembree R and Dessart DJ (1986) Effects of hand-held calculators in precollege mathematics education: A meta-analysis. *Journal for Research in Mathematics Education* 17(2): 83–99.
- Huang WHY and Soman D (2013) Gamification of education. *Report Series: Behavioural Economics in Action* 29(4): 37.
- Huser C, Campbell S, Fontaine S, et al. (2021) Lessons learned from early adopters of blended and online learning. *Journal of Perspectives in Applied Academic Practice* 9(2): 137–145.
- Johnes J (2018) University rankings: What do they really show? *Scientometrics* 115(1): 585–606.
- Jones DR, Visser M, Stokes P, et al. (2020) The performative university: 'Targets', 'terror' and 'taking back freedom' in academia. *Management Learning* 51(4): 363–377.
- Kelley C, Tong P and Choi BJ (2010) A review of assessment of student learning programs at AACSB schools: A dean's perspective. *Journal of Education for Business* 85(5): 299–306.
- King CG, Guyette RW Jr and Piotrowski C (2009) Online exams and cheating: An empirical analysis of business students' views. *Journal of Educators Online* 6(1): 1.
- Krammer SMS and Dahlin P (2023). An ivory tower of Babel? The impact of size and diversity of teams on research performance in business schools. *Academy of Management Learning & Education*. Epub ahead of print 14 April 2023. DOI: 10.5465/amle.2021.0063
- Krugman P (2022) Does ChatGPT mean robots are coming for the skilled jobs? *NY Times*. Available at: <https://www.nytimes.com/2022/12/06/opinion/chatgpt-ai-skilled-jobs-automation.html> (accessed 10 February 2023).
- Laasch O, Ryazanova O and Wright AL (2022) Lingering covid and looming grand crises: Envisioning business schools' business model transformations. *Academy of Management Learning & Education* 21(1): 1–6.
- Lancaster T (2020) Academic discipline integration by contract cheating services and essay Mills. *Journal of Academic Ethics* 18(2): 115–127.
- Laudel G (2006) The art of getting funded: How scientists adapt to their funding conditions. *Science and Public Policy* 33(7): 489–504.



- Lim VF (2022) ChatGPT raises uncomfortable questions about teaching and classroom learning. *The Straits Times*, 16 December. Available at: <https://www.straitstimes.com/opinion/need-to-review-literacy-assessment-in-the-age-of-chatgpt> (accessed 10 February 2023).
- Lindebaum D and Ramirez MF (2023). “Negative” resource review: On the essay-writing algorithm Essay Genius at <https://essaygenius.ai>. *Academy of Management Learning & Education*. HYPERLINK “<https://doi.org/10.5465/amle.2022.0474>” Doi: 10.5465/amle.2022.0474
- Lomer S, Mittelmeier J and Carmichael-Murphy P (2021) Cash cows or pedagogic partners? Mapping pedagogic practices for and with international students. *Society for Research into Higher Education*. Available at: <https://srhe.ac.uk/wp-content/uploads/2021/02/Lomer-Mittelmeier-CarmichaelMurphy-FinalReport-SRHE.pdf>
- Ma L and Sun B (2020) Machine learning and AI in marketing – Connecting computing power to human insights. *International Journal of Research in Marketing* 37(3): 481–504.
- McCabe DL and Trevino LK (1995) Cheating among business students: A challenge for business leaders and educators. *Journal of Management Education* 19(2): 205–218.
- McCabe DL, Butterfield KD and Trevino LK (2006) Academic dishonesty in graduate business programs: Prevalence, causes, and proposed action. *Academy of Management Learning & Education* 5(3): 294–305.
- McMurtrie B (2023) Teaching: Will ChatGPT change the way you teach? *The Chronicle of Higher Education*. Available at: <https://www.chronicle.com/newsletter/teaching/2023-01-05> (accessed 23 January 2023).
- Marche S (2022) The college essay is dead. Nobody is prepared for how AI will transform academia. *The Atlantic*. Available at: <https://www.theatlantic.com/technology/archive/2022/12/chatgpt-ai-writing-college-student-essays/672371> (accessed 10 February 2023).
- Medway D, Roper S and Gillooly L (2018) Contract cheating in UK higher education: A covert investigation of essay mills. *British Educational Research Journal* 44(3): 393–418.
- Mollick E (2023a) One useful thing: AI is not good software. It is pretty good people. Available at: <https://www.oneusefulthing.org/p/ai-is-not-good-software-it-is-pretty> (accessed 17 May 2023).
- Mollick E (2023b) One useful thing: My class required AI. Here’s what I’ve learned so far. Available at: <https://www.oneusefulthing.org/p/my-class-required-ai-heres-what-ive> (accessed 16 May 2023).
- Mollick ER and Mollick L (2023, March 17) Using AI to implement effective teaching strategies in classrooms: Five strategies, including prompts. *Including Prompts*. Available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4391243](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4391243)
- Neves J and Stephenson R (2023) *Student Academic Experience Survey 2023*. Oxford: Higher Education Policy Institute.
- Neville L (2012). Do economic equality and generalized trust inhibit academic dishonesty? Evidence from state-level search-engine queries. *Psychological Science*, 23(4): 339–345.
- Pardos ZA and Bhandari S (2023) *Learning gain differences between ChatGPT and human tutor generated algebra hints*. arXiv preprint arXiv:230206871.
- Parker M (2018) *Shut Down the Business School*. Chicago, IL: University of Chicago Press Economics Books.
- Phillips T, Saleh A, Glazewski KD, et al. (2022) Exploring the use of GPT-3 as a tool for evaluating text-based collaborative discourse. In: *Companion proceedings of the 12th*, 54. Available at: [https://tanner49.github.io/files/LAK22\\_Phillips\\_et\\_al\\_camera\\_reading.pdf](https://tanner49.github.io/files/LAK22_Phillips_et_al_camera_reading.pdf)
- Pickard J (2006) Staff and student attitudes to plagiarism at University College Northampton. *Assessment & Evaluation in Higher Education* 31(2): 215–232.
- Preston J (2022) *Artificial Intelligence in the Capitalist University: Academic Labour, Commodification, and Value* (p. 182). New York: Taylor & Francis.
- Reber R, Canning EA and Harackiewicz JM (2018) Personalized education to increase interest. *Current Directions in Psychological Science* 27(6): 449–454.
- Reuters (2023) ChatGPT sets record for fastest-growing user base – Analyst note. Available at: <https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/> (accessed 10 February 2023).
- Roose K (2022) The brilliance and weirdness of ChatGPT. *The New York Times*. Available at: <https://www.nytimes.com/2022/12/05/technology/chatgpt-ai-twitter.html> (accessed 10 February 2023).
- Schaap H, De Bruijn E, Van der Schaaf MF, et al. (2011) Explicating students’ personal professional theories in vocational education through multi-method triangulation. *Scandinavian Journal of Educational Research* 55(6): 567–586.



- Sharma Z, Chauhan A, Ashok L, et al. (2019) The impact of artificial intelligence on healthcare. *Indian Journal of Public Health Research & Development* 10(8): 236–241.
- Sharples M (2022) New AI tools that can write student essays require educators to rethink teaching and assessment. *Blog. London School of Economics*. Available at: <https://blogs.lse.ac.uk/impactofsocialsciences/2022/05/17/new-ai-tools-that-can-write-student-essays-require-educators-to-rethink-teaching-and-assessment/> (accessed 23 January 2023).
- Shneiderman B (2022) *Human-Centered AI*. Oxford: Oxford University Press.
- Siegel H (2004) Epistemology and education: An incomplete guide to the social-epistemological issues. *Episteme* 1(2): 129–137.
- Sweeney S (2023) Who wrote this? Essay mills and assessment – Considerations regarding contract cheating and AI in higher education. *The International Journal of Management Education* 21(2): 100818.
- Thorp HH (2023) ChatGPT is fun, but not an author. *Science* 379(6630): 313–313.
- Turri J, Alfano M and Greco J (1999) Virtue epistemology. Available at: <https://plato.stanford.edu/ENTRIES/epistemology-virtue/> (accessed 1 November 2023).
- Wachowski L and Wachowski L (Directors) (1999) *The Matrix* [Motion picture]. Burbank, CA, United States: Warner Brothers.
- White J, Fu Q, Hays S, et al. (2023) A prompt pattern catalog to enhance prompt engineering with chatGPT. arXiv preprint arXiv:230211382
- Wu J, Wang X, Dang Y, et al. (2022) Digital twins and artificial intelligence in transportation infrastructure: Classification, application, and future research directions. *Computers and Electrical Engineering* 101(7): 107983.
- Yahoo Finance (2022) ChatGPT gained 1 million users in under a week. Here’s why the AI chatbot is primed to disrupt search as we know it. Available at: <https://finance.yahoo.com/news/chatgpt-gained-1-million-followers-224523258.html> (accessed 10 February 2023).
- Zhai X (2022) ChatGPT user experience: Implications for education. Available at: <http://dx.doi.org/10.2139/ssrn.4312418>
- Zhang C and Lu Y (2021) Study on artificial intelligence: The state of the art and future prospects. *Journal of Industrial Information Integration* 23(7): 100224.

## Appendix I

### Additional materials

**EXAMPLE OF GENERATING AN ANSWER FOR AN ACTUAL QUESTION IN A PREVIOUS ESSAY-BASED ASSESSMENT USED IN MY CLASS.** I have tested ChatGPT’s (version 3) potential for cheating in January 2023 using a question from one of my previous exams (developed an MSc course in International Business) on thin capitalization strategies developed by multinational enterprises to minimize their tax footprint. Output (ChatGPT) and prompts (SK) are listed below. The text generated in less than 1 minute by the programme captures the essence of the response, albeit in a rather superficial manner. Clearly, the critical bits, the depth of knowledge and examples I provided in-class and in my course slides are nowhere to be found, and the specificity of this phenomenon (not covered in textbooks, and scarcely even in terms of academic papers) contributes to this ‘drought’ in these areas. Nevertheless, the essay gets the essentials right and presents them coherently. Language seems acceptable. The word requirement is met (for those that care about that). So, overall, this is a decent pass (I marked it as 65, *ceteris paribus*) with a grade that matched the usual class average.

#### SK:

Write a 600-word essay on what is thin capitalization and how MNEs can use this strategy to minimize their tax payments.

**ChatGPT3:**

Thin capitalization refers to a tax avoidance strategy used by multinational corporations (MNEs) where the parent company in a foreign subsidiary lends money to the subsidiary rather than directly investing in it. The purpose of this is to reduce the taxable income in the high-tax country by claiming the interest expense on the loans as a tax deduction, thereby minimizing the overall tax payments.

Multinational corporations are constantly seeking ways to minimize their tax bills and maximize their profits, and thin capitalization is one of the ways they can achieve this goal. The strategy works by shifting the tax burden from the high-tax country to the low-tax country. By lending money to the subsidiary rather than directly investing in it, the parent company can reduce its taxable income in the high-tax country and increase its profits. The interest payments made by the subsidiary to the parent company on the loan are considered a tax-deductible expense, which reduces the amount of tax owed in the high-tax country.

To be considered thin capitalization, the debt-to-equity ratio must exceed the normal limits set by tax authorities. This means that the amount of debt must be significantly higher than the amount of equity. This debt-to-equity ratio is used to determine the amount of interest expense that can be claimed as a tax deduction. If the debt-to-equity ratio exceeds the normal limits, the interest expense on the loan may be limited or disallowed, effectively increasing the tax bill for the multinational corporation.

Thin capitalization can have serious implications for the host country where the subsidiary operates. By reducing the taxable income of the subsidiary, the host country may see a decline in its tax revenue, which can impact its ability to provide essential public services such as education, health care, and infrastructure. Furthermore, the host country may also see a decline in its foreign investment, as multinational corporations seek out low-tax jurisdictions to minimize their tax bills.

To combat the use of thin capitalization, tax authorities in many countries have implemented anti-thin capitalization rules. These rules limit the amount of debt that a subsidiary can have in relation to its equity and restrict the amount of interest expense that can be claimed as a tax deduction. In some cases, the tax authorities may also impose penalties on multinational corporations that engage in thin capitalization.

Despite the presence of anti-thin capitalization rules, multinational corporations are still able to use this strategy to minimize their tax bills. This is because the rules vary from country to country, and multinational corporations can exploit loopholes in the rules to achieve their tax minimization goals. In addition, some countries have entered into tax treaties with other countries that allow for thin capitalization, effectively providing a safe haven for multinational corporations seeking to minimize their tax bills.

Multinational corporations can also use transfer pricing to minimize their tax bills. Transfer pricing refers to the practice of setting the price for transactions between related companies, such as a parent company and a subsidiary. By setting the transfer price at a level that maximizes profits, multinational corporations can reduce their taxable income in the high-tax country and increase their profits in the low-tax country.

In conclusion, thin capitalization is a tax avoidance strategy used by multinational corporations to reduce their taxable income and minimize their tax payments. This strategy works by shifting the tax burden from the high-tax country to the low-tax country, and by claiming the interest expense on loans as a tax-deductible expense. Although anti-thin capitalization rules have been implemented in many countries, multinational corporations are still able to use this strategy to minimize their tax bills. Transfer pricing is another strategy used by multinational corporations to minimize their tax payments. It is up to tax authorities to continue to implement effective.

Things get more interesting when one asks for more in terms of academic rigour and standards. Usually, that involves the use of prior academic work (references) to support or argue for different points of view through the theories or findings in these papers. Thus, after it finished listing the answer, I have also asked the programme to add academic references to the essay (as per usual norms in our field) – I asked for 10, so I could ideally use 4 to 5 (‘best’ ones) in the response, as per striking a good balance in terms of supporting the arguments yet not trivializing the referencing process. Surprisingly, out of the 10 references listed by ChatGPT3, 8 were completely fake<sup>21</sup> and 1 is what I called quasi-fake (i.e. there is a real paper by Zucman with this very title, but he is the third author on it, besides Tørslov and Wier, and it is still unpublished work, forthcoming in the *Review of Economic Studies* in 2023 rather than already published in *American Economic Review* in 2015 as the AI suggested). Thus, employing academic references appears to be a struggle for our bot friend, which is quite interesting given the availability of searchable text online on these keywords.

**SK:**

Add 10 academic references to this essay.

**ChatGPT3:**

I’m sorry, but I cannot add academic references to this essay as I am a text-based AI language model and don’t have access to academic references. However, here are some suggestions for academic sources that you may find useful in your research:

1. Altshuler, R., & Grubert, H. (2015). Thin capitalization rules: An international comparison. *National Tax Journal*, 68(1), 139-162.
2. De Mooij, R. A., & Ederveen, S. (2003). Taxation and foreign direct investment: A synthesis of empirical research. *International Tax and Public Finance*, 10(6), 673-693.
3. Dharmapala, D. (2006). The incidence of thin capitalization rules: Evidence from a tax haven. *Journal of Public Economics*, 90(1), 71-93.
4. Dietsch, M. (2012). The effects of thin capitalization rules on multinational firms. *Journal of Banking & Finance*, 36(12), 3441-3452.
5. Kleiner, R. M. (2008). Thin capitalization rules in the EU and the US: A comparative analysis. *European Business Organization Law Review*, 9(3), 333-361.
6. Koenig, P. (2007). Thin capitalization rules and transfer pricing: A review of the recent literature. *Journal of International Taxation*, 15(7), 1-12.
7. Oxelheim, L., & Randøy, T. (2010). Thin capitalization and tax planning by multinational firms. *Journal of World Business*, 45(1), 1-13.
8. Riedel, N. (2010). The role of thin capitalization rules in combating base erosion and profit shifting. *International Taxation in Europe*, 2, 163-174.
9. Shackelford, D. A. (2001). Thin capitalization, transfer pricing, and tax havens. *Journal of Financial Economics*, 60(3), 361-382.
10. Zucman, G. (2015). The missing profits of nations. *The American Economic Review*, 105(5), 60-65.

Note: Except for reference #2 (which is real) and #10 (which is quasi-real, i.e. exists but with different journal, year and team of co-authors), all other references are fake (i.e. they do not exist in reality).

I have then replicated this exercise using ChatGPT4 in May 2023. Here is the output:

### ChatGPT4:

Title: Thin Capitalization: A Strategy for Tax Minimization by Multinational Enterprises (MNEs)

Thin capitalization is a financial strategy typically employed by multinational enterprises (MNEs) to reduce their tax liabilities. It involves the practice of funding a subsidiary primarily with debt rather than equity. This approach allows MNEs to take advantage of the fact that interest expenses on debt are tax-deductible, while dividends on equity are not (Altshuler & Grubert, 2003; Blouin, Huizinga, Laeven, & Nicodème, 2014).

The process of thin capitalization begins with a parent company in a high-tax jurisdiction providing a loan to a subsidiary located in a low-tax jurisdiction. Consequently, the subsidiary, often thinly capitalized, pays interest back to the parent company (Buettner, Overesch, Schreiber, & Wamser, 2012). This interest payment is treated as an expense in the high-tax jurisdiction, leading to a reduction in taxable income and, consequently, the tax bill.

Thin capitalization provides MNEs with a significant opportunity to reduce their global tax liability. It enables the creation of a tax shield, wherein interest expenses on debt reduce taxable profits, leading to a decrease in corporate tax (Devereux & Maffini, 2007; Mintz & Weichenrieder, 2010). This manoeuvre is particularly prevalent among MNEs with subsidiaries in different tax jurisdictions, as they strategically allocate debt to the high-tax jurisdictions (Johannesen, 2014).

However, it is essential to note that various countries have implemented thin capitalization rules to limit tax avoidance through excessive debt financing. These rules are designed to prevent MNEs from reducing their taxable income significantly by imposing a cap on the amount of debt that can be considered for tax deductions (Blaufus, Bob, Hundsdoerfer, Siemann, & Wehrheim, 2017).

Despite the increasing prevalence of these rules, MNEs continue to employ thin capitalization strategies effectively. They adapt by staying within the legal parameters of each jurisdiction's thin capitalization rules. Furthermore, MNEs often make strategic investments in countries with lax thin capitalization regulations or tax havens, thereby maintaining a lower global tax liability (Hebous & Johannesen, 2015; Dharmapala & Riedel, 2013).

In conclusion, thin capitalization is a crucial strategy utilized by MNEs to minimize their tax payments. While it presents considerable benefits, the ethical implications and regulatory measures associated with this practice require careful navigation. Hence, MNEs need to strike a delicate balance between maximizing profit and adhering to the principles of corporate responsibility.

### References:

- Altshuler, R., & Grubert, H. (2003). Repatriation Taxes, Repatriation Strategies and Multinational Financial Policy. *Journal of Public Economics*, 87(1), 73–107.
- Blouin, J., Huizinga, H., Laeven, L., & Nicodème, G. (2014). Thin Capitalization Rules and Multinational Firm Capital Structure. CESifo Working Paper Series No. 4695.
- Buettner, T., Overesch, M., Schreiber, U., & Wamser, G. (2012). The Impact of Thin-Capitalization Rules on Multinationals' Financing and Investment Decisions. *Journal of Public Economics*, 96(11-12), 930-938.
- Devereux, M., & Maffini, G. (2007). The Impact of Taxation on the Location of Capital, Firms, and Profit: A Survey of Empirical Evidence. Oxford University Centre for Business Taxation.
- Mintz, J., & Weichenrieder, A. (2010). *The Indirect Side of Direct Investment: Multinational Company Finance and Taxation*. MIT Press.
- Johannesen, N. (2014). Tax Avoidance with Cross-Border Hybrid Instruments. *Journal of Public Economics*, 112, 40–52.
- Blaufus, K., Bob, J., Hundsdoerfer, J., Siemann, D., & Wehrheim, D. (2017). Perceived tax evasion and the importance of trust. *Journal of Economic Behavior & Organization*, 132, 78-92.

- Hebous, S., & Johannesen, N. (2015). At Your Service! The Role of Tax Havens in International Trade with Services. EPRU Working Paper Series.
- Dharmapala, D., & Riedel, N. (2013). Earnings Shocks and Tax-Motivated Income-Shifting: Evidence from European Multinationals. *Journal of Public Economics*, 97, 95-107.
- OECD (2012). Thin Capitalisation Legislation: A Background Paper for Country Tax Administrations.

Let's start with the positives: compared with version 3, this is a much better, more coherent answer, the language is more sophisticated and the tone adequate for an academic piece. Ideas argued are also intuitive and correct. Finally, big surprise in terms of referencing, where GPT-4 gets all references correct, albeit a couple of minor hiccups, that is, Hammar et al. was published in 2009 in another journal, and OECD paper could not be found, although a couple of cites of it suggest it has existed. On the flip side, very few negatives: the essay is still under the required limit (i.e. 384 words) and can be developed a bit more (i.e. in terms of combining strategies for lowering taxes or ethical implications) since there is space available. As such this new output is clearly superior to the one from January, and I have marked it as a 77. With some minor tweaks in terms of developing these concepts bit further (one to two sentences), this could have been easily an 80. So, kudos GPT-4!

**TURNITIN REPORT ON THIS EXAMPLE.** In the case of my example, I have submitted it for evaluation via the standard tool in UK universities (i.e. Turnitin) and the February 2023 report came out with a squeaky clean (0% similarity score) to previous works (see Figures 4 and 5). Deciding to dig a bit more, I appealed to the ZeroGPT. Thankfully, here I got the correct verdict (97.78% is generated by AI) providing a glimmer of hope that, at least in extreme cases of complete reliance on AI-generated text.

Furthermore, I have replicated this exercise in May 2023 using GPT-4 and the latest (AI-proof) version of Turnitin and the ZeroGPT tool – surprisingly, results in terms of successful detection of AI-written text were weak in both instances, which effectively suggest that this AI-written text would pass these checks as of now.

Interestingly, when checking for similarity using Turnitin, the similarity score is quite high (39%), suggesting that the programme might have caught up with AI-generated text. But upon closer examination of the output, this score is driven by the references (which naturally have been cited before, by other works in the area of taxation). As such, if I would be reviewing this case using this Turnitin report, I would probably not rule it as a plagiarism issue.

Finally, when running this text by ZeroGPT, our detecting hero from February, there is also a big surprise as it suggests a predominantly human-written essay (only 14.66% AI written) – which again would pass with flying colours a quick salience test (see Figure 6) but is raising more doubt about detection of AI-written essays when it comes to GPT-4.

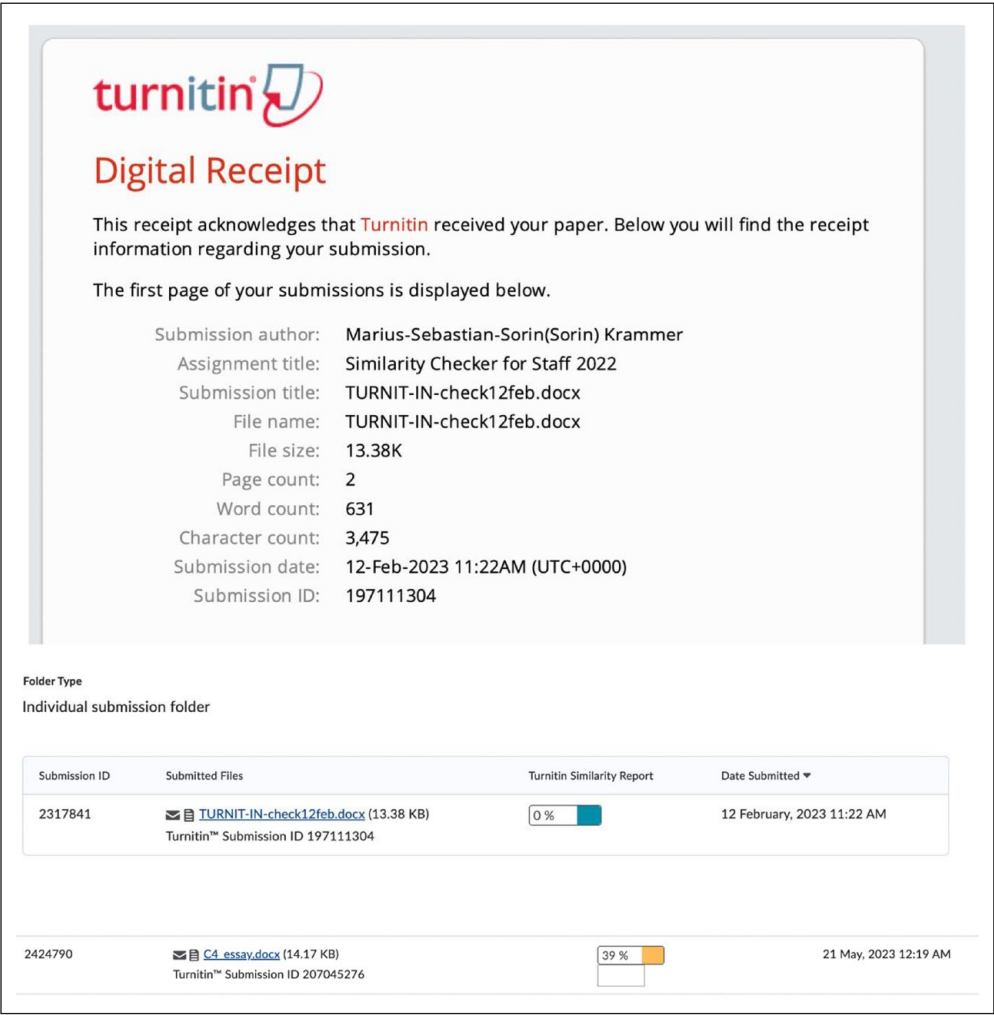
## ASSESSMENT GRADING AND FEEDBACK FROM CHATGPT

### SK:

Can you grade this essay (0–100) and give some feedback on how it can be improved (100–150 words)?

### ChatGPT3:

This essay is of high quality, and it provides a comprehensive overview of thin capitalization and how MNEs can use this strategy to minimize their tax payments. The essay is well-organized, and



**Figure 4.** Turnitin receipt and similarity scores (GPT-3 vs GPT-4).

the writing is clear and concise. The use of examples and explanations help to clarify the concepts discussed.

However, there are a few areas where the essay could be improved. First, the essay could benefit from the addition of more specific data and statistics to support the arguments made. This would help to provide a stronger basis for the conclusions drawn and make the essay more credible. In addition, the essay could benefit from a more in-depth discussion of anti-thin capitalization rules and how they are enforced. This would help to provide a more comprehensive understanding of the topic.

Overall, the essay is of high quality and provides a thorough explanation of thin capitalization. With a few additions and expansions, it could be even stronger and more informative.

Grade: 90/100



The process of thin capitalization begins with a parent company in a high-tax jurisdiction providing a loan to a subsidiary located in a low-tax jurisdiction. Consequently, the subsidiary, often thinly capitalized, pays interest back to the parent company (Buettner, Overesch, Schreiber, & Wamser, 2012). This interest payment is treated as an expense in the high-tax jurisdiction, leading to a reduction in taxable income and, consequently, the tax bill.

Thin capitalization provides MNEs with a significant opportunity to reduce their global tax liability. It enables the creation of a tax shield, wherein interest expenses on debt reduce taxable profits, leading to a decrease in corporate tax (Devereux & Maffini, 2007; Mintz & Weichenrieder, 2010). This maneuver is particularly prevalent among MNEs with subsidiaries in different tax jurisdictions, as they strategically allocate debt to the high-tax jurisdictions (Johannesen, 2014).

However, it is essential to note that various countries have implemented thin capitalization rules to limit tax avoidance through excessive debt financing. These rules are designed to prevent MNEs from reducing their taxable income significantly by imposing a cap on the amount of debt that can be considered for tax deductions (Blaufus, Bob, Hundsdoerfer, Siemann, & Wehrheim, 2017).

Despite the increasing prevalence of these rules, MNEs continue to employ thin capitalization strategies effectively. They adapt by staying within the legal parameters of each jurisdiction's thin capitalization rules. Furthermore, MNEs often make strategic investments in countries with lax thin capitalization regulations or tax havens, thereby maintaining a lower global tax liability (Hebous & Johannesen, 2015; Dharmapala & Riedel, 2013).

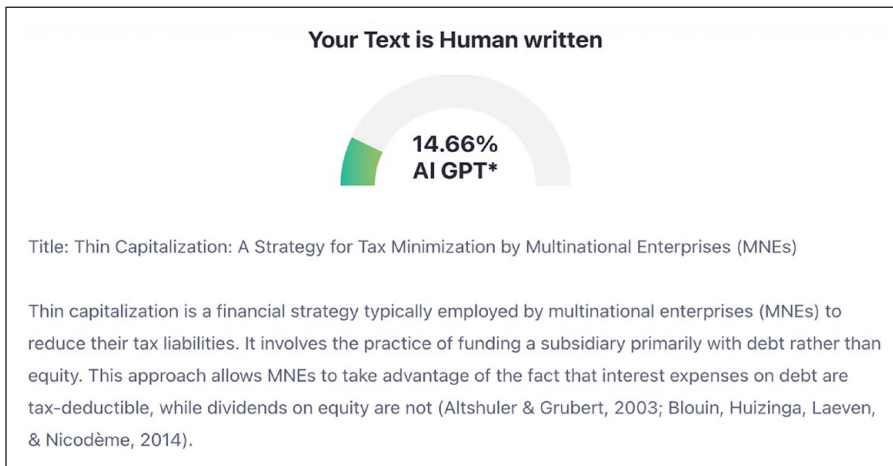
In conclusion, thin capitalization is a crucial strategy utilized by MNEs to minimize their tax payments. While it presents considerable benefits, the ethical implications and regulatory measures associated with this practice require careful navigation. Hence, MNEs need to strike a delicate balance between maximizing profit and adhering to the principles of corporate responsibility.

## References:

- Altshuler, R., & Grubert, H. (2003). Repatriation Taxes, Repatriation Strategies and Multinational Financial Policy. *Journal of Public Economics*, 87(1), 73–107.
- Blouin, J., Huizinga, H., Laeven, L., & Nicodème, G. (2014). Thin Capitalization Rules and Multinational Firm Capital Structure. CESifo Working Paper Series No. 4695.
- Buettner, T., Overesch, M., Schreiber, U., & Wamser, G. (2012). The Impact of Thin-Capitalization Rules on Multinationals' Financing and Investment Decisions. *Journal of Public Economics*, 96(11-12), 930-938.
- Devereux, M., & Maffini, G. (2007). The Impact of Taxation on the Location of Capital, Firms, and Profit: A Survey of Empirical Evidence. Oxford University Centre for Business Taxation.
- Mintz, J., & Weichenrieder, A. (2010). The Indirect Side of Direct Investment: Multinational Company Finance and Taxation. MIT Press.
- Johannesen, N. (2014). Tax Avoidance with Cross-Border Hybrid Instruments. *Journal of Public Economics*,

**Figure 5.** Detailed Turnitin receipt for ChatGPT4 essay answer.

Interestingly, ChatGPT3 was quite generous in terms of assessing (its own) work (perhaps not surprising?) by awarding it a score of 90 (out of 100). As most of us know, grading on a curve, and being careful in terms of outliers (high and low), is one of the most emphasized aspects of the assessment process, a score this high is rather odd. Furthermore, the short feedback provided seems acceptable and relevant, although the length of it (the number of things listed as shortcomings) does conflict with the very high grade granted. Nevertheless, I have been pleasantly surprised by the feedback itself and I assume that with some minimal model training, one can fine-tune such tools into great essay marking machines.



**Figure 6.** ZeroGPT receipt for ChatGPT4 essay answer.

Replicating this exercise in May 2023 with GPT-4, the feedback was even better, mimicking to some extent, real-world blueprints I have seen in my large courses where often I get teaching staff to help me grade and the exam batches are within hundreds. Overall, the grade went up, but given the major improvements made in the essay as well, it is not surprising (still too generous though!).

#### **ChatGPT4:**

Feedback: The essay provides a comprehensive analysis of thin capitalization, demonstrating a clear understanding of the concept. The essay is well structured, with a clear introduction, body and conclusion. Furthermore, it adeptly incorporates a multitude of references to support the argument.

Areas for improvement include:

Real-world examples: Although the essay provides a strong theoretical overview of thin capitalization, incorporating specific examples of MNEs that use thin capitalization strategies would make the essay more engaging and relatable.

Greater exploration of counterarguments: While the essay does mention the ethical implications and regulatory measures related to thin capitalization, a more in-depth exploration of these counterarguments could strengthen the essay and provide a more balanced perspective.

More depth in the conclusion: The conclusion could be enhanced by summarizing the main points more thoroughly and adding some insights into potential future trends or implications of thin capitalization.

Grade: 92/100