Assessing compliance with UK loot box industry self-regulation on the Apple App Store: a 6-month longitudinal study on the implementation process

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Abstract

Loot boxes in video games can be purchased with real-world money in exchange for random rewards. Stakeholders are concerned about loot boxes’ similarities with gambling and their potential harms (e.g., overspending). The UK Government has decided to first try relying on industry self-regulation to address the issue, rather than to impose legislation. These self-regulations have since been published by Ukie (UK Interactive Entertainment). Many stakeholders are interested in a transparent and independent assessment of their implementation. Compliance with some of these self-regulatory measures are empirically testable. The highest-grossing iPhone games will be played for up to one hour to confirm whether they contain loot boxes. If they do, probability disclosures will be searched for in-game; presence disclosures will be searched for on the Apple App Store product page; and attempts will be made to purchase loot boxes without parental consent whilst pretending to be under 18 (e.g., entering an appropriate birth date whenever demanded). This will be done six months after the publication of the principles (baseline; to track the implementation progress) and then again 12 months after their publication (follow-up; to check compliance, as by that point all games would be required to comply). Conclusions will be drawn as to whether the measures have been complied with by companies to an adequate degree. In addition, by checking whether the games identified as non-compliant at baseline have since complied or been removed at follow-up, conclusions will be drawn as to whether stakeholders (e.g., Apple) are enforcing the regulations.

Keywords:
Loot boxes; Video games; Video gaming regulation; Interactive entertainment law;
Information technology law; Consumer protection; Industry self-regulation; Social
corporate responsibility
Conflict of Interest

L.Y.X. was employed by LiveMe, then a subsidiary of Cheetah Mobile (NYSE:CMCM), as an in-house counsel intern from July to August 2019 in Beijing, People’s Republic of China. L.Y.X. was not involved with the monetisation of video games by Cheetah Mobile or its subsidiaries. L.Y.X. undertook a brief period of voluntary work experience at Wiggin LLP (Solicitors Regulation Authority (SRA) number: 420659) in London, England in August 2022. L.Y.X. has contributed and continues to contribute to research projects that were enabled by data access provided by the video game industry, specifically Unity Technologies (NYSE:U) (October 2022 – Present). L.Y.X. has met and discussed policy, regulation, and enforcement with the Belgian Gaming Commission [Belgische Kansspelcommissie] (June 2022 & February 2023), the Danish Competition and Consumer Authority [Konkurrence- og Forbrugerstyrelsen] (August 2022), the Department for Digital, Culture, Media and Sport (DCMS) and its successor of the UK Government (August 2022 & August 2023), PEGI (Pan-European Game Information) (January & March 2023), a member of the European Parliament (February 2023), the US Federal Trade Commission (February 2023), the Finnish Gambling Administration at the National Police Board [Poliisihallituksen arpaajaishallinto / Polisstyrelsens lotteriförvaltning] (March 2023), the Danish Gambling Authority [Spillemyndigheden] (April 2023), the Netherlands Authority for Consumers and Markets [Autoriteit Consument & Markt] (May & June 2023), and the Swedish Gambling Authority [Spelinspektionen] (June 2023). L.Y.X. has been invited to provide advice to the DCMS on the technical working group for loot boxes and the Video Games Research Framework. L.Y.X. was the recipient of two AFSG (Academic Forum for the Study of Gambling) Postgraduate Research Support Grants that were derived from ‘regulatory settlements applied for socially responsible purposes’ received by the UK Gambling Commission and administered by Gambling Research Exchange Ontario (GREO) (March 2022 & January 2023). L.Y.X. has accepted funding to publish academic papers open access from GREO that was received by the UK Gambling Commission as above (October, November, & December 2022 & November 2023). L.Y.X. has accepted conference travel and attendance grants from the Socio-Legal Studies Association (February 2022 & February 2023); the Current Advances in Gambling Research Conference Organising Committee with support from GREO (February 2022); the International Relations Office of The Jagiellonian University (Uniwersytet Jagielloński), the Polish National Agency for Academic Exchange (NAWA;
Narodowa Agencja Wymiany Akademickiej), and the Republic of Poland (Rzeczpospolita Polska) with co-financing from the European Social Fund of the European Commission of the European Union under the Knowledge Education Development Operational Programme (May 2022); the Society for the Study of Addiction (November 2022 & March 2023); the organisers of the 13th Nordic SNSUS (Stiftelsen Nordiska Sällskapet för Upplysning om Spelberoende; the Nordic Society Foundation for Information about Problem Gambling) Conference, which received gambling industry sponsorship (January 2023); and the MiSK Foundation (Prince Mohammed bin Salman bin Abdulaziz Foundation) (November 2023). L.Y.X. has received an honorarium from the Center for Ludomani for contributing a parent guide about a mobile game for Tjekspillet.dk, which is funded by the Danish Ministry of Health’s gambling addiction pool (Sundhedsministeriets Ludomanipulje) (March 2023). A full gifts and hospitality register-equivalent for L.Y.X. is available via: https://sites.google.com/view/leon-xiao/about/gifts-and-hospitality-register. The up-to-date version of L.Y.X.’s conflict-of-interest statement is available via: https://sites.google.com/view/leon-xiao/about/conflict-of-interest.
1. Introduction

Loot boxes are products inside video games that players can buy to obtain random rewards. Some non-paid loot boxes may be obtained without spending real-world money (e.g., through performing various in-game tasks). However, the present study focuses on paid loot boxes that players spend real-world money to purchase either directly or indirectly by spending money to purchase ‘premium’ in-game currency that can then be used to buy loot boxes. Hereinafter, references to ‘loot boxes’ refer only to ‘paid loot boxes’ unless otherwise specified. Importantly, a ‘loot box’ needs not be visually portrayed as a box: any in-game purchase involving real-world money with any randomised elements satisfies the definition.

Stakeholders (e.g., consumers, parents, and advocacy groups) are concerned about loot boxes’ structural and psychological similarities with gambling and how vulnerable consumers (e.g., children and people experiencing problem gambling harms) might be at risk of overspending money. Policymakers around the world are considering potential regulation, and a few countries have already taken action. For example, in 2018, Belgium applied pre-existing gambling law to attempt to ‘ban’ loot boxes as unlicensed illegal gambling. However, this intervention has been poorly enforced, such that 82 of the 100 highest-grossing iPhone games on the Belgian Apple App Store in mid-2022 continued to sell loot boxes in exchange for real-world money. The Belgian experience demonstrates that a traditional gambling regulator that was originally resourced (e.g., in terms of public funding and manpower) to monitor only the traditional gambling industry would not be capable of also regulating the video game industry (which is composed of many smaller operators often based in foreign jurisdictions) without significantly more additional support, monetary and otherwise.

For other countries, amending gambling law to additionally include loot boxes and thereby place them within the purview of the gambling regulator is therefore likely unworkable without substantial investments towards that end. Such investments may be viewed as an unjustifiable expenditure of public money. Recognising that, the UK Government (specifically, the Department for Culture, Media and Sport (DCMS)) decided in July 2022 to ask the industry to try better self-regulating loot boxes and addressing relevant concerns first, rather than to immediately impose legislation. The Government did promise that it ‘will not
hesitate to consider legislative options,’ if video game companies and platforms do not ‘improve protections for children, young people and adults’ and if ‘tangible results’ cannot ‘begin to be seen in the near future’[14(para. 32)]. These self-regulatory rules, presented as 11 principles, have since been published one year later by Ukie (UK Interactive Entertainment), the national video game industry trade body, on 18 July 2023[15], with support from the Government[16].

Besides the aforementioned Belgian example, previous research has also found that companies’ compliance with various other loot box-related regulation has been poor. In China, where companies are required by law to disclose the probabilities of obtaining various random rewards from loot boxes[17], most high-grossing games were found to have complied sub-optimally by choosing methods of displaying the disclosures that lacked visual prominence and were difficult to access[18]. Indeed, industry self-regulation of loot boxes is not a new concept and has already been attempted for several years to dubious benefit. The potential underlying efficacy of the interventions has not been scientifically proven and has never been measured since implementation (although this easily could have, and should have, been done by the industry to inform all stakeholders and improve public confidence).

Importantly, many of the highest-grossing games were found to have been non-compliant, and relevant platforms and rule-makers did not appear to have actively monitored compliance, nor punished non-compliance, with previous industry self-regulation. For example, in mid-2021, 36% of the highest-grossing iPhone games containing loot boxes were found to have failed to disclose probabilities, as required by Apple App Store’s platform rules, seemingly with impunity[19].

The North American (ESRB; the Entertainment Software Rating Board) and European (PEGI; Pan-European Game Information) age rating organisations’ mandated loot box presence warning label was not properly implemented through the IARC (International Age Rating Coalition) system, such that 71% of popular games containing loot boxes did not bear the label on the Google Play Store and thereby failed to inform consumers about the potential risks[20]. Many games were also identified as unlabelled on other storefronts operated by Epic Games, Nintendo, Sony, and Microsoft[21]. A number of unlabelled games have since been duly labelled, for which some credit is due to the self-regulatory age rating organisations; however, that was done only in response to external academic scrutiny and after
being explicitly requested, in the absence of which, those games would likely have remained incorrectly unlabelled even today\textsuperscript{[22]}.

Prior research has demonstrated that loot box regulations, particularly industry self-regulatory ones, were poorly complied with in the past. Accordingly, reasonable doubt can, and ought to, be cast on whether companies will comply with the newly proposed UK loot box industry self-regulation. Many stakeholders are interested in a transparent and fair assessment of the implementation of the Ukie self-regulatory principles. Not every principle contained therein is capable of empirical study. For example, Principle 7 is to support the implementation of the Video Games Research Framework\textsuperscript{[23]}, which is a UK Government document intended to promote better research into video games and related issues. Similarly, Principle 9 is a commitment to adopt more lenient refund policies when it can be demonstrated that in-game purchases were made without parental consent or knowledge. Such principles would be welcomed by all stakeholders without controversy, but compliance with them is difficult to quantify or objectively measure against a predetermined standard.

However, three principles are empirically testable (and indeed two of them have already previously been so assessed\textsuperscript{[18–21]}). Firstly, Principle 1 demands that the purchase of loot boxes with real-world money by under-18s is to be restricted such that it may only be done with parental consent. (This is the only ‘new’ requirement that has not already been otherwise introduced; the following two requirements should already have been adopted elsewise as detailed below.) Secondly, Principle 4 requires companies to disclose the presence of paid loot boxes to consumers prior to purchasing or downloading the game using,\textit{inter alia}, the relevant PEGI presence warning label\textsuperscript{[24]}. Thirdly, Principle 5 states that companies must make probability disclosures informing players of their likelihood of obtaining various random rewards from loot boxes.

Companies have been given a 12-month implementation period (starting from 18 July 2023) to adopt these measures\textsuperscript{[15]}. In other words, one cannot say that a game that continues to permit loot box purchasing by under-18s without parental consent is actually non-compliant with Principle 1 until 18 July 2024. Notwithstanding, the disclosure of loot box presence to consumers prior to purchasing and downloading
on any advertising of a video game (now, arguably misleadingly, presented through Principle 4 as a supposedly new measure) has already been required by advertising regulations, as clarified in the Guidance on advertising in-game purchases published in September 2021, which is enforced by the relevant regulator, the Advertising Standards Authority\textsuperscript{[25]}. I have since complained to the Advertising Standards Authority about games that were non-compliant, and the Advertising Standards Authority Council has held in two separate rulings that companies that do not disclose the presence of loot boxes on Apple\textsuperscript{[26]} and Google\textsuperscript{[27]} store pages are breaching advertising law. Therefore, irrespective of the implementation process, games should already be compliant with the essence of Principle 4, otherwise they are advertising illegally. Similarly, many platforms, including the Apple App Store, have required the disclosure of loot box probabilities since 2019, if not earlier\textsuperscript{[28–30]}, as now also expressed through Principle 5 (again, arguably misleadingly as if this is a new proposal). Hence, non-compliance with Principles 4 and 5 at present, even prior to the end of the 12-month implementation period or 18 July 2024, would contravene other existing regulation and be reprehensible.

The UK Government\textsuperscript{[16(\textsubscript{para. 23})]} and Ukie\textsuperscript{[15]} have both expressed that progress should be monitored and periodically reviewed during the implementation process. Relevant civil servants have informed the author that it would be beneficial for independent, transparent scrutiny of the compliance with these measures (which is one reflection of their potential efficacy, as even an effective measure that is not complied with would be ineffective) to be made six months after the publication of these principles (i.e., around January 2024) and then again following the implementation period (i.e., around July 2024). This would complement any assessments that the industry, represented by Ukie itself, might conduct and publish.

Research Question 1: Are the 100 highest-grossing iPhone games complying with three separate aspects of the UK loot box industry self-regulation?

Hypothesis: This will be assessed by checking whether 1: all highest-grossing iPhone games containing paid loot boxes in the 18 January 2024 sample and the 18 July 2024 sample will (i) prevent loot box purchasing by under-18s unless parental consent has been provided, (ii).
Hypothesis 2: All highest-grossing iPhone games containing paid loot boxes in the 18 January 2024 sample and the 18 July 2024 sample will disclose loot box presence.

Hypothesis 3: All highest-grossing iPhone games containing paid loot boxes in the 18 January 2024 sample and the 18 July 2024 sample will and (iii) make loot box probability disclosures.

Research Question 2: Do platforms and rulemakers enforce their own self-regulation and punish non-compliant companies?

This will be assessed by checking whether Hypothesis 4: All highest-grossing iPhone games containing paid loot boxes in the 18 January 2024 sample that will not disclose loot box presence nor make loot box probability disclosures will either have done both, or have been delisted from the UK Apple App Store, by 18 July 2024.

2. Method

The list of the 100 highest-grossing games for the iPhone platform in the UK on 18 January 2024 and on 18 July 2024 will be separately collated through data.ai, a leading analytics company. These two lists will form the samples, which will be individually studied at two separate points in time immediately following each aforementioned date. If any game in the 100 highest-grossing lists will no longer be available for download from the UK Apple App Store by the data collection period, then it will be excluded from the sample and replaced with the next highest-grossing game (e.g., the first unavailable game will be replaced with the 101st highest-grossing game). The results in relation to each list/sample will be separately reported in two studies in order to ensure that the results may be promptly published to assist in policy implementation when they still remain relevant.

Previous studies assessing loot box prevalence and compliance with presence warning and probability disclosure requirements have focused on the 100 highest-grossing games. That sample size and sampling method are reasonable and justified, due to resource constraints (mostly on researcher time) and given that stakeholders (e.g., parents and policymakers) are far more interested in the situation concerning popular games that many players have demonstrably spent money on, rather than
that of obscure titles that may only be downloaded a handful of times per year. With
that said, a key limitation must now be conceded with this sampling methodology.
Previous research has repeatedly focused directly or indirectly on the 100 highest-
grossing games\cite{13,18-20}. The games on that list have not changed significantly over the
time (although some entries do get replaced by newly released titles occasionally,
they would still be relatively high-grossing games, e.g., be within the 500 highest-
grossing games), meaning that previous research has studied certain games multiple
times and, importantly, had publicly identified them as being non-compliant with
pre-existing regulatory requirements (that the present study will also assess), such as
not making probability disclosures or not disclosing loot box presence. Those
previous research efforts are known to have directly caused the companies behind
some of those games to take remedial actions, or to be forced to do so by age rating
organisations, to become compliant\cite{22}. Some of these same games will likely be
included in the 100 highest-grossing list again on the data collection dates of the
present study, meaning that, although they may now be identified as compliant, that
was already guaranteed by (and indeed only due to) previous external intervention.
It cannot be known whether those now-‘compliant’ games would have been so
without that external interference. This means that the compliance rates amongst the
highest-grossing games are likely to now be artificially higher than those amongst all
other games. Alternatively, randomly sampling 100 games from the 500 highest-
grossing games also would not completely remove this bias because some games
that were previously studied and whose compliance was artificially affected would
have fallen below the 100th rank but still remain within the top 500. Those lower
ranking and less popular games would also affect significantly fewer players and
therefore be less concerning to stakeholders. Indeed, it remains valid to simply
sample the 100 highest-grossing games because the findings would be the most
practically informative and relevant as they show the situation as a consumer would
encounter it. The artificial interventions have already happened and thereby affected
the average consumer experience (hopefully positively), so although any findings
would no longer be entirely ‘natural,’ such findings remain the most useful. The
present results simply must not be overinterpreted as indicative of the compliance
rates amongst less popular games (which are likely to be lower) or how they would
have been had there been no previous intervention.
The focus on the Apple App Store platform is predominantly due to resource constraints on the author’s time. Ideally, the situations on other platforms (e.g., the Google Play Store and the stores of consoles like the Sony PlayStation, Microsoft Xbox, and Nintendo Switch) would also be assessed. However, previous research has suggested that the loot box issue is more concerning on mobile platforms than PC and console platforms: this is because there are significantly more content on mobile platforms (which makes compliance and enforcement more difficult), and the prevalence rate of loot boxes is also significantly higher there.[20] There are also further complications with potentially studying the Android mobile platform specifically. Firstly, games can be installed through many different storefronts (e.g., the Samsung Galaxy Store, HUAWEI AppGallery, etc., which are not covered by the self-regulation, as it applies only to certain explicitly listed platforms). Secondly, games may be easily installed directly with a .apk (Android Package) file that may not be the UK-compliant version. Therefore, a study of only the Google Play Store does not fully reflect the experience of a (child) consumer using Android devices. The present study is intended to focus limited resources on providing a fair perspective on the iOS platforms, where the Apple App Store solely dominates as it is the only permitted app store for the operating system[see 31]. This would also provide data comparable to those of a previous 2021 study on iPhone probability disclosures in the UK[19]. Finally, the versions of the game available on the Apple App Store and Google Play Store should, in theory, be substantively identical, and the highest-grossing lists for the two platforms overlap significantly, so the present results should be broadly transferable. For example, if the iPhone version made probability disclosures, then the Google Android version probably would have done as well.

The following variables will be measured:

Apple age rating
This will be copied from the relevant age rating information displayed on the game’s UK Apple App Store page. No game will be excluded due to its age rating because Apple’s highest age rating is 17+ and the Ukie principles apply to all young people under 18. Therefore, 17-year-olds can play all games available on the Apple App Store but are still supposed to be protected by the self-regulation.
Presence of paid loot boxes

Each game will be downloaded from the UK Apple App Store and played for an hour to identify whether paid loot boxes (as defined in Annex B of the Ukie self-regulation, which aligns with the present study’s and the ESRB’s definition as set out in the Introduction section[2]) are being implemented and sold in exchange for real-world money or premium in-game currency that could in turn be bought with real money. If multiple loot boxes are found within that hour, then they will each be separately noted. Screenshots will be taken of any found loot boxes.

One hour of ‘playing’ the game will mean that, from downloading and starting the software, I will use my best endeavours for 60 minutes to unlock as many aspects of the game and gain access to as many in-game purchasing offers as possible: for example, I will choose to access the in-game store where loot boxes are presumably sold as soon as able, including by skipping unnecessary story elements. Our previous research using this methodology has acknowledged that the detection rate of loot boxes is not 100% because there are likely games that only begin to sell loot boxes many hours after the player starts playing and because loot boxes might simply be missed by the researcher[19(p. 12)]. This one-hour time limit is justified on resource constraints on my time. In addition, based on previous research, this method should be sufficient to detect at least 80% games with loot boxes (assuming that every game contains loot boxes, which is most likely untrue, so the true detection rate is higher)[13]. The percentage rate of games found to contain paid loot boxes within one hour of examination will be referred to as the ‘prevalence rate’ of loot boxes (as has been done in the past), even though more accurately, it would be the prevalence rate when only one hour has been spent examining the game and the true prevalence rate is therefore likely higher.

Presence of technical measures to prevent loot box purchasing by under-18s

When playing each game, if and whenever prompted by the game to answer any questions relating to age (such as ‘how old are you?’ and ‘in which year were you born?’), an answer that would make the user appear to be 17 years old will be provided. This age was chosen because some games on the Apple App Store platform are given the highest age rating of 17+, which should render them unavailable for download by younger users. A 17-year-old can download and play them, but they also remain under 18 for the purposes of the Ukie loot box industry.
self-regulation, such that their loot box purchasing should be restricted until parental consent is provided. The purchase of paid loot boxes will be attempted to check whether this could be done without parental consent or knowledge on a user account that will purportedly belong to a 17-year-old. A game will be deemed as having complied with Principle 1 if the aforementioned paid loot box purchasing attempt is unsuccessful.

Importantly, the operating system-level spending control feature that Apple provides for parents (‘Ask to Buy’[32]) will not be accounted for by the present study. Activating this would blankly require under-18s to send requests for approval to their parents for all in-game purchases (regardless of whether they are loot box purchases), app store purchases, and even app store downloads of ‘free’ games. Under-18s must wait until these are approved before the transaction can take effect. That feature is undoubtedly valuable for parents and other caretakers wanting to better monitor and manage their child’s video game spending and should be used by them, but the present study is concerned with individual game-level compliance and interventions that specifically relate to loot boxes by highlighting that a purchase is potentially problematic because it is a loot box purchase. Broad, platform-wide spending control mechanisms like Apple’s Ask to Buy often fail to provide specific information about loot boxes because loot boxes are very rarely directly purchased with real-world money and often must be purchased using (premium) in-game currency (e.g., ‘Green Gems’) that is in turn bought using real-world money. (Indeed, representatives of the video game industry, including Ukie[33(p. 9, para 43),see also 34(p. 13)], have previously argued that games that directly sell loot boxes, rather than sell them through an intermediary premium currency, are confusing for the player and arguably in contravention of Principle 4 of the Office of Fair Trading’s Principles for online and app-based games.[11,35]) The payment request to parents would therefore merely appear as a request to purchase in-game currency with real-world money and provide no information on what that currency will then be used for (e.g., purchasing loot boxes). No further notification would be provided by the Ask to Buy system to the parent when those Green Gems are then used in-game to purchase loot boxes. This latter instance is where an in-game intervention asking for parental consent to a loot box purchase (as envisioned by the Ukie self-regulation) is expected to occur.
To further illustrate, by relying on platform-level controls only, it would require the parent to ask the child what they intend to spend the Green Gems on (when the Ask to Buy request for that transaction appears), before the real-money-to-Green-Gems transaction takes places, for them to find out that loot boxes will be purchased. The child might be undecided as to how they want to spend the Green Gems, and the child might also not understand that, with those Green Gems, they will be buying a gambling-like ‘loot box’ that is seen as problematic (as many of these products are not advertised as such) or be untruthful. The game company must directly communicate the fact that loot box purchasing by a child is taking place to the parent. Alternatively doing this through the child as an intermediary is not a dependable or acceptable proposal. In short, the platform-level controls (assuming that they are turned on) effectively restrict the first premium currency transaction using real-world money but never the second loot box purchasing transaction using in-game premium currency (which is where the intervention should take place).

Platform-level controls may be deemed sufficient for games where the payment request is for loot box-like mechanics directly and that request clearly explains how the mechanic works and any associated concerns. However, given that nearly all games do not offer this, relying solely on this measure would be unwise. For payment requests to purchase premium currency, Apple may consider allowing (but has not yet allowed) games to append information on how that premium currency might then be spent on loot boxes and such mechanics and outline the potential related concerns. However, until that is uniformly and satisfactorily done, a parent cannot trust the Ask to Buy feature alone to protect their child.

Another point is that platform-wide parental control would also require the parent to activate it. These may be turned on by default in some instances, but regulation must not proceed on the unreasonable assumption that all parents already have this turned on for every child. It would not be right to place that burden on parents. A child may also engage with a game downloaded on a parent’s or the family device, in which case platform-level controls are not active. Multiple layers of protection should be provided. Indeed, had robust parental controls already been widely utilised, then no further regulation (including the Ukie self-regulation) would be required. It is precisely because of the potential failings of pre-existing parental control features that the Ukie self-regulation is being newly introduced to directly address the loot box issue. It is therefore reasonable to expect individual games to be
taking action and making interventions inside the game. The drafters of the self-
regulation surely must not have deemed pre-existing platform-wide parental
controls to already be sufficient, as those have already been available for many years
and so the self-regulation would then be proposing nothing new.

Presence of presence disclosures
For each game found to contain paid loot boxes, its Apple App Store product page
will be reviewed to attempt to find a disclosure of loot box presence, such as the
PEGI warning label of ‘In-game Purchases (Includes Random Items)’\textsuperscript{[20,24]} or some
text describing the availability of paid loot boxes. Any disclosure, however difficult
to find and access and however phrased, will be recognised as a disclosure having
been made as long as it can reasonably be so interpreted, because the self-regulation
merely requires that this be done and not that it be done visually prominently or
informatively\textsuperscript{[15(p. 5)]}. Nonetheless, different methods of disclosure will be categorised.
A game will be deemed as having complied with Principle 4 if a loot box presence
disclosure can be found.

Presence of probability disclosures
In relation to each type of loot box found in each game, a corresponding probability
disclosure will be searched for in-game. No external searches will be conducted (e.g.,
through a search engine) for disclosures that are available only on websites and not
linked from within the game because the relevant Ukie guidance makes clear that
disclosures should be ‘easily accessible’\textsuperscript{[15(p. 5)]} and any website-based disclosures
(although permitted) should also be sign-posted from within the game itself\textsuperscript{[15(p. 15)]}.
All found probability disclosures will be screenshotted, and the process for accessing
them from the loot box purchase screen will be documented. Any disclosure
formats, regardless of their visual prominence or ease of access, will be recognised as
a disclosure having been made, because even though Principle 5 encourages ‘easily
accessible’ and ‘clear and simple’ probability disclosures, those qualities are
subjective to a certain degree. Different methods of disclosure will be categorised. A
game will be deemed as having complied with Principle 5 only if a corresponding
probability disclosure can be found for every identified loot box type.

Changes in compliance following initial study and reporting to Apple and other stakeholders
Any non-compliance with Principles 4 and 5 found amongst the 18 January 2024 sample will be reported to Apple and other stakeholders (e.g., DCMS and Ukie) for enforcement actions to be taken (e.g., an ultimatum to comply by a certain date, failing which the game would be removed from the UK Apple App Store for contravening platform rules or advertising regulations). Any non-compliance with Principle 1 will also be reported, but no further action will be requested given that a game is required only to comply with that measure by 18 July 2024. For games that would be included in the 18 January 2024 sample and would be found to have been non-compliant with any one of the three principles, they will be re-examined alongside the 18 July 2024 sample (if they would not already be included in that sample), to check any potential changes in compliance (e.g., (a) having since complied or (b) having since been delisted).

**Date and time of data collection**

The date and time, based on UK time, on and at which the game was examined, will be recorded.

The ‘compliance rate’ with each loot box self-regulatory measure will be calculated as follows:

\[
\frac{\text{Games containing loot boxes and complying with the relevant measure}}{\text{Games containing loot boxes}}
\]

Even though some games might be inaccurately marked as not containing loot boxes even though they do using the present methodology of examining the game for one hour only (because the loot boxes would only become available for purchase after more than one hour of gameplay), the compliance rates with various regulatory measures will not be affected because games assumed to not contain loot boxes will be excluded. The relevant compliance rates will reflect the true situation amongst the games containing loot boxes that were actually tested.

**For each measure assessed for Research Question 1, a compliance rate of Hypotheses 1 to 3 will each be respectively accepted if at least 95% of games containing loot boxes do comply with the relevant measure (i.e., the compliance rate is \(\geq 95\%\)) will be interpreted in the Discussion section as near perfect and satisfactory compliance.**
Otherwise, they will be rejected. This 5% of leeway (from a perfect compliance of 100%) will be permitted as a type 1 error control measure to account for potential false positives. As to the interpretation of different potential results, if the compliance rate for a certain measure is $\geq 95\%$, then it will be interpreted as that measure having been nearly perfectly complied with. A compliance rate that is $\geq 80\%$ but $< 95\%$ will be interpreted as a measure having been mostly complied with but needs some improvements. A compliance rate that is $< 80\%$ will be interpreted as the measure not having been adequately complied with and needs significant improvements to achieve the regulatory aim. In addition, if the compliance rate with a specific measure improves from one band into the next (e.g., from $< 80\%$ to $\geq 80\%$) when the 18 January 2024 sample is compared with the 18 July 2024 sample, then I will comment positively on how compliance has improved. These cut-offs were used previously and are based on the author’s intuition as to what consumers, policymakers, and independent researchers would likely deem acceptable or not\[^{20,21}\]. These cut-offs are being preregistered to ensure that the author’s subsequent interpretation will not be affected by the compliance rates that will eventually be found. This is because a certain compliance rate is open to multiple interpretations by various stakeholders and indeed by the same person. For example, one might subjectively interpret a 60% compliance rate as either poor or satisfactory: an industry representative might say it is good, whilst an advocacy group in favour of banning loot boxes might view it as terrible; both sides are arguable. However, any flexibility in potential interpretation by the author is hereby eliminated through preregistration of the aforementioned cut-offs.

For that same reason, the author invited stakeholders (specifically, the DCMS and Ukie) will be invited to preregister how they will interpret different potential results that may be found by the present study. However, both have refused. DCMS stated in response to the author’s request that it is ‘extremely cognisant of the need for a high rate of compliance and suitable tracking of it, but [DCMS has] made a recent public statement on loot boxes [referring to its 18 July 2023 statement supporting and approving the Ukie self-regulations upon their publication, which did not set out what degree of compliance would be deemed satisfactory by the UK Government\[^{16}\] and are not planning to say anything further publicly at this point while [it continues] to work behind the scenes with academics and industry.’ The author also understands that there might also be some hesitancy on the parts of civil
servants in purporting to bind not just the current government’s interpretation but also the next government’s (which might well be formed by the opposing political party with different views on what degree of compliance is acceptable).

Ukie’s refusal of the author’s request stated, firstly, that it does not think the assessment should occur before the end of the 12-month implementation period and, secondly, that the author’s proposed method of testing Principle 1, which specifically excludes platform-level controls, is unacceptable. The author is willing to accept Ukie’s refusal in relation to Principle 1 (prevent under-18s from purchasing loot boxes without parental consent). However, the reasons provided by Ukie do not apply to the testing of Principles 4 (presence disclosures) and 5 (probability disclosures), which are both already required by other regulations, irrespective of the implementation period of the Ukie self-regulatory principles, and whose assessment methods are objective and have not been objected to. The author therefore replied and asked Ukie to then instead preregister its potential interpretations for Principles 4 and 5 only. Ukie has not responded after one month. Unfortunately, these negative responses mean that there is a lack of transparency and accountability to the public. It is also unfortunate for the industry that it does not have a clear target to meet and may still be regulated against despite many members having used their best endeavours. If the compliance rate with a specific measure improves from one band into the next (e.g., from < 80% to ≥ 80%) when the 18 January 2024 sample is compared with the 18 July 2024 sample, then I will comment positively on how compliance has improved.

For Research Question 2, I will conclude that the self-regulations are being properly enforced Hypothesis 4 will be accepted if all games amongst the 18 January 2024 sample that were non-compliant with either Principle 4 or 5 will have either complied with both measures, or have been delisted from the UK Apple App Store, by 18 July 2024. Otherwise, I will make the opposite conclusion and criticise relevant stakeholders for not strictly enforcing platform rules, advertising regulations, and the Ukie self-regulatory principles it will be rejected. The only exception would be that if a game has since stopped selling loot boxes, in which case that would cause that game will to be excluded, when answering Research Question 2for the purposes of Hypothesis 4. The expectation that 100% (rather than 95%) of
games will either become compliant or be delisted is justified on the basis that a list containing all relevant games will have been provided to the stakeholders to take enforcement actions. Any potential Type 1 error will be eliminated by how the Apple App Store and/or the relevant video game companies will be given the opportunity to provide evidence that the game does not contain loot boxes or have already made the relevant disclosures, so a further 5% of leeway (given above for other assessments to Hypotheses 1–3) is not appropriate here for Hypothesis 4. In the event Hypothesis 4 is rejected, relevant stakeholders will be criticised for not strictly enforcing platform rules, advertising regulations, and the Ukie self-regulatory principles. Otherwise, the conclusion will be that the self-regulations are being properly enforced.

To further address the issue of how the compliance rates amongst the highest-grossing games may have been affected by previous external intervention, the compliance rates for each loot box self-regulatory measure will also be separately reported for games that have previously been studied and those that have not been.

In accordance with the Danish Code of Conduct for Research Integrity[36], as adopted by the IT University of Copenhagen, the present programmatic registered report will not require research ethics assessment and approval because no human participants or personal data will be involved and only publicly available information will be examined and recorded.

3. Results

4. Discussion

5. Conclusion
Positionality Statement
In terms of the author’s personal engagement with loot boxes, he plays video games containing loot boxes, but he has never purchased any loot boxes with real-world money.

Data Availability Statement
The raw data and a full library of PDF printouts and screenshots showing, *inter alia*, the relevant Apple App Store webpage sections and in-game loot box purchase pages for each game will be publicly available in the Open Science Framework at [https://doi.org/10.17605/OSF.IO/YNJ5X](https://doi.org/10.17605/OSF.IO/YNJ5X).

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27. https://doi.org/10.1017/bpp.2021.23


https://doi.org/10.1017/journal.pone.0286681


https://doi.org/10.1098/rsos.230270


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